Fac/Perm/Co ID # 26-DB | Date 2/8/13 | DIN 19386

US Army Corps of Engineers
Fort Bragg, NC

Construction and Demolition Landfill Phase I Closure

As-Built Documentation and Certification Report

February 2013

02/08/2013 DIN 19386 Page 1 of 330

Prepared for:

DPW Engineering Division
Attn: AFZA-PW-C
Building 3-1933 Butner Road
Fort Bragg, NC 28310-5000

Prepared by:

HDR

HDR Engineering inc. of the Carolinas
3733 National Drive Suite 207
Raleigh, NC 27612-4845
HDR Project 11236-120265-018

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Raleigh, North Carolina 27612

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ABSTRACT

This certification report provides documentation for the construction of the approximately 10.34 acre Phase I closure of the Fort Bragg Construction and Demolition (C&D) Landfill located off of Lamont Road within the Fort Bragg military Reservation in Cumberland County, North Carolina.

The closure construction work was conducted between June and September 2012. HDR Engineering, Inc. of the Carolinas (HDR) provided part-time construction quality assurance (CQA) services to the Fort Bragg Directorate of Public Works (DPW) during closure construction. CQA services provided by HDR included the part-time observation of the following construction activities:

- low-permeability barrier layer test pad construction;
- low-permeability barrier layer construction;
- erosion layer construction including topsoil placement;
- passive gas vent installation;
- installation of sideslope swales, diversion berms, and perimeter stormwater channels; and,
- permanent seeding.

HDR also provided limited CQA testing to independently verify the soil materials used in the project met the specification requirements.

The conformance of the construction materials and installation methods with the requirements of the technical specifications prepared specifically for this project was documented for each component. The required testing was performed using the methods and frequencies outlined in the technical specifications. Materials, site conditions, or test results that indicated nonconformance were identified, reported, and remediated. The low-permeability soil layer was required to achieve both a maximum permeability of $1x10^{-5}$ cm/sec and a minimum thickness of 18 inches. The erosion layer was required to achieve a minimum thickness of 18 inches with the top 6 inches consisting of topsoil capable of supporting vegetation. HDR reviewed construction and as-built survey information to verify conformance with the construction limits and tolerances specified.

CERTIFICATION

HDR Engineering, Inc. of the Carolinas (HDR) hereby provides Certification that:

- The construction specifications entitled *Technical Provisions, Issued for Construction, Specification No: F9-00026-8*, dated January 2012 and drawings entitled *Construction and Demolition Landfill Phase II Construction and Phase I Closure Construction Plans, PWBC Project No. F9-00026-8, Fort Bragg, North Carolina*, prepared by HDR and dated April 2011, for the Fort Bragg C&D Landfill Phase I Closure were developed in general accordance with the following documents:
    - *Construction and Demolition Landfill, Phase II Construction, Phase I Closure, Construction Permit Application* dated May 2010 and Revised in March 2011, by HDR and approved by the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Waste management, Solid Waste Section in April 2011.
    - NCDENR Municipal Solid Waste Facility Permit No. 26-08 dated March 19, 2012.
    - The requirements of the applicable North Carolina Solid Waste Management Regulations, Title 15A, Chapter 13B, Section .0547, *Existing C&DLF Units as of January 1, 2007*.
- To the best of our knowledge, the Phase I closure of the Fort Bragg C&D Landfill was constructed in general accordance with the construction specifications and drawings.
- Our knowledge is based on HDR's observations during construction, along with the test results, reports, and as-built documentation presented in this report.
- The closure of Phase I of the Fort Bragg C&D Landfill was completed around the end of September 2012.

The services provided for this project were performed with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time and the same or similar locality. No warranty, expressed or implied, is made or intended by rendition of these consulting services or by furnishing oral or written reports of the findings made. This certification report has been prepared for the exclusive use of Fort Bragg, North Carolina.

Thomas M. Yanoschak, P.E.
Certifying Engineer
N.C. P.E. # 18887

HDR Engineering, Inc. of the Carolinas
N.C. Engineering Board No. F0116

SECTION 1.0 INTRODUCTION

1.1 Background

Fort Bragg owns and operates the Fort Bragg C&D Landfill (Landfill) located on Lamont Road, Fort Bragg Military Reservation, Cumberland County, North Carolina. The landfill was first permitted to operate in 1999 although land clearing and inert debris (LCID) was disposed within a portion of the site prior to the development of the C&D landfill. The landfill is surrounded principally by undeveloped woodlands that are part of the military reservation.

The current facility plan for the site shows the landfill being developed in four phases for a total area of 41.55 acres. Currently, only Phase I (15.7 acres) and Phase II (6.03 acres) are permitted for operation. This certification report addresses the closure of approximately 10.34 acres of Phase I, which represents the first partial closure of the C&D landfill.

1.2 Project Description

HDR was contracted by Fort Bragg to perform part-time construction quality assurance (CQA) services during construction of the Phase I closure which began in June 2012 and was completed in September 2012. The Phase I closure was designed with a cap system which consists of the following components;

- 18-inch erosion layer with the top 6 inches consisting of topsoil capable of supporting vegetation topsoil layer;
- 18-inch low-permeability soil barrier layer (hydraulic conductivity < $1x10^{-5}$ cm/sec);
- diversion berms and sideslope swales directing stormwater runoff to slope drains; and,
- passive gas vents

Construction of the Phase I closure was completed in general accordance with the requirements of the construction specifications and drawings dated January 2012 and April 2012, respectively, prepared by HDR. Supporting documentation such as field and laboratory testing reports, inspection forms and documentation, and as-built drawings is provided in the appendices of this report.

SECTION 2.0 CONSTRUCTION QUALITY PROGRAMS

2.1 Purpose and Scope

The purpose of this certification report is to present the results of the construction quality control (CQC) and construction quality assurance (CQA) documentation related to observations and test data compiled during construction of the Phase I closure of the landfill. This report has been prepared as required by, and in accordance with, the Closure Plan and CQA Plan for closure as contained within the *Construction and Demolition Landfill, Phase II Construction, Phase I Closure, Construction Permit Application* dated May 2010 and Revised in March 2011, by HDR and approved by the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Waste management, Solid Waste Section in April 2011.

2.1.1 Construction Quality Control Program

Construction quality control (CQC) refers to those actions which provide a means to measure and regulate the characteristics of an item or service to the specified contractual and regulatory requirements, including those actions taken by manufacturers, fabricators, installers, or subcontractors (paid for by the contractor) to ensure that the materials and the workmanship meet the requirements of the technical specifications for the project.

SES Construction and Fuel Services LLC (SES), of Oak Ridge, Tennessee, was the general contractor for the Phase I closure project. SES subcontracted the following firms to provide CQC services.

- Froehling & Robertson, Inc., of Fayetteville, North Carolina provided CQC inspection and testing services required during construction for the earthwork during the Phase I closure. Field and laboratory CQC test results associated with the earthwork portion of the landfill closure are presented in Appendix A.
- Strother Land Surveying of Raeford, North Carolina provided CQC surveying services required for the earthwork for the Phase I closure. Surveying data is provided in Appendix C.

2.1.2 Construction Quality Assurance Program

Construction quality assurance (CQA) is a planned and systematic pattern of all means and actions designed to provide confidence that items or services meet contractual and regulatory requirements and will perform satisfactorily in service.

CQA refers to means and actions employed by the Owner to assure the conformity of the earthwork, cap system, passive gas vents, and drainage with the technical specifications and drawings issued for the project. CQA is provided by a party independent from the manufacturer, fabricator, contractor, and installer. HDR provided part-time CQA monitoring services during construction of the Phase I closure. These services included the following.

- Overall coordination between all parties including Fort Bragg representatives, the contractor, CQC consultants, and CQA soils consultant.
- Periodic inspection during periods of major work.

- Verification testing in the form of laboratory hydraulic conductivity and classification testing of the low-permeability barrier soil layer; classification testing of the erosion layer; and pH, organic content, and moisture content testing of topsoil samples.

Geotechnics provided supplemental CQA laboratory services under the direction of HDR and is also referred to as CQA personnel.

2.2 Project Criteria

The Phase I closure construction was performed under the guidance of the following documents.

- The construction specifications entitled *Technical Provisions, Issued for Construction, Specification No: F9-00026-8*, dated January 2012 and drawings entitled *Construction and Demolition Landfill Phase II Construction and Phase I Closure Construction Plans, PWBC Project No. F9-00026-8, Fort Bragg, North Carolina*, dated April 2011, for the Fort Bragg C&D Landfill Phase I Closure.
- *Construction and Demolition Landfill, Phase II Construction, Phase I Closure, Construction Permit Application* dated May 2010 and Revised in March 2011, by HDR and approved by the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Waste management, Solid Waste Section in April 2011.
- NCDENR Municipal Solid Waste Facility Permit No. 26-08 dated March 19, 2012.
- The requirements of the applicable North Carolina Solid Waste Management Regulations, Title 15A, Chapter 13B, Section .0547, *Existing C&DLF Units as of January 1, 2007*.

The quality of the overall project was governed by adherence to the construction specifications and drawings. The quality of the low-permeability barrier layer and erosion layer was governed by adherence to the construction specifications. All construction and CQA/CQC activities were conducted in accordance with the construction specifications and drawings. Documentation of the construction activities and the results of quality assurance and quality control testing are contained in the following sections and appendices of this report.

2.3 CQA/CQC Personnel

HDR provided part-time CQA services during construction of the Phase I closure, as described in this report. Key HDR personnel for this project are listed below.

- Thomas M. Yanoschak, P.E., Design Engineer and Certifying Engineer
- Michael Batten, E.I., Field Inspection

Key representatives of the other parties involved are as follows.

Owner: Fort Bragg

- Audrey D. Oxendine, Chief, Environmental Compliance Branch
- Sid Williamson, Program Manager, Solid Waste/Recycling
- Daniel J. Messier, Landfill Manager

Contractor/Construction Quality Control:

- SES Construction and Fuel Services LLC (General Contractor)
  - Scott A. Ballard, P.E., Senior Engineer
  - Brian Odom, P.G., Project Manager
- Froehling & Robertson, Inc. (CQC Field Inspection and Testing Services)
  - Craig Mintz, Construction Services Manager
  - Christopher B. Stryffeler, E.I., Field Technician
- Strother Land Surveying (CQC Surveying Services)
  - Leland D. Strother, PLS, Surveyor

Construction Quality Assurance:

- Geotechnics (CQA Testing Services)
  - Michael P. Smith, Regional Manager

SECTION 3.0 EARTHWORK CONSTRUCTION QUALITY ASSURANCE

3.1 General

This section provides information regarding CQC/CQA activities for the earthwork associated with the construction of the Phase I closure including observations and monitoring of all soil components. Preconstruction, field, and laboratory testing for each soil component are also addressed. Earthwork test results are contained in Appendix A (CQC) and Appendix B (CQA). As-built drawings of the closure area and thickness verification tables are contained in Appendix C.

3.2 Preconstruction Material Source Testing

3.2.1 Low Permeability Barrier Layer

The material used for the construction of the low permeability barrier layer was obtained from the landfill borrow area located on the opposite side of Lamont Road from the landfill. Preconstruction testing of this material was conducted by HDR prior to the commencement of construction and consisted of excavating test pits within a clay stockpile located within the borrow area to log the extent of suitable material and to obtain samples for laboratory testing. A summary of this preconstruction testing is included in the Low Permeability Barrier Layer Borrow Source Investigation included in Appendix B. The testing indicated the clay was suitable for use as the barrier layer.

The suitability of the clay source for use as the barrier layer was confirmed during test pad construction at the landfill. The test pad was constructed on the southwest sideslope of the Phase I closure area and was a minimum of 100 feet long and 70 feet wide in accordance with the project specifications. The CQC and CQA field and laboratory testing results for the test pad are included in Appendices A and B, respectively. The test data indicated the clay source was acceptable for use in low permeability barrier layer construction.

3.2.2 Erosion Layer

The 18-inch thick erosion layer required for final cover construction consists of 12 inches of soil fill placed over the low permeability barrier layer with 6 inches of topsoil capable of supporting vegetation placed over the soil fill. The project specifications for the soil fill for the erosion layer required the material to be free of debris, frozen materials, angular rocks, roots and organics. In addition, the soil fill is required to have a maximum particle size of 1 inch and be classified as CL, SC, SM, SP-SM, or SP-SC material in accordance with ASTM D2487. Since these requirements are readily achievable with materials available within the borrow area and other locations on base and since the material does not have a compaction requirement other than being tracked into place, preconstruction testing was not required.

3.2.3 Topsoil Layer

The material used for the construction of the topsoil layer (upper 6 inches of the erosion layer) was obtained from on-site stockpiles, the blending of on-site compost and soil, and an off-site source. The on-site sources proved to be of adequate quantity and quality such that very little off-site topsoil was used. Preconstruction testing of the topsoil layer sources was performed by the

CQC firm and consisted of organic content and pH determinations. The CQC laboratory test results on the samples collected indicated that the materials generally met the requirements of the specifications except the off-site source had difficulty meeting the minimum organic content requirement (greater than 5 percent). The results of the CQC laboratory testing are summarized in Appendix A.

3.3 Inspection and In-Place Testing of Constructed Product

3.3.1 Low Permeability Barrier Layer

The quality of the low permeability barrier layer was visually monitored by CQA personnel on a periodic basis during placement. In accordance with the testing requirements, bulk samples of the barrier layer were obtained by the CQC personnel for moisture-density relationship testing (standard Proctor - ASTM D698, and modified Proctor - ASTM D1557). Field density tests were performed by CQC personnel to verify that the compacted material met projects specifications. CQC personnel also obtained Shelby tube samples of the compacted clay lifts for laboratory hydraulic conductivity testing (ASTM D5084). CQA personnel conducted supplemental sampling and laboratory testing in order to confirm CQC testing results. Organic material, such as roots, was removed by the contractor during placement of the material.

Approximately 25,000 cy of low permeability barrier layer with a maximum hydraulic conductivity of $1x10^{-5}$ cm/sec was required to complete the 10.34 acre Phase I closure. The barrier layer is a minimum of 18 inches thick. Compaction was accomplished using a tamping foot compactor. Compaction quality was monitored by visual and quantitative means (density and moisture content by nuclear gauge and sand cone method). CQA personnel periodically observed the placement, compaction, and field testing activities for the barrier layer. All placed materials were visually monitored to ensure no debris existed in the barrier layer (i.e. roots, stones, etc.); there were no void areas; the barrier layer was firm and uniform after compaction; and no deleterious material existed on the surface. Holes created in the barrier layer as a result of nuclear density testing were backfilled using bentonite powder. Holes created in the barrier layer as a result of drive tubes or sand cone tests were backfilled by tamping barrier layer material into the holes in 2-inch lifts.

The project specifications for the low permeability barrier layer construction required one field density and moisture content test for every 8,500 square feet of material placed per lift. For 10.34 acres, assuming three six-inch compacted lifts for barrier layer construction, a minimum of approximately 160 field density and moisture content tests were required. CQC personnel performed a total of 170 tests. Field density testing was performed using the nuclear gauge (ASTM D6938) or sand cone method (ASTM D1556). A minimum of one sand cone density test and one oven-derived moisture content test (ASTM D2216) were performed by the CQC personnel per 20 density tests using nuclear methods as a means of verifying the nuclear gauge results. The locations of the field density tests are provided on the Density Test Location Map provided in Appendix C.

CQC personnel also collected undisturbed samples for laboratory hydraulic conductivity testing (ASTM D5084) at a minimum frequency of one sample per every 40,000 square feet for each lift placed. For the 10.34 acre Phase I closure, a minimum of 34 hydraulic conductivity tests were

required. A total of 40 hydraulic conductivity tests were performed by CQC personnel and 8 by CQA personnel. All hydraulic conductivity tests performed on the 48 samples collected by CQC and CQA personnel achieved the maximum hydraulic conductivity of $1x10^{-5}$ cm/sec. After review of the data, HDR finds that the installed low permeability barrier layer meets the hydraulic conductivity requirements.

A total of 34 particle size analyses (ASTM D422) were performed on the barrier layer soils (25 by CQC personnel and 9 by CQA personnel). A total of 33 Atterberg limits (ASTM D4318) tests were performed on the barrier layer soils (25 by CQC personnel and 8 by CQA personnel).

Standard Proctor (ASTM D698) laboratory testing was required at a minimum frequency of one test per 6,500 cubic yards of barrier layer placed which is equivalent to a 4 tests for the 10.34 acre closure. CQC personnel performed a total of 4 standard Proctor tests.

The frequency for CQA testing for hydraulic conductivity, particle size, and Atterberg limits was at the discretion of the engineer. CQA personnel conducted testing alongside the CQC firm early on in the construction and all values were found to be consistent between both laboratories. Both the CQC and CQA laboratory conformance testing of the low permeability barrier layer soils indicated compliance with the project specifications.

The project specifications require particle size analyses (ASTM D422) and Atterberg limits determinations (ASTM D4318) be performed at a frequency of 1 test for every 1,000 cubic yards of barrier layer. A total of 25 of each test was required. CQC performed 25 of each test while CQA performed 8 of each test.

All of the CQC and CQA particle size analyses indicated the barrier layer soils met the project specification requirements of a maximum particle size of 1 inch, a minimum 80 percent by weight passing the No. 4 sieve, and a minimum of 25 percent by weight passing the No. 200 sieve. The project specifications require the barrier layer soils to have a minimum liquid limit of 35 and a plasticity index between 10 and 40. All Atterberg limits tests performed by CQC personnel met these requirements. However, 1 of the CQA samples exhibited a liquid limit of 31 which is less than the specified minimum liquid limit of 35. In addition, 4 of the CQA samples exhibited plasticity indices greater than 40 with the maximum being 49. Since the outlier values were relatively close to the specified limits, all the CQC tests were within the specified limits, and since all hydraulic conductivity tests yielded results well below the maximum allowable of $1x10^{-5}$ cm/sec, HDR accepted the CQC Atterberg limits tests during construction to enable these soils to be used in the barrier layer.

The CQC and CQA laboratory test results are provided in Appendices A and B, respectively.

In addition to construction material conformance testing, CQC personnel performed thickness verification of the low permeability barrier layer by comparing survey shots taken on a grid pattern before and after barrier layer placement. The project CQA plan required thickness verifications on a 100-foot grid spacing. As shown by the as-built survey provided in Appendix C, actual thickness verifications were typically performed on a 50-foot grid spacing. Strother Land Surveying provided the CQC survey of construction activities with horizontal and vertical

control of the low permeability barrier layer placement. There were 152 survey points over the 10.34 acres obtained for thickness verification, which is approximately 15 points per acre.

For acceptance, the constructed low permeability barrier layer is required to be at least 18 inches thick and demonstrate a maximum permeability of 1 x 10^{-5} cm/sec upon laboratory testing. Based on testing and survey data, these two requirements were achieved.

3.3.2 Erosion Layer

The 18-inch thick erosion layer required for final cover construction consists of 12 inches of soil fill placed over the low permeability barrier layer with 6 inches of topsoil capable of supporting vegetation placed over the soil fill. The discussion within this section refers to the CQC and CQA activities associated with the placement of the lower 12 inches of soil fill. Most of the soil fill used for the erosion layer was obtained from construction projects elsewhere on base where the excess cut meeting the project specifications was brought to the landfill.

The quality of the erosion layer was visually monitored by CQA personnel on a periodic basis during placement. In accordance with the testing requirements, bulk samples of the erosion layer were obtained by the CQC personnel for particle size analyses (ASTM D422) and Atterberg limits determinations (ASTM D4318). Moisture-density relationship and in-place density testing of the erosion layer was not required by the specifications since there was no compaction requirement other than tracking the material into place. CQA personnel conducted supplemental sampling and laboratory testing in order to confirm CQC testing results. Organic material, such as roots, was removed by the contractor during placement of the material.

Approximately 17,000 cy of erosion layer (excluding topsoil) was required to complete the 10.34 acre Phase I closure. Compaction was accomplished using dozer treads to achieve a uniform surface without large clods or voids. A minimum of 2 passes were required for all areas. Compaction quality was monitored by visual means. CQA personnel periodically observed the placement and compaction activities for the erosion layer. All placed materials were visually monitored to ensure no debris existed in the erosion layer (i.e. roots, stones, etc.); there were no void areas; the erosion layer was firm and uniform after compaction; and no deleterious material existed on the surface.

The project specifications for the lower 12 inches of the erosion layer construction required one particle size analysis and Atterberg limits determination for every 2,000 cubic yards of material placed. For the 10.34 acre closure area, approximately 17,000 cubic yards of material were placed requiring a minimum of 9 tests to be performed. CQC personnel performed a total of 9 tests (combined particle size and Atterberg limits) while CQA personnel conducted a total of 2 tests. All of the CQC and CQA testing of the erosion layer indicated the material met the specification requirements (maximum particle size of 1 inch and classified as CL, SC, SM, SP-SM, or SP-SC material in accordance with ASTM D2487). The CQC and CQA erosion layer test results are provided in Appendices A and B, respectively.

CQC personnel performed thickness verification of the erosion layer (including topsoil layer) by comparing survey shots taken on a grid pattern before erosion layer placement and after topsoil

placement. The total thickness of the erosion layer is 18 inches including topsoil. The project CQA plan required thickness verifications on a 100-foot grid spacing.

Strother Land Surveying provided the CQC survey of construction activities with horizontal and vertical control of the erosion layer placement. Top of erosion layer spot elevations were surveyed for thickness verification and limits after the erosion layer construction was completed. As-built survey information is provided in Appendix C. The survey indicates that an erosion layer thickness of 18 inches was achieved at all survey locations.

3.3.3 Topsoil Layer

As areas of the soil cap layer were completed and determined to meet the acceptance criteria, the topsoil layer was installed. Approximately 8,400 cy of soil was required to cover the soil cap layer with the required 6-inch layer of topsoil layer material. During installation, the specifications required the CQC to perform grain size analyses (ASTM D422), soil pH (ASTM D4972), and organic content (ASTM D 2974) testing at a minimum frequency of 1 of each test per every 2,000 cubic yards of in-place material which is equivalent to a total of 5 series of tests. During construction, the CQC submitted a total of 5 samples of topsoil for grain size analyses and 10 samples for Soil pH and organic content. The specified testing frequency for topsoil was therefore met.

The quality of the topsoil layer material was visually monitored by CQA personnel on a periodic basis. Bulk samples of in-place topsoil layer were obtained by the CQA personnel for laboratory testing. CQA submitted 1 sample for soil pH testing and 3 samples for organic content testing. CQC and CQA personnel also visually monitored for debris (i.e. roots) within the topsoil layer material. Debris was removed by the contractor during placement of the material.

In addition to construction material conformance testing, CQC personnel performed thickness verification of the combined low permeability barrier layer and erosion layer (including topsoil) as previously described.

The construction of the topsoil layer was also visually monitored by both the CQC and CQA representatives to assure that the underlying soil layers were not compromised. Based on the observations made by CQC and CQA, the topsoil layer cover soil component was constructed in accordance with the drawings and specifications using all means to prevent damage to the soil cap layer during construction. Any area of the soil cap layer that was observed to be damaged was reconstructed followed by the necessary testing.

SECTION 4.0 DRAINAGE SYSTEM INSTALLATION

4.1 General

This section provides information regarding construction activities, observation and monitoring conducted during the drainage system installation associated with the construction of the Phase I closure.

4.2 Diversion Berm

The construction plans required installation of a permanent stormwater diversion berm on the top slope of the Phase I closure area. The purpose of the berm is to direct stormwater away from the active Phase I/Phase II interface and channel it to a downpipe located on the west slope of Phase I. The diversion berm was constructed of erosion layer soil fill material. After the berm was constructed, topsoil was placed over the berm, seeding occurred, and temporary erosion matting was installed in accordance with the Drawings. CQC personnel periodically observed diversion berm construction to ensure it was constructed in accordance with the project plans and specifications. The location of the diversion berm is shown on the as-built survey provided in Appendix C.

4.3 Sideslope Swales

Sideslope swales were constructed on the east and west slopes of the Phase I closure area in accordance with the Drawings. The purpose of the swales is to intercept stormwater sheet flow on the landfill sideslopes before excessive erosion occurs and direct it to downpipes which discharge at the perimeter of the landfill. The swales were constructed of erosion layer soil fill. After the swales were constructed, topsoil was placed over the swales, seeding occurred, and temporary erosion matting was installed in accordance with the Drawings. CQC personnel periodically observed sideslope swale construction to ensure they were constructed in accordance with the project plans and specifications. The location of the swales are shown on the as-built survey provided in Appendix C.

4.4 Perimeter Channel

A perimeter stormwater channel was constructed at the toe of the west slope of the Phase I closure area in accordance with the Drawings. The purpose of the channel is to direct stormwater runoff from the closure area toward the existing stormwater detention pond located near the north edge of the landfill property. The Phase I channel is located outside of the limits of waste and was primarily constructed by excavation. The channel is trapezoidal in shape and has 3 (horizontal):1 (vertical) sideslopes, is a minimum of 2.5 feet deep, has a 3-foot wide bottom, and a minimum longitudinal slope of 1 percent. After the channel was constructed, topsoil was placed over the channel, seeding occurred, and permanent turf reinforcement matting was installed in accordance with the Drawings. Where the downpipe located on the west slope of the Phase I closure discharges into the channel, the channel was lined with a minimum of 18 inches of NCDOT Class B riprap underlain by filter fabric. CQC personnel periodically observed perimeter channel construction to ensure it was constructed in accordance with the project plans and specifications. The perimeter channel is shown on the as-built survey provided in Appendix C.

4.5 Downpipes

The Phase I closure cap system includes two downpipes designed to discharge stormwater collected by the final cover diversion berm and sideslope swales to the toe of the landfill. One downpipe is located on

the east slope and the other is located on the west slope. The downpipes were constructed of 18-inch diameter dual wall corrugated plastic pipe (CPP) with water-tight joints. The pipe was backfilled with compacted low permeability barrier layer soil. Erosion layer was then placed over the barrier layer soil such that the final cover surface over the pipe was even with adjacent areas. Inlets and outlets consisted of molded high density polyethylene (HDPE) flared end sections. The downpipes were installed in general accordance with the drawings and specifications. The as-built locations of the downpipes are provided in the as-built drawing located in Appendix C.

4.6 Closure Plan Modifications

The drainage design shown on the Phase I Final Grade Plan (Sheet 4 of 14) provided within the May 2010 Construction Permit Application (Revised March 2011) by HDR, was modified based on field conditions of the landfill during construction. A third downpipe shown on the southwest slope of the Phase I closure area was replaced with a riprap lined stormwater channel located on the north side of the landfill access road. The channel flows into the perimeter stormwater channel. This modification was necessary in order to provide better stormwater drainage on and around the landfill. The modification is shown on the as-built survey provided in Appendix C. A copy of the Phase I Final Grade Plan (Sheet 4 of 14) showing the modification is also provided in Appendix C.

SECTION 5.0 PASSIVE GAS VENT INSTALLATION

A total of 10 passive gas vents were constructed by SES within the Phase I closure area at the approximate locations shown on the construction plans. The vents consisted of excavating a 30-foot long trench into the C&D waste, installing a perforated 8-inch diameter PVC gas collection pipe, backfilling the pipe with NCDOT No. 57 stone and wrapping it with filter fabric, and installing a solid 8-inch diameter PVC vertical vent pipe at the center of the trench extending approximately 4 feet above the top of the final cover system. The excavated waste was either used to backfill the trench once the stone was installed or the excess was placed within the working face of the landfill. The final cover system was constructed over the backfilled trench. CQC personnel verified the trenches were constructed within C&D waste and that vent construction was in accordance with the plans and specifications. The as-built locations of the passive gas vents are shown on the as-built survey provided in Appendix C.

SECTION 6.0 PHOTOGRAPHIC DOCUMENTATION

July 2, 2012 - Stripping vegetation and topsoil from closure area.

July 2, 2012 - Stockpiled topsoil.

July 2, 2012 - Preparing side slopes for cover.

July 3, 2012 - Landfill surface stripped of vegetation and topsoil.

July 4, 2012 - Digging test pit to verify limits of waste.

July 4, 2012 - Test pit verifying location is outside of the limits of waste.

July 4, 2012 - Borrow area prior to excavation for closure soils.

July 4, 2012 - Installation of silt fence.

July 4, 2012 - Slopes prepared for cover soils.

July 6, 2012 - Preparing top of landfill for final cover.

July 7, 2012 - Excavating trench for landfill gas vent.

July 7, 2012 - Assembling pipe for landfill gas vent.

July 7, 2012 - Backfilling landfill gas vent trench with gravel.

July 7, 2012 - Completed landfill gas vent.

July 9, 2012 - Compacting subgrade for test pad.

July 9, 2012 - Placing and compacting low permeability barrier soil for test pad.

July 9, 2012 - CQC testing during test pad installation.

July 9, 2012 - Conditioning low-permeability barrier soil with water during test pad construction.

July 10, 2012 - Obtaining Shelby tube sample of low-permeability barrier soil during test pad construction.

July 16, 2012 - Placing and compacting low-permeability barrier soil.

July 16, 2012 - Excavating low-permeability barrier soil at borrow pit.

July 16, 2012 - Placing low-permeability barrier soil on southeast slope.

July 17, 2013 - Moisture conditioning low-permeability barrier soil during compaction.

July 17, 2012 - Density testing low-permeability barrier layer.

July 19, 2012 - Pushing Shelby tube sample of low-permeability barrier layer.

July 20, 2012 - Transporting low-permeability barrier layer soil to top of landfill.

July 20, 2012 - Surveying low-permeability barrier layer thickness prior to the placement of erosion layer.

July 20, 2012 - Erosion layer stockpile on top of landfill.

July 30, 2012 - Placing low-permeability barrier soil over access road.

July 31, 2012 - Placing erosion layer over low-permeability barrier layer.

August 5, 2012 Excavating low-permeability soil at borrow pit.

August 6, 2012 - Spreading erosion layer over low-permeability barrier layer.

August 13, 2012 - Low-permeability barrier soil on top of landfill.

August 14, 2012 - Placing erosion layer over low-permeability barrier layer.

August 21, 2012 - Loading topsoil for placement on final cover.

August 26, 2012 - Shaping sideslope swale.

August 27, 2012 - Screened topsoil stockpiles.

August 28, 2012 - Spreading topsoil over landfill final cover.

August 28, 2012 - Assembling downpipe.

August 28, 2012 - Compacting backfill around downpipe inlet.

August 29, 2012 - Placing erosion layer and topsoil.

August 29, 2012 - Hydroseeding topsoiled area.

September 6, 2012 - Forming stormwater diversion berm on top of landfill.

September 8, 2012 - Installing temporary erosion matting in sideslope swale.

September 17, 2012 - Constructing perimeter channel.

September 19, 2012 - Lining perimeter channel with turf reinforcement matting.

September 25, 2012 - Hydroseeded final cover.

September 25, 2012 - Hydroseeded final cover.

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX A

CQC Testing (FROEHLING & ROBERTSON, INC.)

Low Permeability Barrier Layer

Clay Classifications

Erosion Layer

Topsoil Layer

HDR

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX A

CQC Testing (FROEHLING & ROBERTSON, INC.)

Low Permeability Barrier Layer

HDR

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FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC License # F-0266

July 25, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, LLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Clay Barrier Testing –** Report No. 1
Phase I Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. **64P-0015**

Dear Mr. Ballard:

This report documents the work performed by Froehling & Robertson, Inc. (F&R) at the above referenced project and summarizes the clay barrier testing services performed during the construction of the Test Fill area (see drawing in Appendix II) on July 9 and 10, 2012. The Test Fill was placed on the southern slope of the Phase I Closure area, which is approximately 70 feet by 100 feet in size.

1.0 Field Density Testing

We understand that the compaction requirements for the clay barrier material shall satisfy the following criteria: (1) an in-situ dry density that is greater than 90 percent of the standard Proctor (ASTM D 698) maximum dry density, and (2) a water content that is greater than the modified Proctor (ASTM D 1557) optimum water content. The results of the field density tests performed (presented in Appendix I), along with a copy of the Standard and Modified Proctor water/density relationships performed (presented in Appendix III) on the clay barrier material are enclosed for your review. The results of the flexible wall permeameter testing (ASTM D 5084) from the material tested and discussed in this report will be forwarded upon completion and attached to a later report.

2.0 Daily Reporting

2.1 9 July 2012

F&R Engineering Technician, Mr. Steven Spikes, was on-site for the observation and testing of clay barrier material placed for the first lift for the Test Fill area. The following testing was performed:

- One nuclear gauge density test (ASTM D 6938) was run.

- The results of Test No. NG-01 suggest that the material place in the above mentioned area was within the acceptable range for water content and dry density with.

- No sand cone density tests (ASTM D 1556) were run due to inclement weather.

2.2 10 July 2012

F&R Engineering Technician, Mr. Steven Spikes, was on-site for the observation and testing of the clay barrier material placed for the second and third lift for the Test Fill area. The following testing was performed:

- Seventeen nuclear gauge density tests (ASTM D 6938) were run.
  - The results of Test No. NG-02 through NG-12 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density at the time of placement.
  - The results of Test No. NG-13 through NG-17 suggest that the material placed in the vicinity of these tests was not within the acceptable range for water content at the time of placement. The water contents ranged from 13.0 to 17.3 percent which is below the minimum target water content of 17.4 percent. This area will have to be reworked and compacted, and retested. During this report period, this area was not reworked thus the test results will be sent in a subsequent report.
- Two sand cone density tests (ASTM D 1556) were run. The results suggest that the material placed in the above mentioned area was within the acceptable range for water content and dry density at the time of placement.
  - The field results from one test performed in the first lift (SC-02) suggest that the material placed in that vicinity had a water content that was less than the minimum water content requirement. After testing a sample of this material using the oven-dry method (ASTM D 2216), the soil's water content was found to be within the acceptable range.
- Five Shelby tube samples (ASTM D 1587) were pushed after the completion of the third lift of the Test Fill area (sample No. TST-01 through TST-05).
  - Results of the flexible wall permeameter testing (ASTM D 5084) will be forwarded upon completion.

3.0 Closing

F&R, Inc. appreciates the opportunity to provide geotechnical testing services during this phase of your project as your geotechnical consultant. If you have any questions concerning this report, please feel free to contact us at your convenience.

Very truly yours,
FROEHLING & ROBERTSON, INC.

Christopher Stryffeler, E.I.
Geotechnical Project Professional

Gilles Bellot, P.E.
Fayetteville Branch Manager

Attachment: Appendix I: Field Density Test Results
Appendix II: Test Location Map
Appendix III: Proctor Compaction Test Results

C:\Users\CStryffeler\Desktop\WEEKEND\64P0015, SES, Phase 1 Closure of Lamont Landfill\Field Density Testing\FDT01 BE.docx

cc: Mr. Scott A. Ballard, P.E. – SES Construction and Fuel Services, LLC (1 original + 1 electronic)
Mr. Lester A. Barnes III, E.I. – SES Construction and Fuel Services, LLC (1 electronic)
Mr. Thomas M. Yanoschak, P.E. – HDR Engineering, Inc. of the Carolinas (1 electronic)

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APPENDIX I

Field Density Test Results

SOIL FIELD DENSITY SUMMARY SHEET

Project: Phase I Closure of Lamont Landfill
Client: SES Construction and Fuel Services LLC
Report No.: 01
Project No.: 64P-0015

Test No.	Test Location	Date	Water Content [%]	Dry Density	Percent of Max. Dry Density [%]		Test Type	Proctor No.
			w_c	(pcf)	Act.	Spec.	-	#
NG-01	Test Fill - 1st Lift	07/09/2012	23.0	97.8	100.3	90.0	NG	115240
SC-01	Test Fill - 1st Lift	07/10/2012	22.3	97.4	99.8	90.0	SC	115240
NG-02	Test Fill - 1st Lift	07/10/2012	22.8	96.7	99.2	90.0	NG	115240
NG-03	Test Fill - 1st Lift	07/10/2012	20.2	96.9	99.4	90.0	NG	115240
NG-04	Test Fill - 1st Lift	07/10/2012	21.7	96.5	98.9	90.0	NG	115240
NG-05	Test Fill - 1st Lift	07/10/2012	28.8	91.1	93.5	90.0	NG	115240
NG-06	Test Fill - 1st Lift	07/10/2012	23.7	91.9	94.2	90.0	NG	115240
NG-07	Test Fill - 2nd Lift	07/10/2012	19.8	95.4	97.9	90.0	NG	115240
NG-08	Test Fill - 2nd Lift	07/10/2012	24.2	93.4	95.8	90.0	NG	115240
SC-02	Test Fill - 2nd Lift	07/10/2012	17.6	95.2	97.6	90.0	SC	115240
NG-09	East Slope, below road - 1st Lift	07/10/2012	23.4	89.6	91.9	90.0	NG	115240
NG-10	Test Fill - 2nd Lift	07/10/2012	21.1	95.3	97.7	90.0	NG	115240
NG-11	Test Fill - 2nd Lift	07/10/2012	24.5	98.6	101.2	90.0	NG	115240
NG-12	Test Fill - 2nd Lift	07/10/2012	21.8	95.6	98.1	90.0	NG	115240
NG-13*	Test Fill - 3rd Lift	07/10/2012	17.3	114.8	117.8	90.0	NG	115240
NG-14*	Test Fill - 3rd Lift	07/10/2012	15.4	120.2	123.3	90.0	NG	115240
NG-15*	Test Fill - 3rd Lift	07/10/2012	14.0	119.2	122.3	90.0	NG	115240
NG-16*	Test Fill - 3rd Lift	07/10/2012	13.8	125.3	128.5	90.0	NG	115240
NG-17*	Test Fill - 3rd Lift	07/10/2012	16.2	124.1	127.3	90.0	NG	115240

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115240	97.5	23.2	CH	STD
115248	109.8	17.4	CH	MOD

Remarks:

The area where NG-13 through NG-17 will be retested and the results attached to a subsequent report.

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:

SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

APPENDIX II

Testing Location Map

TESTING LOCATION MAP

SINCE F&R 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

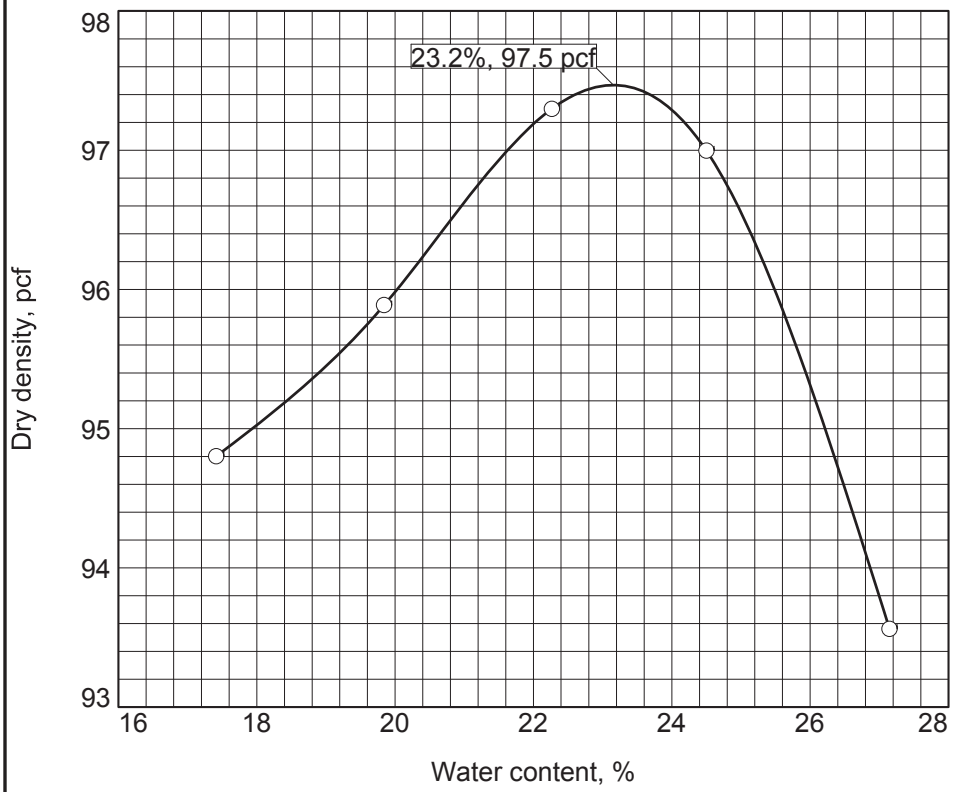
327 East Jenkins Street
Fayetteville, North Carolina 28306 | USA
T 910.323.9832 | F 910.323.5455
www.fandr.com

CLIENT: SES CONSTRUCTION AND FUEL SERVICES, LLC	
PROJECT: LAMONT LANDFILL - PHASE 1 CLOSURE	
LOCATION: FORT BRAGG, NC	
F&R PROJECT No.: 64P-0015	FIGURE No.:
DRAWN BY: CHRISTOPHER STRYFFELER	FDT-01
DATE: 07-25-2012	SCALE: NTS SCALE

APPENDIX III

Proctor Compaction Test Results

Proctor Report



Curve No.
115240

Test Specification:
ASTM D 698-07 Method A Standard

Preparation Method _____
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 20 **LL** 50 **PI** 21
Sp.G. (ASTM D 854) _____
%>#4 0 **%<No.200** 89.1
USCS CH - **AASHTO** _____
Date Sampled 07/06/2012
Date Tested 07/12/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.97	13.09	13.22	13.29	13.22	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	1735.9	1705.7	1851.7	1787.2	1830.7	
WD + T #1	1509.9	1452.5	1552.7	1476.4	1482.7	
TARE #1	212.1	176.3	209.8	207.8	200.8	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	17.4	19.8	22.3	24.5	27.1	
DRY DENSITY	94.8	95.9	97.3	97.0	93.6	

TEST RESULTS

Maximum dry density = 97.5 pcf

Optimum moisture = 23.2 %

Material Description

Grey-tan FAT CLAY with sand

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

○ **Loc.:** Borrow Pit Sample 1 **Depth:** 0 **Sample No.:** 115240

Checked by: Christopher Stryffeler
Title: Geotech Proj Professional

FROEHLING & ROBERTSON, INC.

Figure

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC License # F-0266

August 10, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, LLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Clay Barrier Testing –** Report No.2
Phase I Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. **64P-0015**

Dear Mr. Ballard:

This report documents the work performed by Froehling & Robertson, Inc. (F&R) at the above referenced project and summarizes the clay barrier testing services performed during the construction of the Test Fill area, Section 1, and Section 2 (see drawing in Appendix II) between July 16 and 20, 2012. Clay barrier material for the Test Fill area was placed on the southern slope of the Phase I Closure area, which has an approximate area of 7,000 square feet. Clay barrier material for Section 1 was placed on the southern portion of the eastern slope of the Phase I Closure area, which has an approximate area of 18,600 square feet. Clay barrier material for Section 2 was placed on the north side of Section 1, along the eastern slope of the Phase I Closure area.

1.0 Field Density Testing

We understand that the compaction requirements for the clay barrier material shall satisfy the following criteria: (1) an in-situ dry density that is greater than 90 percent of the standard Proctor (ASTM D 698) maximum dry density, and (2) a water content that is greater than the modified Proctor (ASTM D 1557) optimum water content. The results of the field density tests performed (presented in Appendix I), along with a copy of the Standard and Modified Proctor water/density relationships performed (presented in Appendix III) on the clay barrier material are enclosed for your review. Completed flexible wall permeameter test results from clay barrier material discussed in previous reports are included in Appendix IV. The results of the flexible wall permeameter testing (ASTM D 5084) from the material discussed in this report will be forwarded upon completion and attached to a subsequent report.

2.0 Daily Reporting

2.1 16 July 2012

F&R Engineering Technician, Mr. Steven Spikes, was on-site for the testing of clay barrier material placed for the third lift of the Test Fill area, as well as the observation and testing of clay barrier material placed for the first and second lift of Section 1. The following testing was performed:

- Eleven nuclear gauge density tests (ASTM D 6938) were performed.
  - The results from Test No. NG-14A through NG-18A and NG-19 through NG-24 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.
- Two sand cone density tests (ASTM D 1556) were performed.
  - The results from Test No. SC-04 and SC-05 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.

2.2 17 July 2012

F&R Engineering Technician, Mr. Steven Spikes, was on-site for the testing of clay barrier material placed for the third lift of the second and third lift of Section 1. The following testing was performed:

- Five nuclear gauge density tests (ASTM D 6938) were performed.
  - The results from Test No. NG-25 through NG-31 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.
- One sand cone density test (ASTM D 1556) was performed.
  - The results from Test No. SC-06 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.
- One Shelby tube sample (ASTM D 1587) was collected from the third lift of Section 1 (Sample No. ST-01). Results of the flexible wall permeameter testing (ASTM D 5084) will be forwarded upon completion and appended to a subsequent report.

2.3 18 July 2012

No testing was performed on this date due to inclement weather and unsuitable site conditions.

2.4 19 July 2012

F&R Engineering Technician, Mr. Steven Spikes, was on-site for the testing of clay barrier material placed for the third lift of the Test Fill area and Section 1. The following testing was performed:

- Two nuclear gauge density tests (ASTM D 6938) were performed.
  - The results from Test No. NG-30 and NG-31 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.
- Three sand cone density tests (ASTM D 1556) were performed.
  - The results from Test No. SC-07 through SC-09 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.
- Two Shelby tube sample (ASTM D 1587) were collected from the third lift of Section 1 (Sample No. ST-02 and ST-03). Results of the flexible wall permeameter testing (ASTM D 5084) will be forwarded upon completion and appended to a subsequent report.

2.5 20 July 2012

F&R Engineering Technician, Mr. Steven Spikes, was on-site for the testing of clay barrier material placed for the third lift of the Test Fill area, as well as the observation and testing of clay barrier material placed for the first and second lift of Section 1. The following testing was performed:

- A sample of the clay barrier material was collected to satisfy the requirement for periodic testing, which includes particle size percent finer than No. 200 sieve analysis, Atterburg Limit analysis, natural moisture content, and standard and modified Proctor compaction tests. The values from these tests will be used on subsequent reports.
- One nuclear gauge density test (ASTM D 6938) was performed.
  - The results from Test No. NG-32 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.
- One sand cone density test (ASTM D 1556) was performed.
  - The results from Test No. SC-10 suggest that the material placed in the vicinity of these tests was within the acceptable range for water content and dry density.

3.0 Flexible Wall Permeameter Testing

The flexible wall permeameter test results reported in Appendix IV are from Shelby tube samples collected on July 10, 2012. The tests resulted in values ranging from 8.9E-09 cm/s to 6.5E-08 cm/s; all tests resulted in a hydraulic conductivity less than the maximum allowable hydraulic conductivity of 1.0E-05 cm/s.

4.0 Closing

F&R, Inc. appreciates the opportunity to provide geotechnical testing services during this phase of your project as your geotechnical consultant. If you have any questions concerning this report, please feel free to contact us at your convenience.

Very truly yours,
FROEHLING & ROBERTSON, INC.

Christopher Stryffeler, E.I.
Geotechnical Project Professional

Gilles Bellot, PE
Fayetteville Branch Manager

Attachment: Appendix I: Field Density Test Results
Appendix II: Test Location Map
Appendix III: Proctor Compaction Test Results
Appendix IV: Flexible Wall Permeameter Test Results

F:\Projects 64P\64P0015, SES, Phase 1 Closure of Lamont Landfill\Field Density Testing\FDT02.docx

cc: Mr. Scott A. Ballard, P.E. – SES Construction and Fuel Services, LLC (1 original + 1 electronic)
Mr. Lester A. Barnes III, E.I. – SES Construction and Fuel Services, LLC (1 electronic)
Mr. Thomas M. Yanoschak, P.E. – HDR Engineering, Inc. of the Carolinas (1 electronic)

APPENDIX I

Field Density Test Results

SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase I Closure of Lamont Landfill** **Report No.:** **02**

Client: **SES Construction and Fuel Services LLC** **Project No.:** **64P-0015**

Test No.	Test Location	Date	Depth [ft]	Water Content [%]	Dry Density (pcf)	Percent of Max. Dry Density [%]		Test Type	Proctor No.
						Act.	Spec.	-	#
NG-19	East Slope, Section 1- 1st Lift	07/16/2012	1.0	23.7	94.9	97.3	90.0	NG	115240
NG-14A	Test Fill - 3rd Lift	07/16/2012	0.0	23.4	100.1	102.6	90.0	NG	115240
NG-15A	Test Fill - 3rd Lift	07/16/2012	0.0	24.2	97.6	100.1	90.0	NG	115240
NG-16A	Test Fill - 3rd Lift	07/16/2012	0.0	23.8	96.8	99.3	90.0	NG	115240
NG-17A	Test Fill - 3rd Lift	07/16/2012	0.0	25.7	96.0	98.5	90.0	NG	115240
NG-18A	Test Fill - 3rd Lift	07/16/2012	0.0	24.6	98.2	100.7	90.0	NG	115240
NG-20	East Slope, Section 1- 1st Lift	07/16/2012	1.0	27.8	91.2	93.6	90.0	NG	115240
NG-21	East Slope, Section 1- 1st Lift	07/16/2012	1.0	24.2	98.1	100.6	90.0	NG	115240
NG-22	East Slope, Section 1- 1st Lift	07/16/2012	1.0	24.5	98.6	101.2	90.0	NG	115240
NG-23	East Slope, Section 1- 1st Lift	07/16/2012	1.0	24.2	99.0	101.5	90.0	NG	115240
SC-04	Test Fill - 3rd Lift	07/16/2012	0.0	21.2	99.2	101.7	90.0	SC	115240
SC-05	East Slope, Section 1- 1st Lift	07/16/2012	1.0	21.2	98.0	100.5	90.0	SC	115240
NG-24	East Slope, Section 1- 2nd Lift	07/16/2012	0.5	19.7	97.3	99.8	90.0	NG	115240
SC-06	East Slope, Section 1- 2nd Lift	07/17/2012	0.5	21.4	95.3	97.7	90.0	SC	115240
NG-25	East Slope, Section 1- 2nd Lift	07/17/2012	0.5	20.6	99.5	102.1	90.0	NG	115240
NG-26	East Slope, Section 1- 2nd Lift	07/17/2012	0.5	22.8	95.9	98.4	90.0	NG	115240
NG-27	East Slope, Section 1- 3rd Lift	07/17/2012	0.0	25.8	95.4	97.8	90.0	NG	115240
NG-28	East Slope, Section 1- 3rd Lift	07/17/2012	0.0	27.1	93.7	96.1	90.0	NG	115240
NG-29	East Slope, Section 1- 3rd Lift	07/17/2012	0.0	19.7	96.9	99.4	90.0	NG	115240
NG-30	Test Fill - 3rd Lift	07/19/2012	0.0	32.4	91.3	93.7	90.0	NG	115240
NG-31	East Slope, Section 1- 3rd Lift	07/19/2012	0.0	19.2	96.4	98.9	90.0	NG	115240
SC-07	East Slope, Section 1- 3rd Lift	07/19/2012	0.0	24.8	92.5	94.8	90.0	SC	115240
SC-08	East Slope, Section 1- 3rd Lift	07/19/2012	0.0	26.0	92.5	94.8	90.0	SC	115240
SC-09	East Slope, Section 1- 3rd Lift	07/19/2012	0.0	28.3	87.8	90.1	90.0	SC	115240
SC-10	East Slope, Section 1- 1st Lift	07/20/2012	1.0	27.9	91.2	90.7	90.0	SC	115249
NG-32	East Slope, Section 1- 1st Lift	07/20/2012	1.0	26.9	93.4	92.8	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115240	97.5	23.2	CH	STD
115248	108.7	17.4	CH	MOD
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Remarks:

* Retest Necessary

Froehling & Robertson, Inc.

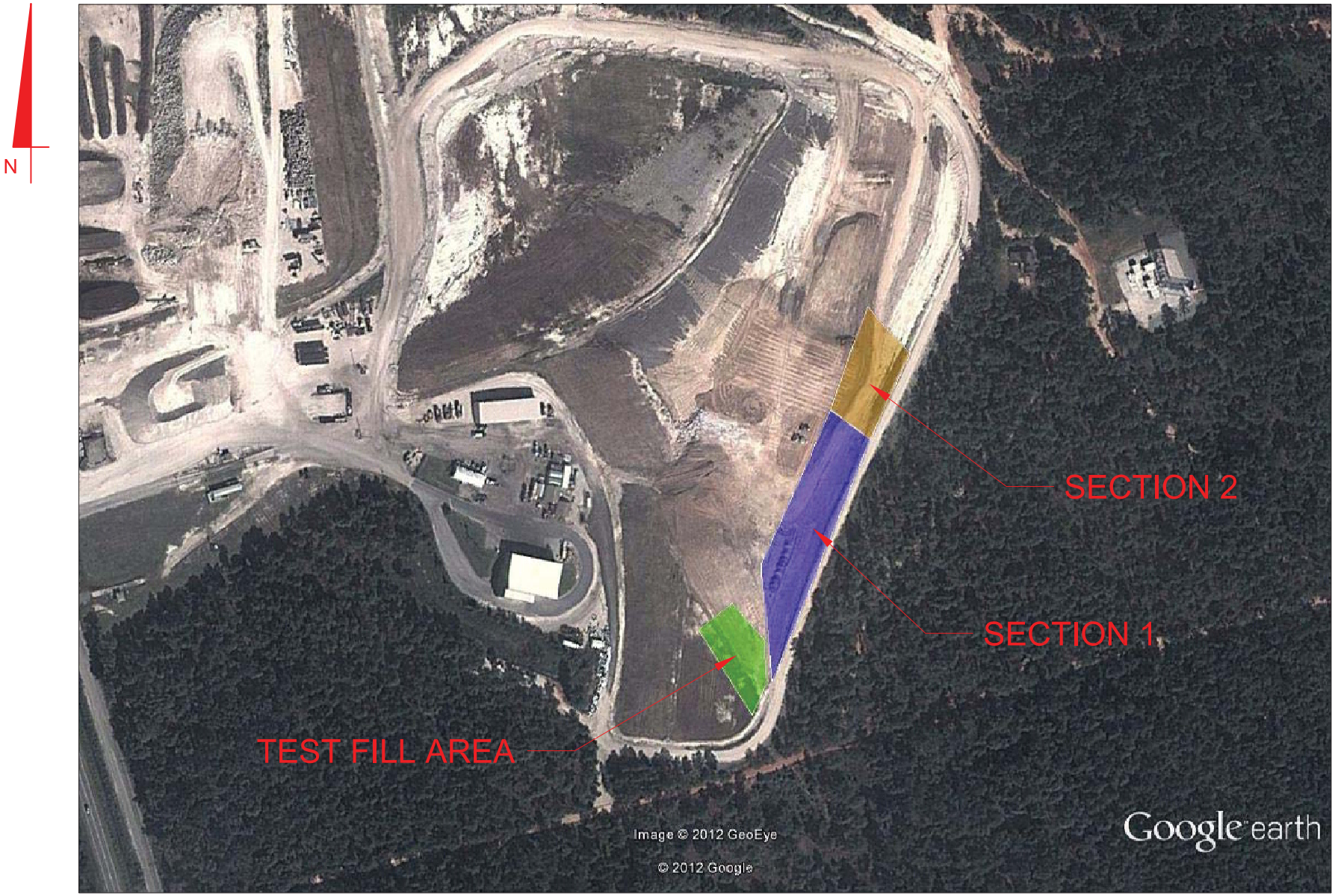
Technician: S. Spikes

Key:

SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

APPENDIX II

Testing Location Map



FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 | USA
T 910.323.9832 | F 910.323.5455
www.fandr.com

SINCE F&R 1881

LEGEND

TEST LOCATION MAP

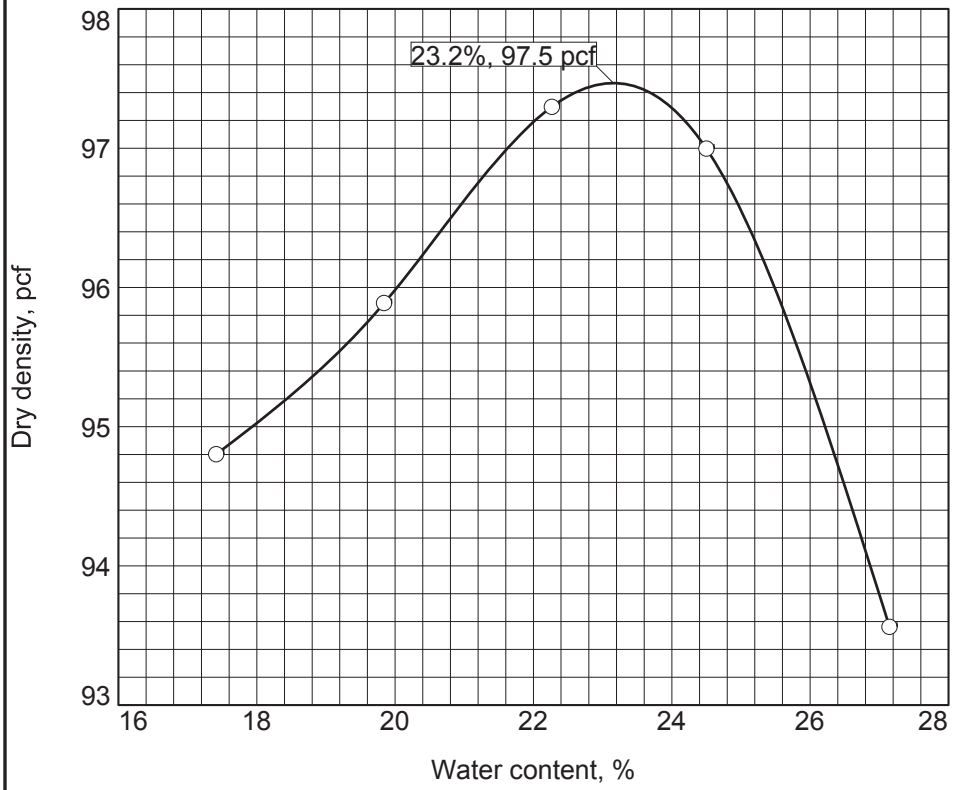
CLIENT:	SES CONSTRUCTION AND FUEL SERVICES, LLC
PROJECT:	PHASE I CLOSURE - LAMONT LANDFILL
LOCATION:	FORT BRAGG, NC
F&R PROJECT No.:	64P-0015
DRAWN BY:	CHRISTOPHER STRYFELER
DATE:	08-08-2012
SCALE:	NO SCALE
FIGURE No.:	1

02/08/2013 DIN 19386 Page 67 of 330

APPENDIX III

Proctor Compaction Test Results

Proctor Report



Curve No.
115240

Test Specification:
ASTM D 698-07 Method A Standard

Preparation Method _____
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 20 **LL** 50 **PI** 21
Sp.G. (ASTM D 854) _____
%>#4 0 **%<No.200** 89.1
USCS CH - **AASHTO** _____
Date Sampled 07/06/2012
Date Tested 07/12/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.97	13.09	13.22	13.29	13.22	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	1735.9	1705.7	1851.7	1787.2	1830.7	
WD + T #1	1509.9	1452.5	1552.7	1476.4	1482.7	
TARE #1	212.1	176.3	209.8	207.8	200.8	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	17.4	19.8	22.3	24.5	27.1	
DRY DENSITY	94.8	95.9	97.3	97.0	93.6	

TEST RESULTS

Maximum dry density = 97.5 pcf

Optimum moisture = 23.2 %

Material Description

Grey-tan FAT CLAY with sand

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

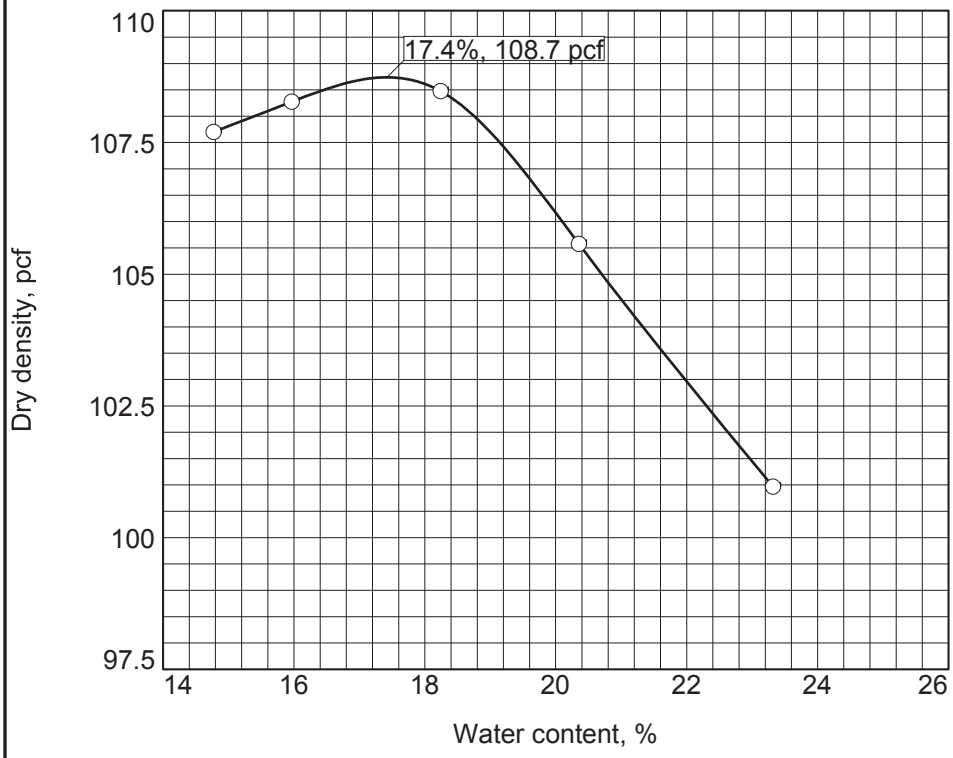
○ **Loc.:** Borrow Pit Sample 1 **Depth:** 0 **Sample No.:** 115240

Checked by: Christopher Stryffeler
Title: Geotech Proj Professional

FROEHLING & ROBERTSON, INC.

Figure

Proctor Report



Curve No.
115248

Test Specification:
ASTM D 1557-07 Method A Modified

Preparation Method _____
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 22.4 **LL** _____ **PI** _____
Sp.G. (ASTM D 854) _____
%>#4 0 **%<No.200** 93.5
USCS CH **AASHTO** A-7-6
Date Sampled 07/20/2012
Date Tested 07/23/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	13.38	13.45	13.54	13.49	13.41	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	2088.2	2007.7	2095.5	2136.0	2130.6	
WD + T #1	1869.3	1777.5	1827.2	1838.0	1801.8	
TARE #1	387.6	335.7	356.4	373.9	391.8	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	14.8	16.0	18.2	20.4	23.3	
DRY DENSITY	107.7	108.3	108.5	105.6	101.0	

TEST RESULTS

Maximum dry density = 108.7 pcf

Optimum moisture = 17.4 %

Material Description

Orange-Grey FAT CLAY

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

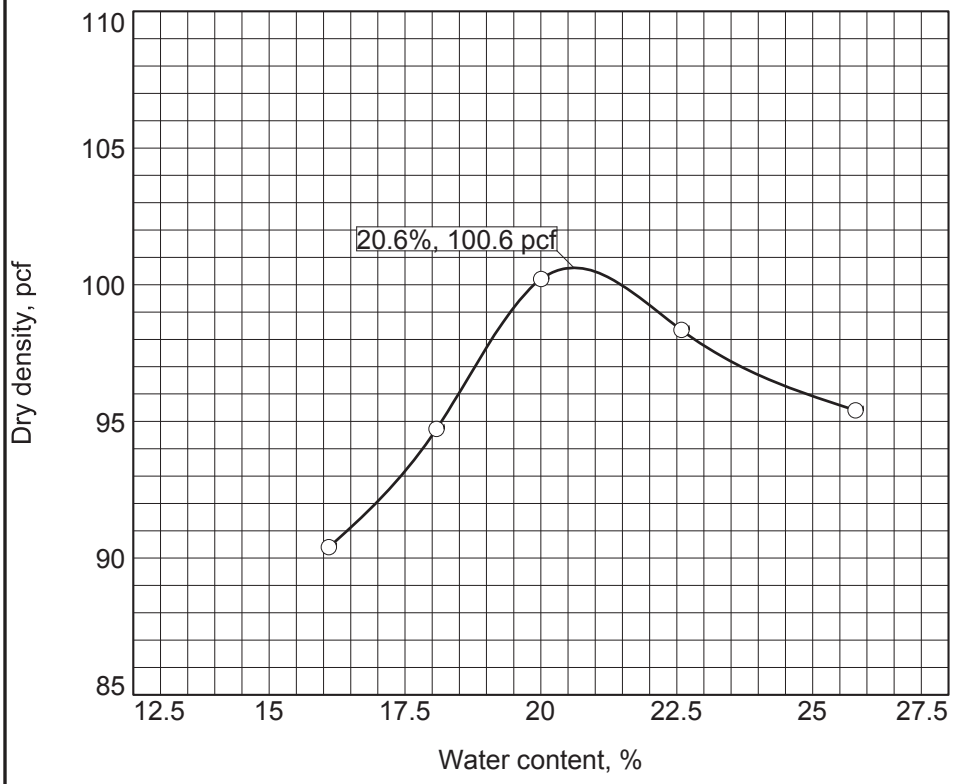
○ **Loc.:** East Slope - Section 2 **Depth:** 1st Lift **Sample No.:** 115248

Checked by: Christopher Stryffeler
Title: Geotech Proj Professional

FROEHLING & ROBERTSON, INC.

Figure

Proctor Report



Curve No.
115249

Test Specification:
ASTM D 698-07 Method A Standard

Preparation Method _____
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 19.1 **LL** 54 **PI** 25
Sp.G. (ASTM D 854) _____
%>#4 0 **%<No.200** 85.1
USCS CH **AASHTO** A-7-6
Date Sampled 07/20/2012
Date Tested 07/23/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.76	12.99	13.27	13.28	13.26	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	1876.7	1895.1	2008.4	1990.4	1973.4	
WD + T #1	1639.7	1637.4	1707.1	1657.9	1605.9	
TARE #1	167.5	212.1	200.9	185.7	180.9	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	16.1	18.1	20.0	22.6	25.8	
DRY DENSITY	90.4	94.7	100.2	98.3	95.4	

TEST RESULTS

Maximum dry density = 100.6 pcf

Optimum moisture = 20.6 %

Material Description

Orange-Grey FAT CLAY

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

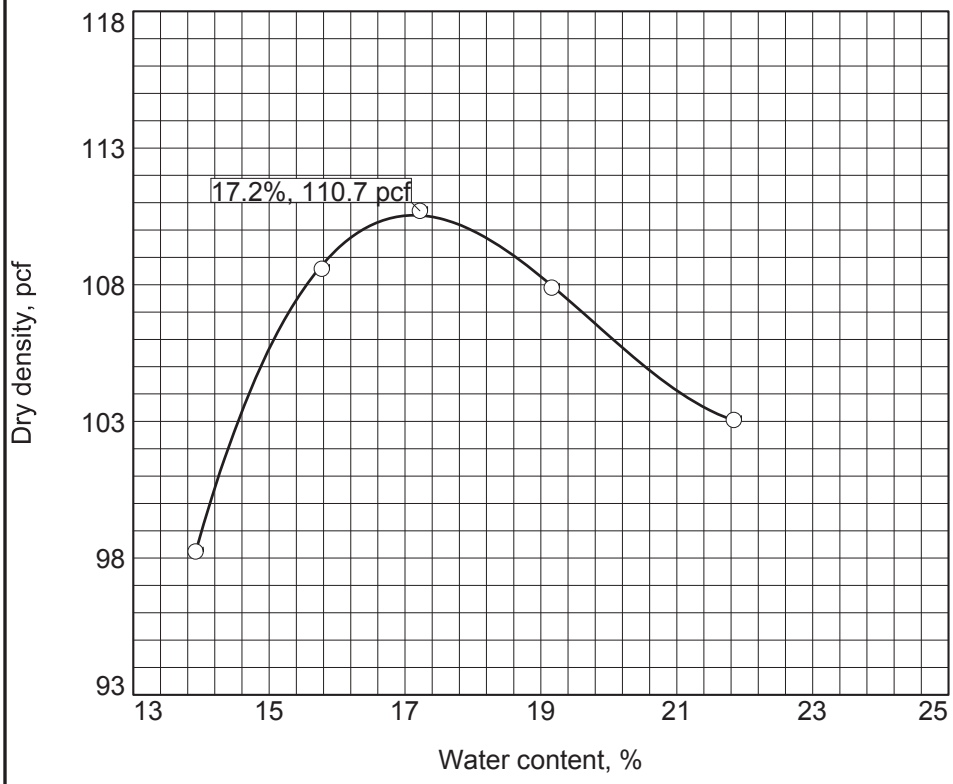
○ **Loc.:** East Slope - Section 1 **Depth:** 2nd Lift **Sample No.:** 115249

Checked by: Christopher Stryffeler
Title: Geotech Proj Professional

FROEHLING & ROBERTSON, INC.

Figure

Proctor Report



Curve No.
115251

Test Specification:
ASTM D 1557-07 Method A Modified

Preparation Method ASTM D 1557-07
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 20.2 **LL** 51 **PI** 26
Sp.G. (ASTM D 854)
%>#4 0 **%<No.200** 92.2
USCS CH **AASHTO**
Date Sampled 07/20/2012
Date Tested 08/08/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.99	13.45	13.59	13.54	13.45	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	2043.9	2098.2	2152.2	2138.5	2087.1	
WD + T #1	1819.6	1840.9	1866.5	1828.2	1752.2	
TARE #1	207.7	209.8	207.3	208.5	218.8	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	13.9	15.8	17.2	19.2	21.8	
DRY DENSITY	98.2	108.6	110.7	107.9	103.1	

TEST RESULTS

Maximum dry density = 110.7 pcf

Optimum moisture = 17.2 %

Material Description

Orange-Grey FAT CLAY

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

○ **Loc.:** East Slope - Section 1 **Depth:** 2nd Lift **Sample No.:** 115251

Checked by: Christopher Stryffeler
Title: 08/10/2012

FROEHLING & ROBERTSON, INC.

Figure

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APPENDIX IV

Flexible Wall Permeameter Test Results

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. 3

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 01
Depth: Test Pad

Moisture Content	Initial	Final
Tare Number	G-13	Z-3
wt. tare & wet sample (gm)	106.76	1199.11
wt. tare & dry sample (gm)	92.38	987.25
wt. of Water (gm)	14.38	211.86
wt. of tare (gm)	30.58	110.21
wt. of dry sample (gm)	61.80	877.04
Water content (%)	23.3	24.2

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	1073.13	1088.95
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	1073.13	1088.95
wt of dry sample (gm)	870.56	877.1

Dimensions - Inches	Initial	Final
Diameter 1	2.838	2.853
Diameter 2	2.835	2.858
Diameter 3	2.834	2.869
Average Diameter	2.836	2.860
Length 1	5.163	5.178
Length 2	5.193	5.173
Length 3	5.176	5.127
Average Length	5.177	5.159
Volume (pcf)	0.0189	0.0192

Wet Density (pcf)	125.0	125.2
Dry Density (pcf)	101.4	100.8
Void Ratio	0.630	
Porosity	0.387	
Hydraulic Gradient	18.2	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 98

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
40.74	41.45
Length (cm)	Length (cm)
13.15	13.10
Diameter (cm)	Diameter (cm)
7.20	7.26

Specimen	
Dry Density	Moisture %
101.4	23.3

Visual Description: Grey-Light Grey Clay

Performed By: Dave Jenks

Date: 7/11/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

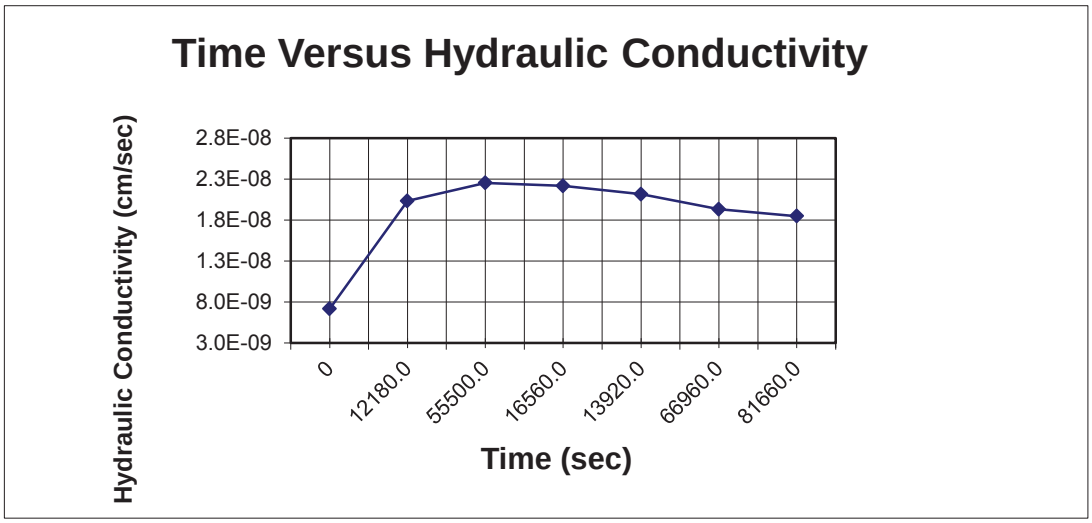
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 01
Location: Test Pad

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/12/12	13:37:00	0	72.73	0.44	9.98	0	0	22.7	
07/12/12	17:00:00	12180.0	72.28	0.53	9.45	1.55	5.889	22.6	7.2E-09
07/13/12	8:25:00	55500.0	66.38	1.71	7.90	6.85	1.314	23.6	2.0E-08
07/13/12	13:01:00	16560.0	64.48	2.09	7.56	1.81	0.895	23.1	2.3E-08
07/13/12	16:53:00	13920.0	62.93	2.40	7.27	1.51	0.935	22.8	2.2E-08
07/14/12	11:29:00	66960.0	55.93	3.80	5.94	6.86	0.950	22.7	2.1E-08
07/15/12	10:10:00	81660.0	48.18	5.35	4.43	7.69	0.974	23.4	1.9E-08
07/16/12	8:53:00	81780.0	41.08	6.77	3.09	6.94	0.944	22.7	1.8E-08

Average Permeability cm/sec.	2.0E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
62.4	57.4	54.0



Performed By: Dave Jenks

Date: 7/12/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **6WF**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 02
Depth: TEST PAD

Moisture Content	Initial	Final
Tare Number	Z	S-02
wt. tare & wet sample (gm)	168.45	852.96
wt. tare & dry sample (gm)	143.70	700.26
wt. of Water (gm)	24.75	152.70
wt. of tare (gm)	30.66	109.55
wt. of dry sample (gm)	113.04	590.71
Water content (%)	**21.9**	**25.9**

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	708.33	743.43
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	708.33	743.43
wt of dry sample (gm)	581.10	590.73

Dimensions - Inches	Initial	Final
Diameter 1	2.864	2.898
Diameter 2	2.830	2.909
Diameter 3	2.854	2.912
Average Diameter	**2.849**	**2.906**
Length 1	3.384	3.454
Length 2	3.396	3.434
Length 3	3.384	3.477
Average Length	**3.388**	**3.455**
Volume (pcf)	**0.0125**	**0.0133**

Wet Density (pcf)	**124.9**	**123.6**
Dry Density (pcf)	**102.5**	**98.2**
Void Ratio	**0.614**	
Porosity	**0.380**	
Hydraulic Gradient	**19.6**	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed **X**
Remolded

(B Coefficient)
Saturation (%) **97**

Confining Pressure
5.0

Initial	Final
Area (cm)	**Area (cm)**
41.14	42.80
Length (cm)	**Length (cm)**
8.61	8.78
Diameter (cm)	**Diameter (cm)**
7.24	7.38

Specimen	
Dry Density	**Moisture %**
102.5	**21.9**

Visual Description: **Grey-Light Grey Clay**

Performed By: Dave Jenks

Date: 7/11/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

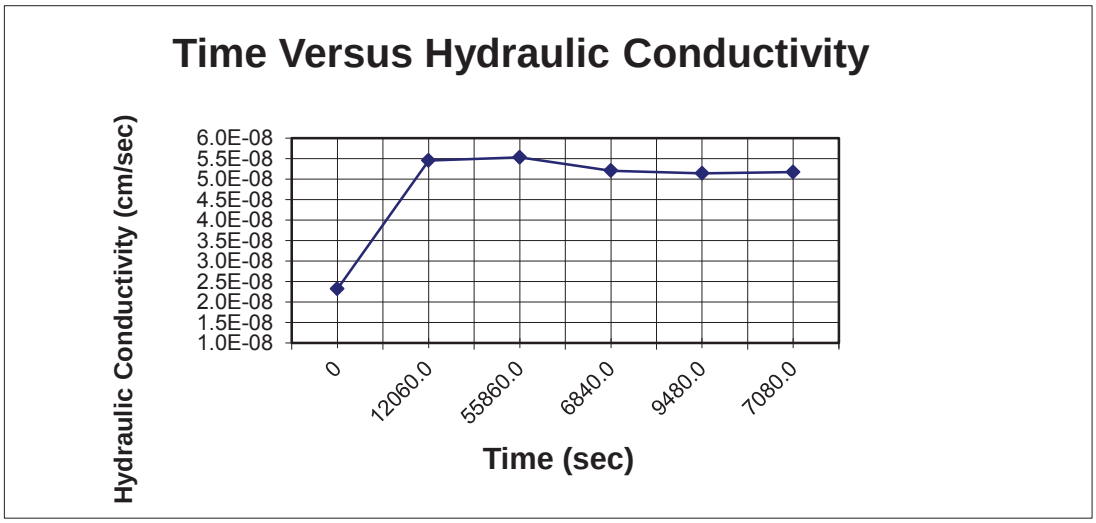
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 02
Location: TEST PAD

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/12/12	13:40:00	0	71.13	0.76	9.97	0	0	22.7	
07/12/12	17:01:00	12060.0	69.43	1.10	8.30	5.03	4.912	22.6	2.3E-08
07/13/12	8:32:00	55860.0	51.23	4.74	4.24	19.34	1.115	23.6	5.5E-08
07/13/12	10:26:00	6840.0	49.08	5.17	3.82	2.14	0.977	23.4	5.5E-08
07/13/12	13:04:00	9480.0	46.33	5.72	3.29	2.71	0.964	23.1	5.2E-08
07/13/12	15:02:00	7080.0	44.33	6.12	2.90	1.99	0.975	23.0	5.1E-08
07/13/12	16:55:00	6780.0	42.43	6.50	2.55	1.83	0.921	22.8	5.2E-08

Average Permeability cm/sec.	5.3E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
55.6	50.6	48.2



Performed By: Dave Jenks

Date: 7/12/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **4WF**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 03
Depth: TEST PAD

Moisture Content	Initial	Final
Tare Number	G-58	S-02
wt. tare & wet sample (gm)	129.28	1069.82
wt. tare & dry sample (gm)	113.36	887.07
wt. of Water (gm)	15.92	182.75
wt. of tare (gm)	30.82	109.56
wt. of dry sample (gm)	82.54	777.51
Water content (%)	19.3	23.5

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	928.61	960.31
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	928.61	960.31
wt of dry sample (gm)	778.46	777.6

Dimensions - Inches	Initial	Final
Diameter 1	2.862	2.912
Diameter 2	2.863	2.906
Diameter 3	2.849	2.902
Average Diameter	2.858	2.907
Length 1	4.323	4.396
Length 2	4.322	4.405
Length 3	4.316	4.386
Average Length	4.320	4.396
Volume (pcf)	0.0160	0.0169

Wet Density (pcf)	127.6	125.4
Dry Density (pcf)	107.0	101.6
Void Ratio	0.545	
Porosity	0.353	
Hydraulic Gradient	19.2	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 96

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
41.39	42.81
Length (cm)	Length (cm)
10.97	11.16
Diameter (cm)	Diameter (cm)
7.26	7.38

Specimen	
Dry Density	Moisture %
107.0	19.3

Visual Description: Grey-Light Grey Clay

Performed By: Dave Jenks

Date: 7/11/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

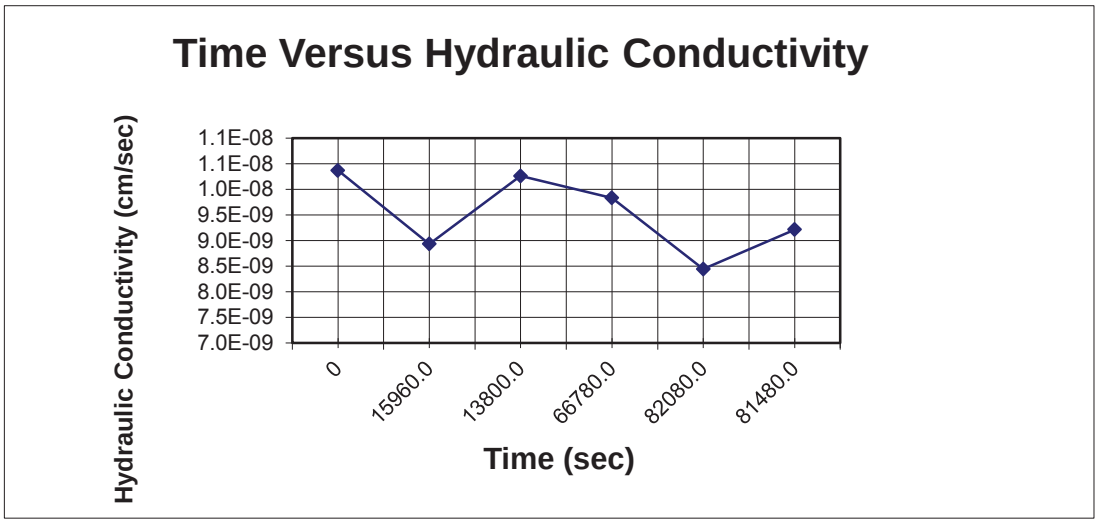
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 03
Location: TEST PAD

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/13/12	8:42:00	0	72.13	0.56	9.97	0	0	23.6	
07/13/12	13:08:00	15960.0	71.18	0.75	9.21	2.38	4.000	23.1	1.0E-08
07/13/12	16:58:00	13800.0	70.48	0.89	8.96	0.98	1.786	22.8	8.9E-09
07/14/12	11:31:00	66780.0	66.63	1.66	8.18	3.89	1.013	22.7	1.0E-08
07/15/12	10:19:00	82080.0	62.08	2.57	7.36	4.35	0.901	23.4	9.8E-09
07/16/12	8:57:00	81480.0	58.33	3.32	6.77	3.37	0.787	22.7	8.4E-09
07/16/12	16:17:00	26400.0	57.03	3.58	6.58	1.13	0.731	22.3	9.2E-09
07/17/12	8:50:00	59580.0	54.43	4.10	6.10	2.51	0.923	22.9	8.1E-09

Average Permeability cm/sec.	8.9E-09
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
85.0	80.0	77.0



Performed By: Dave Jenks

Date: 7/13/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **1**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 04
Depth: TEST PAD

Moisture Content	Initial	Final
Tare Number	G-17	S-06
wt. tare & wet sample (gm)	105.12	898.04
wt. tare & dry sample (gm)	90.34	737.71
wt. of Water (gm)	14.78	160.33
wt. of tare (gm)	30.57	110.31
wt. of dry sample (gm)	59.77	627.40
Water content (%)	24.7	25.6

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	763.18	787.77
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	763.18	787.77
wt of dry sample (gm)	611.87	627.4

Dimensions - Inches	Initial	Final
Diameter 1	2.829	2.832
Diameter 2	2.849	2.867
Diameter 3	2.854	2.900
Average Diameter	2.844	2.866
Length 1	3.705	3.753
Length 2	3.712	3.771
Length 3	3.742	3.758
Average Length	3.720	3.761
Volume (pcf)	0.0137	0.0140

Wet Density (pcf)	123.0	123.7
Dry Density (pcf)	98.6	98.5
Void Ratio	0.676	
Porosity	0.403	
Hydraulic Gradient	19.4	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 95

Confining Pressure
5.0

Initial	Final
Area	Area
(cm)	(cm)
40.98	41.63
Length	Length
(cm)	(cm)
9.45	9.55
Diameter	Diameter
(cm)	(cm)
7.22	7.28

Specimen	
Dry Density	Moisture %
98.6	24.7

Visual Description: Grey-Light Grey & Brown Clay

Performed By: Dave Jenks

Date: 7/12/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

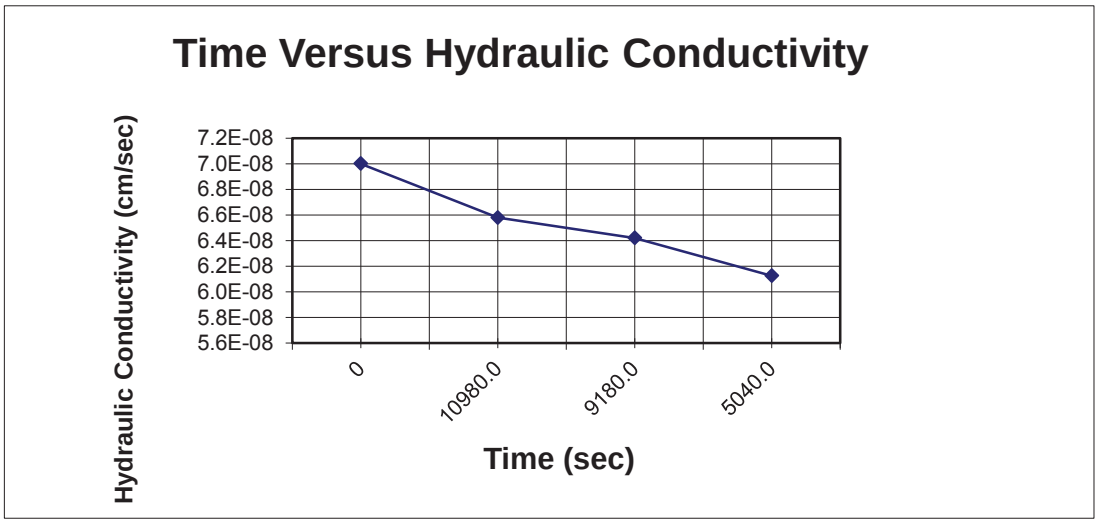
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 04
Location: TEST PAD

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/13/12	9:51:00	0	72.78	0.43	9.98	0	0	23.5	
07/13/12	12:54:00	10980.0	68.23	1.34	8.92	4.95	1.165	23.1	7.0E-08
07/13/12	15:27:00	9180.0	64.73	2.04	8.20	3.57	1.029	22.9	6.6E-08
07/13/12	16:51:00	5040.0	62.88	2.41	7.83	1.86	1.000	22.8	6.4E-08
07/14/12	11:20:00	66540.0	40.78	6.83	3.48	22.04	0.984	22.7	6.1E-08

Average Permeability cm/sec.	6.5E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
63.0	58.0	55.4



Performed By: Dave Jenks

Date: 7/13/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **2**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 05
Depth: TEST PAD

Moisture Content	Initial	Final
Tare Number	G-58	S-02
wt. tare & wet sample (gm)	112.07	911.77
wt. tare & dry sample (gm)	97.97	732.81
wt. of Water (gm)	14.10	178.96
wt. of tare (gm)	30.81	109.57
wt. of dry sample (gm)	67.16	623.24
Water content (%)	21.0	28.7

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	764.16	802.23
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	764.16	802.23
wt of dry sample (gm)	631.57	623.3

Dimensions - Inches	Initial	Final
Diameter 1	2.845	2.867
Diameter 2	2.838	2.813
Diameter 3	2.834	2.834
Average Diameter	2.839	2.838
Length 1	3.918	3.958
Length 2	3.917	3.934
Length 3	3.905	3.990
Average Length	3.913	3.961
Volume (pcf)	0.0143	0.0145

Wet Density (pcf)	117.5	122.0
Dry Density (pcf)	97.1	94.8
Void Ratio	0.703	
Porosity	0.413	
Hydraulic Gradient	19.8	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 95

Confining Pressure
5.0

Initial	Final
Area	Area
(cm)	(cm)
40.84	40.81
Length	Length
(cm)	(cm)
9.94	10.06
Diameter	Diameter
(cm)	(cm)
7.21	7.21

Specimen	
Dry Density	Moisture %
97.1	21.0

Visual Description: Grey-Brown, Clay

Performed By: Dave Jenks

Date: 7/13/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

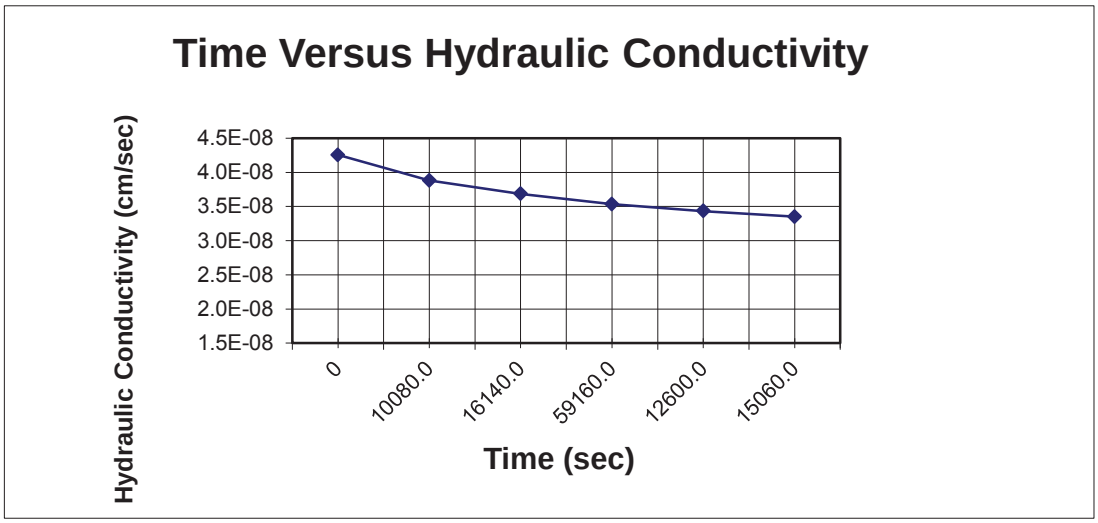
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/10/12
Sample No: 05
Location: TEST PAD

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/16/12	8:56:00	0	72.63	0.46	10.00	0	0	22.7	
07/16/12	11:44:00	10080.0	70.13	0.96	9.52	2.46	0.960	22.4	4.3E-08
07/16/12	16:13:00	16140.0	66.53	1.68	8.92	3.32	0.833	22.3	3.9E-08
07/17/12	8:39:00	59160.0	54.18	4.15	6.70	11.79	0.899	22.9	3.7E-08
07/17/12	12:09:00	12600.0	51.73	4.64	6.28	2.29	0.857	22.9	3.5E-08
07/17/12	16:20:00	15060.0	48.93	5.20	5.78	2.66	0.893	22.7	3.4E-08
07/18/12	8:49:00	59340.0	38.43	7.30	3.86	10.10	0.914	22.8	3.4E-08

Average Permeability cm/sec.	3.5E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
55.0	50.0	47.2



Performed By: Dave Jenks

Date: 7/13/2012

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SINCE 1881

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, LLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Clay Barrier Testing –** Report No. 3
Phase I Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. **64P-0015**

Dear Mr. Ballard:

This report documents the field density testing services performed, as well as the subsequent laboratory testing provided by Froehling & Robertson, Inc. (F&R) during clay barrier and erosion layer placement activities performed by SES Construction between July 30, and September 6, 2012.

Field Density Testing

We understand that the compaction requirements for the clay barrier material shall satisfy the following criteria: (1) an in-situ dry density that is greater than 90 percent of the standard Proctor (ASTM D 698) maximum dry density, and (2) a water content that is greater than the modified Proctor (ASTM D 1557) optimum water content. The results of the field density tests performed (presented in Appendix I), along with a copy of the Standard and Modified Proctor water/density relationships performed (presented in Appendix II) on the clay barrier material are enclosed for your review. Completed flexible wall permeameter test results from clay barrier material, topsoil and erosion layer gradations/classifications, and the remaining Standard and Modified Proctor water density relationships performed are included in Appendix III.

1.0 Closing

F&R, Inc. appreciates the opportunity to provide geotechnical testing services during this phase of your project as your geotechnical consultant. If you have any questions concerning this report, please feel free to contact us at your convenience.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

Gilles Bellot, PE
Fayetteville Branch Manager

Attachment: Appendix I: Field Density Test Results
Appendix II: Proctor Compaction Test Results
Appendix III: Flexible Wall Permeameter Test Results, Classifications, Remaining Proctors

F:\Projects 64P\64P0015, SES, Phase 1 Closure of Lamont Landfill\Field Density Testing\New folder\FDT03.docx

cc: Mr. Scott A. Ballard, P.E. – SES Construction and Fuel Services, LLC (1 original + 1 electronic)

Mr. Lester A. Barnes III, E.I. – SES Construction and Fuel Services, LLC (1 electronic)

APPENDIX I

Field Density Test Results

SOIL FIELD DENSITY SUMMARY SHEET

Project: Phase I Closure of Lamont Landfill
Client: SES Construction and Fuel Services LLC

Report No.: 03
Project No.: 64P-0015

Test No.	Test Location	Date	Depth [ft]	Water Content [%]	Dry Density (pcf)	Percent of Max. Dry Density [%]		Test Type	Proctor No.
						Act.	Spec.	-	#
NG-33	Test Location T1-31	07/30/2012	1.0	25.8	94.6	94.0	90.0	NG	115249
NG-34	Test Location T1-32	07/30/2012	1.0	27.1	92.4	91.8	90.0	NG	115249
NG-35	Test Location T1-33	07/30/2012	1.0	22.9	96.5	95.9	90.0	NG	115249
NG-36	Test Location T2-14	07/30/2012	0.5	25.3	96.8	96.2	90.0	NG	115249
NG-37	Test Location T3-11	07/30/2012	0.0	27.3	91.8	91.2	90.0	NG	115249
SC-11	Test Location T2-32	07/31/2012	0.5	25.8	100.7	100.1	90.0	SC	115249
NG-38	Test Location T2-31	07/31/2012	0.5	25.0	93.0	92.5	90.0	NG	115249
NG-39	Test Location T2-33	07/31/2012	1.0	24.8	96.0	95.4	90.0	NG	115249
NG-40	Test Location T1-15	07/31/2012	1.0	24.8	93.1	92.6	90.0	NG	115249
NG-41	Test Location T1-16	07/31/2012	0.5	20.9	96.5	95.9	90.0	NG	115249
SC-12	Test Location T2-27	08/02/2012	0.5	25.0	96.7	96.1	90.0	SC	115249
NG-42	Test Location T2-44	08/02/2012	0.5	24.5	95.8	95.3	90.0	NG	115249
NG-43	Test Location T2-45	08/02/2012	0.5	28.7	95.3	94.8	90.0	NG	115249
NG-44	Test Location T2-46	08/02/2012	0.5	25.1	95.1	94.5	90.0	NG	115249
SC-13	Test Location T2-21	08/03/2012	0.5	30.0	94.6	94.1	90.0	NG	115249
NG-45	Test Location T2-22	08/03/2012	0.5	27.3	90.7	90.2	90.0	NG	115249
NG-46	Test Location T2-23	08/03/2012	0.5	29.7	93.1	92.6	90.0	NG	115249
NG-47	Test Location T2-24	08/03/2012	0.5	27.6	94.2	93.6	90.0	NG	115249
NG-48	Test Location T2-25	08/03/2012	0.5	20.9	100.2	99.6	90.0	NG	115249
NG-49	Test Location T2-26	08/03/2012	0.5	24.2	95.2	94.6	90.0	NG	115249
NG-50	Test Location T3-22	08/03/2012	1.0	26.7	94.1	93.5	90.0	NG	115249
NG-51	Test Location T3-21	08/03/2012	1.0	25.3	98.2	97.7	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Remarks:

* Retest Necessary

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:

SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

SOIL FIELD DENSITY SUMMARY SHEET

Project: Phase I Closure of Lamont Landfill
Client: SES Construction and Fuel Services LLC

Report No.: 03
Project No.: 64P-0015

Test No.	Test Location	Date	Depth [ft]	Water Content [%]	Dry Density (pcf)	Percent of Max. Dry Density [%]		Test Type	Proctor No.
						Act.	Spec.	-	#
NG-52	Test Location T1-42	8/4/2012	1.0	24.7	94.7	94.1	90.0	NG	115249
NG-53	Test Location T1-44	8/4/2012	1.0	25.7	93.7	93.2	90.0	NG	115249
NG-54	Test Location T1-45	8/4/2012	1.0	27.1	92.8	92.2	90.0	NG	115249
NG-55	Test Location T1-46	8/4/2012	1.0	24.9	95.0	94.5	90.0	NG	115249
NG-56	Test Location T2-41	8/5/2012	0.5	27.8	91.4	90.8	90.0	NG	115249
NG-57	Test Location T2-42	8/5/2012	0.5	25.0	94.8	94.2	90.0	NG	115249
NG-58	Test Location T2-43	8/5/2012	0.5	26.0	94.4	93.9	90.0	NG	115249
SC-14	Test Location T2-43	8/5/2012	0.5	24.8	98.2	97.6	90.0	SC	115249
NG-59	Test Location T2-44	8/5/2012	0.5	24.0	94.4	93.9	90.0	NG	115249
NG-60	Test Location T3-41	8/5/2012	0.0	25.3	92.8	92.3	90.0	NG	115249
NG-61	Test Location T3-42	8/5/2012	0.0	27.3	92.9	92.3	90.0	NG	115249
NG-62	Test Location T3-43	8/5/2012	0.0	26.8	96.2	95.6	90.0	NG	115249
NG-63	Test Location T1-51	8/5/2012	1.0	27.2	93.5	92.9	90.0	NG	115249
NG-64	Test Location T1-52	8/5/2012	1.0	26.2	92.1	91.5	90.0	NG	115249
NG-65	Test Location T2-51	8/5/2012	0.5	24.2	94.2	93.6	90.0	SC	115249
NG-66	Test Location T2-52	8/5/2012	0.5	25.4	94.7	94.2	90.0	NG	115249
NG-67	Test Location T2-53	8/5/2012	0.5	24.2	94.2	93.6	90.0	NG	115249
NG-68	Test Location T2-61	8/6/2012	0.5	28.1	95.2	94.6	90.0	NG	115249
NG-69	Test Location T2-62	8/6/2012	0.5	26.8	95.3	94.8	90.0	NG	115249
NG-70	Test Location T2-63	8/6/2012	0.5	25.5	99.3	98.7	90.0	NG	115249
NG-71	Test Location T2-64	8/6/2012	0.5	28.0	95.2	94.6	90.0	NG	115249
NG-72	Test Location T3-64	8/6/2012	0.0	27.9	93.7	93.2	90.0	NG	115249
NG-73	Test Location T2-46	8/6/2012	0.5	24.7	94.4	93.8	90.0	NG	115249
NG-74	Test Location T3-46	8/6/2012	0.0	23.8	95.3	94.7	90.0	NG	115249
SC-15	Test Location T3-45	8/6/2012	0.0	28.4	96.0	95.5	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Remarks:

* Retest Necessary

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:

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SOIL FIELD DENSITY SUMMARY SHEET

Project: Phase I Closure of Lamont Landfill
Client: SES Construction and Fuel Services LLC

Report No.: 03
Project No.: 64P-0015

Test No.	Test Location	Date	Depth [ft]	Water Content [%]	Dry Density (pcf)	Percent of Max. Dry Density [%]		Test Type	Proctor No.
						Act.	Spec.	-	#
NG-75	Test Location T1-71	8/8/2012	1.0	28.5	96.7	96.2	90.0	NG	115249
NG-76	Test Location T1-72	8/8/2012	1.0	28.0	95.0	94.4	90.0	NG	115249
NG-77	Test Location T1-73	8/8/2012	1.0	25.2	94.4	93.8	90.0	NG	115249
NG-78	Test Location T1-75	8/9/2012	1.0	25.2	95.3	94.7	90.0	NG	115249
NG-79	Test Location T1-81	8/9/2012	1.0	26.9	94.8	94.2	90.0	NG	115249
NG-80	Test Location T1-82	8/9/2012	1.0	23.3	97.7	97.1	90.0	NG	115249
NG-81	Test Location T1-83	8/9/2012	1.0	23.3	95.4	94.8	90.0	NG	115249
NG-82	Test Location T1-84	8/9/2012	1.0	26.1	95.6	95.0	90.0	NG	115249
NG-83	Test Location T2-71	8/9/2012	0.5	26.4	97.7	97.1	90.0	NG	115249
NG-84	Test Location T2-75	8/9/2012	0.5	25.0	93.0	92.5	90.0	NG	115249
NG-85	Test Location T2-71	8/10/2012	0.5	25.6	92.9	92.4	90.0	NG	115249
NG-86	Test Location T2-72	8/10/2012	0.5	25.1	92.2	91.7	90.0	NG	115249
NG-87	Test Location T2-73	8/10/2012	0.5	29.2	90.8	90.2	90.0	NG	115249
NG-88	Test Location T2-74	8/10/2012	0.5	29.1	94.1	93.6	90.0	NG	115249
SC-16	Test Location T3-71	8/10/2012	0.0	27.9	99.2	98.6	90.0	SC	115249
NG-89	Test Location T3-72	8/10/2012	0.0	23.0	96.7	96.1	90.0	NG	115249
NG-90	Test Location T3-73	8/10/2012	0.0	23.9	94.4	93.8	90.0	NG	115249
NG-91	Test Location T3-74	8/10/2012	0.0	27.7	93.7	93.1	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Remarks:

* Retest Necessary

Froehling & Robertson, Inc.

Technician: S. Spikes

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SOIL FIELD DENSITY SUMMARY SHEET

Project: Phase I Closure of Lamont Landfill
Client: SES Construction and Fuel Services LLC

Report No.: 03
Project No.: 64P-0015

Test No.	Test Location	Date	Depth [ft]	Water Content [%]	Dry Density (pcf)	Percent of Max. Dry Density [%]		Test Type	Proctor No.
						Act.	Spec.	-	#
NG-92	Test Location T1-85	8/11/2012	1.0	24.7	90.7	90.2	90.0	NG	115249
NG-93	Test Location T2-85	8/11/2012	0.5	26.5	92.2	91.6	90.0	NG	115249
NG-94	Test Location T1-86	8/11/2012	1.0	26.3	94.5	94.0	90.0	NG	115249
NG-95	Test Location T2-86	8/11/2012	0.5	24.3	96.1	95.5	90.0	NG	115249
NG-96	Test Location T1-88	8/11/2012	1.0	19.6	97.0	96.4	90.0	NG	115249
NG-97	Test Location T2-88	8/11/2012	0.5	24.5	94.0	93.4	90.0	NG	115249
SC-17	Test Location T3-85	8/12/2012	0.0	25.9	95.6	95.1	90.0	SC	115249
NG-97	Test Location T3-86	8/12/2012	0.0	18.8	97.7	97.1	90.0	NG	115249
NG-98	Test Location T3-87	8/12/2012	0.0	18.4	104.2	103.6	90.0	NG	115249
NG-99	Test Location T1-810	8/12/2012	1.0	19.3	101.0	100.4	90.0	NG	115249
NG-100	Test Location T2-810	8/12/2012	0.5	23.6	97.2	96.6	90.0	NG	115249
NG-101	Test Location T1-811	8/12/2012	1.0	21.0	99.5	98.9	90.0	NG	115249
NG-102	Test Location T2-811	8/12/2012	0.5	19.5	102.8	102.2	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Remarks:

* Retest Necessary

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SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase I Closure of Lamont Landfill** **Report No.:** **03**

Client: **SES Construction and Fuel Services LLC** **Project No.:** **64P-0015**

Test No.	Test Location	Date	Depth [ft]	Water Content [%]	Dry Density (pcf)	Percent of Max. Dry Density [%]		Test Type	Proctor No.
						Act.	Spec.	-	#
NG-103	Test Location T3-62	8/13/2012	0.0	22.9	94.2	93.7	90.0	NG	115249
NG-104	Test Location T3-63	8/13/2012	0.0	23.2	94.6	94.0	90.0	NG	115249
NG-105	Test Location T3-88	8/13/2012	0.0	24.8	95.2	94.6	90.0	NG	115249
NG-106	Test Location T3-89	8/13/2012	0.0	27.1	95.3	94.7	90.0	NG	115249
NG-107	Test Location T3-810	8/13/2012	0.0	27.8	94.2	93.6	90.0	NG	115249
NG-108	Test Location T3-811	8/13/2012	0.0	25.4	95.9	95.4	90.0	NG	115249
NG-109	Test Location T1-91	8/14/2012	1.0	24.9	96.6	96.1	90.0	NG	115249
NG-110	Test Location T1-92	8/14/2012	1.0	28.5	94.0	93.4	90.0	NG	115249
NG-111	Test Location T2-91	8/14/2012	0.5	27.6	96.2	95.7	90.0	NG	115249
NG-112	Test Location T2-92	8/14/2012	0.5	25.7	95.7	95.1	90.0	NG	115249
NG-113	Test Location T3-91	8/14/2012	0.0	25.9	95.2	94.6	90.0	NG	115249
NG-114	Test Location T3-92	8/14/2012	0.0	24.5	94.5	93.9	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Remarks:

* Retest Necessary

Froehling & Robertson, Inc.

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SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase 1 Closure of Lamont Landfill**
Client: **SES Construction and Fuel Services LLC**

Date: **22 August 12**
Project No.: **64P-0015**

Test No.	Test Location	Elev./ Depth (Lift)	Field Moisture Content (%)	Field Dry Density (pcf)	Percent of Maximum Dry Density Act.	Percent of Maximum Dry Density Spec.	Field Test Type	Proctor No.
115	Test Location T1-55	1st Lift	27.3	94.4	93.8	90.0	NG	115249
116	Test Location T1-56	1st Lift	29.4	94.0	93.4	90.0	NG	115249
117	Test Location T1-54	1st Lift	30.6	93.9	93.3	90.0	NG	115249
118	Test Location T1-57	1st Lift	28.6	94.9	94.3	90.0	NG	115249
119	Test Location T2-57	2nd Lift	31.0	93.1	92.5	90.0	NG	115249
120	Test Location T2-55	2nd Lift	32.3	91.5	91.0	90.0	NG	115249
121	Test Location T2-56	2nd Lift	29.3	92.7	92.1	90.0	NG	115249
18	Test Location T2-57	2nd Lift	27.5	97.0	96.4	90.0	SC	115249
122R	Test Location T1-87	1st Lift	26.2	98.1	97.5	90.0	NG	115249
123R	Test Location T3-84	3rd Lift	24.2	101.8	101.2	90.0	NG	115249
124R	Test Location T3-13	3rd Lift	27.7	99.3	98.7	90.0	NG	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Notes:

Froehling & Robertson, Inc.

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Key:
SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

Form No. 117 (rev 12/13/07)

SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase 1 Closure of Lamont Landfill**
Client: **SES Construction and Fuel Services LLC**

Date: **22 August 12**
Project No.: **64P-0015**

Test No.	Test Location	Elev./ Depth (Lift)	Field Moisture Content (%)	Field Dry Density (pcf)	Percent of Maximum Dry Density Act.	Percent of Maximum Dry Density Spec.	Field Test Type	Proctor No.
125R	Test Location T3-14	3rd Lift	24.8	98.1	97.5	90.0	NG	115249
126R	Test Location T1-14	1st Lift	24.2	100.6	100.0	90.0	NG	115249
127R	Test Location T3-312	3rd Lift	25.8	102.5	101.9	90.0	NG	115249
19R	Test Location T1-87	1st Lift	26.1	99.4	98.8	90.0	SC	115249
20R	Test Location T3-84	3rd Lift	24.3	101.4	100.8	90.0	SC	115249
21R	Test Location T3-13	3rd Lift	23.4	101.3	100.7	90.0	SC	115249
22R	Test Location T3-14	3rd Lift	25.4	97.8	97.2	90.0	SC	115249
23R	Test Location T1-14	1st Lift	23.8	101.3	100.7	90.0	SC	115249
24R	Test Location T3-12	3rd Lift	26.7	100.6	100.0	90.0	SC	115249
25R	Test Location T1-41	1st Lift	22.0	102.0	101.4	90.0	SC	115249
26R	Test Location T1-43	1st Lift	23.6	99.9	99.3	90.0	SC	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Notes:

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:
SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

Form No. 117 (rev 12/13/07)

SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase 1 Closure of Lamont Landfill**
Client: **SES Construction and Fuel Services LLC**

Date: **23 August 12**
Project No.: **64P-0015**

Test No.	Test Location	Elev./ Depth (Lift)	Field Moisture Content (%)	Field Dry Density (pcf)	Percent of Maximum Dry Density Act.	Percent of Maximum Dry Density Spec.	Field Test Type	Proctor No.
128	Test Location T3-51	3rd Lift	24.5	96.1	95.5	90.0	NG	115249
129	Test Location T3-52	3rd Lift	26.9	98.3	97.7	90.0	NG	115249
130	Test Location T3-54	3rd Lift	25.3	96.1	95.5	90.0	NG	115249
131	Test Location T3-55	3rd Lift	23.1	100.4	99.8	90.0	NG	115249
132	Test Location T3-56	3rd Lift	26.5	96.2	95.6	90.0	NG	115249
133	Test Location T3-57	3rd Lift	28.6	98.8	98.2	90.0	NG	115249
27	Test Location T3-53	3rd Lift	27.5	95.5	94.9	90.0	SC	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Notes:

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:
SC - Sand Cone (ASTM D1556)
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Form No. 117 (rev 12/13/07)

SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase 1 Closure of Lamont Landfill**
Client: **SES Construction and Fuel Services LLC**

Date: **5 September 12**
Project No.: **64P-0015**

Test No.	Test Location	Elev./ Depth (Lift)	Field Moisture Content (%)	Field Dry Density (pcf)	Percent of Maximum Dry Density		Field Test Type	Proctor No.
					Act.	Spec.		
28	Test Location T1-812	1st Lift	20.3	101.3	100.7	90.0	SC	115249
29	Test Location T1-813	1st Lift	26.1	93.1	92.5	90.0	SC	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Notes:

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:
SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

Form No. 117 (rev 12/13/07)

SOIL FIELD DENSITY SUMMARY SHEET

Project: **Phase 1 Closure of Lamont Landfill**
Client: **SES Construction and Fuel Services LLC**

Date: **6 September 12**
Project No.: **64P-0015**

Test No.	Test Location	Elev./ Depth (Lift)	Field Moisture Content (%)	Field Dry Density (pcf)	Percent of Maximum Dry Density		Field Test Type	Proctor No.
					Act.	Spec.		
30	Test Location T2-812	2nd Lift	24.8	95.8	95.2	90.0	SC	115249
31	Test Location T2-813	2nd Lift	22.5	96.0	95.4	90.0	SC	115249
32	Test Location T3-812	3rd Lift	26.0	100.6	100.0	90.0	SC	115249
33	Test Location T3-813	3rd Lift	26.4	97.2	96.6	90.0	SC	115249

Proctor No.	Max. Dry Density (pcf)	Optimum Moisture (%)	Soil Class.	Lab Test Type
115249	100.6	20.6	CH	STD
115251	110.7	17.2	CH	MOD

Notes:

Froehling & Robertson, Inc.

Technician: S. Spikes

Key:
SC - Sand Cone (ASTM D1556)
NG - Nuclear Gauge (ASTM D6938)
DC - Drive Cylinder (ASTM D2937)
STD - Standard Proctor (ASTM D698)
MOD - Modified Proctor (ASTM D1557)

Form No. 117 (rev 12/13/07)

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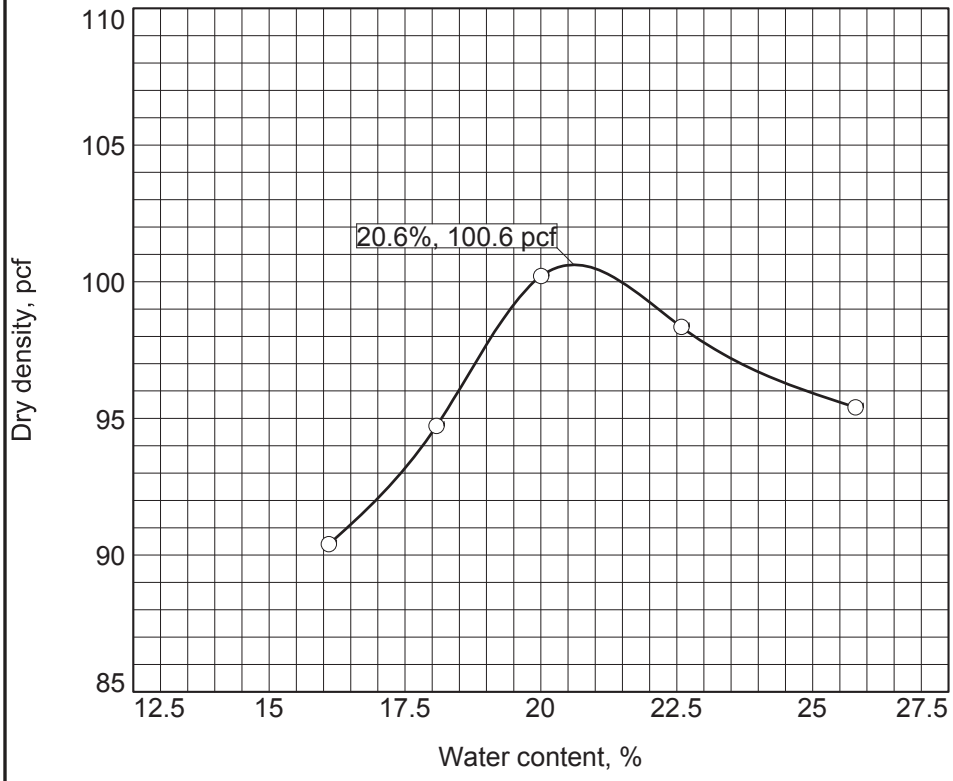
APPENDIX II

Proctor Compaction Test Results

Proctor Report



Curve No.
115249

Test Specification:
ASTM D 698-07 Method A Standard

Preparation Method _____
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 19.1 **LL** 54 **PI** 25
Sp.G. (ASTM D 854) _____
%>#4 0 **%<No.200** 85.1
USCS CH **AASHTO** A-7-6
Date Sampled 07/20/2012
Date Tested 07/23/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.76	12.99	13.27	13.28	13.26	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	1876.7	1895.1	2008.4	1990.4	1973.4	
WD + T #1	1639.7	1637.4	1707.1	1657.9	1605.9	
TARE #1	167.5	212.1	200.9	185.7	180.9	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	16.1	18.1	20.0	22.6	25.8	
DRY DENSITY	90.4	94.7	100.2	98.3	95.4	

TEST RESULTS

Maximum dry density = 100.6 pcf

Optimum moisture = 20.6 %

Material Description

Orange-Grey FAT CLAY

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

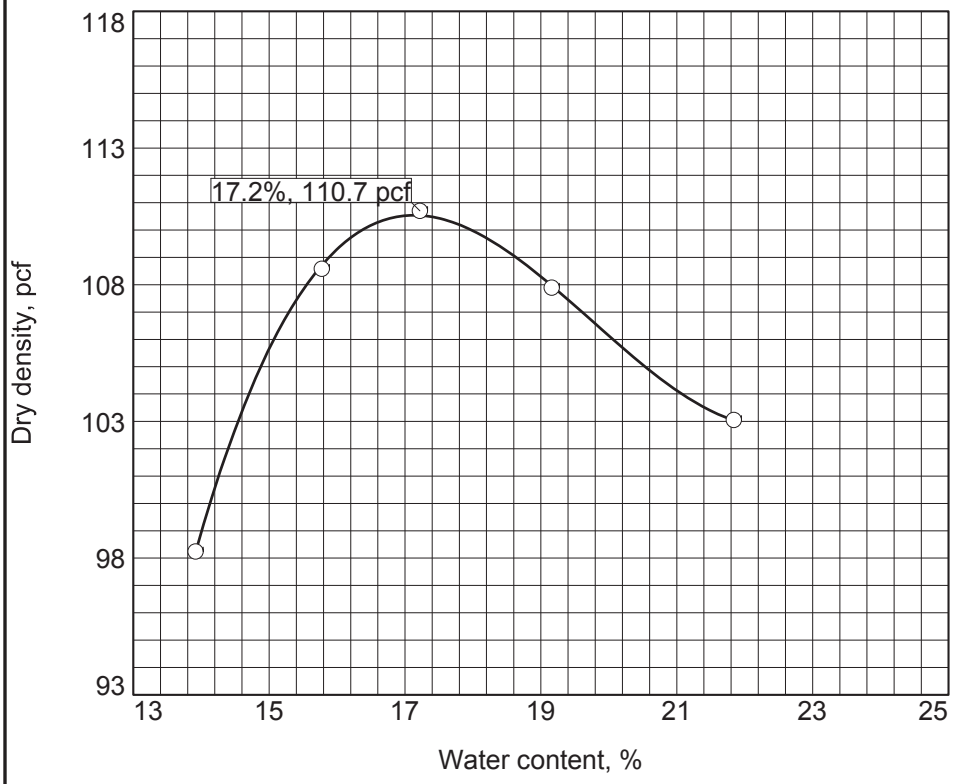
○ **Loc.:** East Slope - Section 1 **Depth:** 2nd Lift **Sample No.:** 115249

Checked by: Christopher Stryffeler
Title: Geotech Proj Professional

FROEHLING & ROBERTSON, INC.

Figure

Proctor Report



Curve No.
115251

Test Specification:
ASTM D 1557-07 Method A Modified

Preparation Method ASTM D 1557-07
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing #4 **Sieve**

NM 20.2 **LL** 51 **PI** 26
Sp.G. (ASTM D 854)
%>#4 0 **%<No.200** 92.2
USCS CH **AASHTO**
Date Sampled 07/20/2012
Date Tested 08/08/2012
Tested By Bill Campbell

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.99	13.45	13.59	13.54	13.45	
WM	9.26	9.26	9.26	9.26	9.26	
WW + T #1	2043.9	2098.2	2152.2	2138.5	2087.1	
WD + T #1	1819.6	1840.9	1866.5	1828.2	1752.2	
TARE #1	207.7	209.8	207.3	208.5	218.8	
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	13.9	15.8	17.2	19.2	21.8	
DRY DENSITY	98.2	108.6	110.7	107.9	103.1	

TEST RESULTS

Maximum dry density = 110.7 pcf

Optimum moisture = 17.2 %

Material Description

Orange-Grey FAT CLAY

Remarks:

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

○ **Loc.:** East Slope - Section 1 **Depth:** 2nd Lift **Sample No.:** 115251

Checked by: Christopher Stryffeler
Title: 08/10/2012

FROEHLING & ROBERTSON, INC.

Figure

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APPENDIX III

Flexible Wall Permeameter Test Results
Topsoil and Erosion Layer Gradation/Classifications
Remaining Proctors

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **1**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/18/12
Sample No: ST-01
Depth: Lift - 2

Moisture Content	Initial	Final
Tare Number	Z	S-02
wt. tare & wet sample (gm)	112.03	1031.95
wt. tare & dry sample (gm)	92.47	808.85
wt. of Water (gm)	19.56	223.10
wt. of tare (gm)	30.66	109.60
wt. of dry sample (gm)	61.81	699.25
Water content (%)	**31.6**	**31.9**

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	907.54	922.38
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	907.54	922.38
wt of dry sample (gm)	689.38	699.27

Dimensions - Inches	Initial	Final
Diameter 1	2.844	2.858
Diameter 2	2.833	2.841
Diameter 3	2.840	2.826
Average Diameter	**2.839**	**2.842**
Length 1	4.605	4.643
Length 2	4.606	4.637
Length 3	4.611	4.624
Average Length	**4.607**	**4.635**
Volume (pcf)	**0.0169**	**0.0170**

Wet Density (pcf)	**118.5**	**119.5**
Dry Density (pcf)	**90.0**	**90.6**
Void Ratio	**0.836**	
Porosity	**0.455**	
Hydraulic Gradient	**16.8**	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed **X**
Remolded

(B Coefficient)
Saturation (%) **96**

Confining Pressure
5.0

Initial	Final
Area (cm)	**Area (cm)**
40.84	40.92
Length (cm)	**Length (cm)**
11.70	11.77
Diameter (cm)	**Diameter (cm)**
7.21	7.22

Specimen	
Dry Density	**Moisture %**
90.0	**31.6**

Visual Description: **Light Grey & Tan, Clay**

Performed By: Dave Jenks

Date: 7/19/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

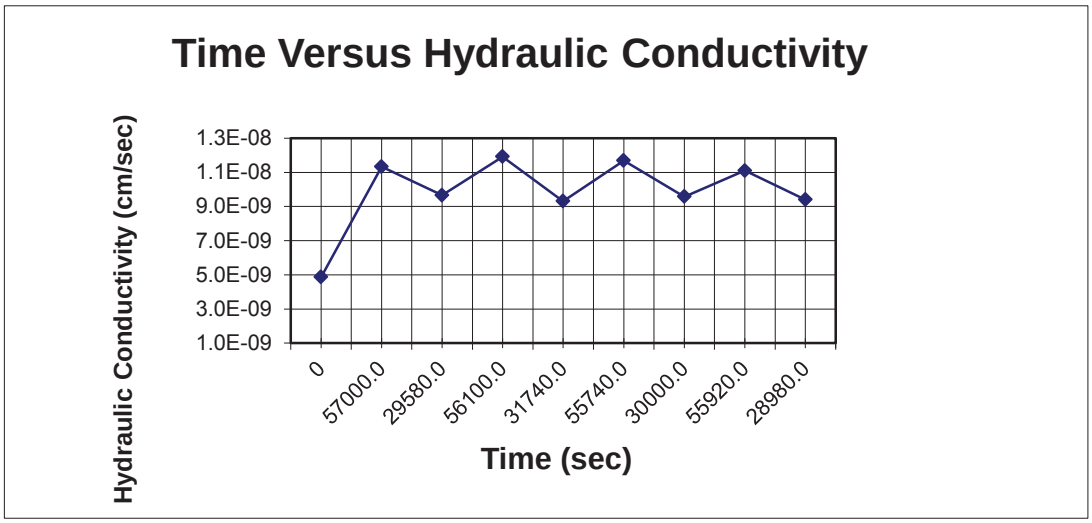
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/18/12
Sample No: ST-01
Location: Lift - 2

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/23/12	16:32:00	0	73.33	0.32	9.98	0	0	22.3	
07/24/12	8:22:00	57000.0	71.93	0.60	9.11	2.88	3.107	22.9	4.9E-09
07/24/12	16:35:00	29580.0	70.28	0.93	8.80	1.61	0.939	22.2	1.1E-08
07/25/12	8:10:00	56100.0	67.58	1.47	8.12	3.06	1.259	23.0	9.7E-09
07/25/12	16:59:00	31740.0	65.83	1.82	7.84	1.58	0.800	20.4	1.2E-08
07/26/12	8:28:00	55740.0	63.28	2.33	7.21	2.86	1.235	23.1	9.3E-09
07/26/12	16:48:00	30000.0	61.68	2.65	6.86	1.68	1.094	20.5	1.2E-08
07/27/12	8:20:00	55920.0	59.13	3.16	6.38	2.49	0.941	22.5	9.6E-09
07/27/12	16:23:00	28980.0	57.63	3.46	6.14	1.36	0.800	22.0	1.1E-08
07/30/12	8:11:00	229680.0	47.58	5.47	4.02	10.38	1.055	22.8	9.4E-09

Average Permeability cm/sec.	1.0E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
71.8	66.8	64.0



Performed By: Dave Jenks

Date: 7/23/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **3**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/03/12
Sample No: ST-02R
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	Z	Z-3
wt. tare & wet sample (gm)	131.28	813.01
wt. tare & dry sample (gm)	111.69	644.13
wt. of Water (gm)	19.59	168.88
wt. of tare (gm)	30.65	110.24
wt. of dry sample (gm)	81.04	533.89
Water content (%)	**24.2**	**31.6**

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	667.98	702.8
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	667.98	702.8
wt of dry sample (gm)	537.94	533.9

Dimensions - Inches	Initial	Final
Diameter 1	2.825	2.839
Diameter 2	2.832	2.798
Diameter 3	2.822	2.839
Average Diameter	**2.826**	**2.825**
Length 1	3.646	3.728
Length 2	3.665	3.654
Length 3	3.647	3.684
Average Length	**3.653**	**3.689**
Volume (pcf)	**0.0133**	**0.0134**

Wet Density (pcf)	**111.0**	**115.8**
Dry Density (pcf)	**89.4**	**88.0**
Void Ratio	**0.849**	
Porosity	**0.459**	
Hydraulic Gradient	**19.7**	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed **X**
Remolded

(B Coefficient)
Saturation (%) **97**

Confining Pressure
5.0

Initial	Final
Area (cm)	**Area (cm)**
40.48	40.45
Length (cm)	**Length (cm)**
9.28	9.37
Diameter (cm)	**Diameter (cm)**
7.18	7.18

Specimen	
Dry Density	**Moisture %**
89.4	**24.2**

Visual Description: **Grey-Brown, Clay**

Performed By: Dave Jenks

Date: 8/13/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

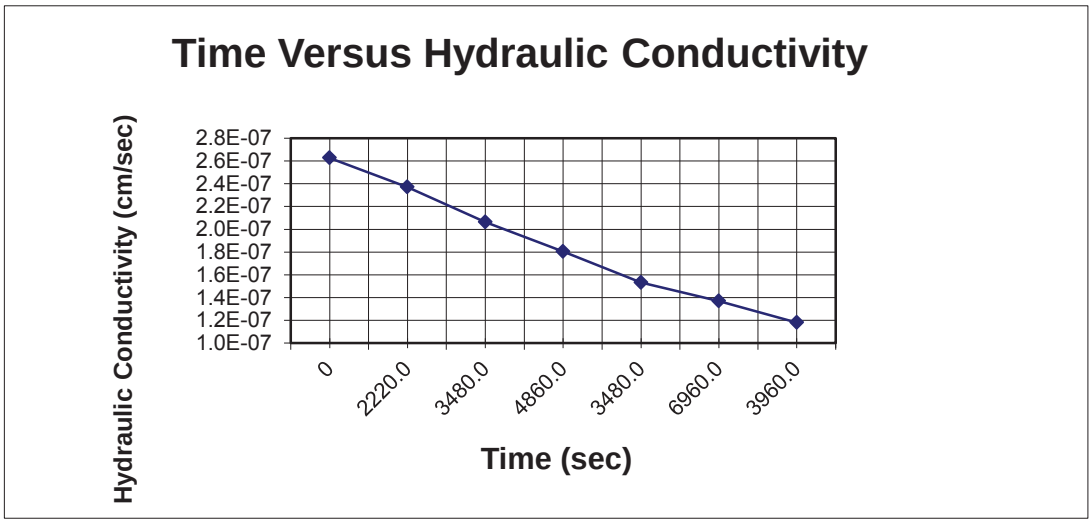
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/03/12
Sample No: ST-02R
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/15/12	8:09:00	0	73.23	0.34	9.86	0	0	23.9	
08/15/12	8:46:00	2220.0	69.68	1.05	8.86	4.29	1.408	23.8	2.6E-07
08/15/12	9:44:00	3480.0	64.78	2.03	7.82	5.07	1.061	23.5	2.4E-07
08/15/12	11:05:00	4860.0	58.98	3.19	6.60	5.98	1.052	23.3	2.1E-07
08/15/12	12:03:00	3480.0	55.43	3.90	5.88	3.59	1.014	23.2	1.8E-07
08/15/12	13:59:00	6960.0	49.53	5.08	4.66	6.03	1.034	23.1	1.5E-07
08/15/12	15:05:00	3960.0	46.58	5.67	4.06	2.99	1.017	23.2	1.4E-07
08/15/12	16:41:00	5760.0	42.93	6.40	3.32	3.69	1.014	23.2	1.2E-07

Average Permeability cm/sec.	1.5E-07
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
65.0	60.0	57.4



Performed By: Dave Jenks

Date: 8/15/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **3**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/19/12
Sample No: ST-03
Depth: LIFT - 3

Moisture Content	Initial	Final
Tare Number	G-58	S-02
wt. tare & wet sample (gm)	160.71	1268.58
wt. tare & dry sample (gm)	136.25	1013.26
wt. of Water (gm)	24.46	255.32
wt. of tare (gm)	30.82	109.60
wt. of dry sample (gm)	105.43	903.66
Water content (%)	23.2	28.3

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	1122.20	1159.02
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	1122.20	1159.02
wt of dry sample (gm)	910.87	903.69

Dimensions - Inches	Initial	Final
Diameter 1	2.844	2.877
Diameter 2	2.845	2.868
Diameter 3	2.846	2.894
Average Diameter	2.845	2.880
Length 1	5.457	5.566
Length 2	5.476	5.532
Length 3	5.457	5.538
Average Length	5.463	5.545
Volume (pcf)	0.0201	0.0209

Wet Density (pcf)	123.1	122.3
Dry Density (pcf)	99.9	95.3
Void Ratio	0.655	
Porosity	0.396	
Hydraulic Gradient	19.3	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 95

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
41.01	42.02
Length (cm)	Length (cm)
13.88	14.09
Diameter (cm)	Diameter (cm)
7.23	7.31

Specimen	
Dry Density	Moisture %
99.9	23.2

Visual Description: Grey-Brown, Clay

Performed By: Dave Jenks

Date: 7/23/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

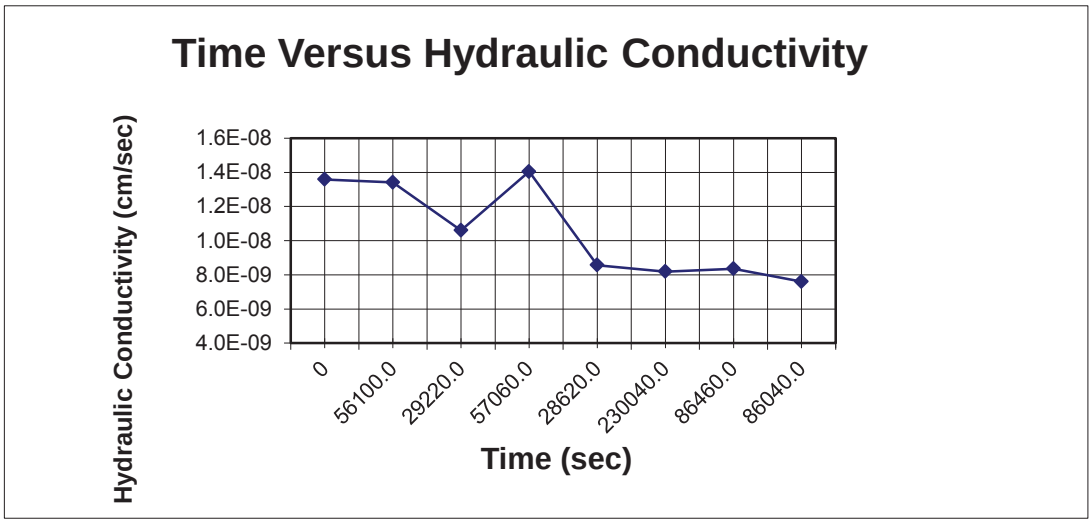
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/19/12
Sample No: ST-03
Location: LIFT - 3

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/25/12	16:58:00	0	72.73	0.44	10.00	0	0	20.4	
07/26/12	8:33:00	56100.0	68.63	1.26	9.60	3.07	0.488	23.1	1.4E-08
07/26/12	16:40:00	29220.0	66.68	1.65	9.46	1.33	0.359	20.4	1.3E-08
07/27/12	8:31:00	57060.0	63.53	2.28	9.12	2.44	0.540	22.5	1.1E-08
07/27/12	16:28:00	28620.0	61.48	2.69	8.96	1.44	0.390	22.0	1.4E-08
07/30/12	8:22:00	230040.0	51.43	4.70	7.42	8.93	0.766	22.7	8.6E-09
07/31/12	8:23:00	86460.0	47.83	5.42	6.82	3.32	0.833	23.4	8.2E-09
08/01/12	8:17:00	86040.0	44.28	6.13	6.25	3.22	0.803	22.7	8.4E-09
08/02/12	8:16:00	86340.0	41.03	6.78	5.72	2.97	0.815	23.2	7.6E-09

Average Permeability cm/sec.	8.2E-09
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
70.2	65.2	61.4



Performed By: Dave Jenks

Date: 7/24/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **2**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/24/12
Sample No: ST-04
Depth: LIFT - 1

Moisture Content	Initial	Final
Tare Number	G-58	Z-3
wt. tare & wet sample (gm)	129.68	1042.42
wt. tare & dry sample (gm)	106.86	823.50
wt. of Water (gm)	22.82	218.92
wt. of tare (gm)	30.83	110.25
wt. of dry sample (gm)	76.03	713.25
Water content (%)	30.0	30.7

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	924.48	932.19
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	924.48	932.19
wt of dry sample (gm)	711.06	713.27

Dimensions - Inches	Initial	Final
Diameter 1	2.849	2.850
Diameter 2	2.835	2.480
Diameter 3	2.836	2.850
Average Diameter	2.840	2.727
Length 1	4.631	4.620
Length 2	4.667	4.664
Length 3	4.631	4.660
Average Length	4.643	4.648
Volume (pcf)	0.0170	0.0157

Wet Density (pcf)	119.7	130.8
Dry Density (pcf)	92.1	100.1
Void Ratio	0.795	
Porosity	0.443	
Hydraulic Gradient	19.7	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 98

Confining Pressure
5.0

Initial	Final
Area	Area
(cm)	(cm)
40.87	37.67
Length	Length
(cm)	(cm)
11.79	11.81
Diameter	Diameter
(cm)	(cm)
7.21	6.93

Specimen	
Dry Density	Moisture %
92.1	30.0

Visual Description: Grey-Light Brown, Clay

Performed By: Dave Jenks

Date: 7/27/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

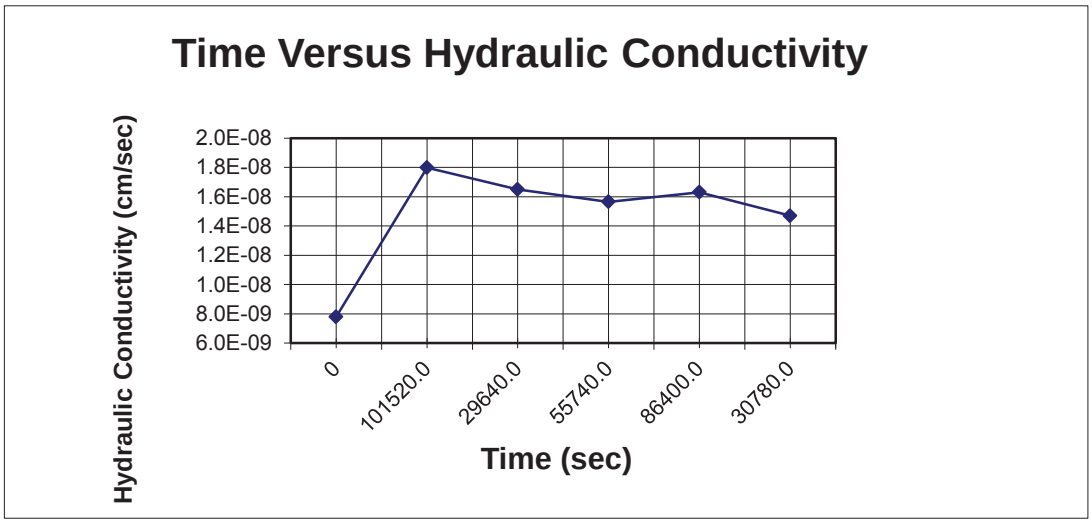
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/24/12
Sample No: ST-04
Location: LIFT - 1

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
07/30/12	4:16:00	0	72.33	0.52	9.68	0	0	22.3	
07/31/12	8:28:00	101520.0	67.83	1.42	7.84	6.87	2.044	23.4	7.8E-09
07/31/12	16:42:00	29640.0	64.93	2.00	7.26	2.91	1.000	22.2	1.8E-08
08/01/12	8:11:00	55740.0	59.93	3.00	6.18	5.23	1.080	22.7	1.6E-08
08/02/12	8:11:00	86400.0	52.63	4.46	4.72	7.34	1.000	23.2	1.6E-08
08/02/12	16:44:00	30780.0	50.03	4.98	4.27	2.44	0.865	22.3	1.6E-08
08/03/12	8:00:00	54960.0	45.83	5.82	3.39	4.32	1.048	22.9	1.5E-08

Average Permeability cm/sec.	1.6E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
57.0	52.0	48.7



Performed By: Dave Jenks

Date: 7/30/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **2**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-05
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	G-13	S-02
wt. tare & wet sample (gm)	100.57	995.97
wt. tare & dry sample (gm)	87.23	791.57
wt. of Water (gm)	13.34	204.40
wt. of tare (gm)	30.59	109.63
wt. of dry sample (gm)	56.64	681.94
Water content (%)	23.6	30.0

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	854.93	886.42
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	854.93	886.42
wt of dry sample (gm)	691.96	682.0

Dimensions - Inches	Initial	Final
Diameter 1	2.845	2.821
Diameter 2	2.844	2.881
Diameter 3	2.848	2.888
Average Diameter	2.846	2.863
Length 1	4.304	4.334
Length 2	4.313	4.339
Length 3	4.306	4.357
Average Length	4.308	4.343
Volume (pcf)	0.0159	0.0162

Wet Density (pcf)	118.9	120.7
Dry Density (pcf)	96.2	92.9
Void Ratio	0.719	
Porosity	0.418	
Hydraulic Gradient	19.3	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 100

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
41.03	41.54
Length (cm)	Length (cm)
10.94	11.03
Diameter (cm)	Diameter (cm)
7.23	7.27

Specimen	
Dry Density	Moisture %
96.2	23.6

Visual Description: Grey-Tan, Clay

Performed By: Dave Jenks

Date: 8/3/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

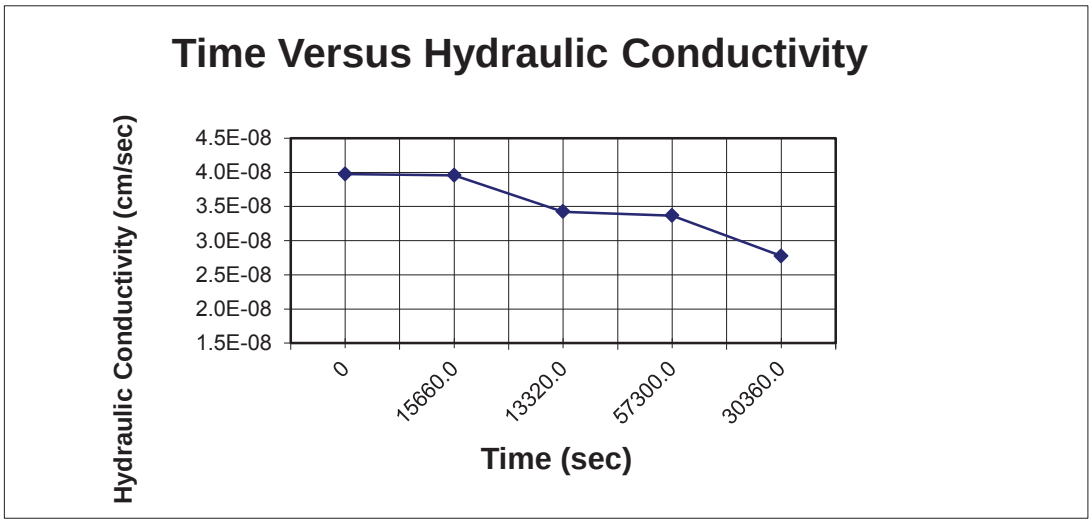
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-05
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/07/12	8:14:00	0	72.23	0.54	9.89	0	0	22.1	
08/07/12	12:35:00	15660.0	68.73	1.24	9.10	3.74	1.129	22.7	4.0E-08
08/07/12	16:17:00	13320.0	65.83	1.82	8.54	2.86	0.966	22.3	4.0E-08
08/08/12	8:12:00	57300.0	55.13	3.96	6.32	10.95	1.037	22.9	3.4E-08
08/08/12	16:38:00	30360.0	49.83	5.02	5.32	5.18	0.943	22.1	3.4E-08
08/09/12	7:01:00	51780.0	42.23	6.54	3.68	7.94	1.079	23.8	2.8E-08

Average Permeability cm/sec.	3.4E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
66.0	61.0	58.0



Performed By: Dave Jenks

Date: 8/3/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **4-WF**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-06
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	G-58	Z-3
wt. tare & wet sample (gm)	120.15	991.91
wt. tare & dry sample (gm)	100.50	780.92
wt. of Water (gm)	19.65	210.99
wt. of tare (gm)	30.83	110.26
wt. of dry sample (gm)	69.67	670.66
Water content (%)	28.2	31.5

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	852.52	881.69
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	852.52	881.69
wt of dry sample (gm)	664.97	670.7

Dimensions - Inches	Initial	Final
Diameter 1	2.836	2.872
Diameter 2	2.852	2.854
Diameter 3	2.852	2.837
Average Diameter	2.847	2.854
Length 1	4.427	4.481
Length 2	4.416	4.446
Length 3	4.405	4.450
Average Length	4.416	4.459
Volume (pcf)	0.0163	0.0165

Wet Density (pcf)	115.6	117.7
Dry Density (pcf)	90.1	89.5
Void Ratio	0.835	
Porosity	0.455	
Hydraulic Gradient	18.8	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 96

Confining Pressure
5.0

Initial	Final
Area	Area
(cm)	(cm)
41.06	41.28
Length	Length
(cm)	(cm)
11.22	11.33
Diameter	Diameter
(cm)	(cm)
7.23	7.25

Specimen	
Dry Density	Moisture %
90.1	28.2

Visual Description: Grey-Tan, Clay

Performed By: Dave Jenks

Date: 8/7/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

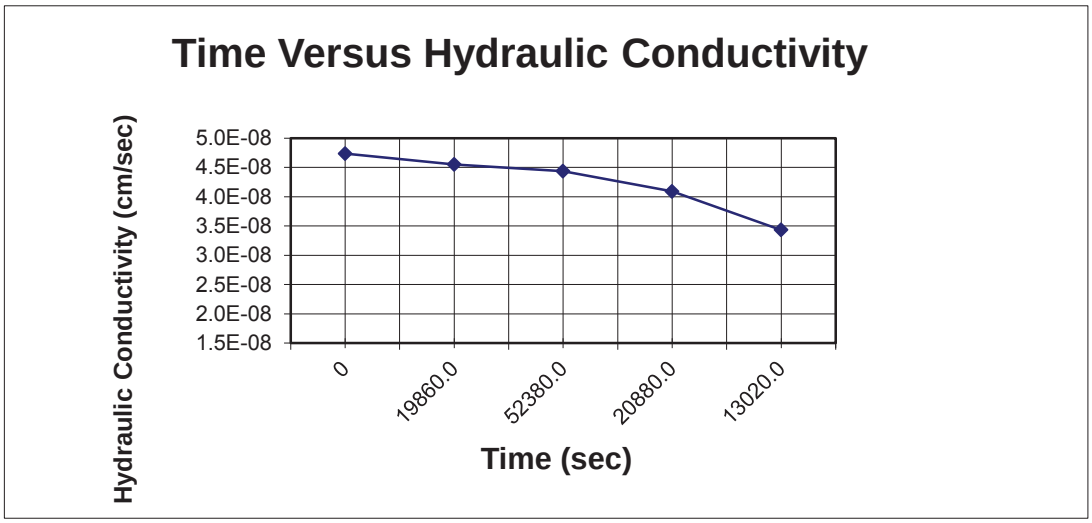
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-06
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/08/12	11:05:00	0	73.88	0.21	9.96	0	0	22.7	
08/08/12	16:36:00	19860.0	68.78	1.23	8.78	5.53	1.157	22.1	4.7E-08
08/09/12	7:09:00	52380.0	55.73	3.84	6.26	12.89	0.966	23.7	4.6E-08
08/09/12	12:57:00	20880.0	50.93	4.80	5.46	4.42	0.833	22.9	4.4E-08
08/09/12	16:34:00	13020.0	48.23	5.34	5.00	2.51	0.852	22.6	4.1E-08
08/10/12	8:08:00	56040.0	38.58	7.27	3.24	9.27	0.912	23.1	3.4E-08

Average Permeability cm/sec.	4.1E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
58.0	53.0	50.0



Performed By: Dave Jenks

Date: 8/8/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **6-WF**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-07
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	G-17	P-03
wt. tare & wet sample (gm)	192.18	1014.40
wt. tare & dry sample (gm)	160.86	811.10
wt. of Water (gm)	31.32	203.30
wt. of tare (gm)	30.56	109.98
wt. of dry sample (gm)	130.30	701.12
Water content (%)	24.0	29.0

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	881.30	904.45
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	881.30	904.45
wt of dry sample (gm)	710.51	701.14

Dimensions - Inches	Initial	Final
Diameter 1	2.842	2.834
Diameter 2	2.842	2.851
Diameter 3	2.839	2.841
Average Diameter	2.841	2.842
Length 1	4.471	4.551
Length 2	4.463	4.458
Length 3	4.440	4.449
Average Length	4.458	4.486
Volume (pcf)	0.0164	0.0165

Wet Density (pcf)	118.8	121.1
Dry Density (pcf)	95.8	93.9
Void Ratio	0.726	
Porosity	0.421	
Hydraulic Gradient	18.6	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 98

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
40.90	40.93
Length (cm)	Length (cm)
11.32	11.39
Diameter (cm)	Diameter (cm)
7.22	7.22

Specimen	
Dry Density	Moisture %
95.8	24.0

Visual Description: Grey-Purple, Clay

Performed By: Dave Jenks

Date: 8/8/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

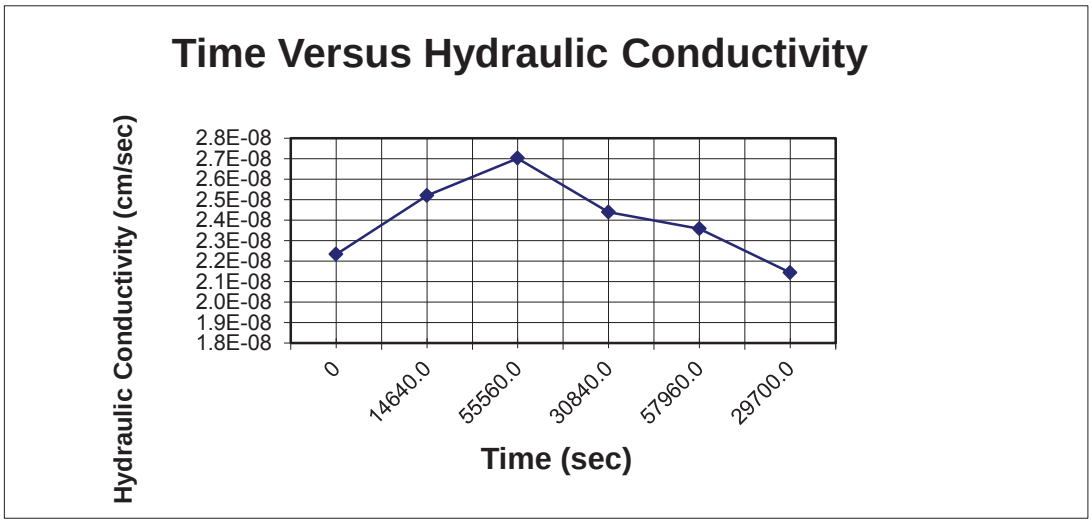
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-07
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/14/12	12:40:00	0	71.43	0.70	9.96	0	0	23.0	
08/14/12	16:44:00	14640.0	69.63	1.06	9.28	2.61	1.889	23.3	2.2E-08
08/15/12	8:10:00	55560.0	61.93	2.60	7.27	8.91	1.305	23.9	2.5E-08
08/15/12	16:44:00	30840.0	57.53	3.48	6.38	4.45	1.011	23.2	2.7E-08
08/16/12	8:50:00	57960.0	50.13	4.96	4.74	7.84	1.108	23.7	2.4E-08
08/16/12	17:05:00	29700.0	46.73	5.64	4.08	3.37	0.971	21.6	2.4E-08
08/17/12	8:20:00	54900.0	41.13	6.76	2.89	5.80	1.063	21.5	2.1E-08

Average Permeability cm/sec.	2.4E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
65.0	60.0	57.0



Performed By: Dave Jenks

Date: 8/15/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **4-WF**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 07/31/12
Sample No: ST-08
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	G-17	S-02
wt. tare & wet sample (gm)	108.05	1084.54
wt. tare & dry sample (gm)	92.52	860.22
wt. of Water (gm)	15.53	224.32
wt. of tare (gm)	32.17	109.65
wt. of dry sample (gm)	60.35	750.57
Water content (%)	25.7	29.9

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	919.33	975.03
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	919.33	975.03
wt of dry sample (gm)	731.18	750.68

Dimensions - Inches	Initial	Final
Diameter 1	2.840	2.912
Diameter 2	2.852	2.901
Diameter 3	2.838	2.895
Average Diameter	2.843	2.903
Length 1	4.579	4.731
Length 2	4.582	4.778
Length 3	4.590	4.697
Average Length	4.584	4.735
Volume (pcf)	0.0168	0.0181

Wet Density (pcf)	120.3	118.5
Dry Density (pcf)	95.7	91.3
Void Ratio	0.728	
Porosity	0.421	
Hydraulic Gradient	19.9	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 100

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
40.96	42.69
Length (cm)	Length (cm)
11.64	12.03
Diameter (cm)	Diameter (cm)
7.22	7.37

Specimen	
Dry Density	Moisture %
95.7	25.7

Visual Description: Grey-Light Grey, Clay

Performed By: Dave Jenks

Date: 8/13/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

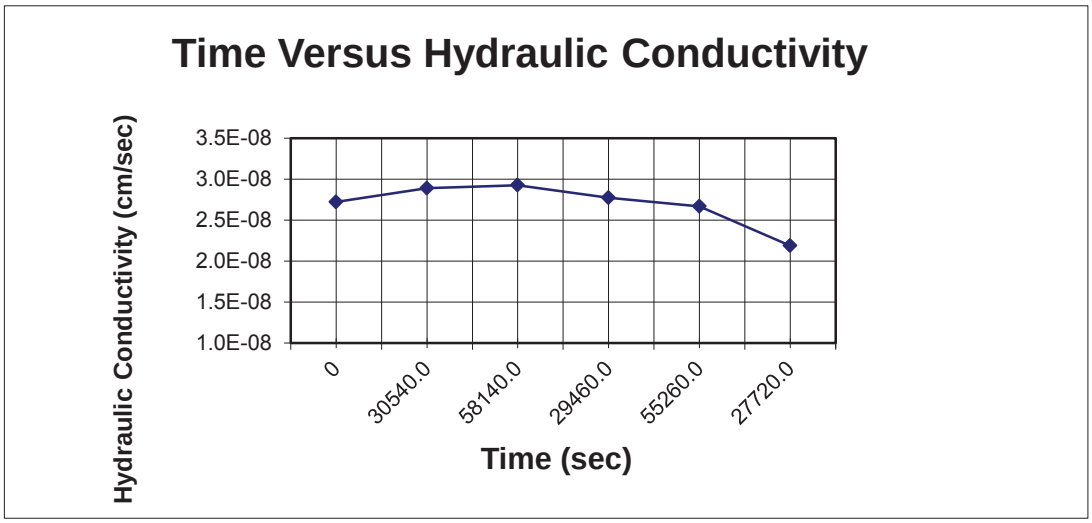
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/03/12
Sample No: ST-08
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/15/12	8:17:00	0	74.13	0.16	9.95	0	0	23.9	
08/15/12	16:46:00	30540.0	69.33	1.12	7.87	7.62	2.167	23.2	2.7E-08
08/16/12	8:55:00	58140.0	59.73	3.04	5.80	10.02	1.078	23.7	2.9E-08
08/16/12	17:06:00	29460.0	55.18	3.95	4.97	4.37	0.912	21.6	2.9E-08
08/17/12	8:27:00	55260.0	47.28	5.53	3.40	7.91	0.994	21.5	2.8E-08
08/17/12	16:09:00	27720.0	43.48	6.29	2.73	3.59	0.882	22.2	2.7E-08
08/18/12	10:22:00	65580.0	35.48	7.89	1.00	8.37	1.081	26.0	2.2E-08

Average Permeability cm/sec.	2.6E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
64.8	59.8	56.5



Performed By: Dave Jenks

Date: 8/14/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **2**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/03/12
Sample No: ST-09
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	G-13	Z-3
wt. tare & wet sample (gm)	120.80	1099.43
wt. tare & dry sample (gm)	103.39	883.77
wt. of Water (gm)	17.41	215.66
wt. of tare (gm)	30.59	110.31
wt. of dry sample (gm)	72.80	773.46
Water content (%)	23.9	27.9

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	958.36	989.21
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	958.36	989.21
wt of dry sample (gm)	773.40	773.53

Dimensions - Inches	Initial	Final
Diameter 1	2.863	2.887
Diameter 2	2.837	2.879
Diameter 3	2.851	2.809
Average Diameter	2.850	2.858
Length 1	4.807	4.839
Length 2	4.821	4.817
Length 3	4.816	4.842
Average Length	4.815	4.833
Volume (pcf)	0.0178	0.0179

Wet Density (pcf)	118.8	121.5
Dry Density (pcf)	95.9	95.0
Void Ratio	0.724	
Porosity	0.420	
Hydraulic Gradient	19.6	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 95

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
41.17	41.40
Length (cm)	Length (cm)
12.23	12.27
Diameter (cm)	Diameter (cm)
7.24	7.26

Specimen	
Dry Density	Moisture %
95.9	23.9

Visual Description: Grey-Light Grey, Clay

Performed By: Dave Jenks

Date: 8/13/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

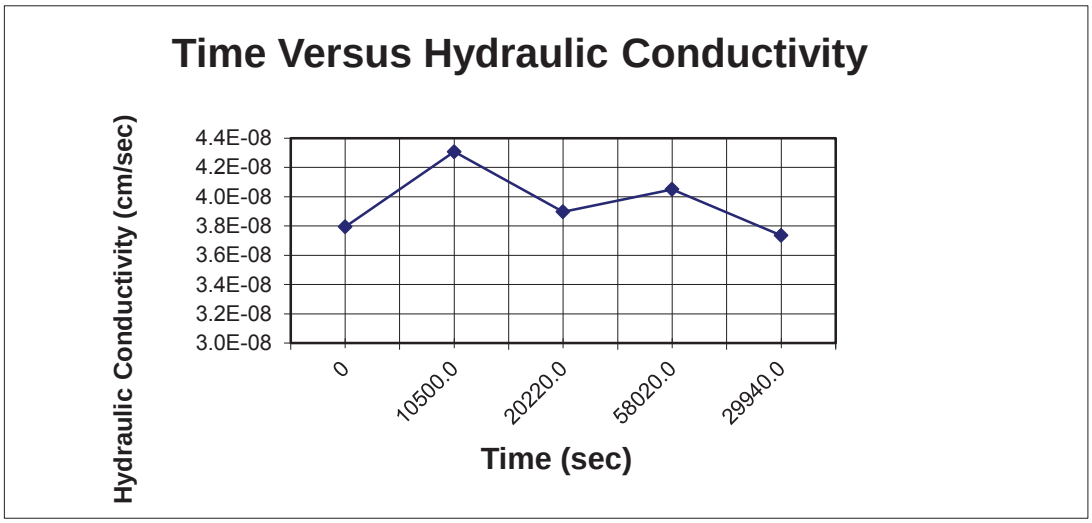
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/03/12
Sample No: ST-09
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/15/12	8:06:00	0	71.93	0.60	9.88	0	0	24.0	
08/15/12	11:01:00	10500.0	69.68	1.05	9.24	2.74	1.422	23.3	3.8E-08
08/15/12	16:38:00	20220.0	64.83	2.02	8.34	4.70	0.928	23.2	4.3E-08
08/16/12	8:45:00	58020.0	52.43	4.50	5.92	12.31	0.976	23.7	3.9E-08
08/16/12	17:04:00	29940.0	46.33	5.72	4.82	5.83	0.902	21.6	4.0E-08
08/17/12	8:14:00	54600.0	36.38	7.71	2.91	9.80	0.960	21.5	3.7E-08

Average Permeability cm/sec.	4.0E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
53.8	48.8	45.4



Performed By: Dave Jenks

Date: 8/15/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **3**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/02/12
Sample No: ST-10
Depth: N.A.

Moisture Content	Initial	Final
Tare Number	G-17	11
wt. tare & wet sample (gm)	92.84	1114.82
wt. tare & dry sample (gm)	79.63	881.89
wt. of Water (gm)	13.21	232.93
wt. of tare (gm)	32.17	86.93
wt. of dry sample (gm)	47.46	794.96
Water content (%)	27.8	29.3

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	990.76	1028.09
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	990.76	1028.09
wt of dry sample (gm)	775.04	795.1

Dimensions - Inches	Initial	Final
Diameter 1	2.849	2.865
Diameter 2	2.825	2.867
Diameter 3	2.835	2.846
Average Diameter	2.836	2.859
Length 1	4.905	4.964
Length 2	4.914	4.971
Length 3	4.932	4.949
Average Length	4.917	4.961
Volume (pcf)	0.0180	0.0184

Wet Density (pcf)	121.5	122.9
Dry Density (pcf)	95.0	95.1
Void Ratio	0.740	
Porosity	0.425	
Hydraulic Gradient	19.1	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed X
Remolded

(B Coefficient)
Saturation (%) 100

Confining Pressure
5.0

Initial	Final
Area (cm)	Area (cm)
40.76	41.43
Length (cm)	Length (cm)
12.49	12.60
Diameter (cm)	Diameter (cm)
7.20	7.26

Specimen	
Dry Density	Moisture %
95.0	27.8

Visual Description: Grey, Clay

Performed By: Dave Jenks

Date: 8/16/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

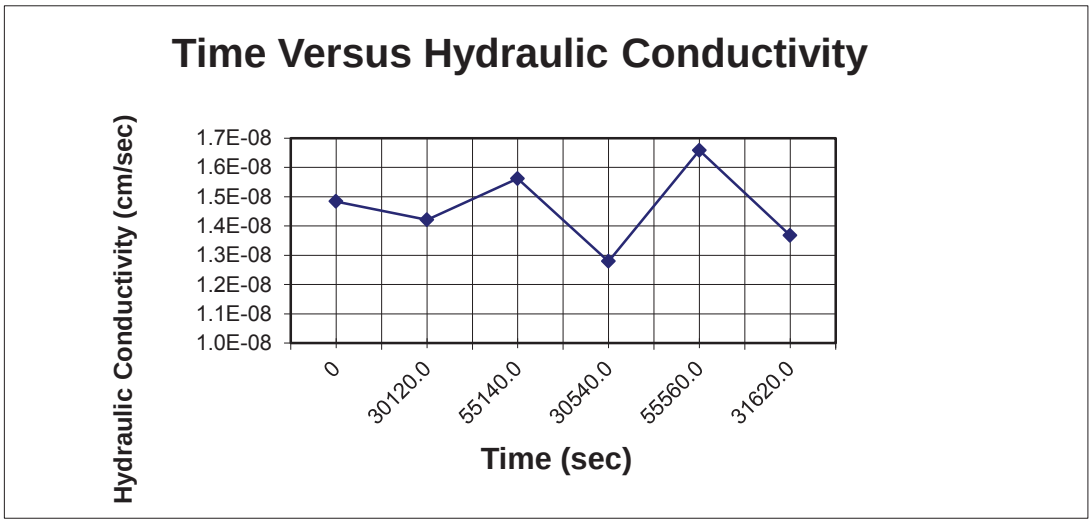
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 08/02/12
Sample No: ST-10
Location: N.A.

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
08/20/12	8:26:00	0	71.43	0.70	9.98	0	0	26.1	
08/20/12	16:48:00	30120.0	69.08	1.17	9.01	3.61	2.064	21.8	1.5E-08
08/21/12	8:07:00	55140.0	64.93	2.00	8.14	4.27	1.048	22.5	1.4E-08
08/21/12	16:36:00	30540.0	62.53	2.48	7.72	2.26	0.875	20.9	1.6E-08
08/22/12	8:02:00	55560.0	58.88	3.21	6.86	3.99	1.178	22.1	1.3E-08
08/22/12	16:49:00	31620.0	56.23	3.74	6.27	2.81	1.113	21.9	1.7E-08
08/23/12	7:05:00	51360.0	52.68	4.45	5.60	3.47	0.944	22.3	1.4E-08

Average Permeability cm/sec.	1.5E-08
Inflow Area	Outflow Area
0.20	0.20

Pressures		
Cell	Head	Tail
PSI	PSI	PSI
65.8	60.8	57.4



Performed By: Dave Jenks

Date: 8/20/2012

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-11
Sample Weight, gm.	655.27
Sample Initial Water Content, %	21.9
Sample Diameter, cm	7.28
Sample Length, cm	7.80
Sample Area, cm^2	41.59
Max. Dry Density, pcf	103.5
Saturation, %	95.0
Final Water Content, %	25.1
Hydraulic Conductivity, K_{avg}, cm/sec	1.4×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-12,. Lift 1 – S.W. Slope
Sample Weight, gm.	348.72
Sample Initial Water Content, %	20.1
Sample Diameter, cm	7.28
Sample Length, cm	4.65
Sample Area, cm^2	41.59
Max. Dry Density, pcf	93.8
Saturation, %	95.0
Final Water Content, %	29.0
Hydraulic Conductivity, K_{avg}, cm/sec	3.9×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-13, Beside TP-1 Area
Sample Weight, gm.	822.55
Sample Initial Water Content, %	27.3
Sample Diameter, cm	7.28
Sample Length, cm	10.34
Sample Area, cm^2	41.59
Max. Dry Density, pcf	93.8
Saturation, %	95.0
Final Water Content, %	31.4
Hydraulic Conductivity, K_{avg}, cm/sec	1.0×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-14, Lift 2, S.W. Slope Near TP-1
Sample Weight, gm.	669.04
Sample Initial Water Content, %	24.1
Sample Diameter, cm	7.28
Sample Length, cm	8.28
Sample Area, cm^2	41.59
Max. Dry Density, pcf	97.7
Saturation, %	95.0
Final Water Content, %	28.9
Hydraulic Conductivity, K_{avg}, cm/sec	1.5×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-15, Beside TP-1 & 2nd Lift
Sample Weight, gm.	675.09
Sample Initial Water Content, %	23.5
Sample Diameter, cm	7.28
Sample Length, cm	8.28
Sample Area, cm^2	41.59
Max. Dry Density, pcf	99.1
Saturation, %	95.0
Final Water Content, %	27.0
Hydraulic Conductivity, K_{avg}, cm/sec	1.7×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-16, Lift 3
Sample Weight, gm.	791.92
Sample Initial Water Content, %	21.4
Sample Diameter, cm	7.28
Sample Length, cm	9.14
Sample Area, cm^2	41.59
Max. Dry Density, pcf	104.8
Saturation, %	95.0
Final Water Content, %	25.6
Hydraulic Conductivity, K_{avg}, cm/sec	1.8×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-17, S.W. Entry Rd. Slope
Sample Weight, gm.	786.31
Sample Initial Water Content, %	20.7
Sample Diameter, cm	7.28
Sample Length, cm	9.22
Sample Area, cm^2	41.59
Max. Dry Density, pcf	106.1
Saturation, %	95.0
Final Water Content, %	22.4
Hydraulic Conductivity, K_{avg}, cm/sec	2.2×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-18
Sample Weight, gm.	672.48
Sample Initial Water Content, %	24.6
Sample Diameter, cm	7.28
Sample Length, cm	8.28
Sample Area, cm^2	41.59
Max. Dry Density, pcf	97.8
Saturation, %	95.0
Final Water Content, %	26.5
Hydraulic Conductivity, K_{avg}, cm/sec	2.7×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-19, Lift 3, S.W. Down Slope
Sample Weight, gm.	708.74
Sample Initial Water Content, %	23.2
Sample Diameter, cm	7.28
Sample Length, cm	8.69
Sample Area, cm^2	41.59
Max. Dry Density, pcf	99.4
Saturation, %	95.0
Final Water Content, %	28.0
Hydraulic Conductivity, K_{avg}, cm/sec	2.6×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-20
Sample Weight, gm.	675.76
Sample Initial Water Content, %	21.7
Sample Diameter, cm	7.28
Sample Length, cm	8.36
Sample Area, cm^2	41.59
Max. Dry Density, pcf	99.8
Saturation, %	95.0
Final Water Content, %	26.8
Hydraulic Conductivity, K_{avg}, cm/sec	5.5×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-21 @ (8-10)'
Sample Weight, gm.	494.96
Sample Initial Water Content, %	24.5
Sample Diameter, cm	7.28
Sample Length, cm	6.22
Sample Area, cm^2	41.59
Max. Dry Density, pcf	95.9
Saturation, %	95.0
Final Water Content, %	28.8
Hydraulic Conductivity, K_{avg}, cm/sec	2.7×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-22 @ T2-82
Sample Weight, gm.	638.56
Sample Initial Water Content, %	23.0
Sample Diameter, cm	7.28
Sample Length, cm	7.49
Sample Area, cm^2	41.59
Max. Dry Density, pcf	104.0
Saturation, %	95.0
Final Water Content, %	25.0
Hydraulic Conductivity, K_{avg}, cm/sec	4.3×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-23 @ 3-71
Sample Weight, gm.	672.31
Sample Initial Water Content, %	33.7
Sample Diameter, cm	7.28
Sample Length, cm	8.59
Sample Area, cm^2	41.59
Max. Dry Density, pcf	87.9
Saturation, %	95.0
Final Water Content, %	34.7
Hydraulic Conductivity, K_{avg}, cm/sec	2.0×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-24 @ 2-72
Sample Weight, gm.	691.28
Sample Initial Water Content, %	29.1
Sample Diameter, cm	7.28
Sample Length, cm	8.92
Sample Area, cm^2	41.59
Max. Dry Density, pcf	90.2
Saturation, %	95.0
Final Water Content, %	30.5
Hydraulic Conductivity, K_{avg}, cm/sec	2.6×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-25 @ 3-84
Sample Weight, gm.	625.42
Sample Initial Water Content, %	25.1
Sample Diameter, cm	7.28
Sample Length, cm	8.15
Sample Area, cm^2	41.59
Max. Dry Density, pcf	92.0
Saturation, %	95.0
Final Water Content, %	29.4
Hydraulic Conductivity, K_{avg}, cm/sec	2.6×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-26 @ 2-88
Sample Weight, gm.	738.84
Sample Initial Water Content, %	22.0
Sample Diameter, cm	7.28
Sample Length, cm	8.97
Sample Area, cm^2	41.59
Max. Dry Density, pcf	101.4
Saturation, %	95.0
Final Water Content, %	24.2
Hydraulic Conductivity, K_{avg}, cm/sec	2.0×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-27 @ 3-87
Sample Weight, gm.	593.28
Sample Initial Water Content, %	21.7
Sample Diameter, cm	7.28
Sample Length, cm	7.24
Sample Area, cm^2	41.59
Max. Dry Density, pcf	101.1
Saturation, %	95.0
Final Water Content, %	24.5
Hydraulic Conductivity, K_{avg}, cm/sec	5.1×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-28 @ 1-810
Sample Weight, gm.	794.80
Sample Initial Water Content, %	21.7
Sample Diameter, cm	7.28
Sample Length, cm	9.70
Sample Area, cm^2	41.59
Max. Dry Density, pcf	101.0
Saturation, %	95.0
Final Water Content, %	27.9
Hydraulic Conductivity, K_{avg}, cm/sec	1.7×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-29 @ 3-811
Sample Weight, gm.	657.43
Sample Initial Water Content, %	21.9
Sample Diameter, cm	7.28
Sample Length, cm	7.98
Sample Area, cm^2	41.59
Max. Dry Density, pcf	101.5
Saturation, %	95.0
Final Water Content, %	26.2
Hydraulic Conductivity, K_{avg}, cm/sec	2.0×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-30@ 3-75
Sample Weight, gm.	750.94
Sample Initial Water Content, %	23.2
Sample Diameter, cm	7.28
Sample Length, cm	9.40
Sample Area, cm^2	41.59
Max. Dry Density, pcf	97.4
Saturation, %	95.0
Final Water Content, %	28.6
Hydraulic Conductivity, K_{avg}, cm/sec	2.8×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-31 @ T1-56, Lift 1
Sample Weight, gm.	754.64
Sample Initial Water Content, %	23.8
Sample Diameter, cm	7.28
Sample Length, cm	9.37
Sample Area, cm^2	41.59
Max. Dry Density, pcf	97.6
Saturation, %	95.0
Final Water Content, %	30.9
Hydraulic Conductivity, K_{avg}, cm/sec	1.2×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-32 @ 2-5' Lift 2
Sample Weight, gm.	540.74
Sample Initial Water Content, %	23.2
Sample Diameter, cm	7.28
Sample Length, cm	7.13
Sample Area, cm^2	41.59
Max. Dry Density, pcf	92.3
Saturation, %	95.0
Final Water Content, %	29.1
Hydraulic Conductivity, K_{avg}, cm/sec	2.9×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-33 @ T3-54
Sample Weight, gm.	710.73
Sample Initial Water Content, %	22.7
Sample Diameter, cm	7.28
Sample Length, cm	8.99
Sample Area, cm^2	41.59
Max. Dry Density, pcf	96.7
Saturation, %	95.0
Final Water Content, %	28.2
Hydraulic Conductivity, K_{avg}, cm/sec	1.9×10^{-8}

HYDRAULIC CONDUCTIVITY (ASTM D 5084)	
Sample Location	ST-34 @ T3-53
Sample Weight, gm.	752.34
Sample Initial Water Content, %	22.6
Sample Diameter, cm	7.28
Sample Length, cm	9.17
Sample Area, cm^2	41.59
Max. Dry Density, pcf	100.5
Saturation, %	95.0
Final Water Content, %	25.5
Hydraulic Conductivity, K_{avg}, cm/sec	2.5×10^{-8}

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

CELL NO. **6WF**

Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 09/06/12
Sample No: ST-35
Depth: Lift-2

Moisture Content	Initial	Final
Tare Number	G-13	K-03
wt. tare & wet sample (gm)	107.76	945.69
wt. tare & dry sample (gm)	92.52	758.55
wt. of Water (gm)	15.24	187.14
wt. of tare (gm)	30.58	110.05
wt. of dry sample (gm)	61.94	648.50
Water content (%)	**24.6**	**28.9**

Sample Parameters	Initial	Final
wt. wet sample + tube (gm)	794.75	835.66
wt. of tube (gm)	0.00	0.00
wt. of wet sample (gm)	794.75	835.66
wt of dry sample (gm)	637.82	648.52

Dimensions - Inches	Initial	Final
Diameter 1	2.828	2.914
Diameter 2	2.841	2.873
Diameter 3	2.841	2.834
Average Diameter	**2.837**	**2.874**
Length 1	4.000	4.098
Length 2	4.046	4.096
Length 3	4.042	4.071
Average Length	**4.029**	**4.088**
Volume (pcf)	**0.0147**	**0.0153**

Wet Density (pcf)	**118.9**	**120.1**
Dry Density (pcf)	**95.4**	**93.2**
Void Ratio	**0.733**	
Porosity	**0.423**	
Hydraulic Gradient	**17.9**	

Specific Gravity
Assumed 2.65

Sample Condition
Undisturbed **X**
Remolded

(B Coefficient)
Saturation (%) **98**

Confining Pressure
5.0

Initial	Final
Area (cm)	**Area (cm)**
40.77	41.84
Length (cm)	**Length (cm)**
10.23	10.38
Diameter (cm)	**Diameter (cm)**
7.21	7.30

Specimen	
Dry Density	**Moisture %**
95.4	**24.6**

Visual Description: **Grey-Light Grey-Light Brown Clay.**

Performed By: Dave Jenks

Date: 9/12/2012

HYDRAULIC CONDUCTIVITY
Using A Flexible Wall Permeameter
ASTM D-5084

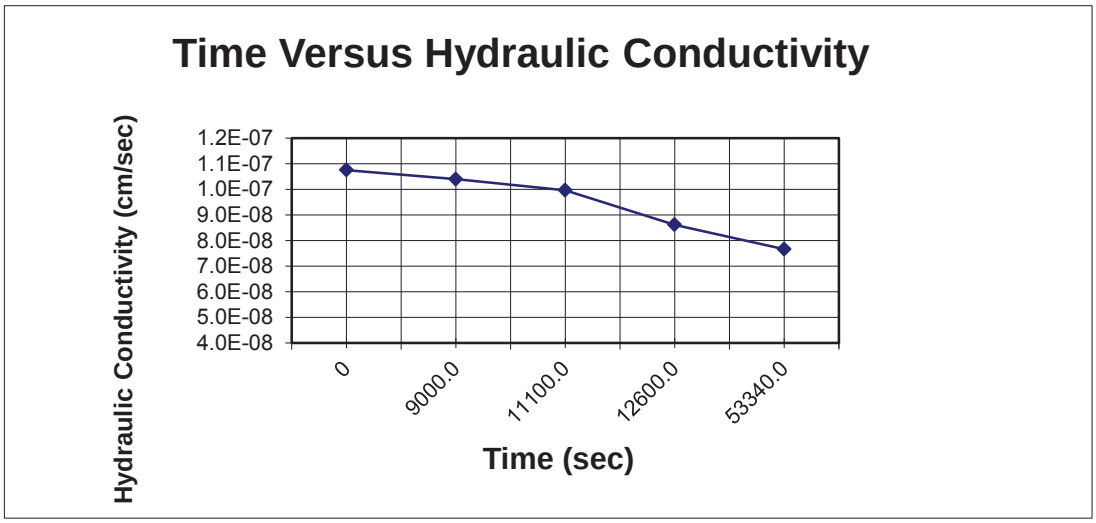
Project: Phase 1 Closure of Lamont Landfill
Client: SES Construction & Fuel Services
Project No: 64P-0015

Date: 09/06/12
Sample No: ST-35
Location: Lift-2

DATE	Time	Elapsed Time (sec)	Head water (cm)	Inflow Burette (cc)	Outflow Burette (cc)	Average Flow (cm)	Flow Ratio	Temp (C°)	Permeability cm/sec
09/17/12	8:06:00	0	72.83	0.42	9.67	0	0	22.5	
09/17/12	10:36:00	9000.0	67.63	1.46	8.42	5.75	1.202	22.7	1.1E-07
09/17/12	13:41:00	11100.0	61.58	2.67	7.24	6.01	0.975	22.6	1.0E-07
09/17/12	17:11:00	12600.0	55.33	3.92	5.99	6.28	1.000	21.6	1.0E-07
09/18/12	8:00:00	53340.0	33.13	8.36	1.43	22.61	1.027	22.8	8.6E-08
09/18/12	12:29:00	16140.0	27.53	9.48	0.30	5.65	1.009	22.7	7.7E-08

Average Permeability cm/sec.	9.2E-08
Inflow Area	Outflow Area
0.20	0.20

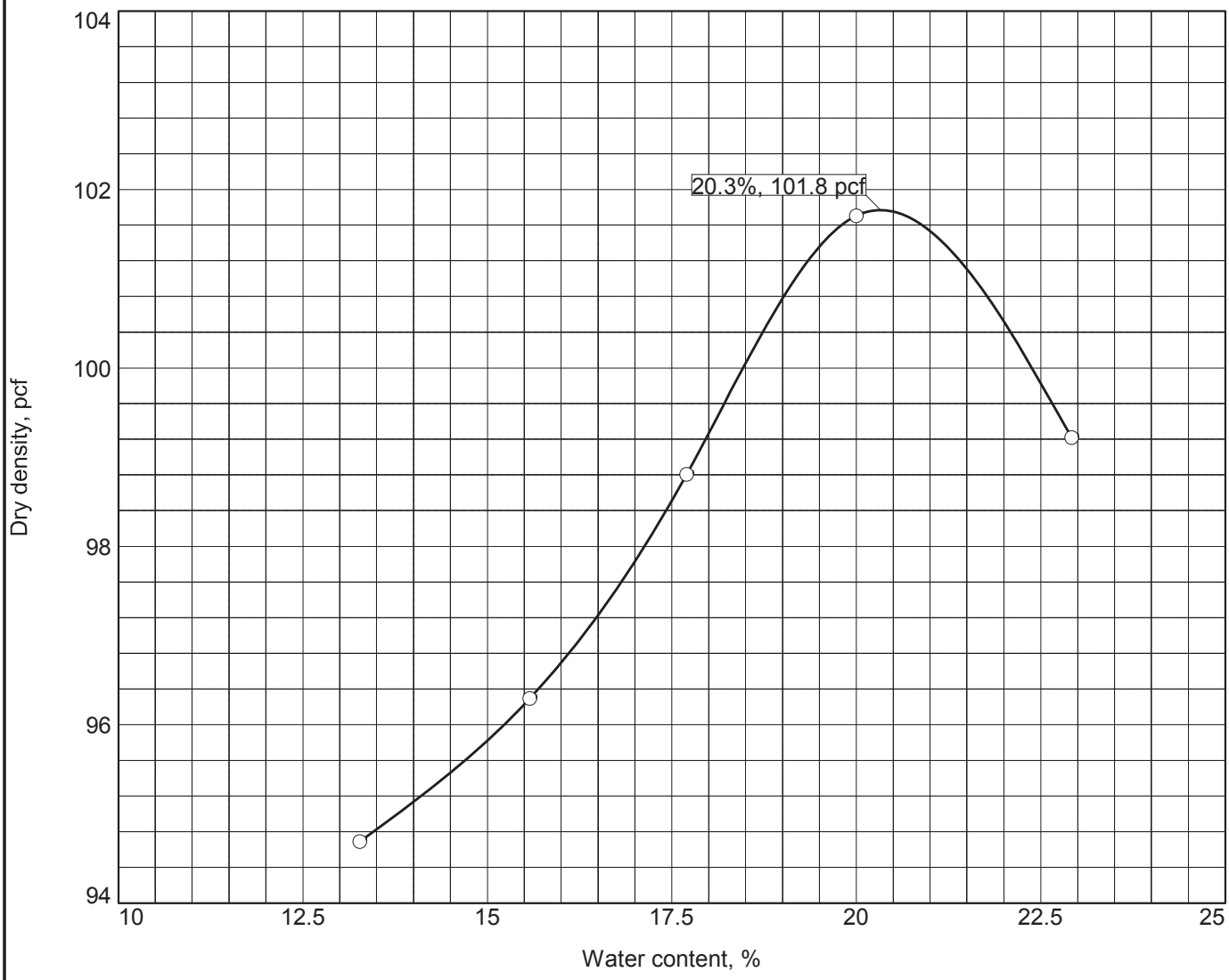
Pressures		
Cell	Head	Tail
PSI	PSI	PSI
70.0	65.0	62.4



Performed By: Dave Jenks

Date: 9/18/2012

Proctor Report



Test specification: ASTM D 698-07 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
			22				0	82

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 101.8 pcf Optimum moisture = 20.3 %	Grey Fat Clay

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

○ **Sample Number:** 115259

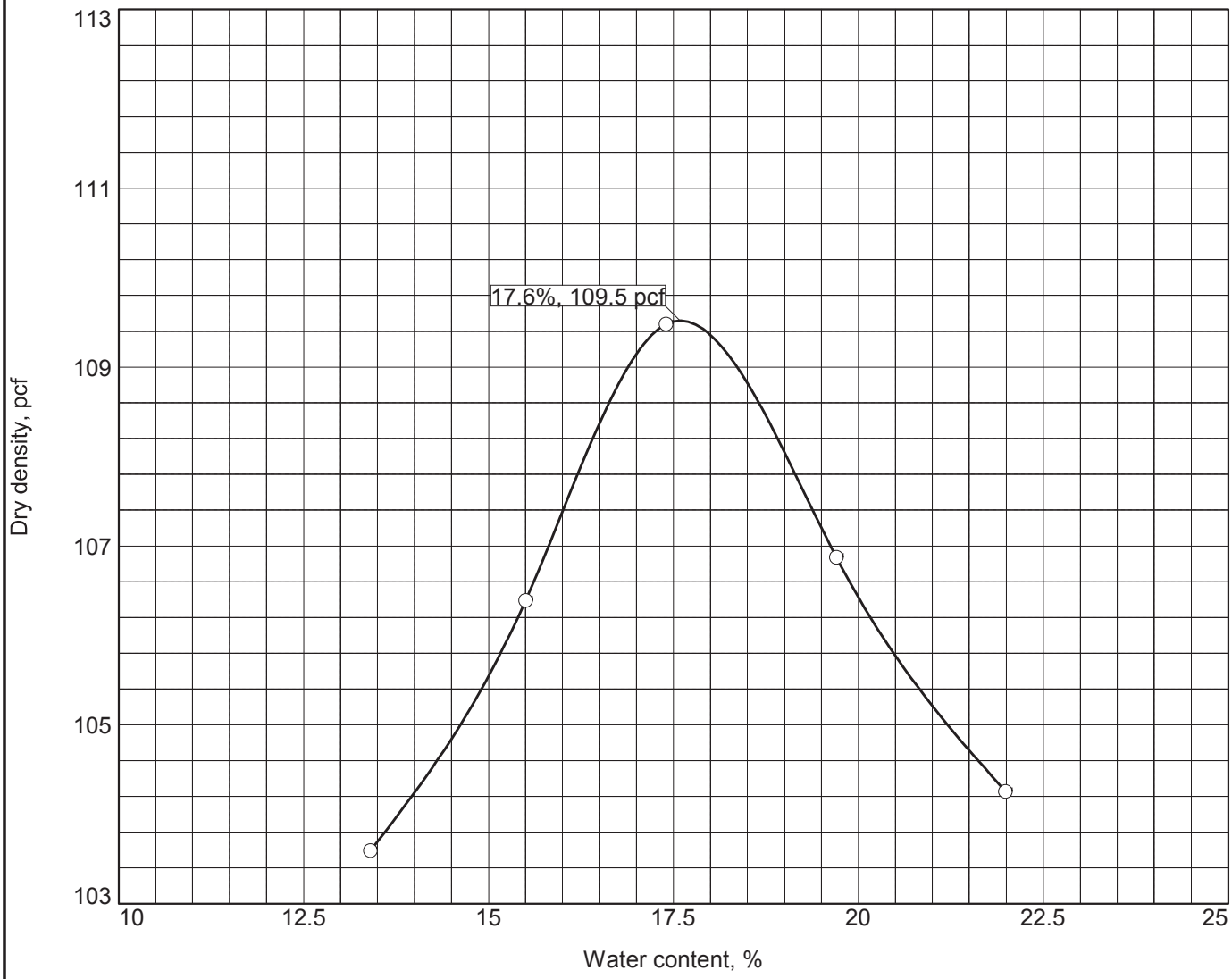
Remarks:

FROEHLING & ROBERTSON, INC.

Figure

Tested By: B Campbell

Proctor Report



Test specification: ASTM D 1557-07 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
			22				0	91

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 109.5 pcf Optimum moisture = 17.6 %	Grey Fat Clay

Project No. 64P0015 **Client:** SES Construction and Fuel Services, LLC
Project: Phase 1 Closure of Lamont Landfill

○ **Location:** Project Site Stockpile **Sample Number:** 115260

Remarks:

FROEHLING & ROBERTSON, INC.

Figure

Tested By: B Campbell

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T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Clay Layer Classifications
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the clay layer soil samples for the above referenced project. Twenty-five soil samples were delivered to our laboratory (during the clay layer placement) for classification in accordance with ASTM D2487-10 (Please see "Table 1" included with this report for the approximate locations and laboratory results). The samples were tested in accordance with the following ASTM procedures:

1. C136-6 for grain size.
2. D4318-10 for liquid and plastic limits, and plastic index calculation.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

Table 1

Test/Sample No.	Date	Location	Liquid Limit	Plastic Limit	Percent Fines	Classification
NG-33 (1)	07-30-12	T1-31	59	36	88.1	CH
NG-35 (2)	07-30-12	T1-33	60	40	92.3	CH
NG-36 (3)	07-30-12	T2-14	62	42	96.0	CH
SC-11 (4)	07-31-12	T2-32	60	35	91.3	CH
SC-12 (5)	08-02-12	T2-27	58	36	89.2	CH
NG-45 (6)	08-03-12	T2-22	55	34	87.8	CH
NG-51 (7)	08-03-12	T3-21	61	38	94.7	CH
NG-54 (8)	08-04-12	T1-45	60	34	93.6	CH
NG-60 (9)	08-05-12	T3-41	58	36	90.2	CH
NG-67 (10)	08-05-12	T2-53	59	37	91.8	CH
NG-69 (11)	08-06-12	T2-62	62	39	95.4	CH
NG-76 (12)	08-08-12	T1-72	61	41	93.9	CH
SC-16 (13)	08-10-12	T3-71	57	33	90.0	CH
NG-92 (14)	08-11-12	T1-85	54	31	85.8	CH
SC-17 (15)	08-12-12	T3-85	58	33	87.9	CH
NG-102 (16)	08-12-12	T2-811	52	30	90.2	CH
NG-107 (17)	08-13-12	T3-810	60	34	93.4	CH
NG-113 (18)	08-14-12	T3-91	65	37	92.3	CH
N/A (19)	08-21-12	N/A	51	29	88.9	CH
NG-121 (20)	08-22-12	T2-56	57	34	84.6	CH
NG-132 (21)	08-23-12	T3-56	61	40	91.5	CH
N/A (22)	08-24-12	N/A	63	38	92.3	CH
SC-29 (23)	09-05-12	T1-813	61	37	93.4	CH
SC-31 (24)	09-06-12	T2-813	58	29	90.9	CH
SC-32 (25)	09-06-12	T3-812	52	31	89.2	CH

Key:
NG – Nuclear Gauge Test Number (ASTM D6938)
SC – Sand Cone Test Number (ASTM D1556)
T2 – Test Layer (Layer No. 2)
813 – Grid Number

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX A

CQC Testing (FROEHLING & ROBERTSON, INC.)

Erosion Layer

HDR

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T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 1
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 1, Tested on 8-13-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	97
No. 40	40
No. 60	32
No. 200	16
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	9.5

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 2
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 2, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	99
No. 40	45
No. 60	40
No. 200	19
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	10.1

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

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Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 3
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 3, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	99
No. 40	46
No. 60	30
No. 200	16
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	9.5

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 4
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 4, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	97
No. 10	86
No. 40	41
No. 60	29
No. 200	17
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	10.1

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 5
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 5, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	100
No. 40	48
No. 60	32
No. 200	18
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	12.2

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 6
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 6, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	99
No. 10	89
No. 40	47
No. 60	21
No. 200	11
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	9.3

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 7
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 7, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	94
No. 40	44
No. 60	25
No. 200	16
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	8.3

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 8
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 8, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	98
No. 10	91
No. 40	36
No. 60	18
No. 200	10
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	7.0

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Erosion Layer Classification Report No. 9
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the erosion layer soil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Erosion Layer Sample No. 9, Tested on 8-27-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	96
No. 40	42
No. 60	29
No. 200	14
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	11.5

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX A

CQC Testing (FROEHLING & ROBERTSON, INC.)

Topsoil Layer

HDR

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Fayetteville Division
2592 Hope Mills Rd
Fayetteville, NC 28306
910.864.1920 Phone
910.864.8774 Fax

Certificate of Analysis

Froehling & Robertson, Inc.
Mr. Gilles Bellot
327 E. Jenkins Street
Fayetteville NC, 28306

Project: **Topsoil Sample - Lamont Landfill**

Date Reported: August 06, 2012
Date Received: July 25, 2012
Date Sampled: July 24, 2012
Sampled By: C. Mintz

#1 - Phase I Closure On-Site South End

1207679-01

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	89.8	%	8/6/12 1:00	JAW	2974-07aA&C	
Organic Matter at 440° C	10.2	%	8/6/12 1:00	JAW	D2974-01aA&C	
pH	6.79	pH Units	7/31/12 10:45	DSK	SM 4500 H+ B	H

#2 - Phase I Closure On-Site Stockpile

1207679-02

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	97.7	%	8/6/12 1:00	JAW	2974-07aA&C	
Organic Matter at 440° C	2.28	%	8/6/12 1:00	JAW	D2974-01aA&C	
pH	6.20	pH Units	7/31/12 10:45	DSK	SM 4500 H+ B	H

Notes and Definitions

H Analyte was prepared and/or analyzed outside of the analytical method holding time

State Certifications:
NCDNR #11
NCDOH #37714
USDA #3787

Respectfully Submitted

Bonnie Sanders

Bonnie K. Sanders, Administrative Assistant

Fayetteville Division
2592 Hope Mills Rd
Fayetteville, NC 28306
910.864.1920 Phone
910.864.8774 Fax

Certificate of Analysis

Froehling & Robertson, Inc.
Mr. Gilles Bellot
327 E. Jenkins Street
Fayetteville NC, 28306

Project: **Topsoil Sample - 401 Sand**

Date Reported: August 06, 2012
Date Received: July 25, 2012
Date Sampled: July 24, 2012
Sampled By: C. Mintz

#3 - At Field
1207680-01

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	93.3	%	8/6/12 1:00	JAW	2974-07aA&C	
Organic Matter at 440° C	6.69	%	8/6/12 1:00	JAW	D2974-01aA&C	
pH	5.42	pH Units	7/31/12 10:45	DSK	SM 4500 H+ B	H

Notes and Definitions

H Analyte was prepared and/or analyzed outside of the analytical method holding time

State Certifications:
NCDNR #11
NCDOH #37714
USDA #3787

Respectfully Submitted

Bonnie Sanders

Bonnie K. Sanders, Administrative Assistant

Microbac®

Fayetteville Division
2592 Hope Mills Rd
Fayetteville, NC 28306
910.864.1920 Phone
910.864.8774 Fax

Certificate of Analysis

Froehling & Robertson, Inc.
Mr. Gilles Bellot
327 E. Jenkins Street
Fayetteville NC, 28306

Project: **Soil Sample**

Date Reported: July 19, 2012
Date Received: July 12, 2012
Date Sampled: July 06, 2012
Sampled By: B. Campbell

DRAFT: ~~401 Brow Pit;~~ 401 Sand
1207338-01

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	98.5	%	7/18/12 18:52	JAW	2974-07aA&C	
Organic Matter at 440° C	1.46	%	7/18/12 18:52	JAW	D2974-01aA&C	
pH	5.41	pH Units	7/16/12 16:35	DSK	D2974-01a	H

Lamont Landfill **~~DRAFT: 401 Brow Pit~~, On Site**
1207338-02

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	97.6	%	7/18/12 18:52	JAW	2974-07aA&C	
Organic Matter at 440° C	2.36	%	7/18/12 18:52	JAW	D2974-01aA&C	
pH	5.58	pH Units	7/16/12 16:35	DSK	D2974-01a	H

Notes and Definitions

H Analyte was prepared and/or analyzed outside of the analytical method holding time

State Certifications:
NCDNR #11
NCDOH #37714
USDA #3787

Respectfully Submitted

DRAFT REPORT, DATA SUBJECT TO CHANGE

Microbac®

Fayetteville Division
2592 Hope Mills Rd
Fayetteville, NC 28306
910.864.1920 Phone
910.864.8774 Fax

Certificate of Analysis

Froehling & Robertson, Inc.
Mr. Gilles Bellot
327 E. Jenkins Street
Fayetteville NC, 28306

Project: **Topsoil Sample - Lamont Landfill**

Date Reported: September 24, 2012
Date Received: September 12, 2012
Date Sampled: September 11, 2012
Sampled By: client

Phase I Closure 401 Sand Co. Field
1209271-01

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	96.2	%	9/21/12 18:00	JAW	2974-07aA&C	
Organic Matter at 440° C	3.75	%	9/21/12 18:00	JAW	D2974-01aA&C	
pH	4.60	pH Units	9/18/12 10:00	DSK	SM 4500 H+ B	H

Phase I Closure 401 Sand Co. Field
1209271-02

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	99.0	%	9/21/12 18:00	JAW	2974-07aA&C	
Organic Matter at 440° C	1.03	%	9/21/12 18:00	JAW	D2974-01aA&C	
pH	5.10	pH Units	9/18/12 10:00	DSK	SM 4500 H+ B	H

Phase I Closure On site Blend
1209271-03

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	94.5	%	9/21/12 18:00	JAW	2974-07aA&C	
Organic Matter at 440° C	5.49	%	9/21/12 18:00	JAW	D2974-01aA&C	
pH	7.30	pH Units	9/18/12 10:00	DSK	SM 4500 H+ B	H

State Certifications:
NCDNR #11
NCDOH #37714
USDA #3787

Respectfully Submitted

Bonnie Sanders

Bonnie K. Sanders, Administrative Assistant

Microbac®

Fayetteville Division
2592 Hope Mills Rd
Fayetteville, NC 28306
910.864.1920 Phone
910.864.8774 Fax

Certificate of Analysis

Froehling & Robertson, Inc.
Mr. Gilles Bellot
327 E. Jenkins Street
Fayetteville NC, 28306

Project: **Topsoil Sample - Lamont Landfill**

Date Reported: September 24, 2012
Date Received: September 12, 2012
Date Sampled: September 11, 2012
Sampled By: client

Phase I Closure On site Blend

1209271-04

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	94.2	%	9/21/12 18:00	JAW	2974-07aA&C	
Organic Matter at 440° C	5.80	%	9/21/12 18:00	JAW	D2974-01aA&C	
pH	6.50	pH Units	9/18/12 10:00	DSK	SM 4500 H+ B	H

Phase I Closure North Pile

1209271-05

Analyte	Result	Units	Analyzed	Analyzed By	Method	Qualifier
Analyzed by: Microbac - Fayetteville Division						
Ash	96.4	%	9/21/12 18:00	JAW	2974-07aA&C	
Organic Matter at 440° C	3.61	%	9/21/12 18:00	JAW	D2974-01aA&C	
pH	5.70	pH Units	9/18/12 10:00	DSK	SM 4500 H+ B	H

Notes and Definitions

H Analyte was prepared and/or analyzed outside of the analytical method holding time

State Certifications:
NCDNR #11
NCDOH #37714
USDA #3787

Respectfully Submitted

Bonnie Sanders

Bonnie K. Sanders, Administrative Assistant

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FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Topsoil Classification Report No. 1
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the topsoil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Topsoil Sample No. 1 (On-site, Blend No. 1), Tested on 9-6-2012	
Sieve Size	Percent Passing
No. 4	98
No. 10	95
No. 40	67
No. 60	47
No. 200	19
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	16.6

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Topsoil Classification Report No. 2
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the topsoil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Topsoil Sample No. 2 (On-site, Blend No. 2), Tested on 9-12-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	99
No. 40	70
No. 60	60
No. 200	11
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	7.4

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

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Engineering Stability Since 1881

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Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
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November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Topsoil Classification Report No. 3
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the topsoil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Topsoil Sample No. 3 (On-site, North Pile), Tested on 9-12-2012	
Sieve Size	Percent Passing
No. 4	98
No. 10	97
No. 40	69
No. 60	48
No. 200	18
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	13.4

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Topsoil Classification Report No. 4
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the topsoil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Topsoil Sample No. 4 (401 Sand Field), Tested on 9-12-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	100
No. 40	63
No. 60	37
No. 200	3
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	14.0

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
327 East Jenkins Street
Fayetteville, North Carolina 28306 I USA
T 910.323.9832 I F 910.323.5455
NC Engineering License # F-0266

November 12, 2012

Mr. Scott A. Ballard, P.E.
Senior Engineer
SES Construction and Fuel Services, PLLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Reference: **Report of Laboratory Testing Services –** Topsoil Classification Report No. 5
Phase 1 Closure of Lamont Landfill
Fort Bragg, North Carolina
F&R Record No. 64P-0015

Dear Mr. Ballard:

As requested, F&R has completed the appropriate laboratory testing to complete the classification of the topsoil sample for the above referenced project. The soil sample was delivered to our laboratory for classification in accordance with ASTM D2487-10. The sample was tested in accordance with the following ASTM procedures:

1. D2216-10 for moisture for moisture content (as received in lab).
2. C136-6 for grain size.
3. D4318-10 for liquid and plastic limits, and plastic index calculation.

Topsoil Sample No. 5 (401 Sand Field), Tested on 9-12-2012	
Sieve Size	Percent Passing
No. 4	100
No. 10	99
No. 40	70
No. 60	65
No. 200	11
Liquid Limit, %	NP (Non-Plastic)
Plasticity Index, %	NP (Non-Plastic)
Natural Moisture Content, %	7.4

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
FROEHLING & ROBERTSON, INC.

A. Craig Mintz
Construction Services Manager

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX B

CQA Testing (HDR, GEOTECHNICS)

Low Permeability Barrier Layer Borrow Source Investigation

Low Permeability Barrier Layer Construction Testing

Erosion Layer

Topsoil Layer

Field Reports

HDR

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX B

CQA Testing (HDR, GEOTECHNICS)

Low Permeability Barrier Layer Borrow Source Investigation

HDR

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TEST PIT LOCATION PLAN

Google maps

To see all the details that are visible on the screen,use the "Print" link next to the map.

Get Directions My Maps

Print Send Link

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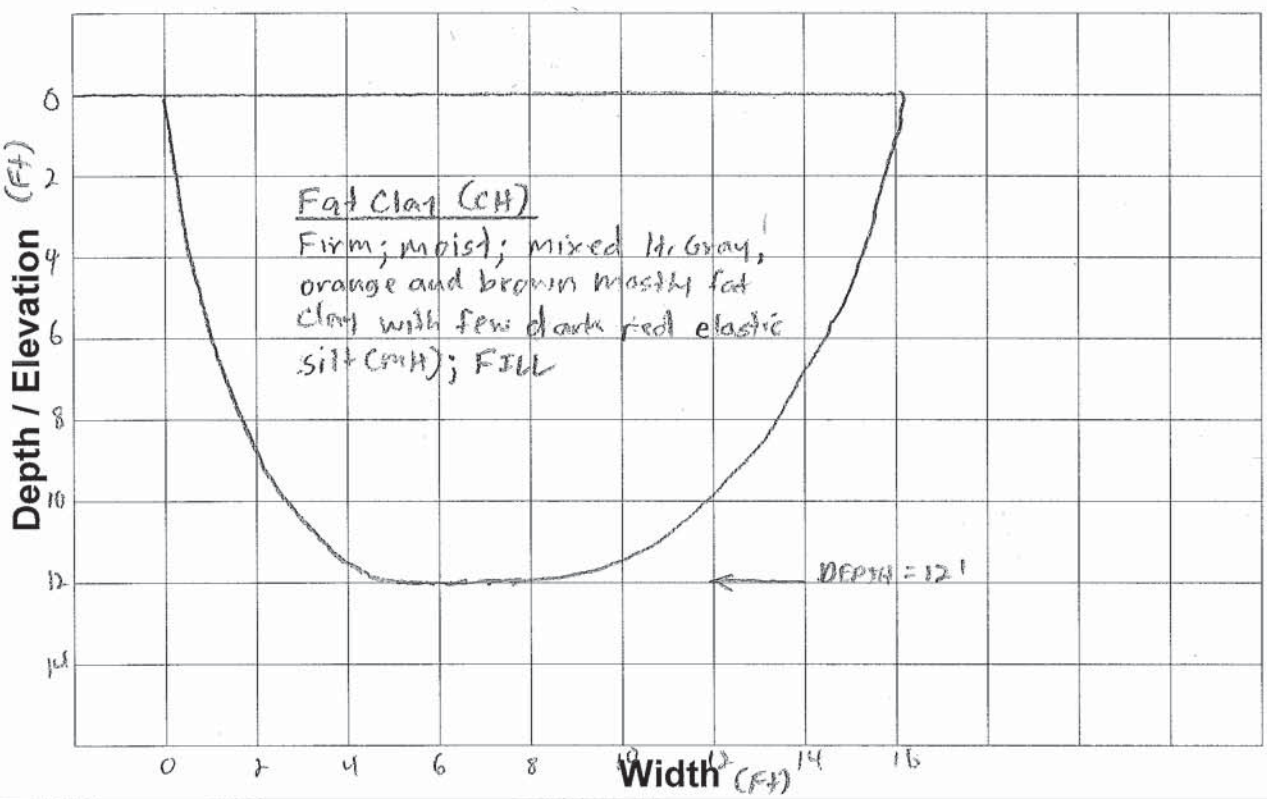
Test Pit Log	HDR Engineering, Inc.	Test Pit No. TP-1

City/Town:	Ft. Bragg, NC	Project File Number:	120265	Boring Contract Number:	N/A
Location:	Center-North of Stockpile	Coordinates (Feet): N	Unknown	E	Unknown
Bridge Number:	N/A	Date & Time Started	Date & Time Finished	Total Hours Worked	
Ground Elevation (Feet):	Unknown	3/16/10 9:45	3/16/2010 10:05	0.33	
Inspector's Name (Print):	Thomas Yanoschak	Equipment Used:	CAT 320B Excavator		
Inspector's Company:	HDR Engineering	Driller's / Operator's Name (Print):	Dan Messier		
		Contractor / Sub-Contractor:	N/A		



Plan View

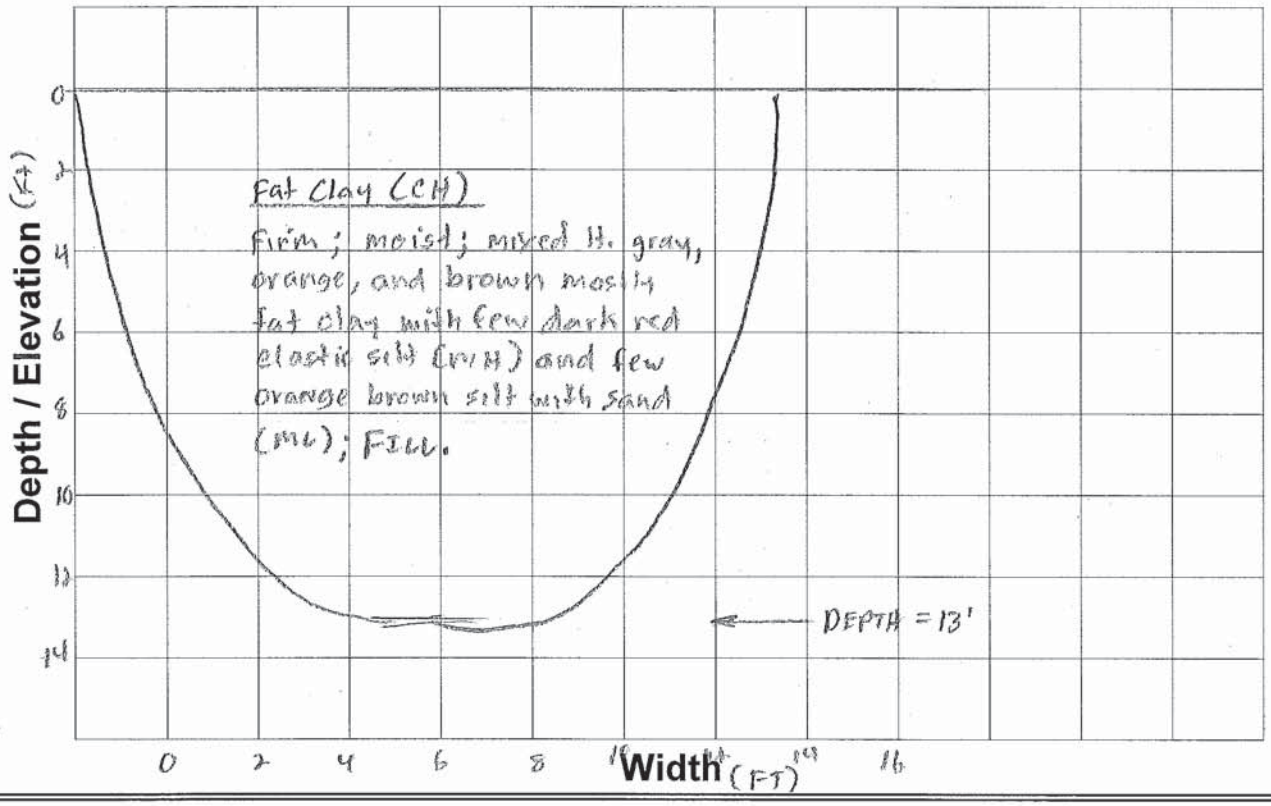
The following information shall be clearly and accurately noted on the above sketches: Soil descriptions (See MHD Visual Identification of Soils Chart), test pit dimensions, strata changes, Cobbles, boulders, structures, north arrow, water level, excavation effort (easy, moderate, difficult).

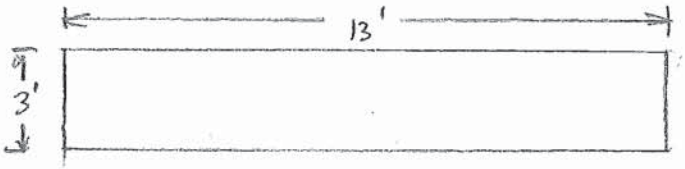
Remarks: Took representative sample from pit for testing (5 gallons).
Backfilled pit upon completion

Samples	Depths
TP-1	Misc.

Test Pit Log	HDR Engineering, Inc.	Test Pit No. TP-2

City/Town:	Ft. Bragg, NC	Project File Number:	120265	Boring Contract Number:	N/A
Location:	Center-South of Stockpile	Coordinates (Feet): N	Unknown	E	Unknown
Bridge Number:	N/A	Date & Time Started	Date & Time Finished	Total Hours Worked	
Ground Elevation (Feet):	Unknown	3/16/10 10:07	3/16/2010 10:30	0.38	
Inspector's Name (Print):	Thomas Yanoschak	Equipment Used:	CAT 320B Excavator		
Inspector's Company:	HDR Engineering	Driller's / Operator's Name (Print):	Dan Messier		
		Contractor / Sub-Contractor:	N/A		





Plan View

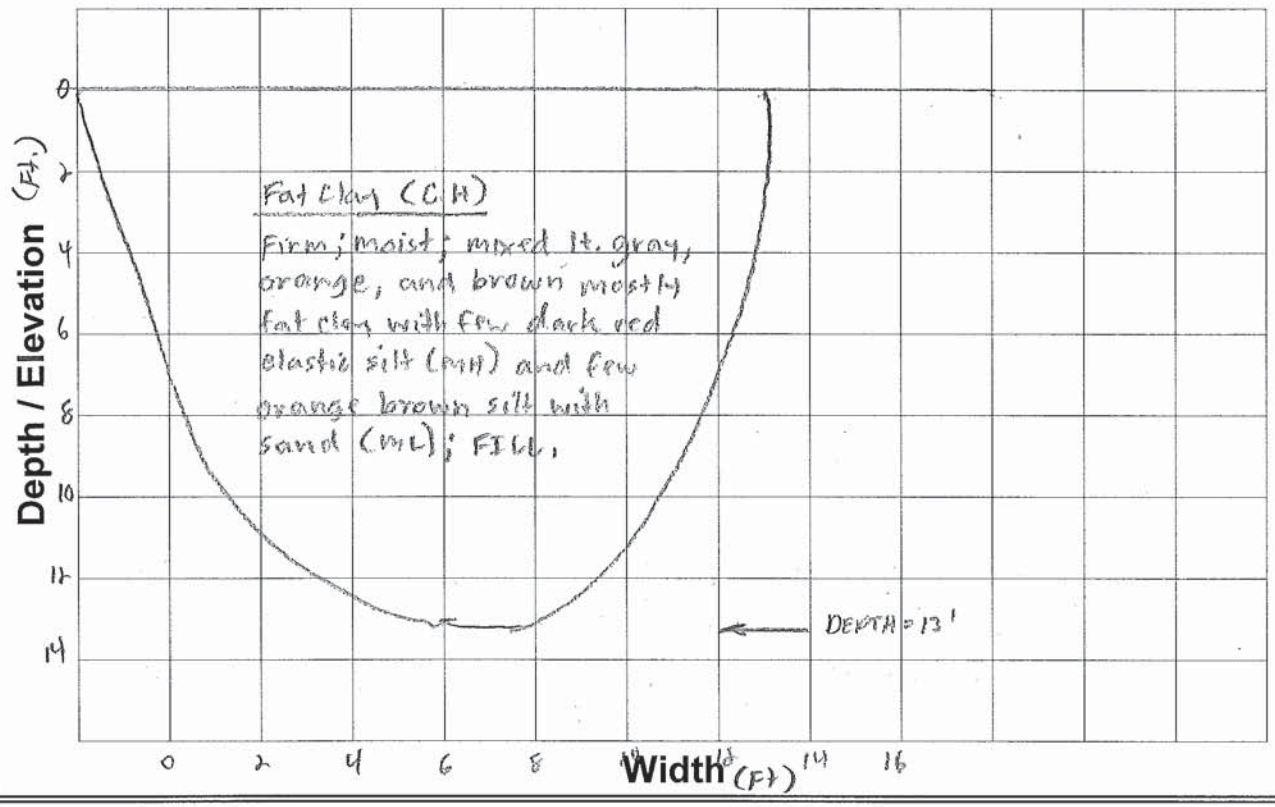
The following information shall be clearly and accurately noted on the above sketches: Soil descriptions (See MHD Visual Identification of Soils Chart), test pit dimensions, strata changes, Cobbles, boulders, structures, north arrow, water level, excavation effort (easy, moderate, difficult).

Remarks: Took representative sample from pit for testing (5 gallons).
Backfilled pit upon completion

Samples	Depths
TP-2	Misc.

Test Pit Log	HDR Engineering, Inc.	Test Pit No. TP-3

City/Town: Ft. Bragg, NC	Project File Number: 120265	Boring Contract Number: N/A	
Location: Center-North of Stockpile	Coordinates (Feet): N Unknown	E Unknown	
Bridge Number: N/A	Date & Time Started	Date & Time Finished	Total Hours Worked
Ground Elevation (Feet): Unknown	3/16/10 10:30	3/16/2010 10:45	0.25
Inspector's Name (Print): Thomas Yanoschak	Equipment Used: CAT 320B Excavator		
Inspector's Company: HDR Engineering	Driller's / Operator's Name (Print): Dan Messier		
	Contractor / Sub-Contractor: N/A		



Plan View

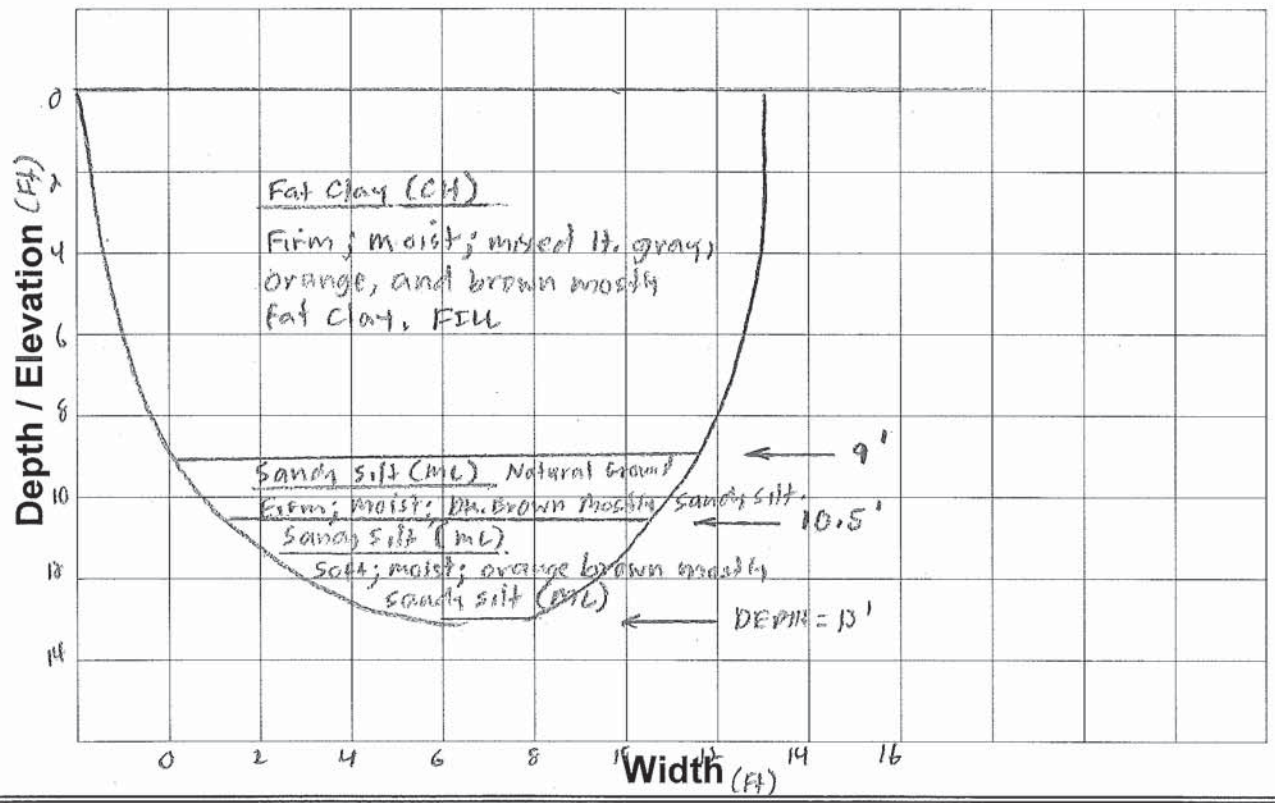
The following information shall be clearly and accurately noted on the above sketches: Soil descriptions (See MHD Visual Identification of Soils Chart), test pit dimensions, strata changes, Cobbles, boulders, structures, north arrow, water level, excavation effort (easy, moderate, difficult).

Remarks: Took representative sample from pit for testing (5 gallons).
Backfilled pit upon completion

Samples	Depths
TP-3	Misc.

Test Pit Log	HDR Engineering, Inc.	Test Pit No. TP-4

City/Town:	Ft. Bragg, NC	Project File Number:	120265	Boring Contract Number:	N/A
Location:	North End of Stockpile	Coordinates (Feet): N	Unknown	E	Unknown
Bridge Number:	N/A	Date & Time Started	Date & Time Finished	Total Hours Worked	
Ground Elevation (Feet):	Unknown	3/16/10 10:45	3/16/2010 11:10	0.42	
Inspector's Name (Print):	Thomas Yanoschak	Equipment Used:	CAT 320B Excavator		
Inspector's Company:	HDR Engineering	Driller's / Operator's Name (Print):	Dan Messier		
		Contractor / Sub-Contractor:	N/A		



Plan View

The following information shall be clearly and accurately noted on the above sketches: Soil descriptions (See MHD Visual Identification of Soils Chart), test pit dimensions, strata changes, Cobbles, boulders, structures, north arrow, water level, excavation effort (easy, moderate, difficult).

Remarks: Took representative sample from pit for testing (5 gallons).
Backfilled pit upon completion

Samples	Depths
TP-4	Misc.

Geotechnics
INTEGRITY IN TESTING

March 31, 2010

Project No. 2010-645-01

Mr. Tom Yanoschak
HDR Engineering, Inc.
3733 National Drive, Suite 207
Raleigh, NC 27612

Transmittal
Laboratory Test Results
Ft. Bragg C & D Landfill

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.

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MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	HDR ENGINEERING, INC.
Client Reference	FT. BRAGG C&D LF.
Project No.	2010-645-01

Lab ID	.001	.002	.003	.004
Boring No.	TP-1	TP-2	TP-3	TP-4
Depth (ft)	NA	NA	NA	NA
Sample No.	NA	NA	NA	NA
Tare Number	834	829	837	843
Wt. of Tare & WS (gm)	640.22	638.26	667.96	629.47
Wt. of Tare & DS (gm)	550.90	559.14	588.17	548.75
Wt. of Tare (gm)	259.46	261.53	260.75	262.12
Wt. of Water (gm)	89.32	79.12	79.79	80.72
Wt. of DS (gm)	291.44	297.61	327.42	286.63
Water Content (%)	**30.6**	**26.6**	**24.4**	**28.2**

Notes : *NA*

Tested By *DAW* *Date* *3/26/2010* *Checked By* GEM *Date* 3-29-10

DCN: CT-S1 DATE 6-30-98 REVISION: 2

\\Server\data drive\Data Sheets\[WATCONT.XLS]Sheet1

02/08/2013 DIN 19386 Page 205 of 330

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ATTERBERG LIMITS

ASTM D 4318-05 / AASHTO T89 (SOP - S4A)

Client	HDR ENGINEERING, INC	Boring No.	TP-1
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-01	Soil Description	**ORANGE BROWN FAT 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)

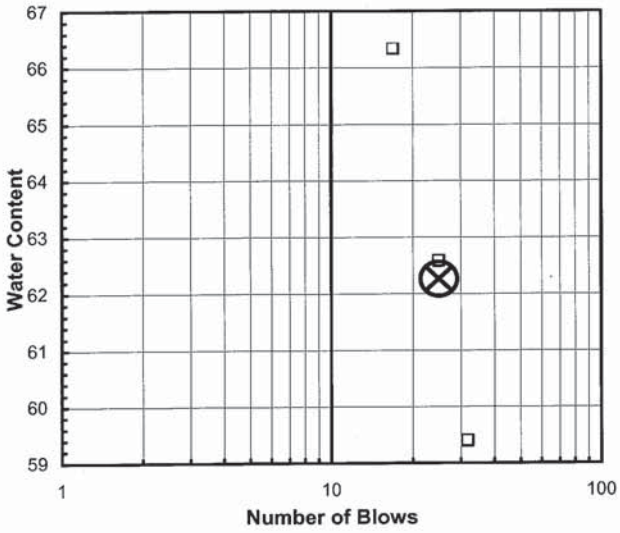
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-D	A-N	A-B	MULTIPOINT
Wt. of Tare & WS (gm)	25.13	25.74	25.97	
Wt. of Tare & DS (gm)	21.23	21.76	22.08	
Wt. of Tare (gm)	15.35	15.40	15.53	
Wt. of Water (gm)	3.9	4.0	3.9	
Wt. of DS (gm)	5.9	6.4	6.6	
Moisture Content (%)	**66.3**	**62.6**	**59.4**	
Number of Blows	**17**	**25**	**32**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-C	A-F	
Wt. of Tare & WS (gm)	21.71	21.53	
Wt. of Tare & DS (gm)	20.42	20.25	
Wt. of Tare (gm)	15.54	15.42	
Wt. of Water (gm)	1.3	1.3	
Wt. of DS (gm)	4.9	4.8	
Moisture Content (%)	**26.4**	**26.5**	**-0.1**

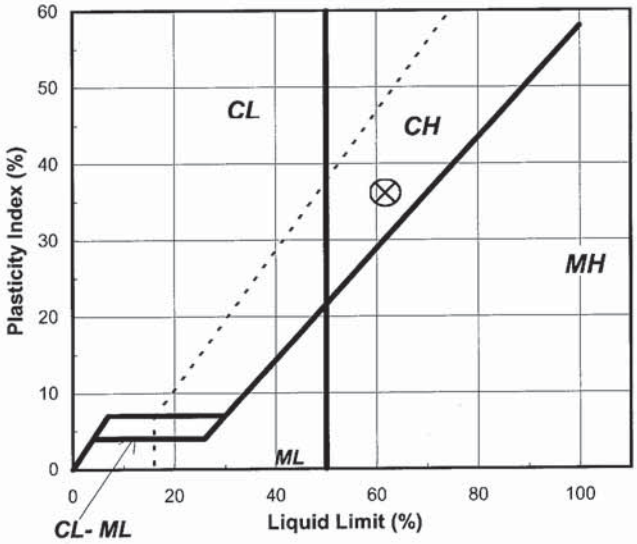
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**62**
Plastic Limit (%)	**26**
Plasticity Index (%)	**36**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By SD *Date* 3/23/2010 *Checked By* GEM *Date* 3-29-10

page 1 of 1 **DCN:** CT-S4B **DATE:** 10/8/2001 **REVISION:** 2

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ATTERBERG LIMITS

ASTM D 4318-05 / AASHTO T89 (SOP - S4A)

Client	HDR ENGINEERING, INC	Boring No.	TP-2
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-02	Soil Description	**ORANGE BROWN FAT 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)

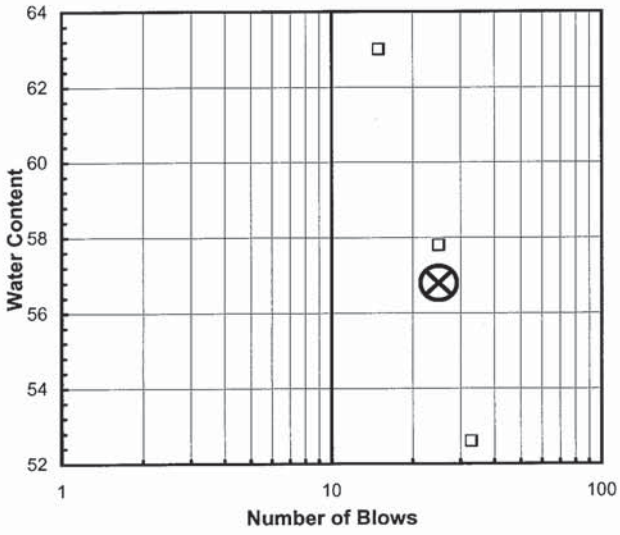
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	Y	B	T	MULTIPOINT
Wt. of Tare & WS (gm)	26.66	25.70	25.80	
Wt. of Tare & DS (gm)	22.37	21.84	22.14	
Wt. of Tare (gm)	15.56	15.16	15.18	
Wt. of Water (gm)	4.3	3.9	3.7	
Wt. of DS (gm)	6.8	6.7	7.0	
Moisture Content (%)	**63.0**	**57.8**	**52.6**	
Number of Blows	**15**	**25**	**33**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	W	G	
Wt. of Tare & WS (gm)	21.23	21.01	
Wt. of Tare & DS (gm)	19.99	19.78	
Wt. of Tare (gm)	15.11	14.99	
Wt. of Water (gm)	1.2	1.2	
Wt. of DS (gm)	4.9	4.8	
Moisture Content (%)	**25.4**	**25.7**	**-0.3**

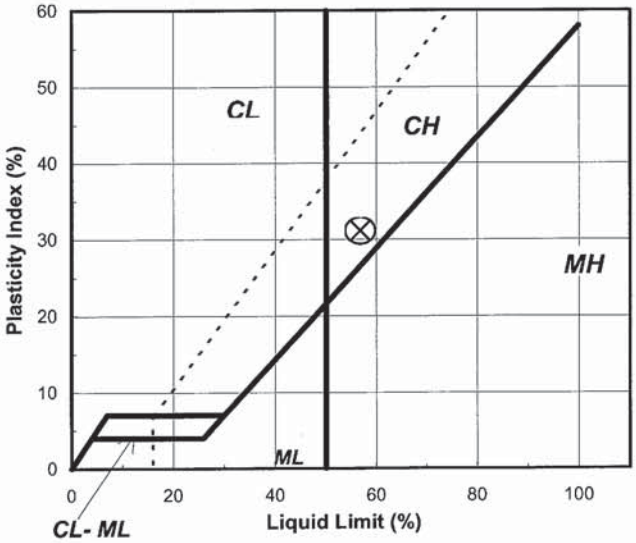
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**57**
Plastic Limit (%)	**26**
Plasticity Index (%)	**31**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By SD *Date* 3/23/2010 *Checked By* GEM *Date* 3-29-10

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ATTERBERG LIMITS

ASTM D 4318-05 / AASHTO T89 (SOP - S4A)

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-03	Soil Description	**BROWN FAT 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)

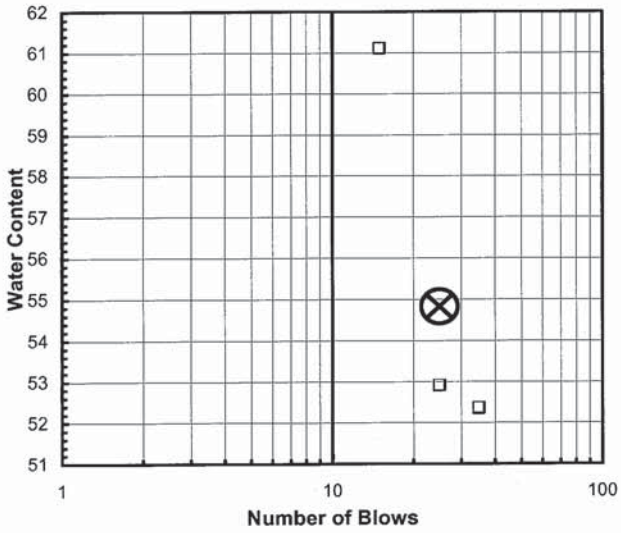
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B-B	A-T	A-H	MULTIPOINT
Wt. of Tare & WS (gm)	25.14	24.53	25.88	
Wt. of Tare & DS (gm)	21.48	21.43	22.32	
Wt. of Tare (gm)	15.49	15.57	15.52	
Wt. of Water (gm)	3.7	3.1	3.6	
Wt. of DS (gm)	6.0	5.9	6.8	
Moisture Content (%)	**61.1**	**52.9**	**52.4**	
Number of Blows	**15**	**25**	**35**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-L	A-O	
Wt. of Tare & WS (gm)	21.53	21.57	
Wt. of Tare & DS (gm)	20.31	20.34	
Wt. of Tare (gm)	15.48	15.38	
Wt. of Water (gm)	1.2	1.2	
Wt. of DS (gm)	4.8	5.0	
Moisture Content (%)	**25.3**	**24.8**	**0.5**

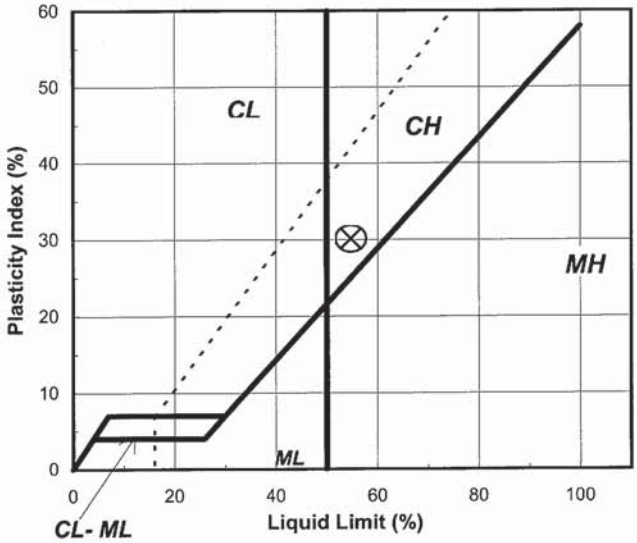
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**55**
Plastic Limit (%)	**25**
Plasticity Index (%)	**30**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



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ATTERBERG LIMITS

ASTM D 4318-05 / AASHTO T89 (SOP - S4A)

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-04	Soil Description	**BROWN FAT 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)

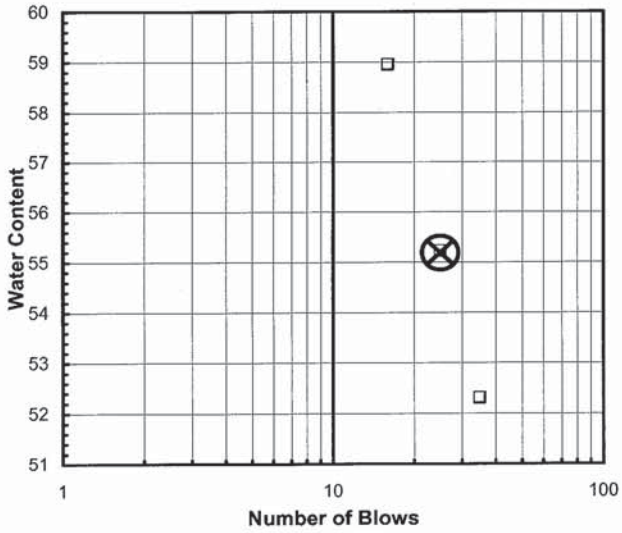
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	W	Y	G	MULTIPOINT
Wt. of Tare & WS (gm)	25.67	24.79	24.57	
Wt. of Tare & DS (gm)	21.75	21.51	21.28	
Wt. of Tare (gm)	15.10	15.57	14.99	
Wt. of Water (gm)	3.9	3.3	3.3	
Wt. of DS (gm)	6.7	5.9	6.3	
Moisture Content (%)	**58.9**	**55.2**	**52.3**	
Number of Blows	**16**	**25**	**35**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	B	T	
Wt. of Tare & WS (gm)	21.31	21.21	
Wt. of Tare & DS (gm)	20.02	19.92	
Wt. of Tare (gm)	15.16	15.17	
Wt. of Water (gm)	1.3	1.3	
Wt. of DS (gm)	4.9	4.8	
Moisture Content (%)	**26.5**	**27.2**	**-0.6**

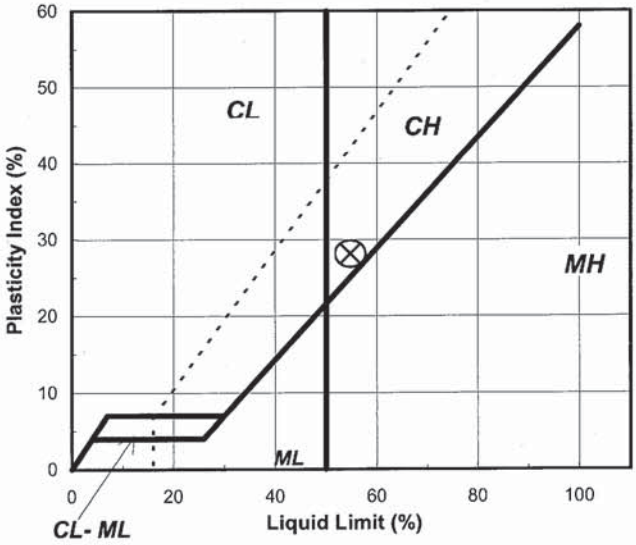
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**55**
Plastic Limit (%)	**27**
Plasticity Index (%)	**28**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By SD *Date* 3/26/2010 *Checked By* GEM *Date* 3-30-10

page 1 of 1 **DCN:** CT-S4B **DATE:** 10/8/2001 **REVISION:** 2

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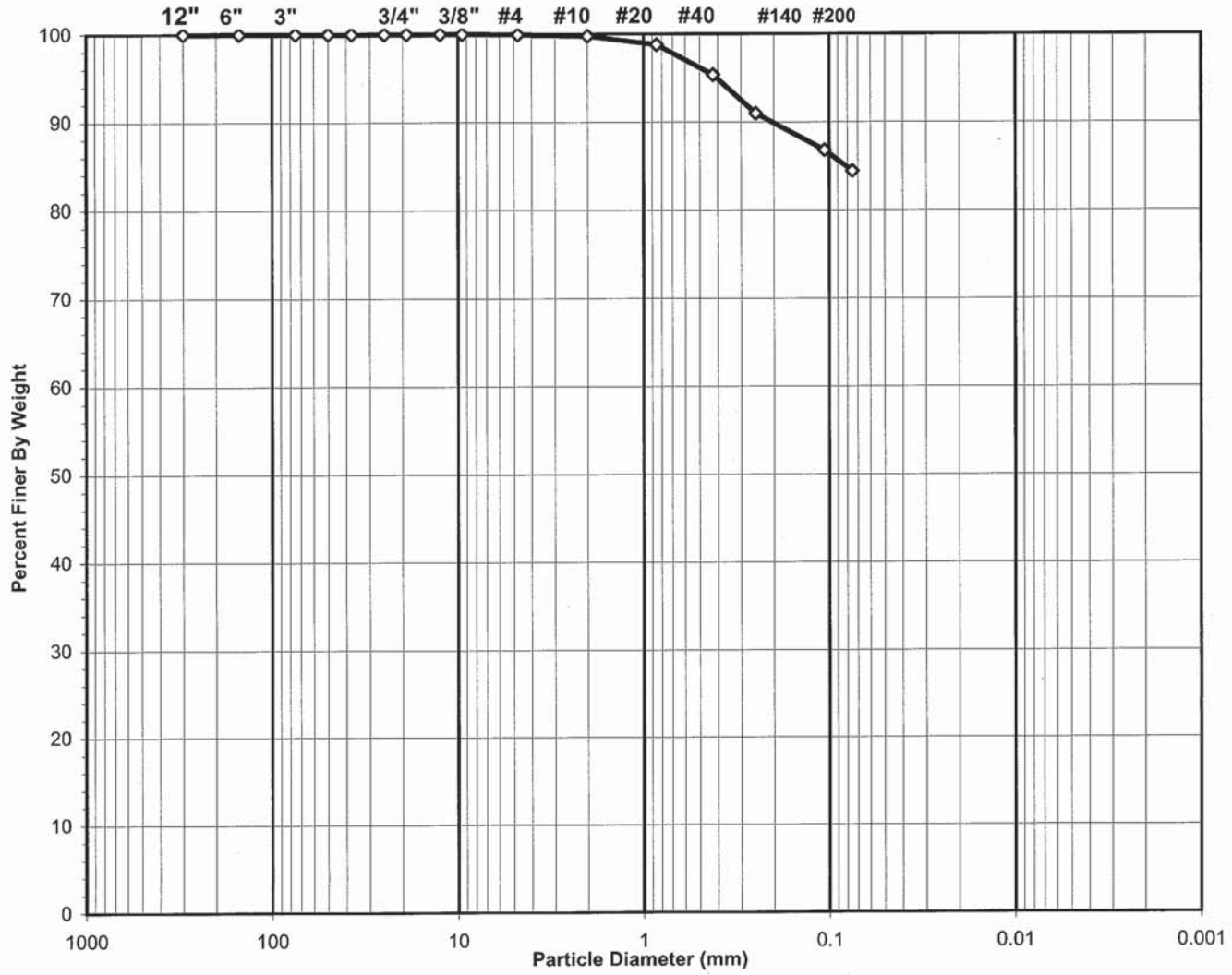
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Reference	FT. BRAGG C&D LF.	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-01	Soil Color	**ORANGE BROWN**

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



USCS Symbol ***CH, TESTED***

USCS Classification ***FAT CLAY WITH SAND***

Tested By DAW Date 3/22/2010 Checked By GZM Date 3-29-10

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Reference	FT. BRAGG C&D LF.	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-01	Soil Color	**ORANGE BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	834	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	640.22	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	550.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	259.46	Weight of Tare (gm)	NA
Weight of Water (gm)	89.32	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	291.44	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**30.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	291.44
Dry Weight - 3/4" Sample (gm)	45.4	Weight of minus #200 material (gm)	246.00
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	45.44
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	0.19	0.1	0.1	99.9	**99.9**
#10	2.00	0.47	0.2	0.2	99.8	**99.8**
#20	0.850	2.89	1.0	1.2	98.8	**98.8**
#40	0.425	9.97	3.4	4.6	95.4	**95.4**
#60	0.250	12.87	4.4	9.1	90.9	**90.9**
#140	0.106	12.20	4.2	13.2	86.8	**86.8**
#200	0.075	6.85	2.4	15.6	84.4	**84.4**
Pan	-	246.00	84.4	100.0	-	-

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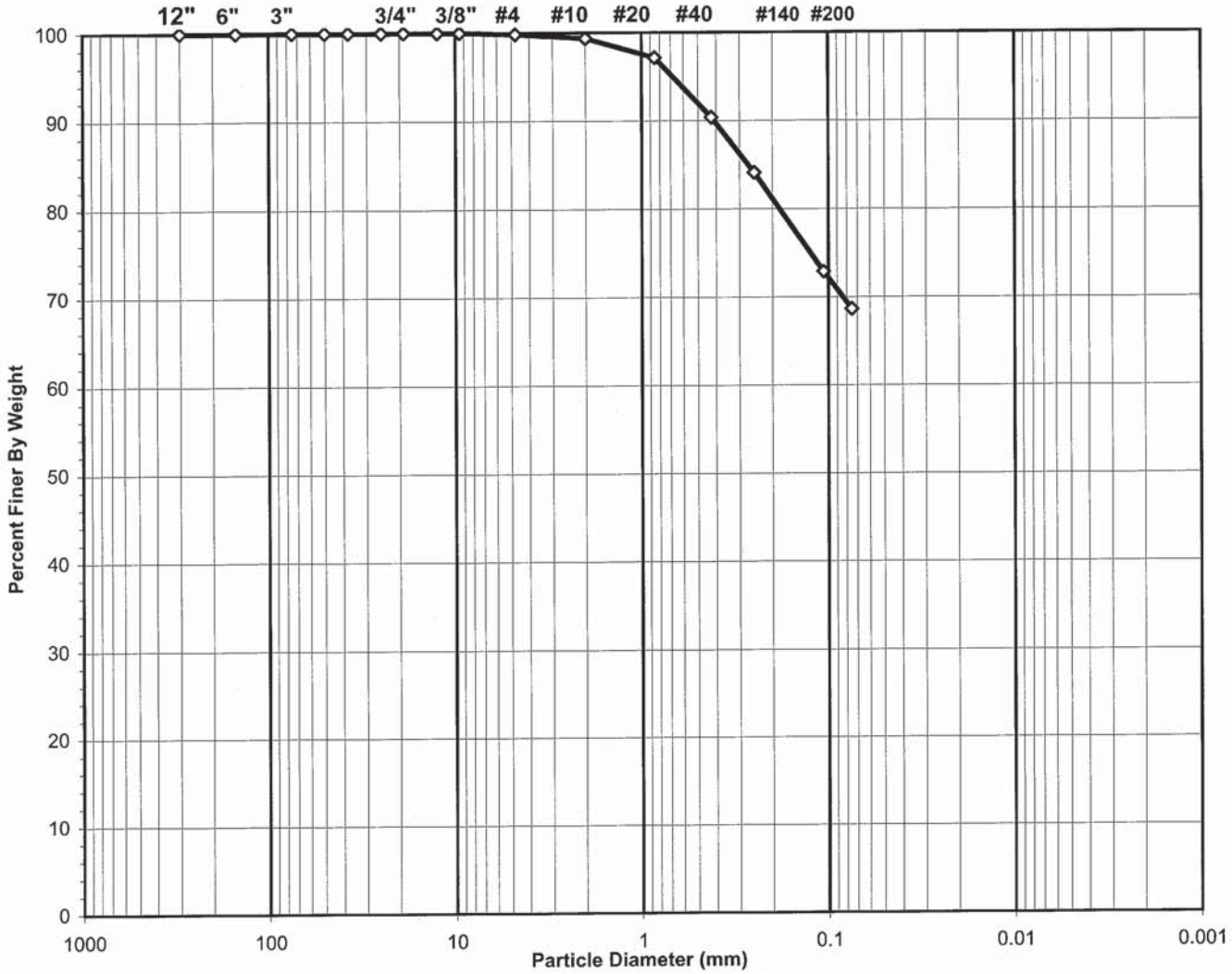
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Reference	FT. BRAGG C&D LF.	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-02	Soil Color	**ORANGE BROWN**

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification ***SANDY FAT CLAY***

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Reference	FT. BRAGG C&D LF.	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-02	Soil Color	**ORANGE BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	829	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	638.26	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	559.14	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	261.53	Weight of Tare (gm)	NA
Weight of Water (gm)	79.12	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	297.61	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**26.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	297.61
Dry Weight - 3/4" Sample (gm)	93.4	Weight of minus #200 material (gm)	204.21
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	93.40
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	0.54	0.2	0.2	99.8	**99.8**
#10	2.00	1.38	0.5	0.6	99.4	**99.4**
#20	0.850	6.57	2.2	2.9	97.1	**97.1**
#40	0.425	20.22	6.8	9.6	90.4	**90.4**
#60	0.250	18.57	6.2	15.9	84.1	**84.1**
#140	0.106	33.41	11.2	27.1	72.9	**72.9**
#200	0.075	12.71	4.3	31.4	68.6	**68.6**
Pan	-	204.21	68.6	100.0	-	**-**

Tested By DAW Date 3/22/2010 Checked By GEM Date 3-29-10

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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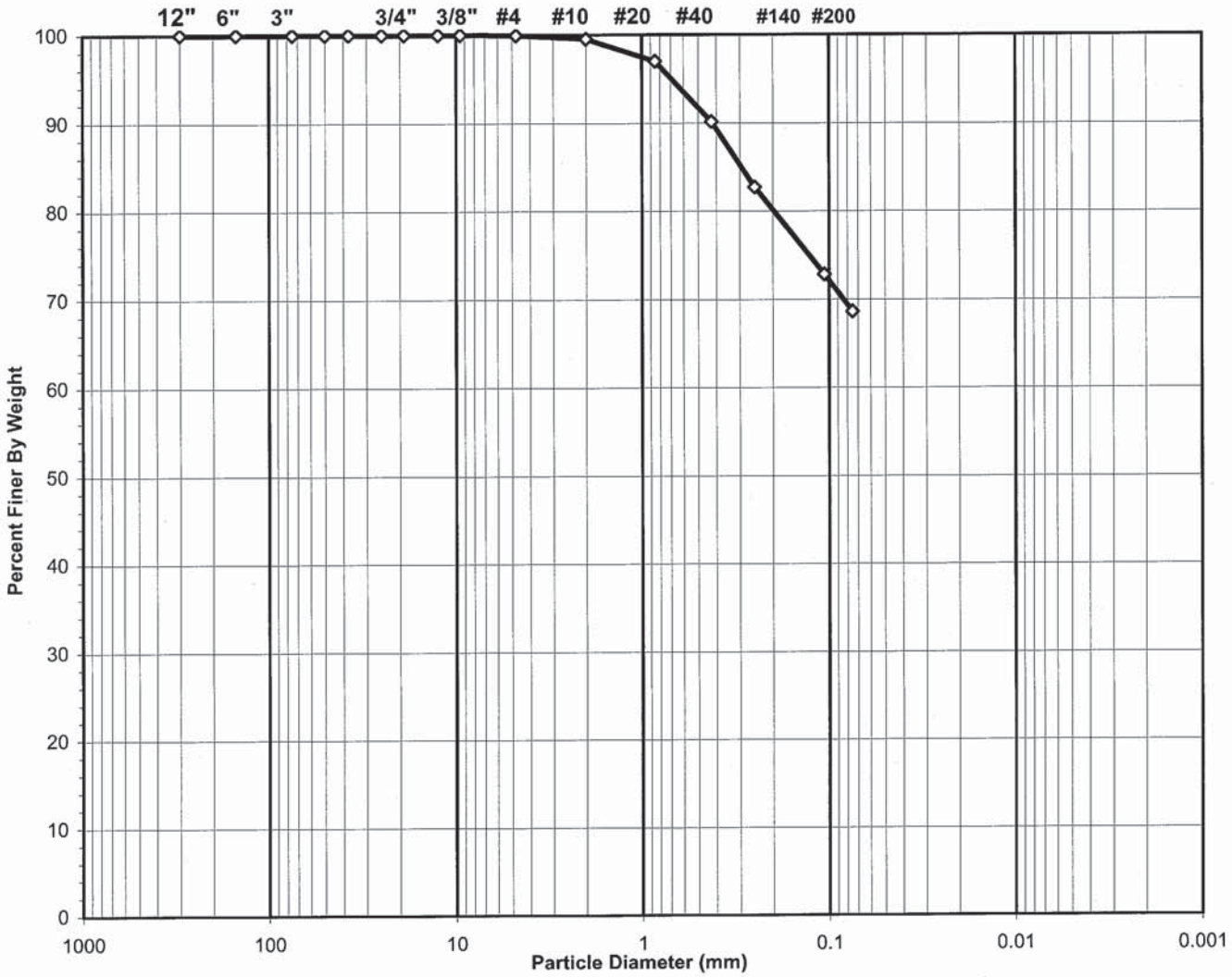
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-03	Soil Color	**BROWN**

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification ***SANDY FAT CLAY***

Tested By DAW Date 3/24/2010 Checked By GEM Date 3-30-10

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *\\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-03 SIEVON REV 4.XLS]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-03	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	837	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	667.96	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	588.17	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	260.75	Weight of Tare (gm)	NA
Weight of Water (gm)	79.79	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	327.42	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	327.42
Dry Weight - 3/4" Sample (gm)	102.8	Weight of minus #200 material (gm)	224.63
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	102.79
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	0.23	0.1	0.1	99.9	**99.9**
#10	2.00	1.36	0.4	0.5	99.5	**99.5**
#20	0.850	8.17	2.5	3.0	97.0	**97.0**
#40	0.425	22.45	6.9	9.8	90.2	**90.2**
#60	0.250	24.39	7.4	17.3	82.7	**82.7**
#140	0.106	32.37	9.9	27.2	72.8	**72.8**
#200	0.075	13.82	4.2	31.4	68.6	**68.6**
Pan	-	224.63	68.6	100.0	-	-

Tested By DAW Date 3/24/2010 Checked By GEM Date 3-30-10

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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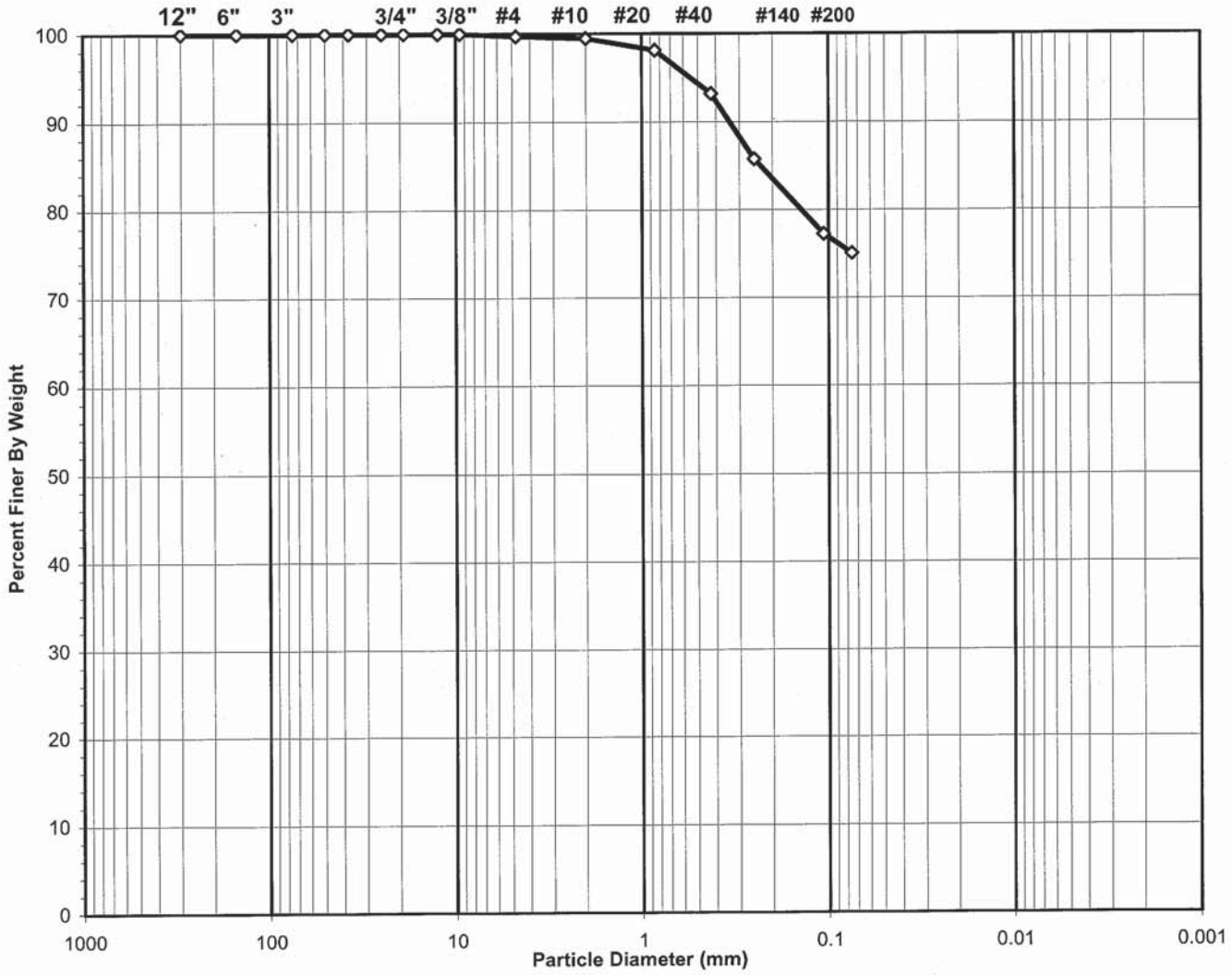
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-04	Soil Color	**BROWN**

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification ***FAT CLAY WITH SAND***

Tested By DAW Date 3/24/2010 Checked By GZM Date 3-30-10

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-04	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	843	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	629.47	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	548.75	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	262.13	Weight of Tare (gm)	NA
Weight of Water (gm)	80.72	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	286.62	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**28.2**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	286.62
Dry Weight - 3/4" Sample (gm)	71.5	Weight of minus #200 material (gm)	215.13
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	71.49
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	0.84	0.3	0.3	99.7	**99.7**
#10	2.00	0.69	0.2	0.5	99.5	**99.5**
#20	0.850	3.90	1.4	1.9	98.1	**98.1**
#40	0.425	14.11	4.9	6.8	93.2	**93.2**
#60	0.250	21.31	7.4	14.3	85.7	**85.7**
#140	0.106	24.39	8.5	22.8	77.2	**77.2**
#200	0.075	6.25	2.2	24.9	75.1	**75.1**
Pan	-	215.13	75.1	100.0	-	**-**

Tested By DAW Date 3/24/2010 Checked By GAM Date 3-30-10

DCN: CT-S3C DATE 6-25-98 REVISION: 2 *\\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 SIEVON REV 4.XLS]Sheet1*

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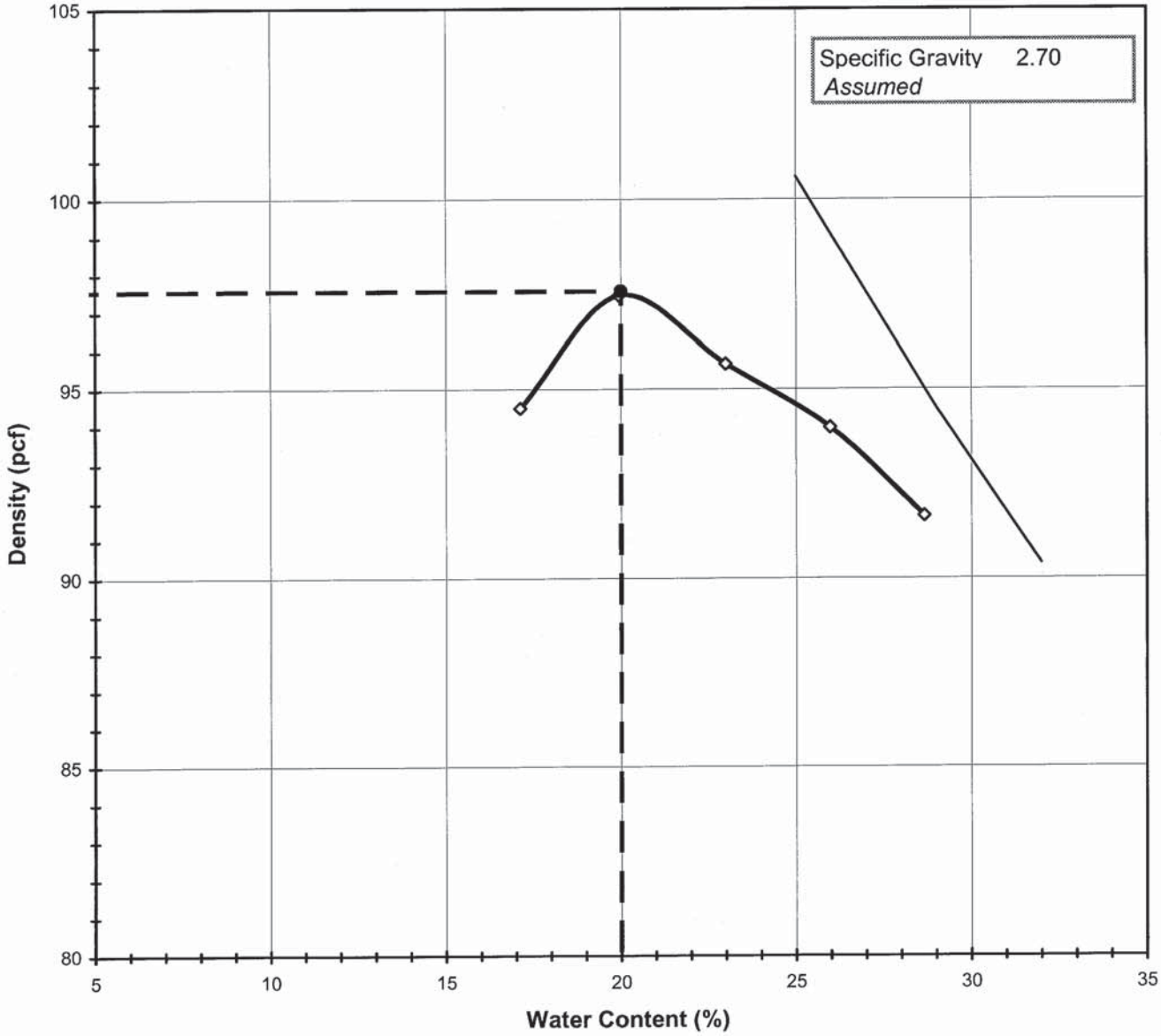
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-01	Test Method	**STANDARD**

Visual Description ORANGE BROWN FAT CLAY WITH SAND

Optimum Water Content	**20.0**
Maximum Dry Density	**97.6**



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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-01		

Visual Description ORANGE BROWN FAT CLAY WITH SAND

Total Weight of the Sample (gm)	23507
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		4311
Volume of the Mold(cc)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	5982	6076	6087	6098	6091
Wt.of Mold (gm)	4311	4311	4311	4311	4311
Wt. of WS	1671	1765	1776	1787	1780
Mold Volume (cc)	942	942	942	942	942

Moisture Content / Density

Tare Number	305	311	310	309	306
Wt. of Tare & WS (gm)	427.00	464.40	566.20	557.70	503.50
Wt. of Tare & DS (gm)	376.90	401.20	480.91	465.30	411.00
Wt. of Tare (gm)	84.50	84.40	109.90	109.60	88.30
Wt. of Water (gm)	50.10	63.20	85.29	92.40	92.50
Wt. of DS (gm)	292.40	316.80	371.01	355.70	322.70

Wet Density (gm/cc)	1.77	1.87	1.89	1.90	1.89
Wet Density (pcf)	110.7	116.9	117.7	118.4	117.9
Moisture Content (%)	**17.1**	**19.9**	**23.0**	**26.0**	**28.7**
Dry Density (pcf)	**94.5**	**97.5**	**95.7**	**94.0**	**91.6**

Zero Air Voids

Moisture Content (%)	25.0	29.0	32.0
Dry Unit Weight (pcf)	100.6	94.5	90.4

Tested By *DAW* *Date* *3/19/2010* *Checked By* GZM *Date* 3-29-10

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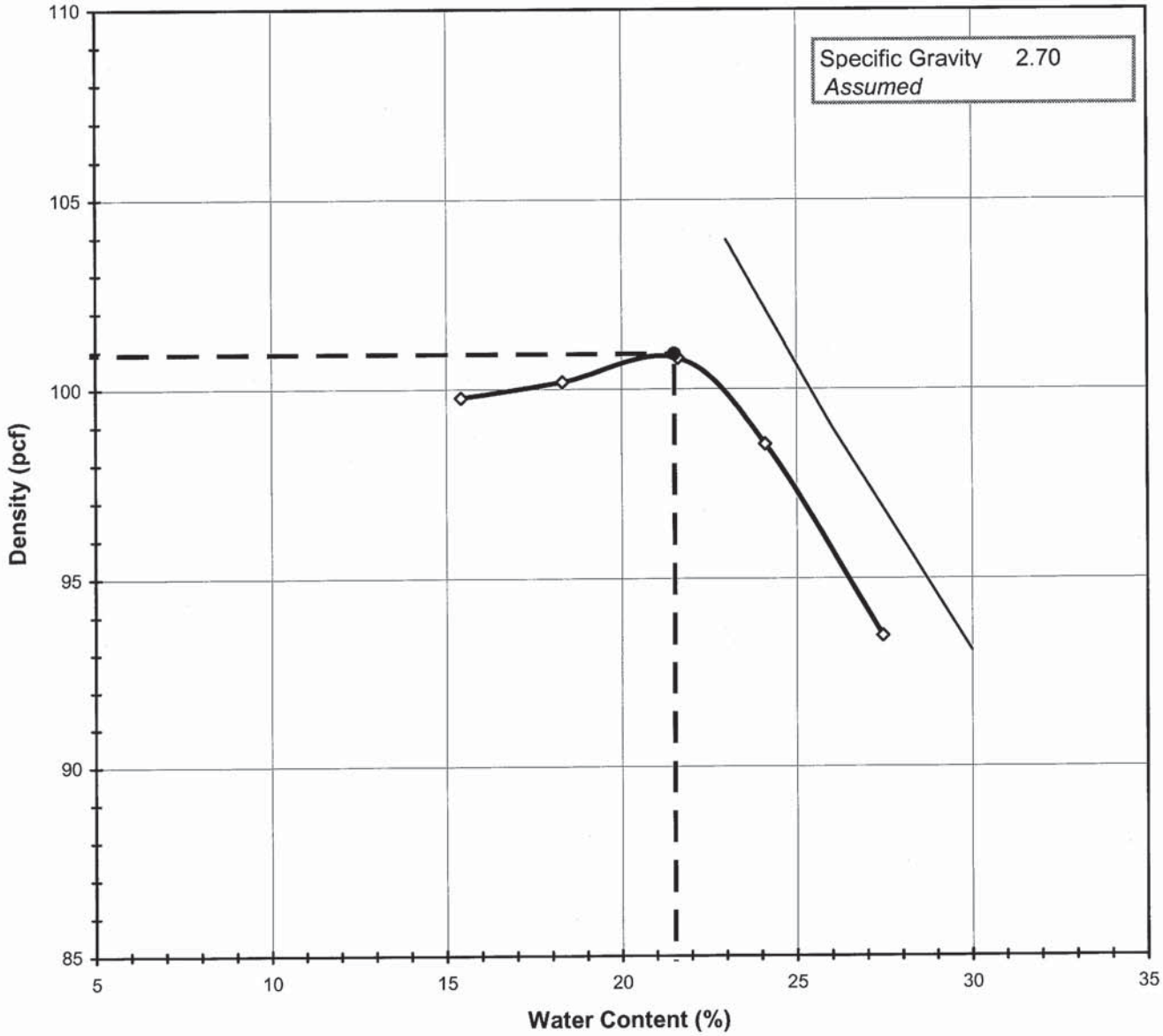
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-02	Test Method	**STANDARD**

Visual Description ORANGE BROWN SANDY FAT CLAY

Optimum Water Content	**21.5**
Maximum Dry Density	**100.9**



Tested By SD *Date* 3/22/2010 *Checked By* GEM *Date* 3-29-10

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-02		

Visual Description ORANGE BROWN SANDY FAT CLAY

Total Weight of the Sample (gm)	22194
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		4311
Volume of the Mold(cc)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	6049	6100	6162	6157	6110
Wt.of Mold (gm)	4311	4311	4311	4311	4311
Wt. of WS	1738	1789	1851	1846	1799
Mold Volume (cc)	942	942	942	942	942

Moisture Content / Density

Tare Number	317	315	318	304	300
Wt. of Tare & WS (gm)	473.40	483.50	478.70	561.60	542.00
Wt. of Tare & DS (gm)	421.40	425.80	409.00	474.00	449.10
Wt. of Tare (gm)	84.10	110.50	86.70	110.70	110.60
Wt. of Water (gm)	52.00	57.70	69.70	87.60	92.90
Wt. of DS (gm)	337.30	315.30	322.30	363.30	338.50

Wet Density (gm/cc)	1.85	1.90	1.97	1.96	1.91
Wet Density (pcf)	115.2	118.5	122.6	122.3	119.1
Moisture Content (%)	**15.4**	**18.3**	**21.6**	**24.1**	**27.4**
Dry Density (pcf)	**99.8**	**100.2**	**100.8**	**98.5**	**93.5**

Zero Air Voids

Moisture Content (%)	23.0	26.0	30.0
Dry Unit Weight (pcf)	103.9	99.0	93.1

Tested By SD *Date* 3/22/2010 *Checked By* GEM *Date* 3-29-10

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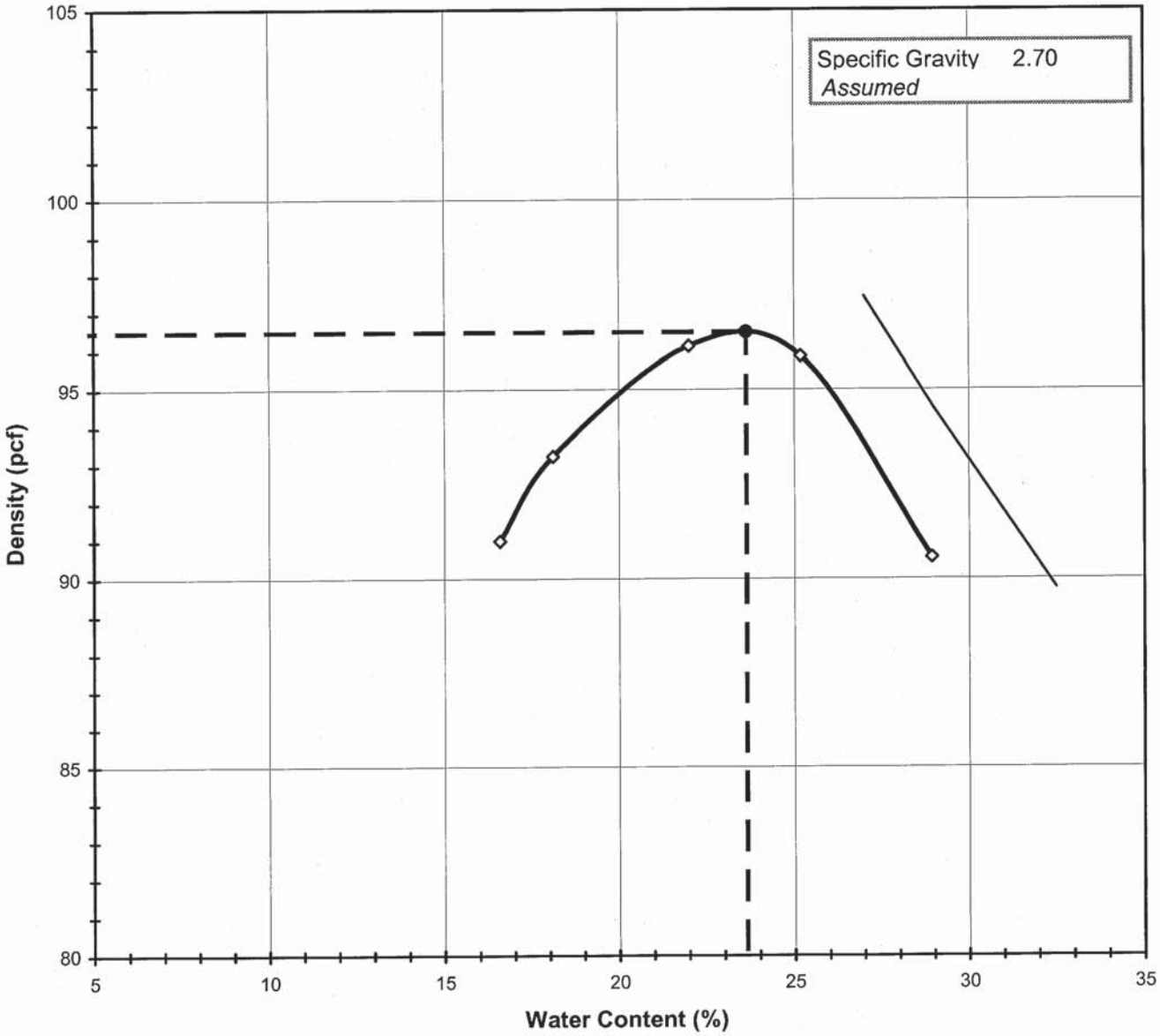
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-03	Test Method	**STANDARD**

Visual Description BROWN SANDY FAT CLAY

Optimum Water Content	**23.6**
Maximum Dry Density	**96.5**



Tested By DAW *Date* 3/25/2010 *Checked By* GEM *Date* 3-30-10

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

\\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 Proctor.XLS]Sheet1

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-03		

Visual Description: BROWN SANDY FAT CLAY

Total Weight of the Sample (gm)	NA
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		4311
Volume of the Mold(cc)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	5912	5973	6081	6122	6073
Wt.of Mold (gm)	4311	4311	4311	4311	4311
Wt. of WS	1602	1662	1771	1812	1763
Mold Volume (cc)	942	942	942	942	942

Moisture Content / Density

Tare Number	309	301	315	305	308
Wt. of Tare & WS (gm)	535.90	294.70	566.10	517.00	514.30
Wt. of Tare & DS (gm)	475.30	262.40	483.90	430.00	423.80
Wt. of Tare (gm)	109.80	84.00	110.40	84.60	111.10
Wt. of Water (gm)	60.60	32.30	82.20	87.00	90.50
Wt. of DS (gm)	365.50	178.40	373.50	345.40	312.70
Wet Density (gm/cc)	1.70	1.76	1.88	1.92	1.87
Wet Density (pcf)	106.1	110.1	117.3	120.0	116.8
Moisture Content (%)	**16.6**	**18.1**	**22.0**	**25.2**	**28.9**
Dry Density (pcf)	**91.0**	**93.2**	**96.1**	**95.9**	**90.6**

Zero Air Voids

Moisture Content (%)	27.0	29.0	32.5
Dry Unit Weight (pcf)	97.4	94.5	89.7

Tested By DAW *Date* 3/25/2010 *Checked By* GZM *Date* 3-30-10

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

\\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 Proctor.XLS]Sheet1

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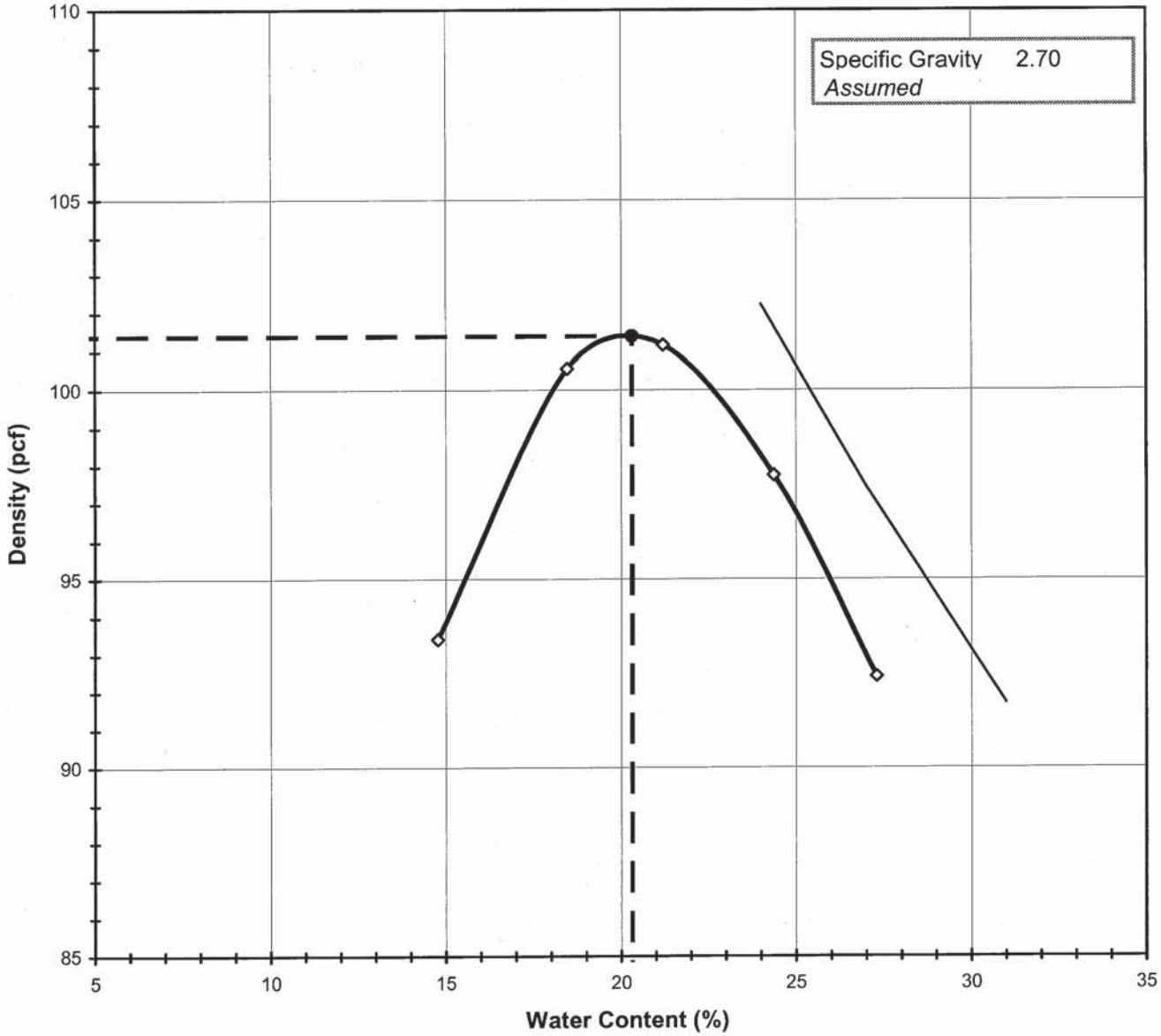
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-04	Test Method	**STANDARD**

Visual Description BROWN FAT CLAY WITH SAND

Optimum Water Content **20.3**
Maximum Dry Density **101.4**



Tested By *DAW* *Date* *3/25/2010* *Checked By* GEM *Date* 3-30-10

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

\\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 Proctor.XLS]Sheet1

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Reference	FT. BRAGG C&D LF	Depth (ft)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID	2010-645-01-04		

Visual Description: BROWN FAT CLAY WITH SAND

Total Weight of the Sample (gm)	22507
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		4311
Volume of the Mold(cc)		942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	5929	6109	6162	6146	6087
Wt.of Mold (gm)	4311	4311	4311	4311	4311
Wt. of WS	1619	1798	1851	1835	1776
Mold Volume (cc)	942	942	942	942	942

Moisture Content / Density

Tare Number	399	317	300	304	318
Wt. of Tare & WS (gm)	440.80	414.00	497.70	562.70	512.50
Wt. of Tare & DS (gm)	395.20	362.60	430.00	474.10	421.20
Wt. of Tare (gm)	86.50	84.20	110.80	110.60	86.70
Wt. of Water (gm)	45.60	51.40	67.70	88.60	91.30
Wt. of DS (gm)	308.70	278.40	319.20	363.50	334.50

Wet Density (gm/cc)	1.72	1.91	1.97	1.95	1.89
Wet Density (pcf)	107.2	119.1	122.6	121.6	117.7
Moisture Content (%)	**14.8**	**18.5**	**21.2**	**24.4**	**27.3**
Dry Density (pcf)	**93.4**	**100.6**	**101.2**	**97.8**	**92.4**

Zero Air Voids

Moisture Content (%)	24.0	27.0	31.0
Dry Unit Weight (pcf)	102.2	97.4	91.7

Tested By DAW *Date* 3/25/2010 *Checked By* GEM *Date* 3-30-10

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

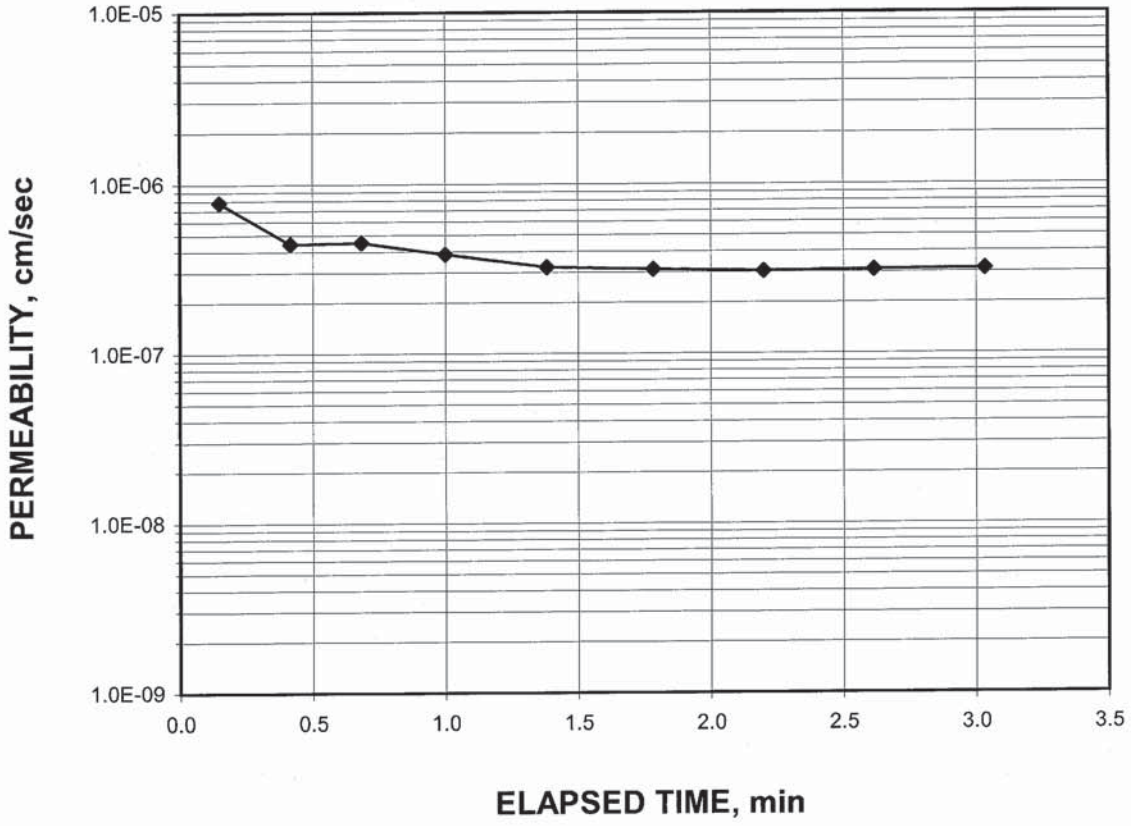
ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-01		

Visual Description: ORANGE/BROWN FAT CLAY WITH SAND

AVERAGE PERMEABILITY = 3.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.1E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: TMS Date: 3/26/2010 Checked By: GEM Date: 3-29-10

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

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Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-01		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: ORANGE/BROWN FAT CLAY WITH SAND

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	3	813
Wt. of Tare & WS (gm.)	95.64	457.71
Wt. of Tare & DS (gm.)	84.64	378.7
Wt. of Tare (gm.)	36.57	112.87
Wt. of Water (gm.)	11.00	79.01
Wt. of DS (gm.)	48.07	265.83
Moisture Content (%)	**22.9**	**29.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	775.43	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	775.43	818.58
Length 1 (in.)	4.007	4.073
Length 2 (in.)	4.007	4.044
Length 3 (in.)	4.007	4.024
Top Diameter (in.)	2.871	2.896
Middle Diameter (in.)	2.871	2.869
Bottom Diameter (in.)	2.871	2.860
Average Length (in.)	4.01	4.05
Average Area (in.^{2})	6.47	6.49
Sample Volume (cm^3)	425.09	430.53
Unit Wet Wt. (gm./ cm^3)	1.824	1.901
Unit Wet Wt. (pcf)	113.9	118.7
Unit Dry Wt. (pcf)	92.7	91.5
Unit Dry Wt. (gm./ cm^3)	1.484	1.466
Void Ratio, e	0.819	0.842
Porosity, n	0.450	0.457
Pore Volume (cm^3)	191.4	196.8
Total Wt. Of Sample After Test		834.24

Tested By: TMS Date: 3/26/2010 Checked By: GEM Date: 3-29-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-01 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-1
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-01		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	55.0	Sample Length (cm), L	10.28
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.88
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}	1.7

AVERAGE PERMEABILITY = 3.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.1E-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)
3/26/2010	12	57	9	57.15	0.000	9.4	9.8	24.0	NA
3/26/2010	12	57	18	57.30	0.150	9.3	9.7	24.0	7.8E-07
3/26/2010	12	57	34	57.57	0.417	9.2	9.5	24.0	4.4E-07
3/26/2010	12	57	50	57.83	0.683	9.1	9.4	24.0	4.5E-07
3/26/2010	12	58	9	58.15	1.000	9.0	9.3	24.0	3.8E-07
3/26/2010	12	58	32	58.53	1.383	8.9	9.1	24.0	3.2E-07
3/26/2010	12	58	56	58.93	1.783	8.8	9.0	24.0	3.1E-07
3/26/2010	12	59	21	59.35	2.200	8.7	8.9	24.0	3.0E-07
3/26/2010	12	59	46	59.77	2.617	8.6	8.8	24.0	3.1E-07
3/26/2010	13	0	11	0.18	3.033	8.5	8.6	24.0	3.1E-07

Tested By: TMS Date: 3/26/2010 Checked By: GEM Date: 3-29-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-01 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-03

(SOP-S22C)

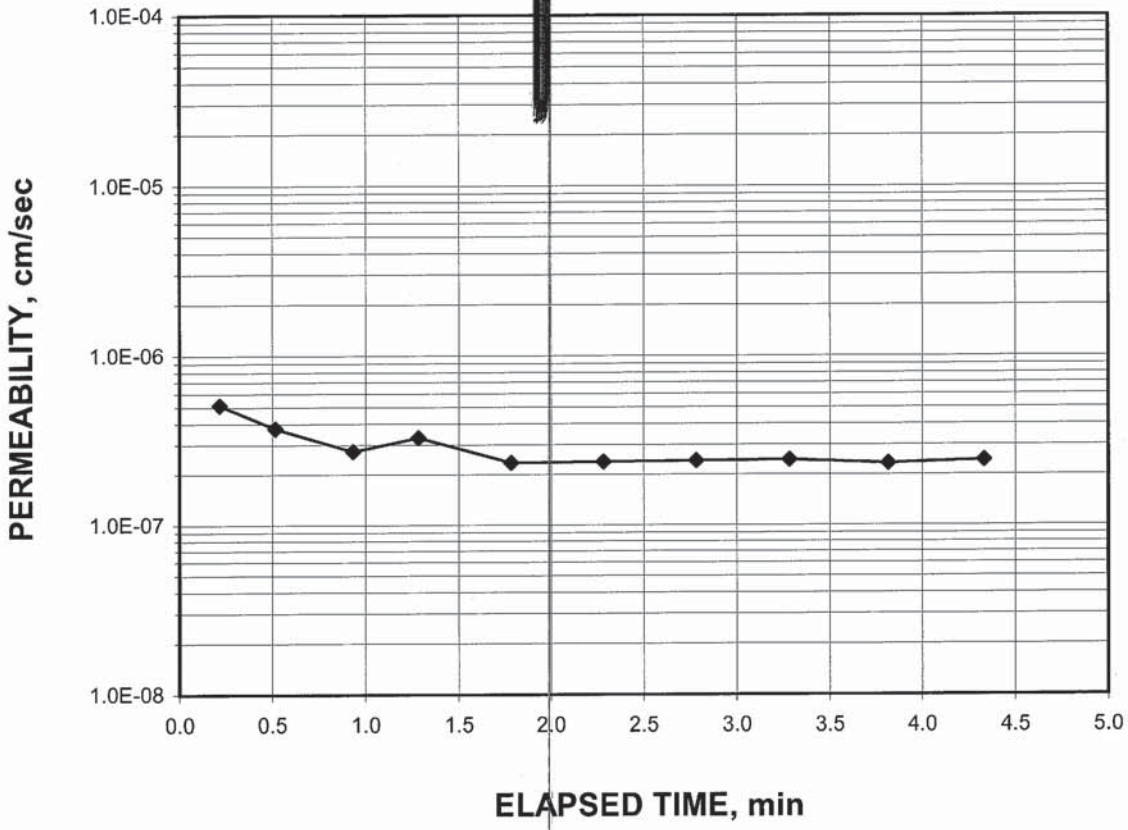
Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-02		

Visual Description: ORANGE/BROWN SANDY FAT CLAY

AVERAGE PERMEABILITY = 2.4E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: TMS Date: 3/26/2010 Checked By: GAM Date: 3-29-10

DCN: CT-22A DATE:2-2-10 REVISION: 5\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-02 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

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PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-02		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: ORANGE/BROWN SANDY FAT CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	1010	801
Wt. of Tare & WS (gm.)	80.91	470.42
Wt. of Tare & DS (gm.)	72.25	393.98
Wt. of Tare (gm.)	36.39	107.08
Wt. of Water (gm.)	8.66	76.44
Wt. of DS (gm.)	35.86	286.90
Moisture Content (%)	**24.1**	**26.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	806.93	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	806.93	823.14
Length 1 (in.)	4.007	3.891
Length 2 (in.)	4.007	3.918
Length 3 (in.)	4.007	3.942
Top Diameter (in.)	2.871	2.899
Middle Diameter (in.)	2.871	2.877
Bottom Diameter (in.)	2.871	2.882
Average Length (in.)	4.01	3.92
Average Area (in.^{2})	6.47	6.54
Sample Volume (cm^3)	425.09	419.89
Unit Wet Wt. (gm./ cm^3)	1.898	1.960
Unit Wet Wt. (pcf)	118.5	122.4
Unit Dry Wt. (pcf)	95.4	96.6
Unit Dry Wt. (gm./ cm^3)	1.529	1.548
Void Ratio, e	0.766	0.744
Porosity, n	0.434	0.427
Pore Volume (cm^3)	184.4	179.2
Total Wt. Of Sample After Test		823.64

Tested By: TMS Date: 3/26/2010 Checked By: GEM Date: 3-29-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-02 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY T-9

PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-2
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-02		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	55.0	Sample Length (cm), L	9.95
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.20
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}	1.7

AVERAGE PERMEABILITY = 2.4E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.4E-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)
3/26/2010	13	7	43	7.72	0.000	9.5	10.2	24.0	NA
3/26/2010	13	7	56	7.93	0.217	9.4	10.1	24.0	5.1E-07
3/26/2010	13	8	14	8.23	0.517	9.3	10.0	24.0	3.7E-07
3/26/2010	13	8	39	8.65	0.933	9.2	9.8	24.0	2.7E-07
3/26/2010	13	9	0	9.00	1.283	9.1	9.7	24.0	3.3E-07
3/26/2010	13	9	30	9.50	1.783	9.0	9.6	24.0	2.3E-07
3/26/2010	13	10	0	10.00	2.283	8.9	9.5	24.0	2.4E-07
3/26/2010	13	10	30	10.50	2.783	8.8	9.3	24.0	2.4E-07
3/26/2010	13	11	0	11.00	3.283	8.7	9.2	24.0	2.4E-07
3/26/2010	13	11	32	11.53	3.817	8.6	9.1	24.0	2.3E-07
3/26/2010	13	12	3	12.05	4.333	8.5	8.9	24.0	2.4E-07

Tested By: TMS Date: 3/26/2010 Checked By: GJM Date: 3-29-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-02 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

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PERMOMETER METHOD

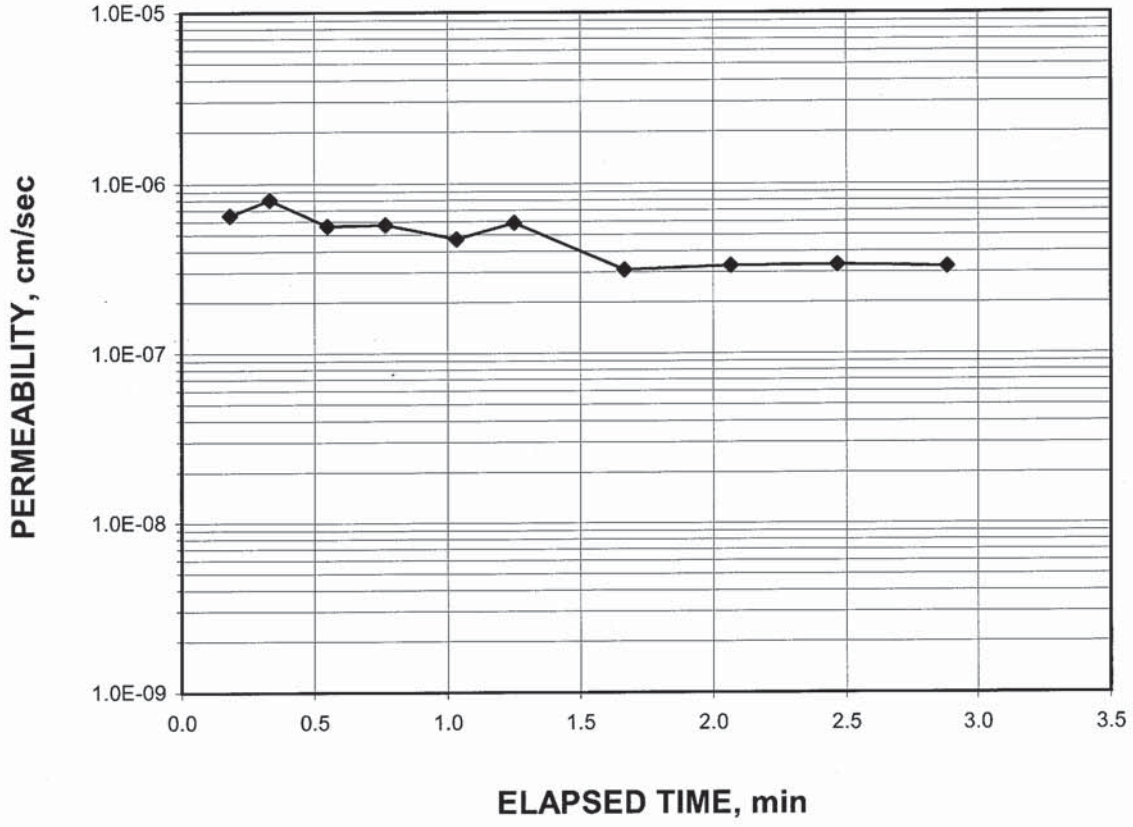
ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-03		

Visual Description: BROWN SANDY CLAY

AVERAGE PERMEABILITY = 3.2E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.2E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: TMS Date: 3/31/2010 Checked By: GEM Date: 4-1-10

DCN: CT-22A DATE:2-2-10 REVISION: 5\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-03 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

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PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-03		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	1010	8010
Wt. of Tare & WS (gm.)	89.68	490.13
Wt. of Tare & DS (gm.)	78.50	410.81
Wt. of Tare (gm.)	36.48	136.29
Wt. of Water (gm.)	11.18	79.32
Wt. of DS (gm.)	42.02	274.52
Moisture Content (%)	**26.6**	**28.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	794.19	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	794.19	808.54
Length 1 (in.)	4.007	4.053
Length 2 (in.)	4.007	3.949
Length 3 (in.)	4.007	3.998
Top Diameter (in.)	2.871	2.867
Middle Diameter (in.)	2.871	2.863
Bottom Diameter (in.)	2.871	2.863
Average Length (in.)	4.01	4.00
Average Area (in.^{2})	6.47	6.44
Sample Volume (cm^3)	425.09	422.37
Unit Wet Wt. (gm./ cm^3)	1.868	1.914
Unit Wet Wt. (pcf)	116.6	119.5
Unit Dry Wt. (pcf)	92.1	92.7
Unit Dry Wt. (gm./ cm^3)	1.476	1.485
Void Ratio, e	0.830	0.818
Porosity, n	0.453	0.450
Pore Volume (cm^3)	192.8	190.0
Total Wt. Of Sample After Test		809.06

Tested By: TMS Date: 3/31/2010 Checked By: GAM Date: 4-1-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-03 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY T

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PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-3
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-03		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	55.0	Sample Length (cm), L	10.16
Back Pressure(psi)	50.0	Sample Area (cm^2), A	41.57
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}	1.7

AVERAGE PERMEABILITY = 3.2E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.2E-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)
3/31/2010	9	59	40	59.67	0.000	9.5	10.0	22.5	NA
3/31/2010	9	59	51	59.85	0.183	9.4	9.9	22.5	6.5E-07
3/31/2010	10	0	0	0.00	0.333	9.3	9.8	22.5	8.0E-07
3/31/2010	10	0	13	0.22	0.550	9.2	9.6	22.5	5.6E-07
3/31/2010	10	0	26	0.43	0.767	9.1	9.5	22.5	5.7E-07
3/31/2010	10	0	42	0.70	1.033	9.0	9.4	22.5	4.7E-07
3/31/2010	10	0	55	0.92	1.250	8.9	9.3	22.5	5.9E-07
3/31/2010	10	1	20	1.33	1.667	8.8	9.1	22.5	3.1E-07
3/31/2010	10	1	44	1.73	2.067	8.7	9.0	22.5	3.3E-07
3/31/2010	10	2	8	2.13	2.467	8.6	8.9	22.5	3.3E-07
3/31/2010	10	2	33	2.55	2.883	8.5	8.7	22.5	3.2E-07

Tested By: TMS Date: 3/31/2010 Checked By: GBM Date: 4-1-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-03 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

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PERMOMETER METHOD

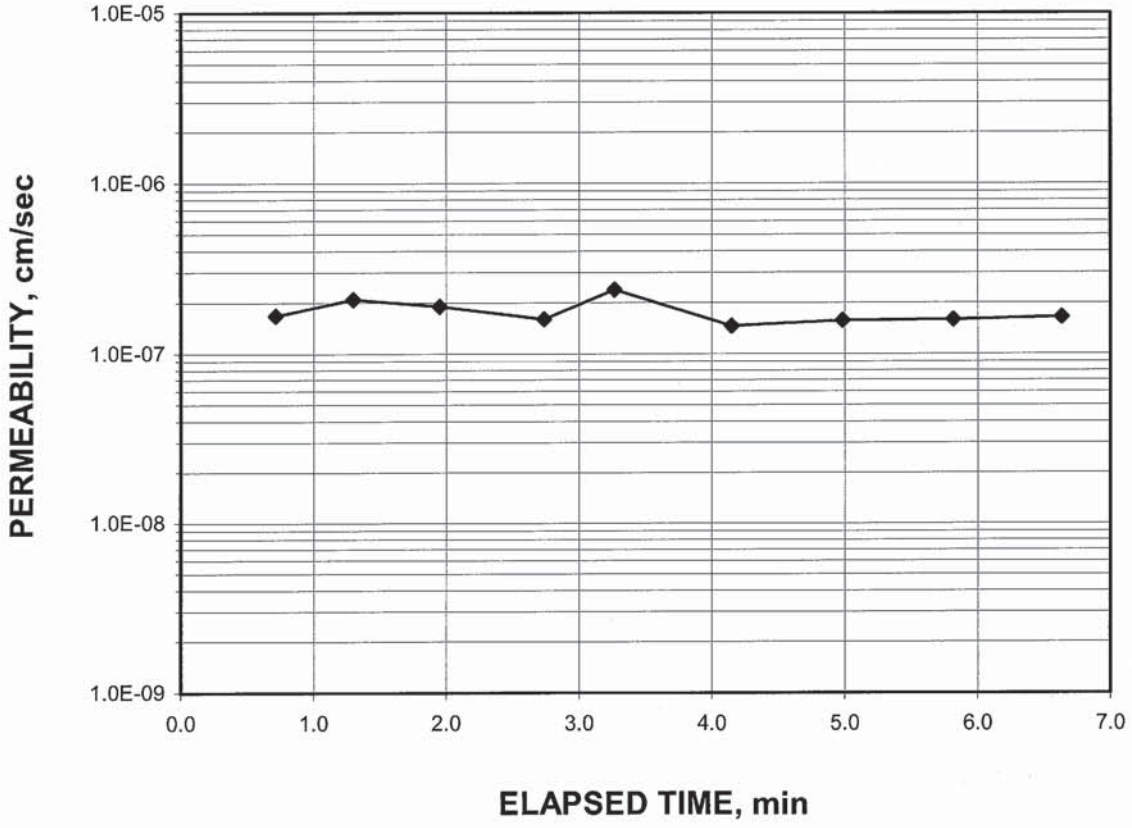
ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-04		

Visual Description: BROWN CLAY

AVERAGE PERMEABILITY = 1.6E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.6E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: TMS Date: 3/31/2010 Checked By: GAM Date: 4-1-10

DCN: CT-22A DATE:2-2-10 REVISION: 5\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

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PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-04		

Specific Gravity	2.70	Assumed
Sample Condition		Remolded

Visual Description: BROWN CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	270	812
Wt. of Tare & WS (gm.)	99.16	420.51
Wt. of Tare & DS (gm.)	87.23	348.96
Wt. of Tare (gm.)	37.49	106.69
Wt. of Water (gm.)	11.93	71.55
Wt. of DS (gm.)	49.74	242.27
Moisture Content (%)	**24.0**	**29.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	821.74	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	821.74	858.51
Length 1 (in.)	4.007	4.117
Length 2 (in.)	4.007	4.062
Length 3 (in.)	4.007	4.046
Top Diameter (in.)	2.871	2.923
Middle Diameter (in.)	2.871	2.881
Bottom Diameter (in.)	2.871	2.884
Average Length (in.)	4.01	4.08
Average Area (in.^{2})	6.47	6.59
Sample Volume (cm^3)	425.09	439.86
Unit Wet Wt. (gm./ cm^3)	1.933	1.952
Unit Wet Wt. (pcf)	120.7	121.8
Unit Dry Wt. (pcf)	97.3	94.1
Unit Dry Wt. (gm./ cm^3)	1.559	1.507
Void Ratio, e	0.732	0.792
Porosity, n	0.423	0.442
Pore Volume (cm^3)	179.6	194.4
Total Wt. Of Sample After Test		856.41

Tested By: TMS Date: 3/31/2010 Checked By: GEM Date: 4-1-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 Permometer.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

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PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	HDR ENGINEERING, INC.	Boring No.	TP-4
Client Project	FT. BRAGG C&D LF.	Depth (ft.)	NA
Project No.	2010-645-01	Sample No.	NA
Lab ID No.	2010-645-01-04		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	55.0	Sample Length (cm), L	10.35
Back Pressure(psi)	50.0	Sample Area (cm^2), A	42.50
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}	1.7

AVERAGE PERMEABILITY = 1.6E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.6E-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)
3/31/2010	9	44	15	44.25	0.000	9.4	9.7	22.5	NA
3/31/2010	9	44	58	44.97	0.717	9.3	9.6	22.5	1.7E-07
3/31/2010	9	45	33	45.55	1.300	9.2	9.5	22.5	2.1E-07
3/31/2010	9	46	12	46.20	1.950	9.1	9.3	22.5	1.9E-07
3/31/2010	9	46	59	46.98	2.733	9.0	9.2	22.5	1.6E-07
3/31/2010	9	47	31	47.52	3.267	8.9	9.1	22.5	2.4E-07
3/31/2010	9	48	24	48.40	4.150	8.8	9.0	22.5	1.5E-07
3/31/2010	9	49	14	49.23	4.983	8.7	8.8	22.5	1.6E-07
3/31/2010	9	50	4	50.07	5.817	8.6	8.7	22.5	1.6E-07
3/31/2010	9	50	53	50.88	6.633	8.5	8.6	22.5	1.6E-07

Tested By: TMS Date: 3/31/2010 Checked By: GAM Date: 4-1-10

DCN: CT-22A DATE:2-2-10 REVISION: 5 \\Server\data drive\2010 PROJECTS\2010-645 HDR\[2010-645-01-04 Permometer.xls]Sheet1

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As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX B

CQA Testing (HDR, GEOTECHNICS)

Low Permeability Barrier Layer Construction Testing

HDR

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	TST-01A
Client Reference	FT. BRAGG C&D LF PH2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-01	Soil Description	**GRAY 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)

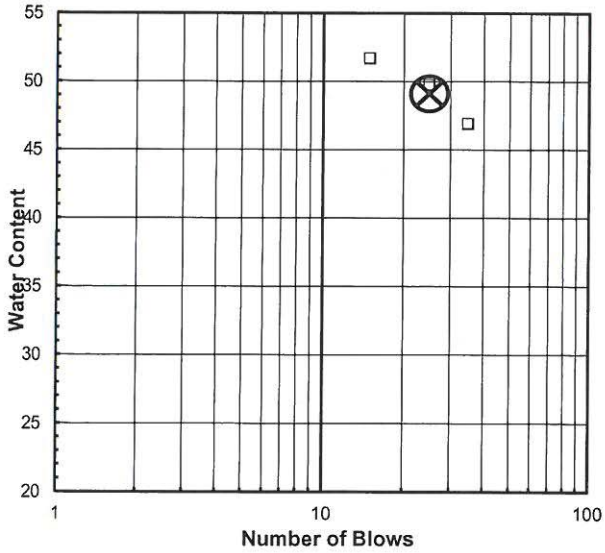
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B-B	A-B	A-C	MULTIPOINT
Wt. of Tare & WS (gm)	33.87	34.48	30.62	
Wt. of Tare & DS (gm)	28.02	28.19	25.50	
Wt. of Tare (gm)	15.54	15.54	15.59	
Wt. of Water (gm)	5.9	6.3	5.1	
Wt. of DS (gm)	12.5	12.7	9.9	
Moisture Content (%)	**46.9**	**49.7**	**51.7**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	H	L	
Wt. of Tare & WS (gm)	23.83	22.63	
Wt. of Tare & DS (gm)	22.19	21.31	
Wt. of Tare (gm)	15.08	15.19	
Wt. of Water (gm)	1.6	1.3	
Wt. of DS (gm)	7.1	6.1	
Moisture Content (%)	**23.1**	**21.6**	**1.5**

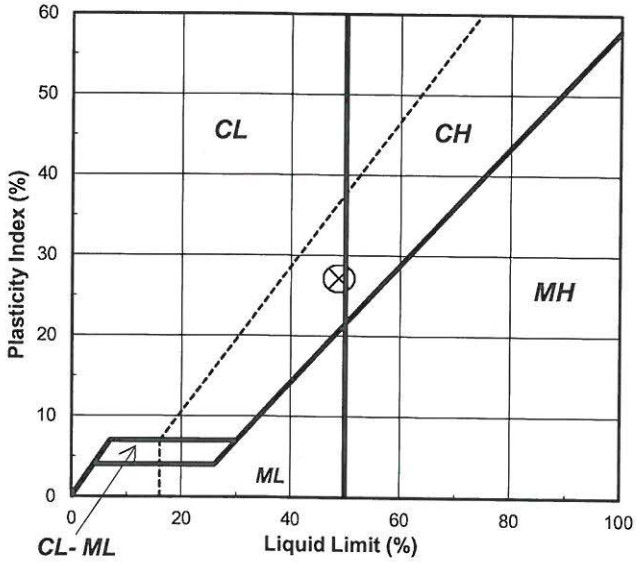
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**49**
Plastic Limit (%)	**22**
Plasticity Index (%)	**27**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By *JBD* *Date* *7/18/2012* *Checked By* GEM *Date* 7-19-12

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	TST-04A
Client Reference	FT. BRAGG C&D LF PH2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-02	Soil Description	**GRAY FAT 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)

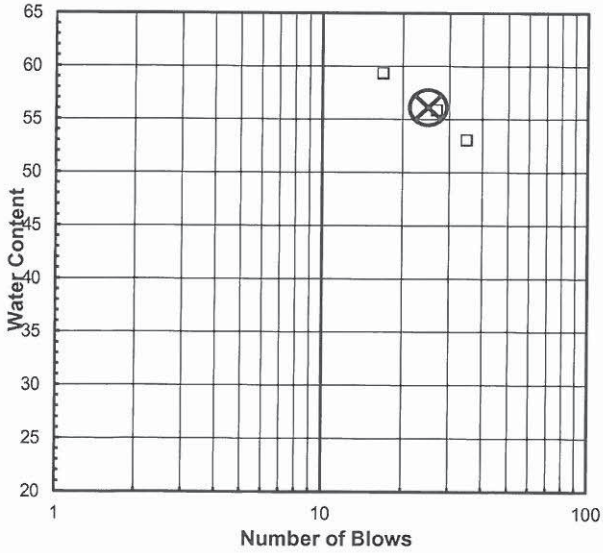
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	W-2	B-4	A-N	MULTIPOINT
Wt. of Tare & WS (gm)	32.02	29.35	30.75	
Wt. of Tare & DS (gm)	26.38	24.37	25.04	
Wt. of Tare (gm)	15.74	15.45	15.41	
Wt. of Water (gm)	5.6	5.0	5.7	
Wt. of DS (gm)	10.6	8.9	9.6	
Moisture Content (%)	**53.0**	**55.8**	**59.3**	
Number of Blows	**35**	**27**	**17**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	F	T	
Wt. of Tare & WS (gm)	21.84	21.86	
Wt. of Tare & DS (gm)	20.56	20.61	
Wt. of Tare (gm)	15.09	15.19	
Wt. of Water (gm)	1.3	1.3	
Wt. of DS (gm)	5.5	5.4	
Moisture Content (%)	**23.4**	**23.1**	**0.3**

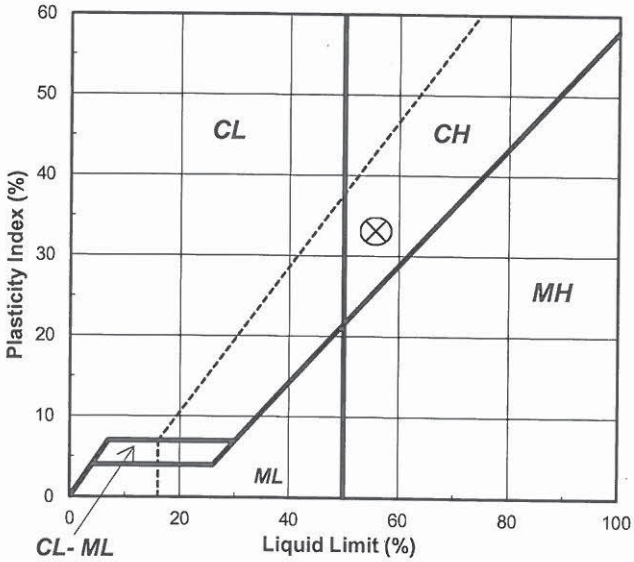
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**56**
Plastic Limit (%)	**23**
Plasticity Index (%)	**33**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By JBD *Date* 7/18/2012 *Checked By* GEM *Date* 7-19-12

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	TST-01A
Client Reference	FT. BRAGG C&D LF PH2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-01	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	A-1	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	516.87	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	440.05	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	93.94	Weight of Tare (gm)	NA
Weight of Water (gm)	76.82	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	346.11	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**22.2**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	346.11
Dry Weight - 3/4" Sample (gm)	66.5	Weight of minus #200 material (gm)	279.65
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	66.46
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	0.59	0.2	0.2	99.8	**99.8**
#10	2.00	1.33	0.4	0.6	99.4	**99.4**
#20	0.850	2.78	0.8	1.4	98.6	**98.6**
#40	0.425	4.71	1.4	2.7	97.3	**97.3**
#60	0.250	7.34	2.1	4.8	95.2	**95.2**
#140	0.106	30.45	8.8	13.6	86.4	**86.4**
#200	0.075	19.26	5.6	19.2	80.8	**80.8**
Pan	-	279.65	80.8	100.0	-	-

Tested By BW Date 7/17/2012 Checked By GEM Date 7-19-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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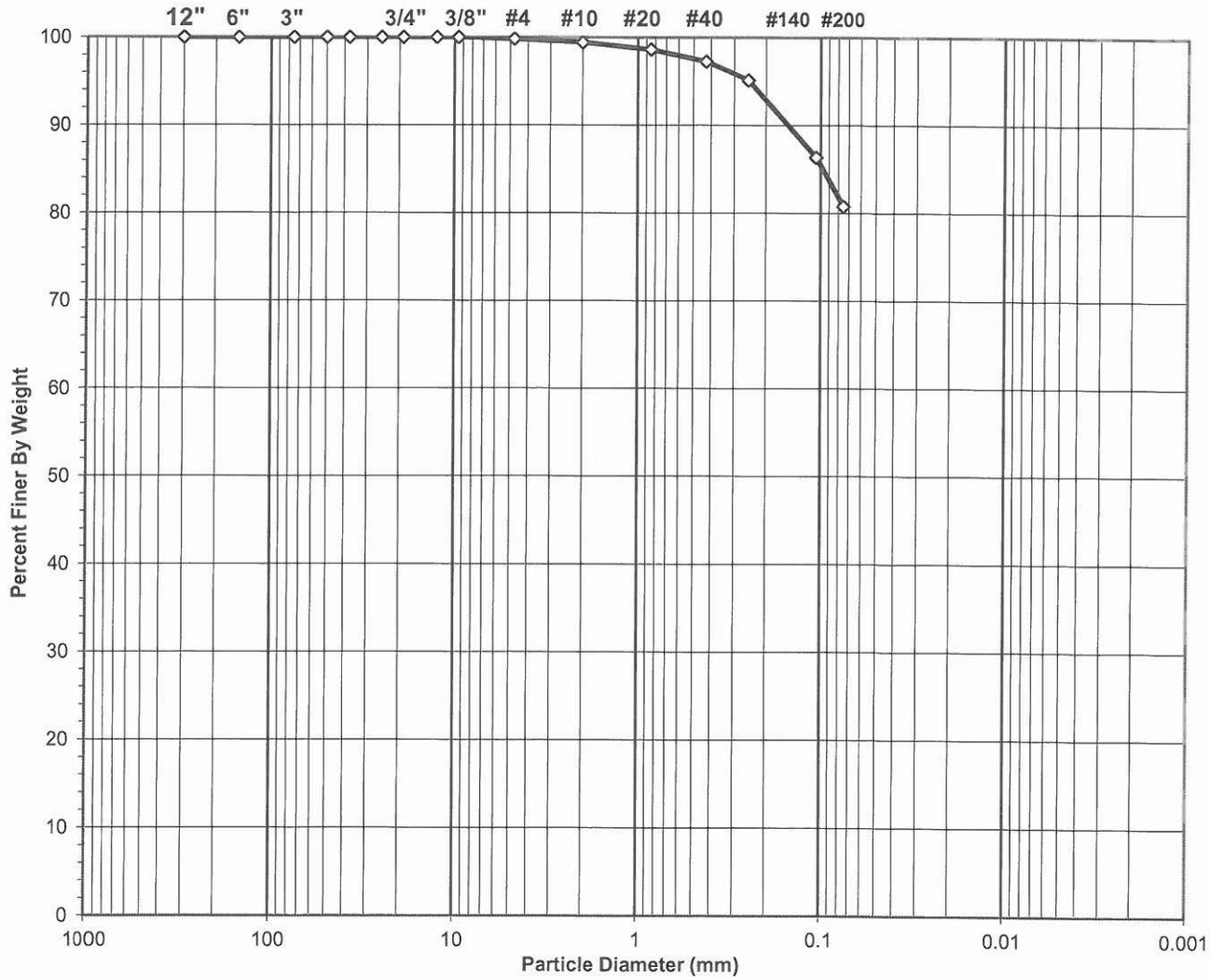
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	TST-01A
Client Reference	FT. BRAGG C&D LF PH2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-01	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification LEAN CLAY WITH SAND

Tested By BW Date 7/17/2012 Checked By GJM Date 7-19-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-627 HDR\[2012-627-02-01 SIEVON REV 4 wHeader.xls]Sheet1*

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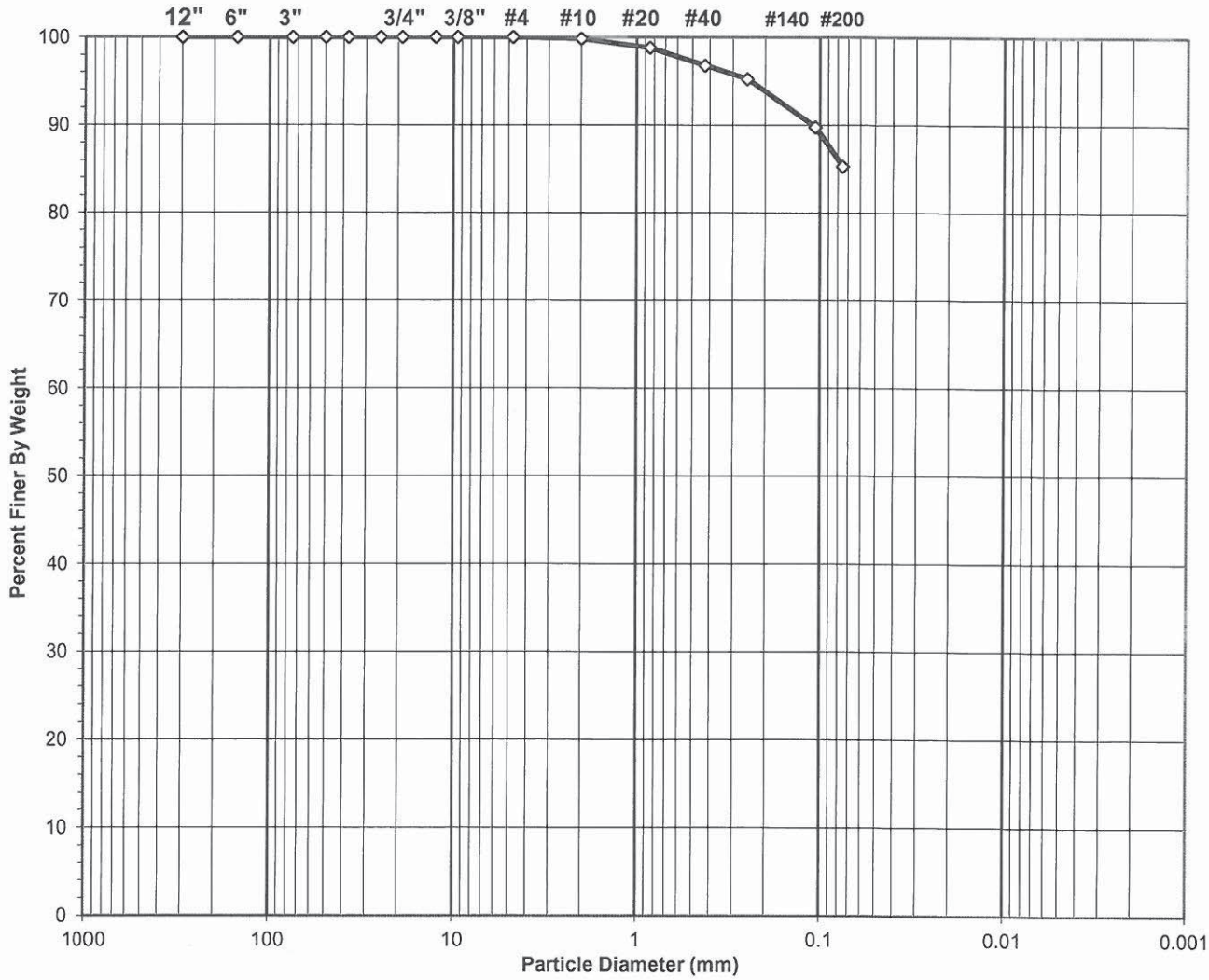
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	TST-04A
Client Reference	FT. BRAGG C&D LF PH2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-02	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY

Tested By BW Date 7/17/2012 Checked By GZM Date 7-19-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-627 HDR\[2012-627-02-02 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	TST-04A
Client Reference	FT. BRAGG C&D LF PH2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-02	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	807	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	645.08	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	548.01	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	105.08	Weight of Tare (gm)	NA
Weight of Water (gm)	97.07	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	442.93	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**21.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	442.93
Dry Weight - 3/4" Sample (gm)	65.2	Weight of minus #200 material (gm)	377.73
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	65.20
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	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.72	0.2	0.2	99.8	**99.8**
#20	0.850	4.51	1.0	1.2	98.8	**98.8**
#40	0.425	9.01	2.0	3.2	96.8	**96.8**
#60	0.250	6.79	1.5	4.7	95.3	**95.3**
#140	0.106	24.26	5.5	10.2	89.8	**89.8**
#200	0.075	19.91	4.5	14.7	85.3	**85.3**
Pan	-	377.73	85.3	100.0	-	-

Tested By BW Date 7/17/2012 Checked By GEM Date 7-19-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

Z:\2012 PROJECTS\2012-627 HDR\[2012-627-02-02 SIEVON REV 4 wHeader.xls]Sheet1

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INTEGRITY IN TESTING

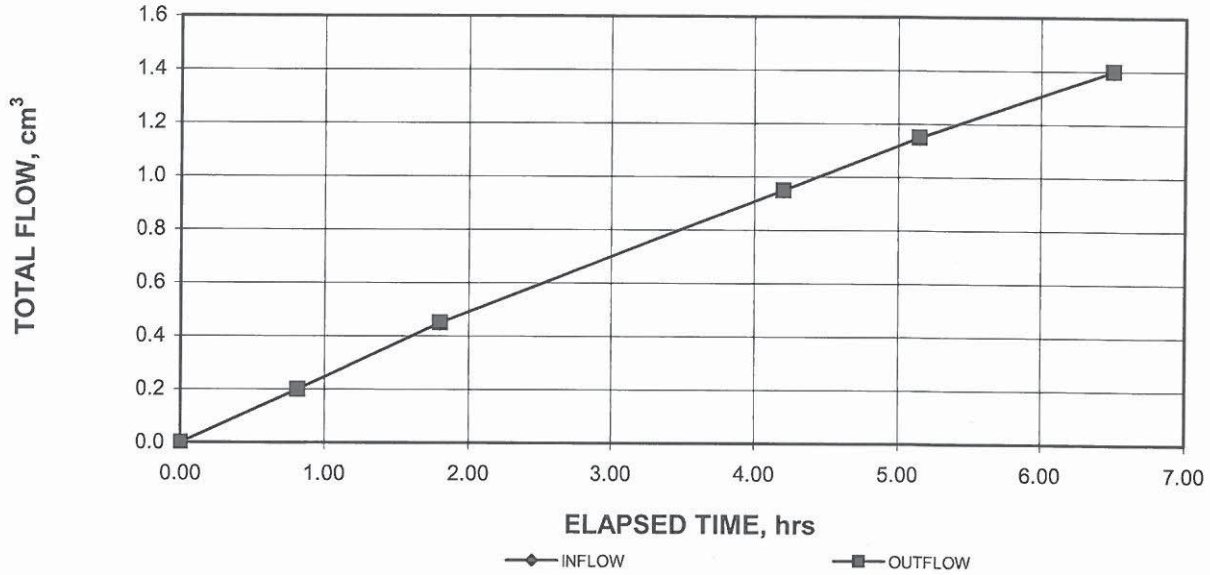
PERMEABILITY TEST

ASTM D 5084-03

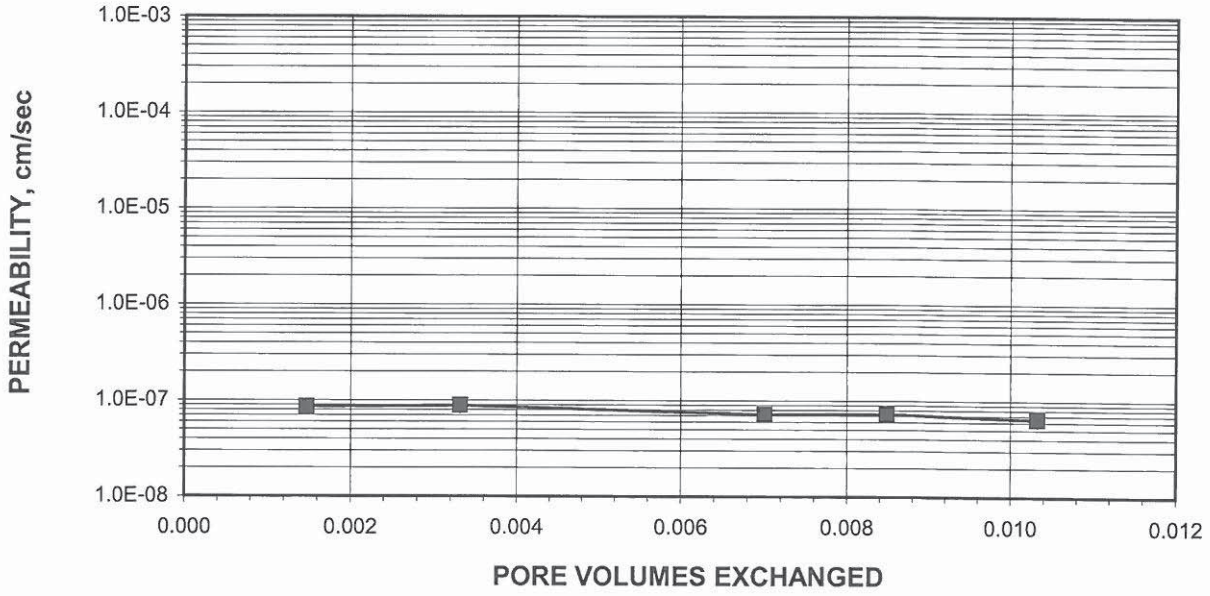
Client	HDR ENGINEERING	Boring No.	TST-01A
Client Project	FT. BRAGG C&D LF PH 2	Depth (ft.)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID No.	2012-627-02-01		

AVERAGE PERMEABILITY = 7.4E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 7.4E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 7/13/2012 Checked By: GAM Date: 7-19-12

DCN: CT-22 DATE: 02/10/2012 REVISION: 2 \\Server\Data\2012 PROJECTS\2012-627 HDR\[2012-627-02-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	HDR ENGINEERING	Boring No.	TST-01A
Client Project	FT. BRAGG C&D LF PH 2	Depth (ft.)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID No.	2012-627-02-01		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	A-1	Y-1
Wt. of Tare & WS (gm.)	516.87	328.85
Wt. of Tare & DS (gm.)	440.35	281.73
Wt. of Tare (gm.)	94.03	94.71
Wt. of Water (gm.)	76.52	47.12
Wt. of DS (gm.)	346.32	187.02
Moisture Content (%)	**22.1**	**25.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	659.55	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	659.55	676.30
Length 1 (in.)	3.130	3.145
Length 2 (in.)	3.119	3.112
Length 3 (in.)	3.117	3.140
Top Diameter (in.)	2.846	2.889
Middle Diameter (in.)	2.840	2.888
Bottom Diameter (in.)	2.840	2.879
Average Length (in.)	3.12	3.13
Average Area (in.^{2})	6.34	6.54
Sample Volume (cm^3)	324.54	335.62
Unit Wet Wt. (gm./ cm^3)	2.03	2.02
Unit Wet Wt. (pcf)	126.9	125.8
Unit Dry Wt. (pcf)	103.9	100.5
Unit Dry Wt. (gm./ cm^3)	1.66	1.61
Void Ratio, e	0.62	0.68
Porosity, n	0.38	0.40
Pore Volume (cm^3)	124.5	135.6
Total Wgt. Of Sample After Test		676.43

Tested By: BW Date: 7/13/2012 Checked By: GTM Date: 7-19-12

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PERMEABILITY TEST

ASTM D 5084-03

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INTEGRITY IN TESTING

Client	HDR ENGINEERING	Boring No.	TST-01A
Client Project	FT. BRAGG C&D LF PH 2	Depth (ft.)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID No.	2012-627-02-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.96
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.33
Cell (psi)	43.0	Sample Area (cm^2), A	42.18
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.891
Hydraulic Gradient	13.25	Outflow Burette Area (cm^2), a-out	0.883
		B Parameter (%)	98

AVERAGE PERMEABILITY = 7.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 7.4E-10 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)
7/17/2012	10	59	0.00	0.0	0.0	129.0	0	25.8	NA
7/17/2012	11	48	0.82	0.2	0.2	128.6	0	26.2	8.6E-08
7/17/2012	12	47	1.80	0.5	0.4	128.0	0	26.5	8.9E-08
7/17/2012	15	11	4.20	1.0	0.9	126.9	0	27.2	7.2E-08
7/17/2012	16	8	5.15	1.2	1.2	126.4	0	27.3	7.3E-08
7/17/2012	17	29	6.50	1.4	1.4	125.9	0	27.3	6.4E-08

Tested By: BW Date: 7/13/2012 Checked By: GEM Date: 7-19-12

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INTEGRITY IN TESTING

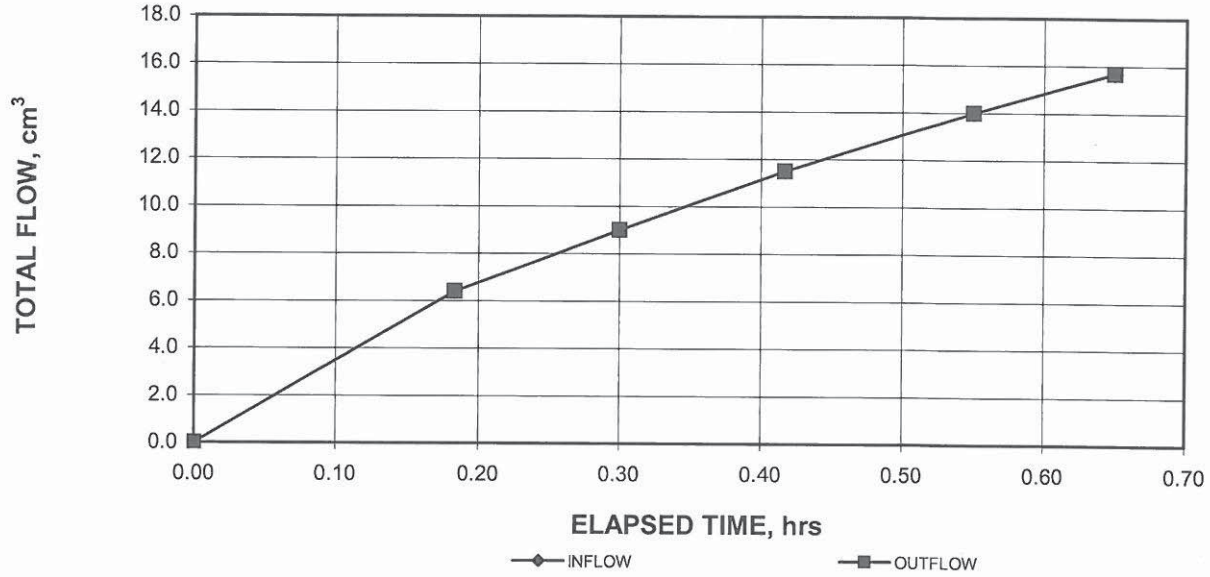
PERMEABILITY TEST

ASTM D 5084-03

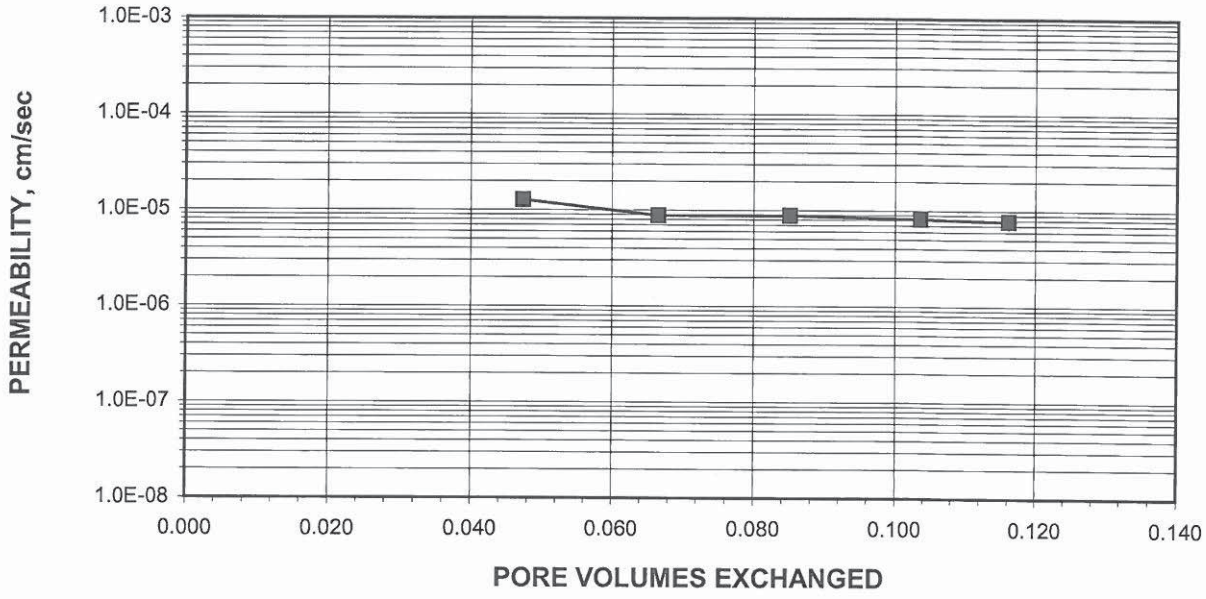
Client	HDR ENGINEERING	Boring No.	TST-04A
Client Project	FT. BRAGG C&D LF PH 2	Depth (ft.)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID No.	2012-627-02-02		

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: 7/13/2012 Checked By: GM Date: 7-19-12

DCN: CT-22 DATE: 02/10/2012 REVISION: 2 \\Server\Data\2012 PROJECTS\2012-627 HDR\[2012-627-02-02 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

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INTEGRITY IN TESTING

Client	HDR ENGINEERING	Boring No.	TST-04A
Client Project	FT. BRAGG C&D LF PH 2	Depth (ft.)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID No.	2012-627-02-02		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	807	Y-11
Wt. of Tare & WS (gm.)	645.06	259.05
Wt. of Tare & DS (gm.)	550.10	226.24
Wt. of Tare (gm.)	105.08	96.32
Wt. of Water (gm.)	94.96	32.81
Wt. of DS (gm.)	445.02	129.92
Moisture Content (%)	**21.3**	**25.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	602.10	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	602.10	621.53
Length 1 (in.)	3.077	3.091
Length 2 (in.)	3.079	3.058
Length 3 (in.)	3.070	3.041
Top Diameter (in.)	2.867	2.849
Middle Diameter (in.)	2.851	2.844
Bottom Diameter (in.)	2.840	2.839
Average Length (in.)	3.08	3.06
Average Area (in.^{2})	6.39	6.35
Sample Volume (cm^3)	322.10	318.89
Unit Wet Wt. (gm./ cm^3)	1.87	1.95
Unit Wet Wt. (pcf)	116.7	121.7
Unit Dry Wt. (pcf)	96.2	97.1
Unit Dry Wt. (gm./ cm^3)	1.54	1.56
Void Ratio, e	0.75	0.74
Porosity, n	0.43	0.42
Pore Volume (cm^3)	138.3	135.1
Total Wgt. Of Sample After Test		621.40

Tested By: BW Date: 7/13/2012 Checked By: GEM Date: 7-19-12

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PERMEABILITY TEST

ASTM D 5084-03

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INTEGRITY IN TESTING

Client	HDR ENGINEERING	Boring No.	TST-04A
Client Project	FT. BRAGG C&D LF PH 2	Depth (ft.)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID No.	2012-627-02-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	43.5	Sample Length (cm), L	7.78
Bottom Cap (psi)	45.0	Sample Diameter (cm)	7.22
Cell (psi)	48.0	Sample Area (cm^2), A	40.98
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	13.55	Outflow Burette Area (cm^2), a-out	0.972
		B Parameter (%)	98

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)
7/18/2012	16	41	0.00	0.0	0.0	130.8	0	26.8	NA
7/18/2012	16	52	0.18	6.4	6.4	116.7	0	26.8	1.3E-05
7/18/2012	16	59	0.30	9.0	9.0	111.0	0	26.8	8.8E-06
7/18/2012	17	6	0.42	11.5	11.5	105.5	0	26.8	8.9E-06
7/18/2012	17	14	0.55	14.0	14.0	100.1	0	26.8	8.2E-06
7/18/2012	17	20	0.65	15.7	15.7	96.3	0	26.8	7.8E-06

Tested By: BW Date: 7/13/2012 Checked By: GJM Date: 7-19-12

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INTEGRITY IN TESTING

Moisture, Ash, and Organic Matter (Loss on Ignition)

ASTM D 2974-07a, AASHTO T 267-86 (SOP - S8)

Client	HDR ENGINEERING
Client Reference	FT BRAGG PHASE 1 CLOSURE
Project No.	2012-718-01

Moisture Content (Oven Dried, minus #10 Sieve Material)

Lab ID	06	07
Boring No.	BAG-1	BAG-2
Depth(ft).	NA	NA
Sample No.	NA	NA
Tare Number	P+X	16+14
Wt. Tare & WS (gm)	142.41	123.46
Wt. Tare & DS (gm)	127.65	116.19
Wt. Tare (gm)	37.32	37.36
Wt. Water (gm)	14.76	7.27
Wt. DS (gm)	90.33	78.83
Moisture Content	**16.3%**	**9.2%**

Ash Content, Organic Matter

Furnace Temperature ° C	440	440
Wt. Tare & Ash (gm)	126.59	115.29
Wt. Volatiles (gm)	1.06	0.90
Wt. Ash (gm)	89.27	77.93
Ash Content	**98.8%**	**98.9%**
Organic Matter	**1.2%**	**1.1%**

Tested By PC *Date* 8/22/12 *Checked By* KC *Date* 8-29-12

DCN: CT-S8 DATE: 11/15/10 REVISION:4

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INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216-10

Client	HDR ENGINEERING, INC.
Client Reference	FT. BRAGG PHASE 1 CLOSURE
Project No.	2012-718-01

Lab ID	.001	.002	.003	.004	.005
Boring No.	NA	NA	NA	NA	NA
Depth (ft)	0-6"	12-18"	NA	2-12"	3-8"
Sample No.	ST-04A	ST-11A	ST-21A	ST-24A	ST-27A
Tare Number	801	800	807	835	833
Wt. of Tare & WS (gm)	243.33	309.08	240.93	657.05	610.93
Wt. of Tare & DS (gm)	214.44	269.05	217.13	576.63	548.9
Wt. of Tare (gm)	107.34	103.85	104.71	254.76	259.12
Wt. of Water (gm)	28.89	40.03	23.8	80.42	62.03
Wt. of DS (gm)	107.1	165.2	112.42	321.87	289.78
Water Content (%)	**27.0**	**24.2**	**21.2**	**25.0**	**21.4**

Lab ID	.006	.007
Boring No.	NA	NA
Depth (ft)	NA	NA
Sample No.	BAG-1	BAG-2
Tare Number	830	839
Wt. of Tare & WS (gm)	787.45	698.87
Wt. of Tare & DS (gm)	713.92	650.39
Wt. of Tare (gm)	258.21	257.67
Wt. of Water (gm)	73.53	48.48
Wt. of DS (gm)	455.71	392.72
Water Content (%)	**16.1**	**12.3**

Notes : *NA*

Tested By *JBD* *Date* *8/23/2012* *Checked By* GEM *Date* 8-24-12

DCN: CT-S1 DATE 6-30-98 REVISION: 2

Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01 WATCONT W Header.xls]Sheet1

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	0-6'
Project No.	2012-718-01	Sample No.	ST-04A
Lab ID	2012-718-01-01	Soil Description	**GRAY FAT 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)

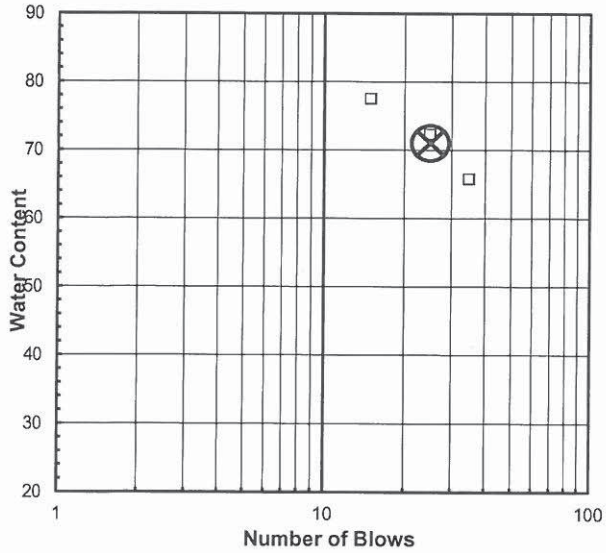
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	2M	W-5	A-Q	MULTIPOINT
Wt. of Tare & WS (gm)	22.75	23.63	26.48	
Wt. of Tare & DS (gm)	19.91	20.27	21.67	
Wt. of Tare (gm)	15.59	15.62	15.46	
Wt. of Water (gm)	2.8	3.4	4.8	
Wt. of DS (gm)	4.3	4.7	6.2	
Moisture Content (%)	**65.7**	**72.3**	**77.5**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-H	X-9	
Wt. of Tare & WS (gm)	22.38	22.72	
Wt. of Tare & DS (gm)	20.94	21.29	
Wt. of Tare (gm)	15.54	15.71	
Wt. of Water (gm)	1.4	1.4	
Wt. of DS (gm)	5.4	5.6	
Moisture Content (%)	**26.7**	**25.6**	**1.0**

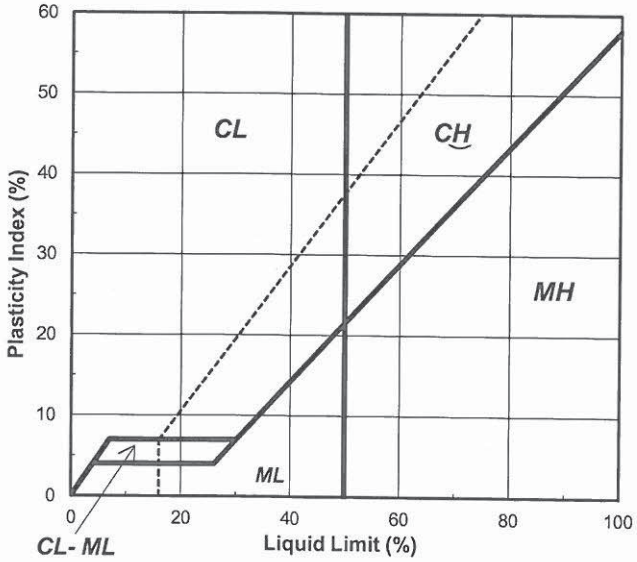
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**71**
Plastic Limit (%)	**26**
Plasticity Index (%)	**45**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By BW *Date* 8/22/2012 *Checked By* GEM *Date* 8-23-12

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	12-18"
Project No.	2012-718-01	Sample No.	ST-11A
Lab ID	2012-718-01-02	Soil Description	**GRAY FAT 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)

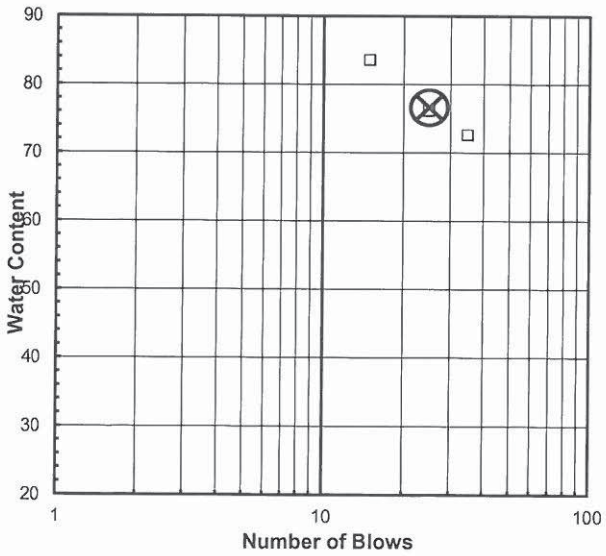
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-Q	W-5	A-H	MULTIPOINT
Wt. of Tare & WS (gm)	31.12	30.59	31.36	
Wt. of Tare & DS (gm)	24.55	24.13	24.16	
Wt. of Tare (gm)	15.49	15.64	15.54	
Wt. of Water (gm)	6.6	6.5	7.2	
Wt. of DS (gm)	9.1	8.5	8.6	
Moisture Content (%)	**72.5**	**76.1**	**83.5**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	X-9	2M	
Wt. of Tare & WS (gm)	21.17	21.44	
Wt. of Tare & DS (gm)	19.87	20.06	
Wt. of Tare (gm)	15.72	15.59	
Wt. of Water (gm)	1.3	1.4	
Wt. of DS (gm)	4.2	4.5	
Moisture Content (%)	**31.3**	**30.9**	**0.5**

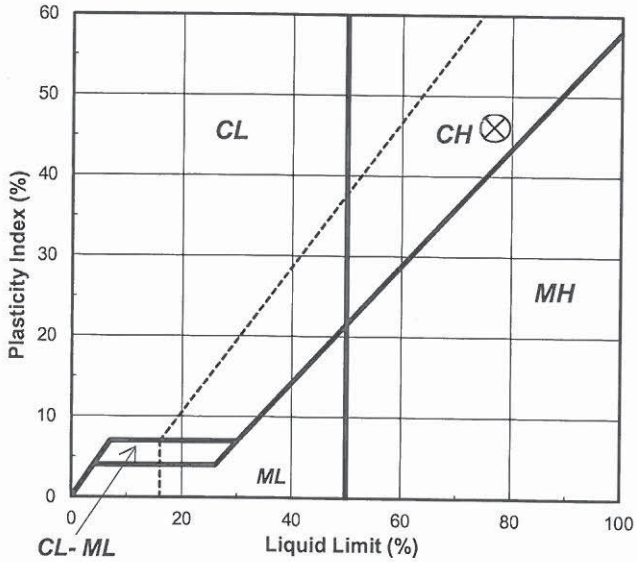
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**77**
Plastic Limit (%)	**31**
Plasticity Index (%)	**46**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By JBD *Date* 8/24/2012 *Checked By* GAM *Date* 8-27-12

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	ST-21A
Lab ID	2012-718-01-03	Soil Description	**GRAY FAT 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)

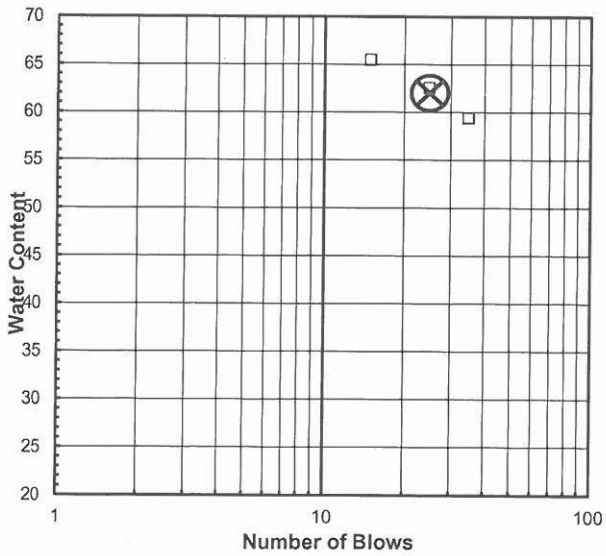
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	M	R	P	MULTIPOINT
Wt. of Tare & WS (gm)	30.50	28.25	33.59	
Wt. of Tare & DS (gm)	24.79	23.23	26.32	
Wt. of Tare (gm)	15.17	15.20	15.21	
Wt. of Water (gm)	5.7	5.0	7.3	
Wt. of DS (gm)	9.6	8.0	11.1	
Moisture Content (%)	**59.4**	**62.5**	**65.4**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-L	4M	
Wt. of Tare & WS (gm)	23.16	21.76	
Wt. of Tare & DS (gm)	21.44	20.39	
Wt. of Tare (gm)	15.55	15.60	
Wt. of Water (gm)	1.7	1.4	
Wt. of DS (gm)	5.9	4.8	
Moisture Content (%)	**29.2**	**28.6**	**0.6**

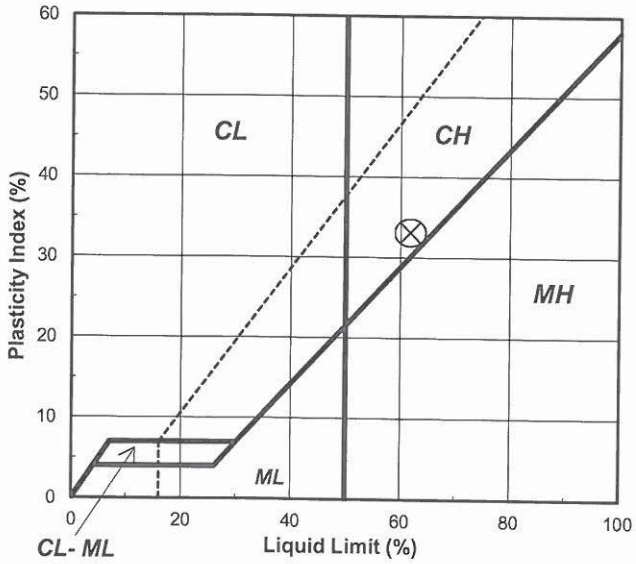
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**62**
Plastic Limit (%)	**29**
Plasticity Index (%)	**33**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By JBD *Date* 8/24/2012 *Checked By* GEM *Date* 8-27-12

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	2-12"
Project No.	2012-718-01	Sample No.	ST-24A
Lab ID	2012-718-01-04	Soil Description	**GRAY FAT 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)

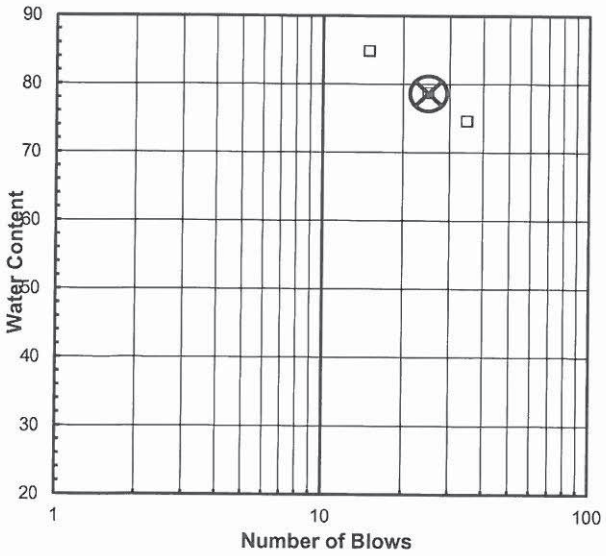
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	2M	W-5	X-9	MULTIPOINT
Wt. of Tare & WS (gm)	32.20	31.80	32.57	
Wt. of Tare & DS (gm)	25.11	24.68	24.83	
Wt. of Tare (gm)	15.60	15.63	15.70	
Wt. of Water (gm)	7.1	7.1	7.7	
Wt. of DS (gm)	9.5	9.1	9.1	
Moisture Content (%)	**74.6**	**78.7**	**84.8**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-H	A-Q	
Wt. of Tare & WS (gm)	22.51	21.81	
Wt. of Tare & DS (gm)	20.85	20.35	
Wt. of Tare (gm)	15.54	15.49	
Wt. of Water (gm)	1.7	1.5	
Wt. of DS (gm)	5.3	4.9	
Moisture Content (%)	**31.3**	**30.0**	**1.2**

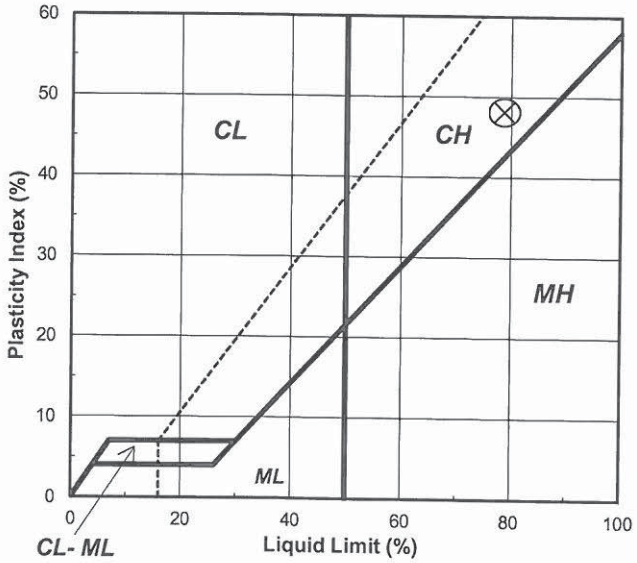
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**79**
Plastic Limit (%)	**31**
Plasticity Index (%)	**48**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By JBD *Date* 8/23/2012 *Checked By* GEM *Date* 8-24-12

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	3-8"
Project No.	2012-718-01	Sample No.	ST-27A
Lab ID	2012-718-01-05	Soil Description	**GRAY FAT 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)

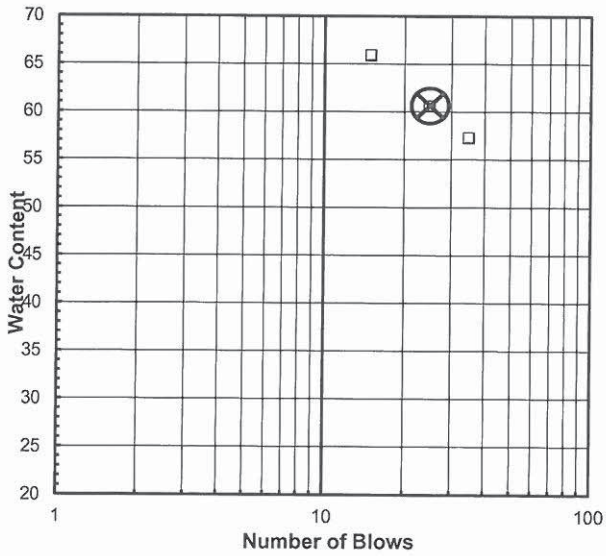
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B-B	A-B	A-C	MULTIPOINT
Wt. of Tare & WS (gm)	30.91	34.91	32.51	
Wt. of Tare & DS (gm)	25.31	27.61	25.79	
Wt. of Tare (gm)	15.53	15.56	15.59	
Wt. of Water (gm)	5.6	7.3	6.7	
Wt. of DS (gm)	9.8	12.1	10.2	
Moisture Content (%)	**57.3**	**60.6**	**65.9**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	H	L	
Wt. of Tare & WS (gm)	21.80	22.13	
Wt. of Tare & DS (gm)	20.41	20.69	
Wt. of Tare (gm)	15.08	15.20	
Wt. of Water (gm)	1.4	1.4	
Wt. of DS (gm)	5.3	5.5	
Moisture Content (%)	**26.1**	**26.2**	**-0.2**

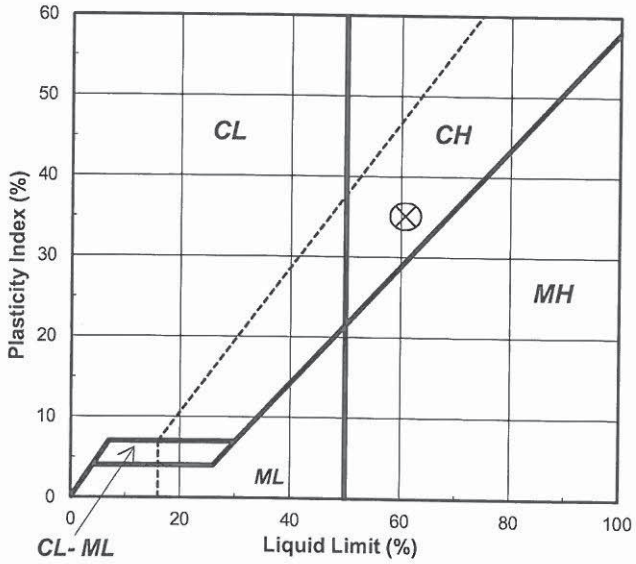
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**61**
Plastic Limit (%)	**26**
Plasticity Index (%)	**35**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By JBD *Date* 8/24/2012 *Checked By* GZM *Date* 8-27-12

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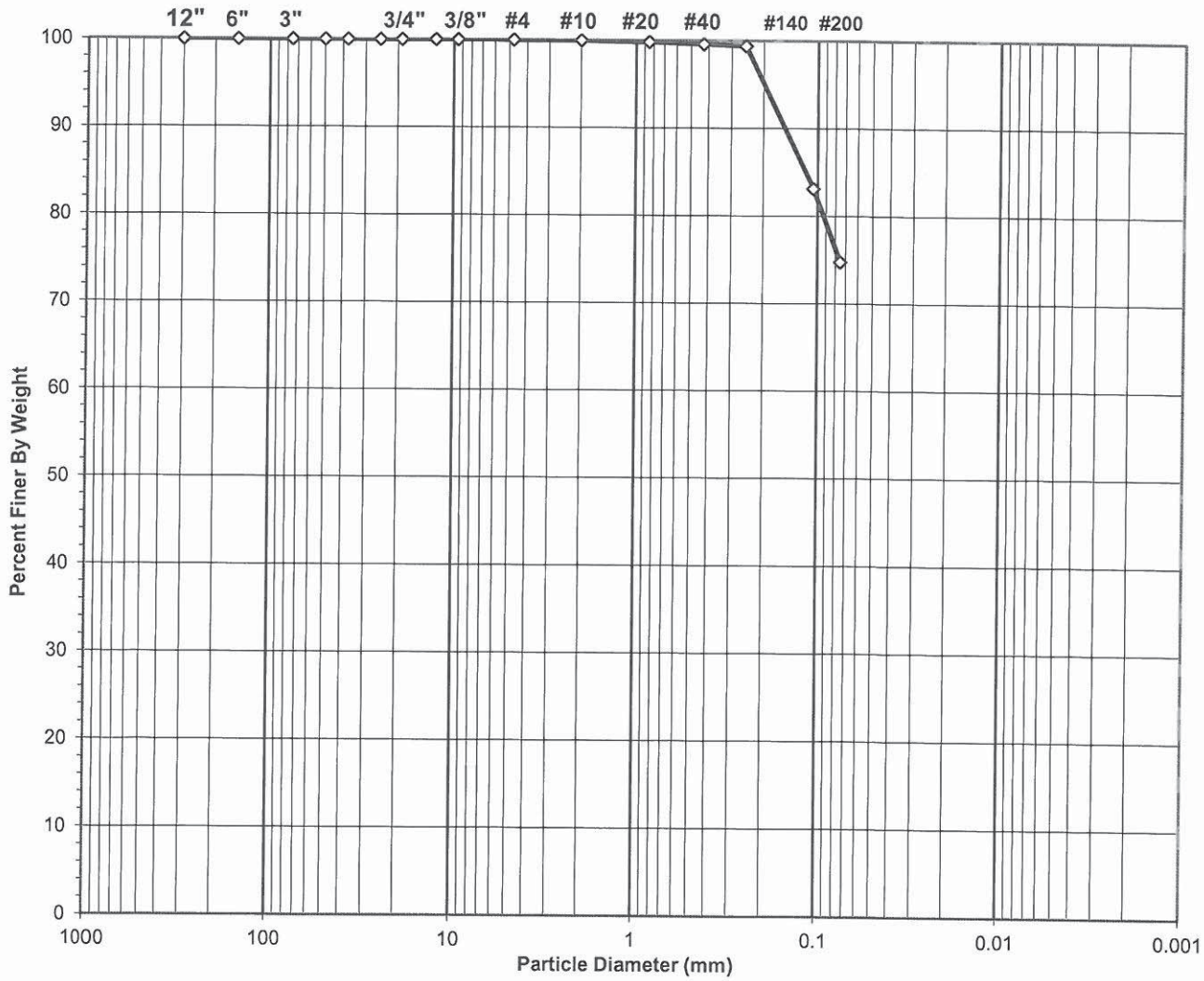
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	0-6"
Project No.	2012-718-01	Sample No.	ST-04A
Lab ID	2012-718-01-01	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY WITH SAND

Tested By MB Date 8/20/2012 Checked By GJM Date 8-23-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-01 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	0-6"
Project No.	2012-718-01	Sample No.	ST-04A
Lab ID	2012-718-01-01	Soil Color	**GRAY**

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)	790.04	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	691.58	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	261.71	Weight of Tare (gm)	NA
Weight of Water (gm)	98.46	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	429.87	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**22.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	429.87
Dry Weight - 3/4" Sample (gm)	108.5	Weight of minus #200 material (gm)	321.40
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	108.47
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	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.15	0.0	0.0	100.0	**100.0**
#20	0.850	0.56	0.1	0.2	99.8	**99.8**
#40	0.425	0.95	0.2	0.4	99.6	**99.6**
#60	0.250	0.87	0.2	0.6	99.4	**99.4**
#140	0.106	69.85	16.2	16.8	83.2	**83.2**
#200	0.075	36.09	8.4	25.2	74.8	**74.8**
Pan	-	321.40	74.8	100.0	-	**-**

Tested By MB Date 8/20/2012 Checked By GEM Date 8-23-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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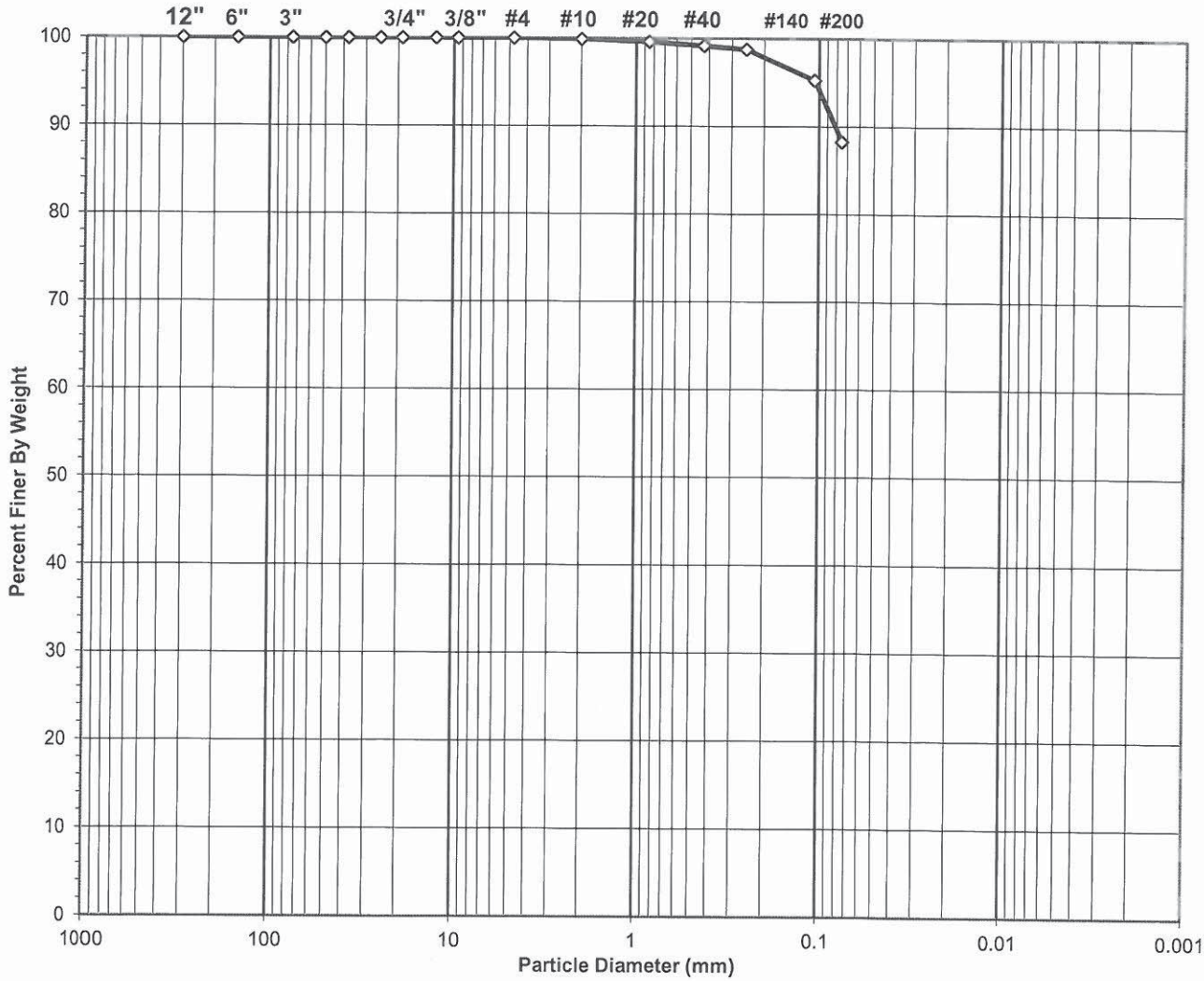
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	12-18"
Project No.	2012-718-01	Sample No.	ST-11A
Lab ID	2012-718-01-02	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY

Tested By MB Date 8/20/2012 Checked By GEM Date 8-27-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-02 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	12-18"
Project No.	2012-718-01	Sample No.	ST-11A
Lab ID	2012-718-01-02	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	832	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	677.95	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	597.04	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	259.02	Weight of Tare (gm)	NA
Weight of Water (gm)	80.91	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	338.02	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**23.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	338.02
Dry Weight - 3/4" Sample (gm)	39.6	Weight of minus #200 material (gm)	298.41
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	39.61
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	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.26	0.1	0.1	99.9	**99.9**
#20	0.850	1.00	0.3	0.4	99.6	**99.6**
#40	0.425	1.51	0.4	0.8	99.2	**99.2**
#60	0.250	1.33	0.4	1.2	98.8	**98.8**
#140	0.106	11.86	3.5	4.7	95.3	**95.3**
#200	0.075	23.65	7.0	11.7	88.3	**88.3**
Pan	-	298.41	88.3	100.0	-	**-**

Tested By MB Date 8/20/2012 Checked By GEM Date 8-27-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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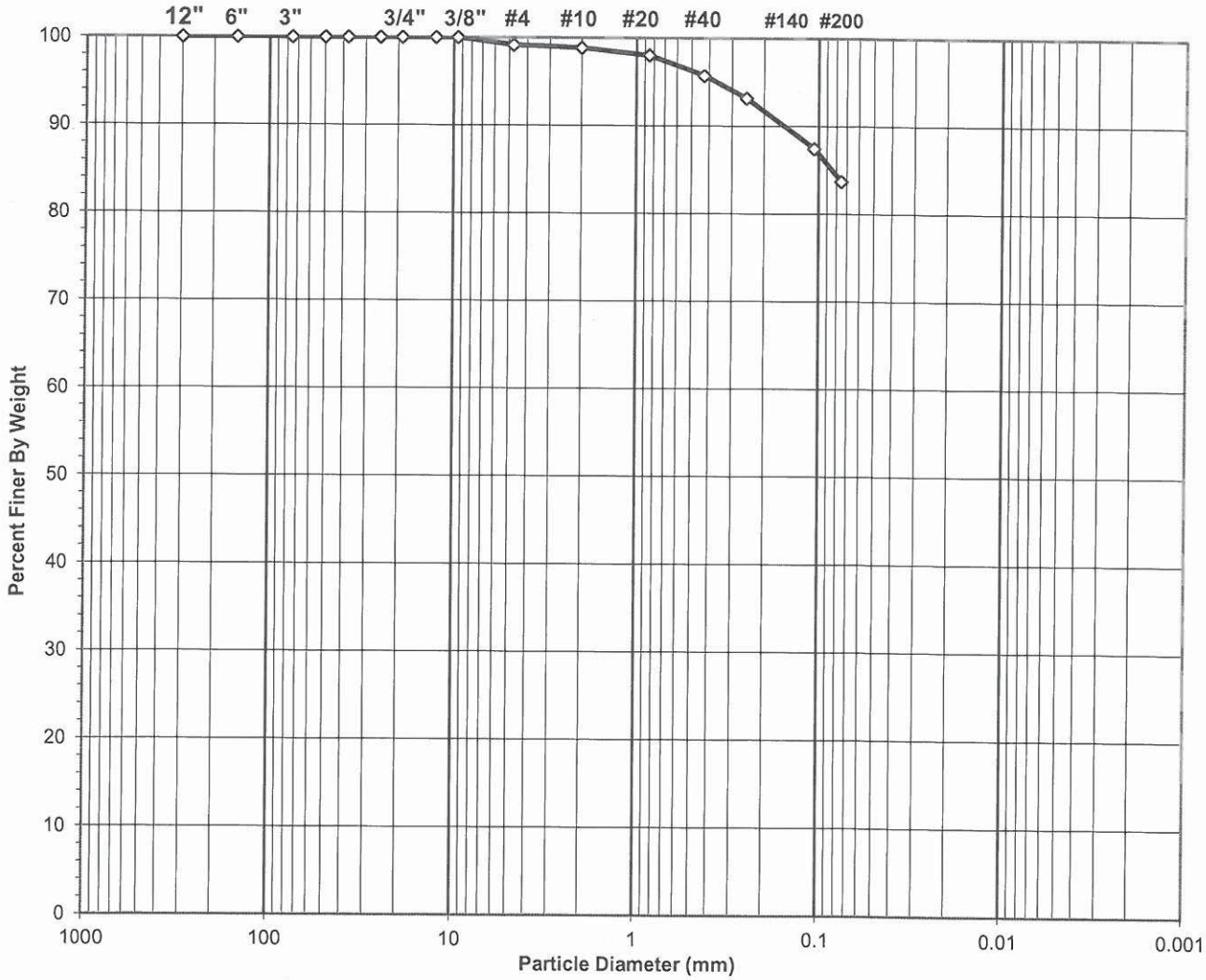
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	ST-21A
Lab ID	2012-718-01-03	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY WITH SAND

Tested By MB Date 8/20/2012 Checked By GEM Date 8-27-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-03 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	ST-21A
Lab ID	2012-718-01-03	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	841	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	640.37	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	560.63	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	258.73	Weight of Tare (gm)	NA
Weight of Water (gm)	79.74	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	301.90	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**26.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	301.90
Dry Weight - 3/4" Sample (gm)	49.2	Weight of minus #200 material (gm)	252.75
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	49.15
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	2.52	0.8	0.8	99.2	**99.2**
#10	2.00	0.89	0.3	1.1	98.9	**98.9**
#20	0.850	2.53	0.8	2.0	98.0	**98.0**
#40	0.425	6.95	2.3	4.3	95.7	**95.7**
#60	0.250	7.66	2.5	6.8	93.2	**93.2**
#140	0.106	17.25	5.7	12.5	87.5	**87.5**
#200	0.075	11.35	3.8	16.3	83.7	**83.7**
Pan	-	252.75	83.7	100.0	-	**-**

Tested By MB Date 8/20/2012 Checked By GM Date 8-27-12

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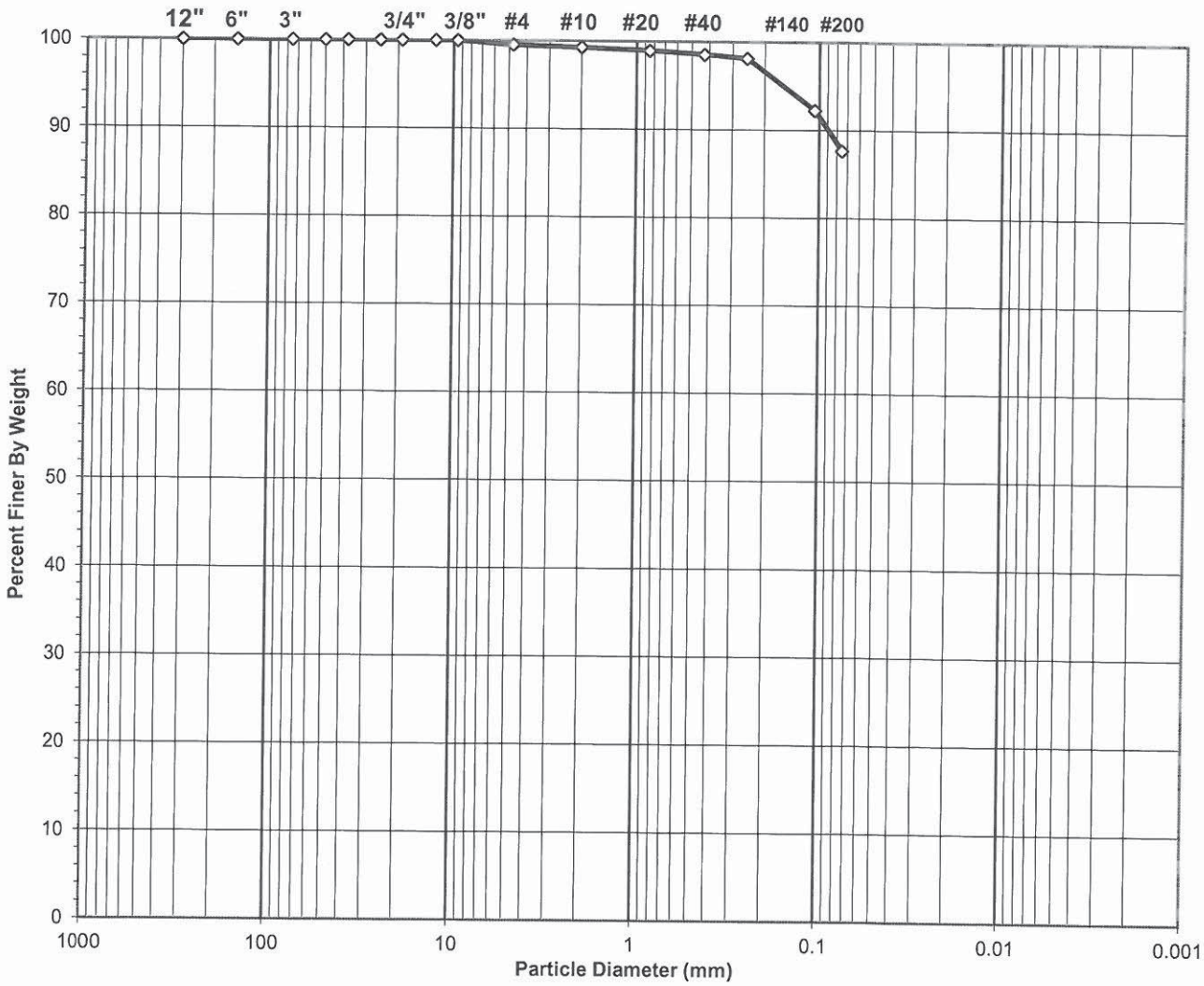
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	2-12"
Project No.	2012-718-01	Sample No.	ST-24A
Lab ID	2012-718-01-04	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY

Tested By MB Date 8/20/2012 Checked By GJM Date 8-27-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-04 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	2-12"
Project No.	2012-718-01	Sample No.	ST-24A
Lab ID	2012-718-01-04	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	835	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	657.05	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	576.63	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	254.76	Weight of Tare (gm)	NA
Weight of Water (gm)	80.42	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	321.87	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**25.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	321.87
Dry Weight - 3/4" Sample (gm)	39.7	Weight of minus #200 material (gm)	282.20
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	39.67
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	1.53	0.5	0.5	99.5	**99.5**
#10	2.00	0.78	0.2	0.7	99.3	**99.3**
#20	0.850	1.04	0.3	1.0	99.0	**99.0**
#40	0.425	1.30	0.4	1.4	98.6	**98.6**
#60	0.250	1.29	0.4	1.8	98.2	**98.2**
#140	0.106	18.95	5.9	7.7	92.3	**92.3**
#200	0.075	14.78	4.6	12.3	87.7	**87.7**
Pan	-	282.20	87.7	100.0	-	**-**

Tested By MB Date 8/20/2012 Checked By GJM Date 8-27-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-04 SIEVON REV 4 wHeader.xls]Sheet1

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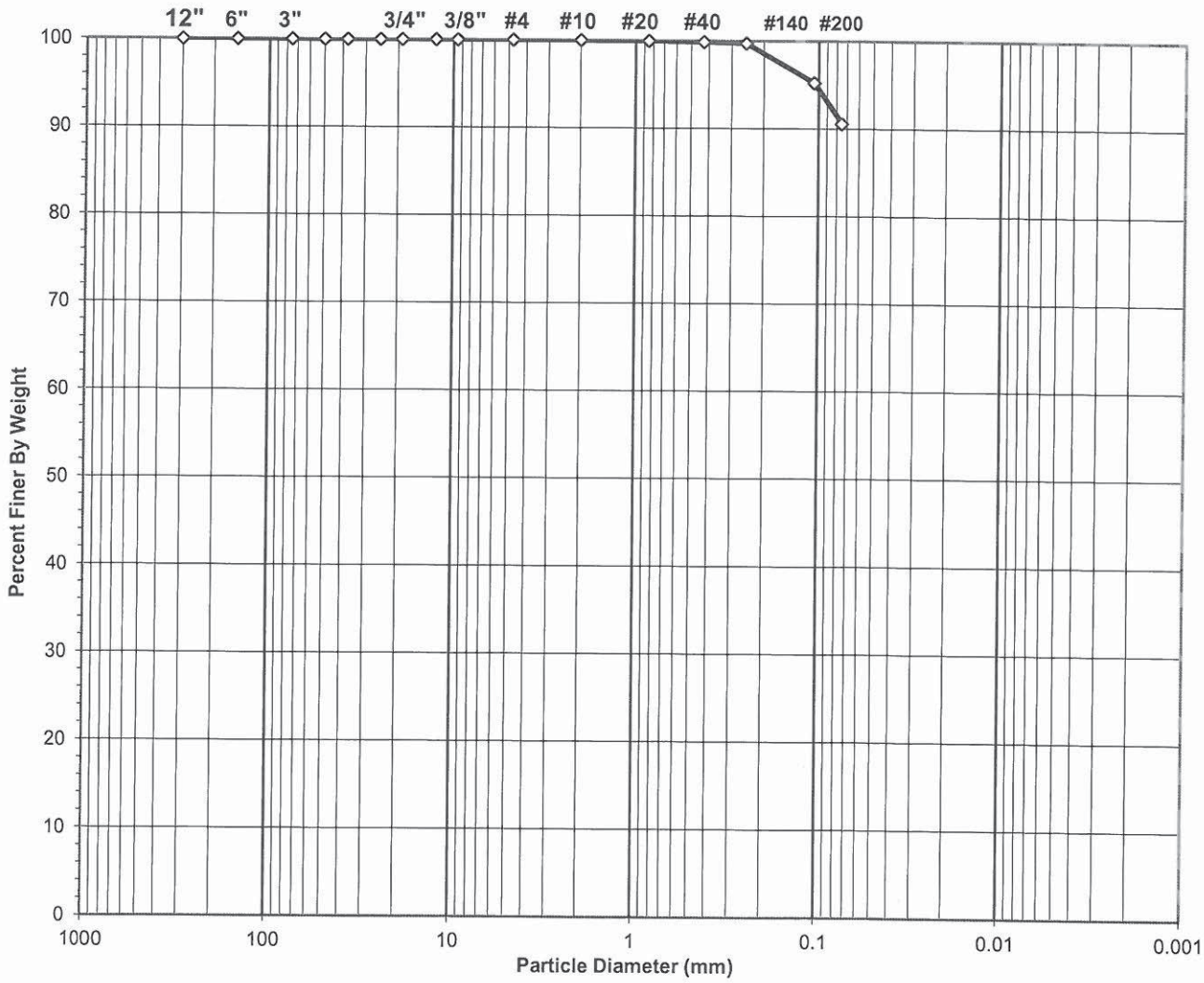
geotechnics
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	3-8"
Project No.	2012-718-01	Sample No.	ST-27A
Lab ID	2012-718-01-05	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY

Tested By MB Date 8/20/2012 Checked By GEM Date 8-27-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-05 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	3-8"
Project No.	2012-718-01	Sample No.	ST-27A
Lab ID	2012-718-01-05	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	833	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	610.93	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	548.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	259.12	Weight of Tare (gm)	NA
Weight of Water (gm)	62.03	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	289.78	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**21.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	289.78
Dry Weight - 3/4" Sample (gm)	27.2	Weight of minus #200 material (gm)	262.57
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	27.21
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	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.00	0.0	0.0	100.0	**100.0**
#20	0.850	0.09	0.0	0.0	100.0	**100.0**
#40	0.425	0.27	0.1	0.1	99.9	**99.9**
#60	0.250	0.40	0.1	0.3	99.7	**99.7**
#140	0.106	13.02	4.5	4.8	95.2	**95.2**
#200	0.075	13.43	4.6	9.4	90.6	**90.6**
Pan	-	262.57	90.6	100.0	-	-

Tested By MB Date 8/20/2012 Checked By GEM Date 8-27-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-05 SIEVON REV 4 wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

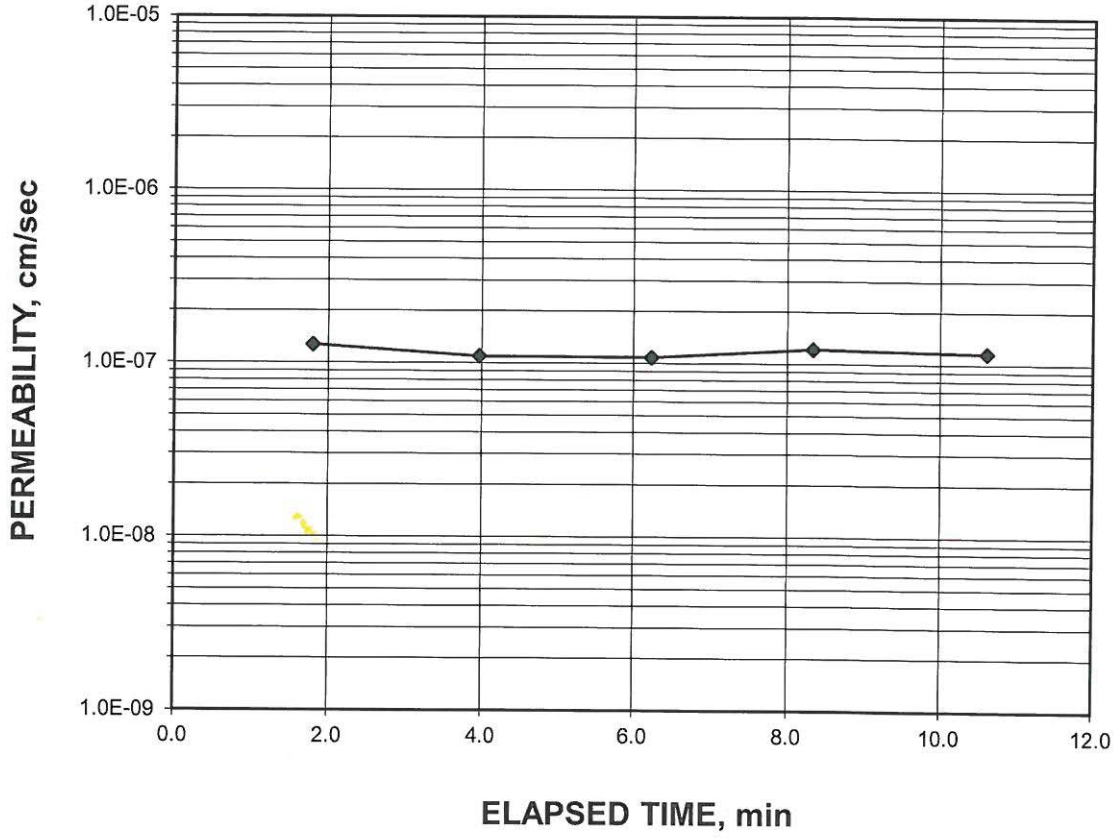
ASTM D 5084-03

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	0-6"
Project No.	2012-718-01	Sample No.	ST-04A
Lab ID No.	2012-718-01-01		

Visual Description: GRAY CLAY

AVERAGE PERMEABILITY = 1.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 8/15/2012 Checked By: GM Date: 8-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-01 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	0-6"
Project No.	2012-718-01	Sample No.	ST-04A
Lab ID No.	2012-718-01-01		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	801	804
Wt. of Tare & WS (gm.)	243.33	334.46
Wt. of Tare & DS (gm.)	214.44	279.07
Wt. of Tare (gm.)	107.34	105.13
Wt. of Water (gm.)	28.89	55.39
Wt. of DS (gm.)	107.10	173.94
Moisture Content (%)	**27.0**	**31.8**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	607.49	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	607.49	630.79
Length 1 (in.)	3.124	3.125
Length 2 (in.)	3.127	3.178
Length 3 (in.)	3.125	3.162
Top Diameter (in.)	2.842	2.856
Middle Diameter (in.)	2.834	2.874
Bottom Diameter (in.)	2.827	2.872
Average Length (in.)	3.13	3.16
Average Area (in.^{2})	6.31	6.46
Sample Volume (cm^3)	323.14	333.85
Unit Wet Wt. (gm./ cm^3)	1.880	1.889
Unit Wet Wt. (pcf)	117.4	117.9
Unit Dry Wt. (pcf)	92.4	89.5
Unit Dry Wt. (gm./ cm^3)	1.481	1.433
Void Ratio, e	0.824	0.884
Porosity, n	0.452	0.469
Pore Volume (cm^3)	145.9	156.6
Total Wt. Of Sample After Test		631.49

Tested By: BW Date: 8/15/2012 Checked By: GZM Date: 8-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-01 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	0-6"
Project No.	2012-718-01	Sample No.	ST-04A
Lab ID No.	2012-718-01-01		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	43.0	Sample Length (cm), L	8.01
Back Pressure(psi)	40.0	Sample Area (cm^2), A	41.66
Eff. Cons. Pressure(psi)	3.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-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)
8/16/2012	16	29	18	29.30	0.000	7.0	9.8	25.6	NA
8/16/2012	16	31	6	31.10	1.800	6.8	9.5	25.6	1.3E-07
8/16/2012	16	33	16	33.27	3.967	6.6	9.1	25.6	1.1E-07
8/16/2012	16	35	32	35.53	6.233	6.4	8.8	25.6	1.1E-07
8/16/2012	16	37	38	37.63	8.333	6.2	8.5	25.6	1.2E-07
8/16/2012	16	39	55	39.92	10.617	6.0	8.1	25.6	1.2E-07

Tested By: BW Date: 8/15/2012 Checked By: GAM Date: 8-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-01 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

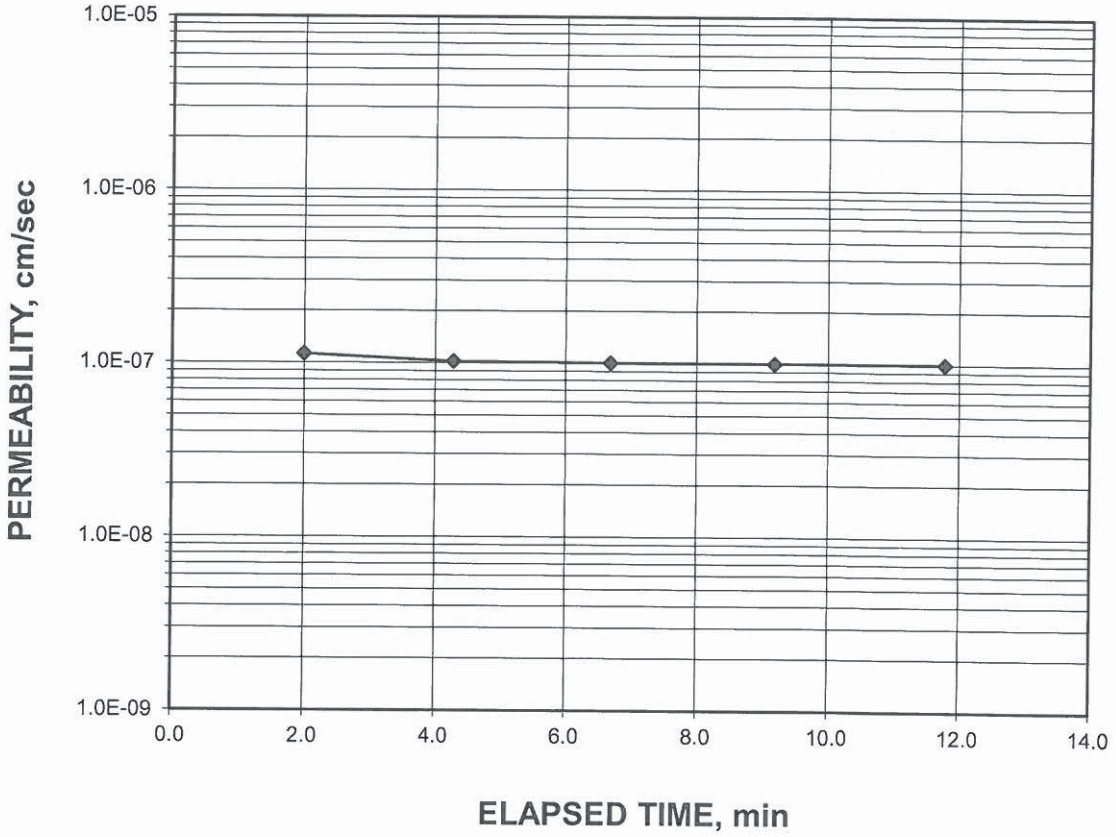
ASTM D 5084-03

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	12-18'
Project No.	2012-718-01	Sample No.	ST-11A
Lab ID No.	2012-718-01-02		

Visual Description: GRAY CLAY

AVERAGE PERMEABILITY = 1.0E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.0E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 8/15/2012 Checked By: GEM Date: 8-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-02 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	12-18'
Project No.	2012-718-01	Sample No.	ST-11A
Lab ID No.	2012-718-01-02		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	800	803
Wt. of Tare & WS (gm.)	309.08	323.42
Wt. of Tare & DS (gm.)	269.05	271.94
Wt. of Tare (gm.)	103.85	103.63
Wt. of Water (gm.)	40.03	51.48
Wt. of DS (gm.)	165.20	168.31
Moisture Content (%)	**24.2**	**30.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	629.00	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	629.00	661.18
Length 1 (in.)	3.100	3.190
Length 2 (in.)	3.124	3.177
Length 3 (in.)	3.118	3.172
Top Diameter (in.)	2.858	2.899
Middle Diameter (in.)	2.856	2.908
Bottom Diameter (in.)	2.858	2.906
Average Length (in.)	3.11	3.18
Average Area (in.^{2})	6.41	6.62
Sample Volume (cm^3)	327.21	345.20
Unit Wet Wt. (gm./ cm^3)	1.922	1.915
Unit Wet Wt. (pcf)	120.0	119.6
Unit Dry Wt. (pcf)	96.6	91.6
Unit Dry Wt. (gm./ cm^3)	1.547	1.467
Void Ratio, e	0.745	0.841
Porosity, n	0.427	0.457
Pore Volume (cm^3)	139.7	157.7
Total Wt. Of Sample After Test		659.76

Tested By: BW Date: 8/15/2012 Checked By: GM Date: 8-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-02 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	12-18'
Project No.	2012-718-01	Sample No.	ST-11A
Lab ID No.	2012-718-01-02		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	43.0	Sample Length (cm), L	8.08
Back Pressure(psi)	40.0	Sample Area (cm^2), A	42.74
Eff. Cons. Pressure(psi)	3.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.0E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.0E-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)
8/16/2012	15	19	38	19.63	0.000	7.0	9.7	25.5	NA
8/16/2012	15	21	38	21.63	2.000	6.8	9.4	25.5	1.1E-07
8/16/2012	15	23	55	23.92	4.283	6.6	9.1	25.5	1.0E-07
8/16/2012	15	26	19	26.32	6.683	6.4	8.7	25.5	1.0E-07
8/16/2012	15	28	49	28.82	9.183	6.2	8.4	25.5	1.0E-07
8/16/2012	15	31	25	31.42	11.783	6.0	8.1	25.5	1.0E-07

Tested By: BW Date: 8/15/2012 Checked By: GEM Date: 8-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-02 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

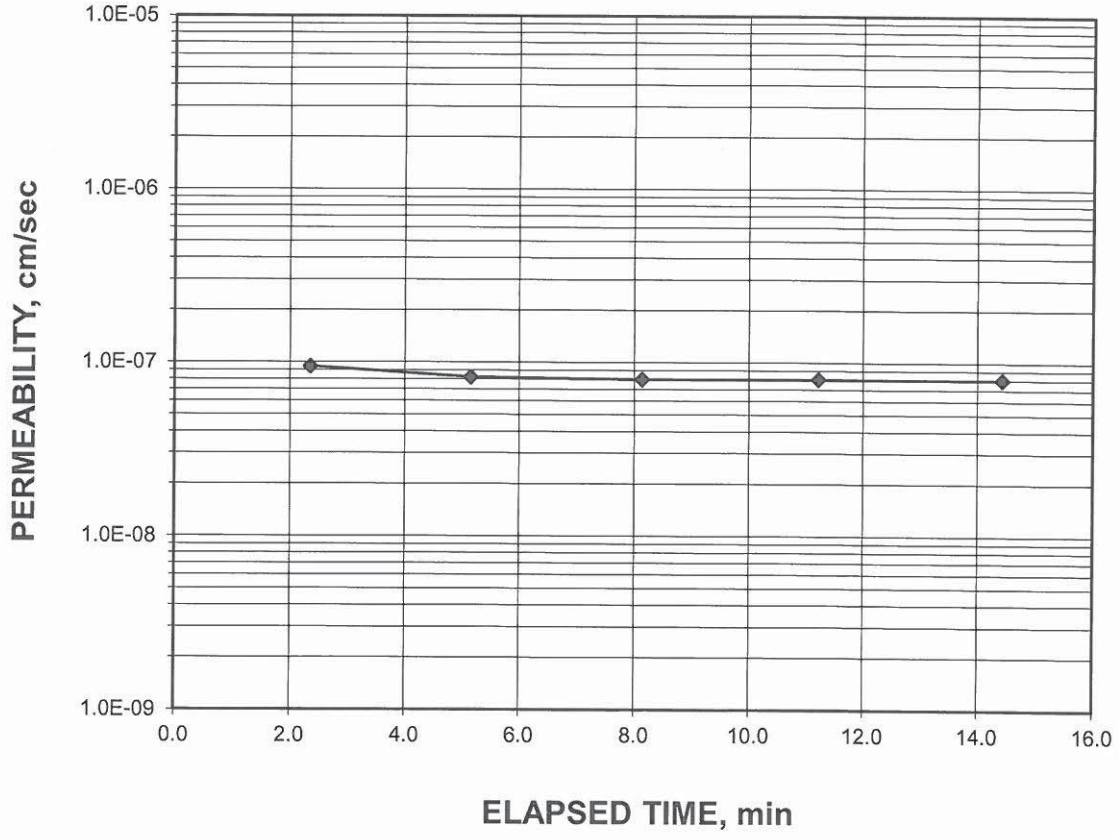
FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-03

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	NA
Project No.	2012-718-01	Sample No.	ST-21A
Lab ID No.	2012-718-01-03		

Visual Description: GRAY CLAY

AVERAGE PERMEABILITY = 8.0E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 8.0E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 8/16/2012 Checked By: GEM Date: 8-21-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-03 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	NA
Project No.	2012-718-01	Sample No.	ST-21A
Lab ID No.	2012-718-01-03		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	807	A-1
Wt. of Tare & WS (gm.)	240.93	325.38
Wt. of Tare & DS (gm.)	217.13	275.80
Wt. of Tare (gm.)	104.71	93.21
Wt. of Water (gm.)	23.80	49.58
Wt. of DS (gm.)	112.42	182.59
Moisture Content (%)	**21.2**	**27.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	632.89	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	632.89	664.14
Length 1 (in.)	3.052	3.088
Length 2 (in.)	3.031	3.081
Length 3 (in.)	3.025	3.058
Top Diameter (in.)	2.826	2.853
Middle Diameter (in.)	2.844	2.904
Bottom Diameter (in.)	2.838	2.915
Average Length (in.)	3.04	3.08
Average Area (in.^{2})	6.32	6.56
Sample Volume (cm^3)	314.27	330.77
Unit Wet Wt. (gm./ cm^3)	2.014	2.008
Unit Wet Wt. (pcf)	125.7	125.3
Unit Dry Wt. (pcf)	103.7	98.6
Unit Dry Wt. (gm./ cm^3)	1.662	1.579
Void Ratio, e	0.625	0.710
Porosity, n	0.384	0.415
Pore Volume (cm^3)	120.8	137.3
Total Wt. Of Sample After Test		655.89

Tested By: BW Date: 8/16/2012 Checked By: GEM Date: 8-21-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-03 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	NA
Project No.	2012-718-01	Sample No.	ST-21A
Lab ID No.	2012-718-01-03		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	43.0	Sample Length (cm), L	7.81
Back Pressure(psi)	40.0	Sample Area (cm^2), A	42.34
Eff. Cons. Pressure(psi)	3.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 8.0E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 8.0E-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)
8/18/2012	11	41	52	41.87	0.000	7.0	10.0	25.1	NA
8/18/2012	11	44	13	44.22	2.350	6.8	9.7	25.1	9.5E-08
8/18/2012	11	47	1	47.02	5.150	6.6	9.4	25.1	8.2E-08
8/18/2012	11	50	0	50.00	8.133	6.4	9.0	25.1	8.0E-08
8/18/2012	11	53	5	53.08	11.217	6.2	8.7	25.1	8.0E-08
8/18/2012	11	56	18	56.30	14.433	6.0	8.4	25.1	8.0E-08

Tested By: BW Date: 8/16/2012 Checked By: GEM Date: 8-21-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-03 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

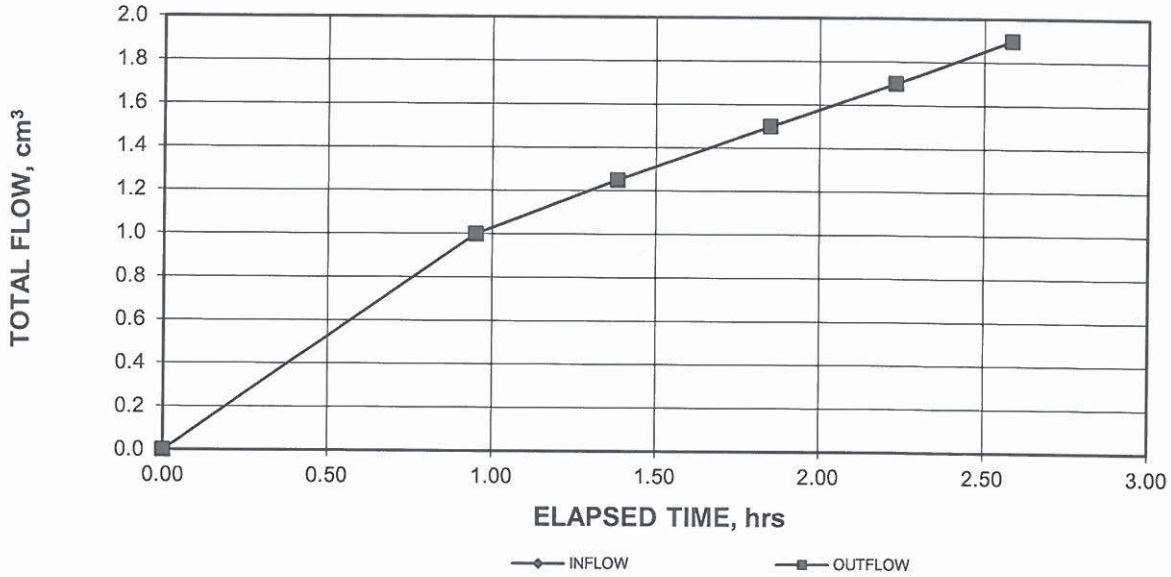
PERMEABILITY TEST

ASTM D 5084-03

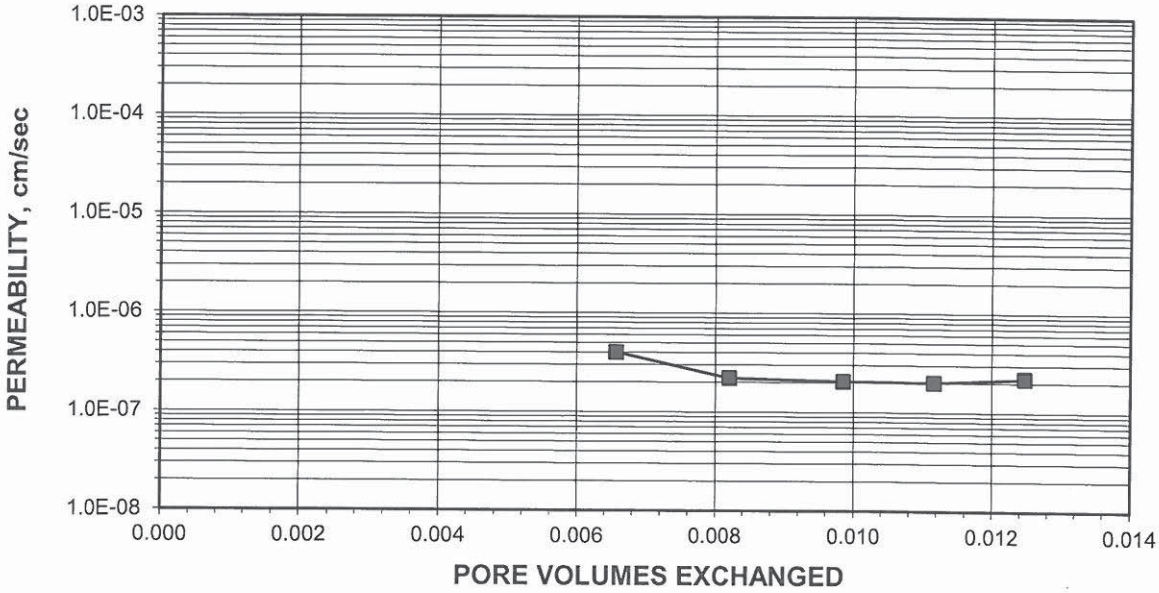
Client	HDR ENGINEERING	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	2-12"
Project No.	2012-718-01	Sample No.	ST-24A
Lab ID No.	2012-718-01-04		

AVERAGE PERMEABILITY = 2.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.1E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/16/2012 Checked By: GEM Date: 8-21-12

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10

Client	HDR ENGINEERING	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	2-12"
Project No.	2012-718-01	Sample No.	ST-24A
Lab ID No.	2012-718-01-04		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	835	806
Wt. of Tare & WS (gm.)	657.05	288.00
Wt. of Tare & DS (gm.)	576.63	241.49
Wt. of Tare (gm.)	254.74	102.16
Wt. of Water (gm.)	80.42	46.51
Wt. of DS (gm.)	321.89	139.33
Moisture Content (%)	**25.0**	**33.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	588.09	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	588.09	627.60
Length 1 (in.)	3.106	3.143
Length 2 (in.)	3.123	3.145
Length 3 (in.)	3.092	3.159
Top Diameter (in.)	2.847	2.845
Middle Diameter (in.)	2.846	2.831
Bottom Diameter (in.)	2.841	2.840
Average Length (in.)	3.11	3.15
Average Area (in.^{2})	6.36	6.33
Sample Volume (cm^3)	323.59	326.58
Unit Wet Wt. (gm./ cm^3)	1.82	1.92
Unit Wet Wt. (pcf)	113.4	120.0
Unit Dry Wt. (pcf)	90.8	89.9
Unit Dry Wt. (gm./ cm^3)	1.45	1.44
Void Ratio, e	0.86	0.87
Porosity, n	0.46	0.47
Pore Volume (cm^3)	149.3	152.3
Total Wgt. Of Sample After Test		619.25

Tested By: BW Date: 8/16/2012 Checked By: GZM Date: 8-21-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-04 PERMflow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-03

Client	HDR ENGINEERING	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	2-12"
Project No.	2012-718-01	Sample No.	ST-24A
Lab ID No.	2012-718-01-04		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	8.00
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.21
Cell (psi)	43.0	Sample Area (cm^2), A	40.83
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.891
Hydraulic Gradient	13.18	Outflow Burette Area (cm^2), a-out	0.883
		B Parameter (%)	100

AVERAGE PERMEABILITY = 2.1E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.1E-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)
8/20/2012	11	0	0.00	0.0	0.0	129.0	0	24.3	NA
8/20/2012	11	57	0.95	1.0	1.0	126.8	0	24.4	4.0E-07
8/20/2012	12	23	1.38	1.3	1.3	126.2	0	24.5	2.2E-07
8/20/2012	12	51	1.85	1.5	1.5	125.6	0	24.6	2.1E-07
8/20/2012	13	14	2.23	1.7	1.7	125.2	0	24.6	2.0E-07
8/20/2012	13	35	2.58	1.9	1.9	124.8	1	24.7	2.2E-07

Tested By: BW Date: 8/16/2012 Checked By: GEM Date: 8-21-12

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INTEGRITY IN TESTING

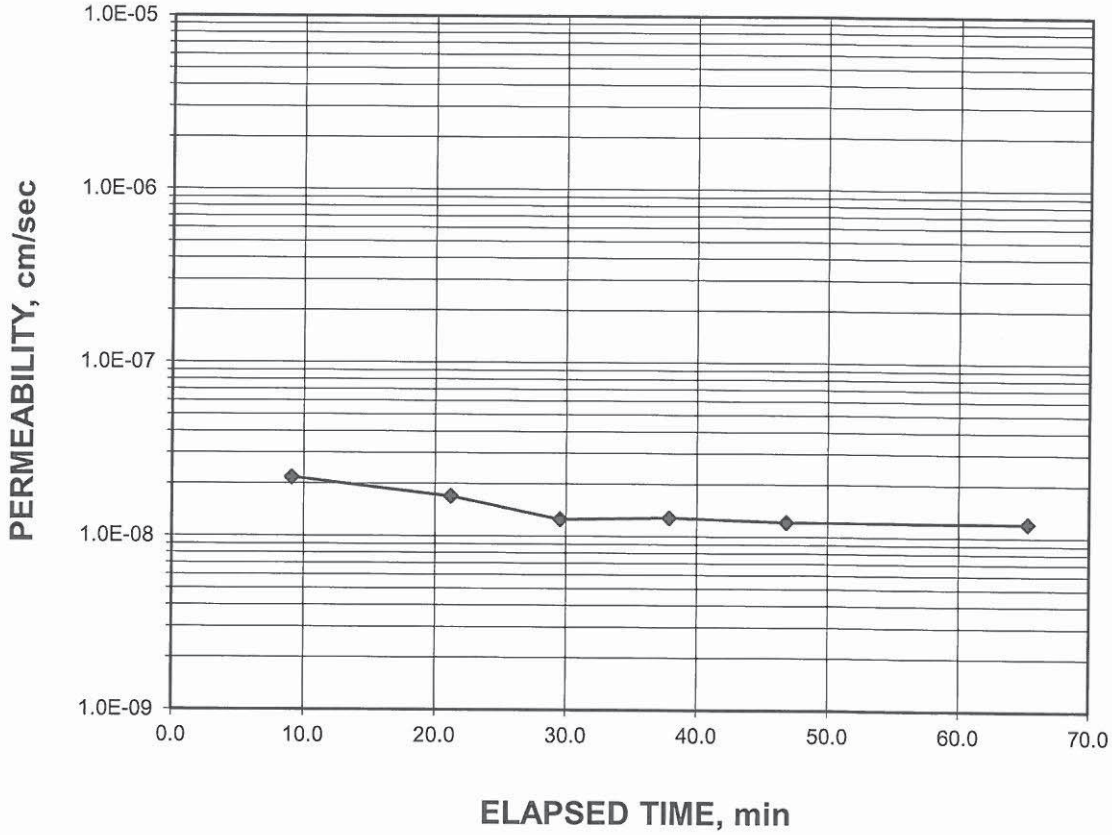
FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-03

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	3-8"
Project No.	2012-718-01	Sample No.	ST-27A
Lab ID No.	2012-718-01-05		

Visual Description: GRAY CLAY

AVERAGE PERMEABILITY = 1.2E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.2E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 8/16/2012 Checked By: GAM Date: 8-21-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-05 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	3-8"
Project No.	2012-718-01	Sample No.	ST-27A
Lab ID No.	2012-718-01-05		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	833	Y-1
Wt. of Tare & WS (gm.)	610.93	304.24
Wt. of Tare & DS (gm.)	548.90	261.45
Wt. of Tare (gm.)	259.12	93.58
Wt. of Water (gm.)	62.03	42.79
Wt. of DS (gm.)	289.78	167.87
Moisture Content (%)	**21.4**	**25.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	544.59	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	544.59	562.91
Length 1 (in.)	2.666	2.704
Length 2 (in.)	2.661	2.657
Length 3 (in.)	2.684	2.682
Top Diameter (in.)	2.862	2.853
Middle Diameter (in.)	2.854	2.889
Bottom Diameter (in.)	2.856	2.875
Average Length (in.)	2.67	2.68
Average Area (in.^{2})	6.41	6.48
Sample Volume (cm^3)	280.59	284.68
Unit Wet Wt. (gm./ cm^3)	1.941	1.977
Unit Wet Wt. (pcf)	121.2	123.4
Unit Dry Wt. (pcf)	99.8	98.4
Unit Dry Wt. (gm./ cm^3)	1.599	1.576
Void Ratio, e	0.689	0.714
Porosity, n	0.408	0.416
Pore Volume (cm^3)	114.5	118.5
Total Wt. Of Sample After Test		560.93

Tested By: BW Date: 8/16/2012 Checked By: GJM Date: 8-21-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-05 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING INC.	Boring No.	NA
Client Project	FT BRAGG PHASE 1 CLOSURE	Depth (ft.)	3-8"
Project No.	2012-718-01	Sample No.	ST-27A
Lab ID No.	2012-718-01-05		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	43.0	Sample Length (cm), L	6.81
Back Pressure(psi)	40.0	Sample Area (cm^2), A	41.80
Eff. Cons. Pressure(psi)	3.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	100	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.2E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.2E-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)
8/18/2012	10	27	5	27.08	0.000	7.0	11.5	24.8	NA
8/18/2012	10	36	11	36.18	9.100	6.8	11.1	24.8	2.2E-08
8/18/2012	10	48	16	48.27	21.183	6.6	10.7	24.8	1.7E-08
8/18/2012	10	56	38	56.63	29.550	6.5	10.5	24.9	1.3E-08
8/18/2012	11	4	58	4.97	37.883	6.4	10.4	24.9	1.3E-08
8/18/2012	11	13	55	13.92	46.833	6.3	10.2	25.0	1.2E-08
8/18/2012	11	32	24	32.40	65.317	6.1	9.8	25.1	1.2E-08

Tested By: BW Date: 8/16/2012 Checked By: GEM Date: 8-21-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-05 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216-10

Client	HDR ENGINEERING
Client Reference	FT. BRAGG PHASE 1 CLOSURE
Project No.	2012-718-02

Lab ID	.001
Boring No.	NA
Depth (ft)	.5-1
Sample No.	ST-35A
Tare Number	B-4
Wt. of Tare & WS (gm)	325.41
Wt. of Tare & DS (gm)	284.62
Wt. of Tare (gm)	94.08
Wt. of Water (gm)	40.79
Wt. of DS (gm)	190.54
Water Content (%)	**21.4**

Notes : *NA*

Tested By *BW* *Date* *9/19/2012* *Checked By* GBM *Date* 9-19-12

DCN: CT-S1 DATE 6-30-98 REVISION: 2

Z:\Data Sheets\[WATCONT W Header.XLS]Sheet1

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	6-12"
Project No.	2012-718-02	Sample No.	ST-35A
Lab ID	2012-718-02-01	Soil Description	**GRAY FAT 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)

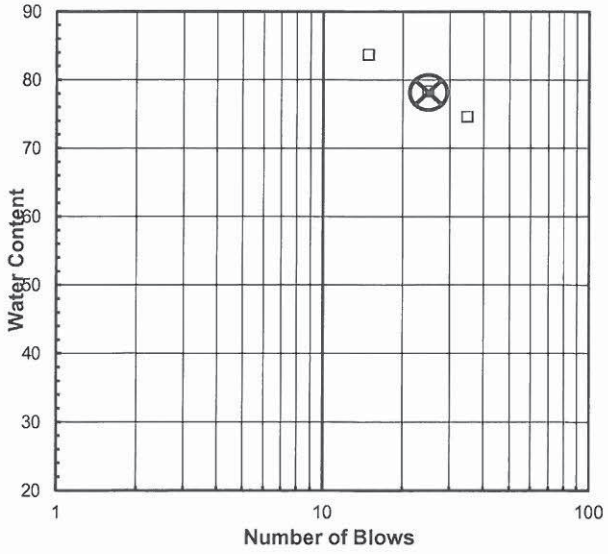
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	BB	AC	L	MULTIPOINT
Wt. of Tare & WS (gm)	25.96	25.93	27.30	
Wt. of Tare & DS (gm)	21.51	21.40	21.80	
Wt. of Tare (gm)	15.54	15.61	15.22	
Wt. of Water (gm)	4.5	4.5	5.5	
Wt. of DS (gm)	6.0	5.8	6.6	
Moisture Content (%)	**74.5**	**78.2**	**83.6**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	AB	H	
Wt. of Tare & WS (gm)	23.39	21.46	
Wt. of Tare & DS (gm)	21.66	20.04	
Wt. of Tare (gm)	15.57	15.08	
Wt. of Water (gm)	1.7	1.4	
Wt. of DS (gm)	6.1	5.0	
Moisture Content (%)	**28.4**	**28.6**	**-0.2**

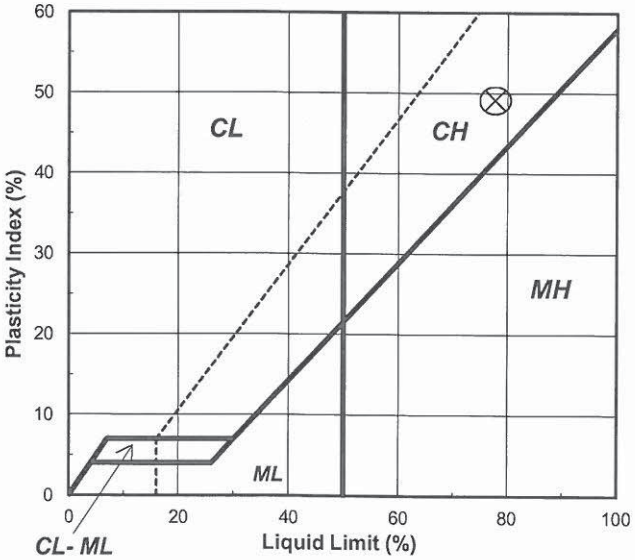
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**78**
Plastic Limit (%)	**29**
Plasticity Index (%)	**49**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By BW *Date* 9/20/2012 *Checked By* GM *Date* 9-21-12

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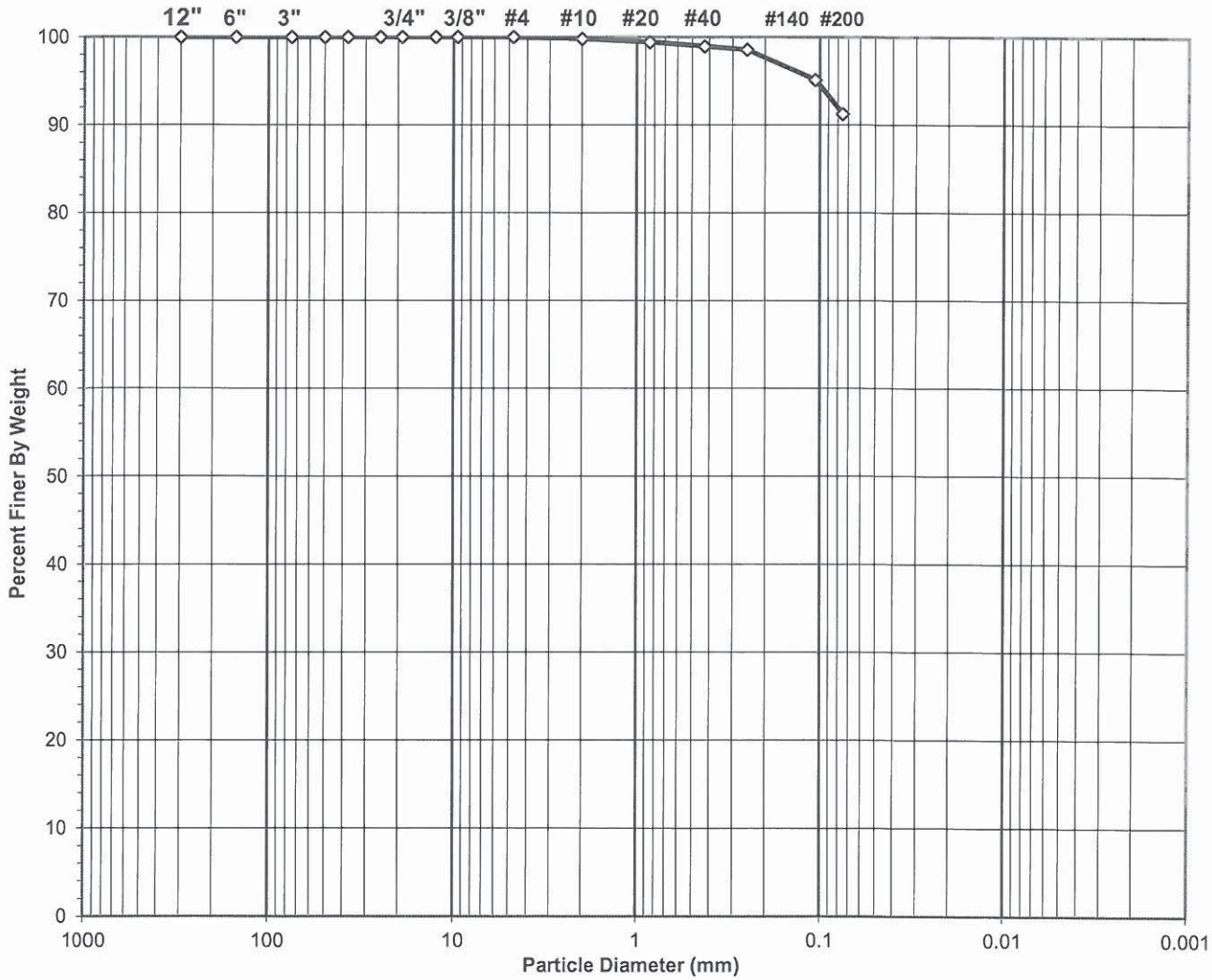
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	6-12"
Project No.	2012-718-02	Sample No.	ST-35A
Lab ID	2012-718-02-01	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CH, TESTED***

USCS Classification FAT CLAY

Tested By SFS Date 9/2/2012 Checked By GZM Date 9-21-12

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	6-12"
Project No.	2012-718-02	Sample No.	ST-35A
Lab ID	2012-718-02-01	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	831	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	601.06	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	534.64	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	262.13	Weight of Tare (gm)	NA
Weight of Water (gm)	66.42	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	272.51	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	272.51
Dry Weight - 3/4" Sample (gm)	23.8	Weight of minus #200 material (gm)	248.69
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	23.82
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	0.00	0.0	0.0	100.0	**100.0**
#10	2.00	0.50	0.2	0.2	99.8	**99.8**
#20	0.850	1.02	0.4	0.6	99.4	**99.4**
#40	0.425	1.30	0.5	1.0	99.0	**99.0**
#60	0.250	1.05	0.4	1.4	98.6	**98.6**
#140	0.106	9.33	3.4	4.8	95.2	**95.2**
#200	0.075	10.62	3.9	8.7	91.3	**91.3**
Pan	-	248.69	91.3	100.0	-	-

Tested By SFS Date 9/2/2012 Checked By GAM Date 9-21-12

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

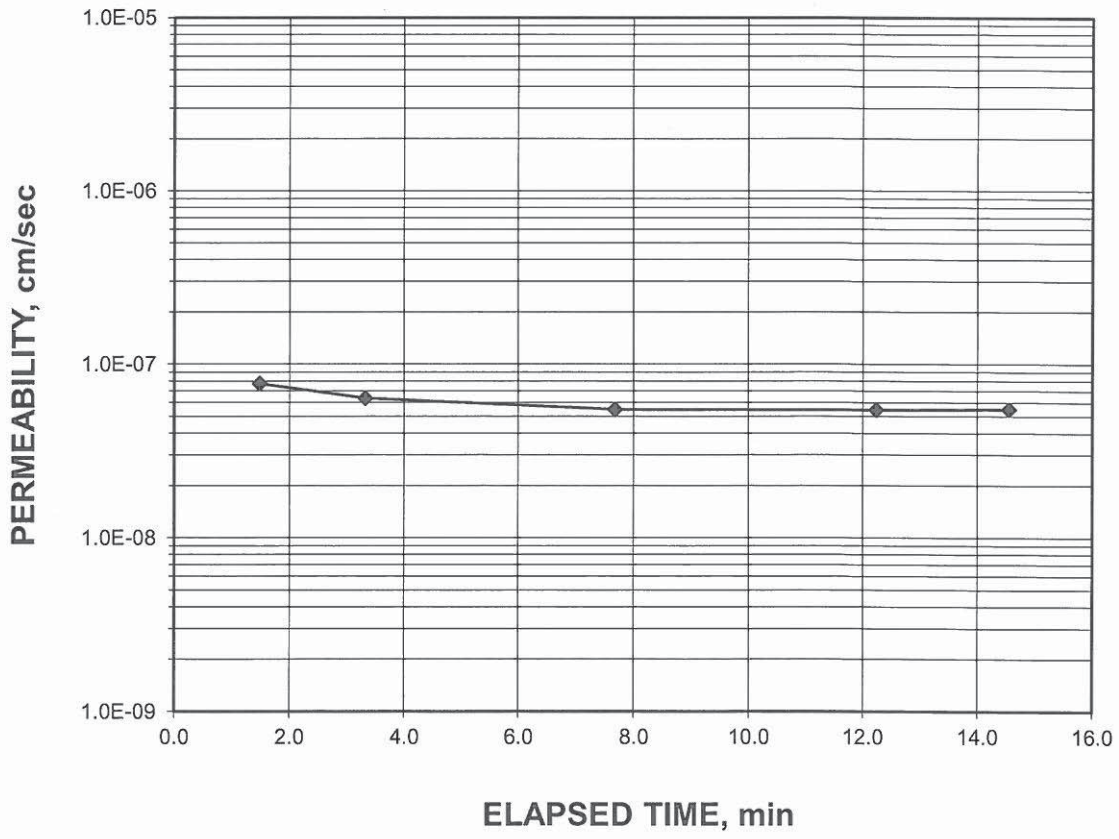
ASTM D 5084-03

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Project	FT BRAGG PHASE1 CLOSURE	Depth (ft.)	0.5-1
Project No.	2012-718-02	Sample No.	ST-35A
Lab ID No.	2012-718-02-01		

Visual Description: GRAY CLAY

AVERAGE PERMEABILITY = 5.7E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.7E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 9/18/2012 Checked By: GEM Date: 9-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-02-01Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Project	FT BRAGG PHASE1 CLOSURE	Depth (ft.)	0.5-1
Project No.	2012-718-02	Sample No.	ST-35A
Lab ID No.	2012-718-02-01		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: GRAY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	B-4	b-1
Wt. of Tare & WS (gm.)	325.41	342.93
Wt. of Tare & DS (gm.)	284.62	289.55
Wt. of Tare (gm.)	94.08	98.95
Wt. of Water (gm.)	40.79	53.38
Wt. of DS (gm.)	190.54	190.60
Moisture Content (%)	**21.4**	**28.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	657.27	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	657.27	692.99
Length 1 (in.)	3.132	3.172
Length 2 (in.)	3.152	3.219
Length 3 (in.)	3.114	3.233
Top Diameter (in.)	2.856	2.889
Middle Diameter (in.)	2.856	2.934
Bottom Diameter (in.)	2.854	2.928
Average Length (in.)	3.13	3.21
Average Area (in.^{2})	6.40	6.68
Sample Volume (cm^3)	328.71	351.32
Unit Wet Wt. (gm./ cm^3)	2.000	1.973
Unit Wet Wt. (pcf)	124.8	123.1
Unit Dry Wt. (pcf)	102.8	96.2
Unit Dry Wt. (gm./ cm^3)	1.647	1.541
Void Ratio, e	0.639	0.752
Porosity, n	0.390	0.429
Pore Volume (cm^3)	128.2	150.8
Total Wt. Of Sample After Test		695.49

Tested By: BW Date: 9/18/2012 Checked By: GZM Date: 9-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-02-01Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Project	FT BRAGG PHASE1 CLOSURE	Depth (ft.)	0.5-1
Project No.	2012-718-02	Sample No.	ST-35A
Lab ID No.	2012-718-02-01		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	43.0	Sample Length (cm), L	8.15
Back Pressure(psi)	40.0	Sample Area (cm^2), A	43.12
Eff. Cons. Pressure(psi)	3.0	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 = 5.7E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.7E-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)
9/19/2012	10	50	31	50.52	0.000	7.0	9.6	24.4	NA
9/19/2012	10	52	0	52.00	1.483	6.9	9.5	24.4	7.7E-08
9/19/2012	10	53	50	53.83	3.317	6.8	9.3	24.4	6.4E-08
9/19/2012	10	58	12	58.20	7.683	6.6	9.0	24.4	5.5E-08
9/19/2012	11	2	45	2.75	12.233	6.4	8.7	24.4	5.5E-08
9/19/2012	11	5	4	5.07	14.550	6.3	8.5	24.4	5.5E-08

Tested By: BW Date: 9/18/2012 Checked By: GEM Date: 9-20-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-718 HDR\[2012-718-02-01Permometer wHeader.xls]Sheet1

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As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX B

CQA Testing (HDR, GEOTECHNICS)

Erosion Layer

HDR

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	BAG-1
Lab ID	2012-718-01-06	Soil Description	**ORANGE 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)

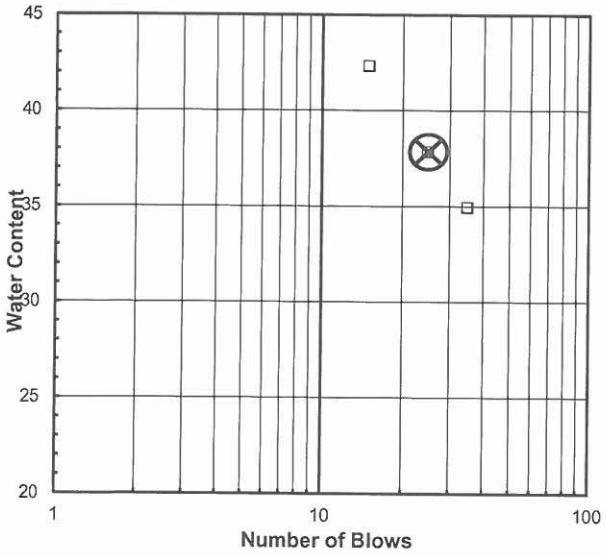
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B1	A-T	A-P	MULTIPOINT
Wt. of Tare & WS (gm)	31.52	33.87	31.47	
Wt. of Tare & DS (gm)	27.41	28.85	26.75	
Wt. of Tare (gm)	15.64	15.58	15.59	
Wt. of Water (gm)	4.1	5.0	4.7	
Wt. of DS (gm)	11.8	13.3	11.2	
Moisture Content (%)	**34.9**	**37.8**	**42.3**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	Q	O	
Wt. of Tare & WS (gm)	23.37	23.50	
Wt. of Tare & DS (gm)	21.89	22.07	
Wt. of Tare (gm)	15.13	15.20	
Wt. of Water (gm)	1.5	1.4	
Wt. of DS (gm)	6.8	6.9	
Moisture Content (%)	**21.9**	**20.8**	**1.1**

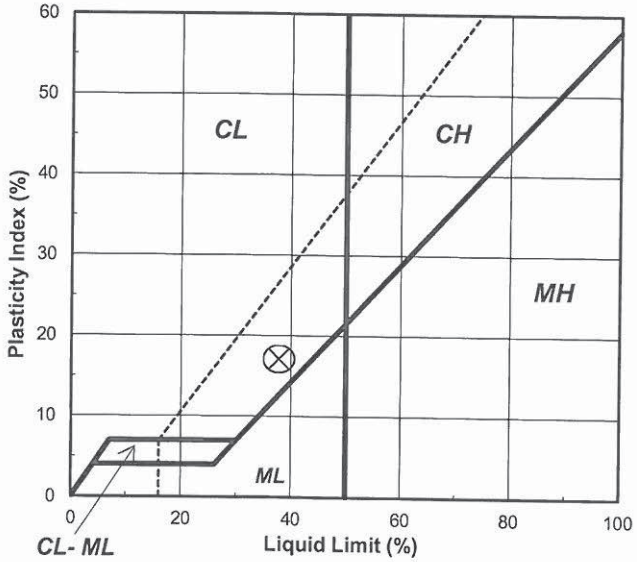
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**38**
Plastic Limit (%)	**21**
Plasticity Index (%)	**17**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By JBD *Date* 8/24/2012 *Checked By* GEM *Date* 8-27-12

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-10

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT. BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	BAG-2
Lab ID	2012-718-01-07	Soil Description	**ORANGE 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)

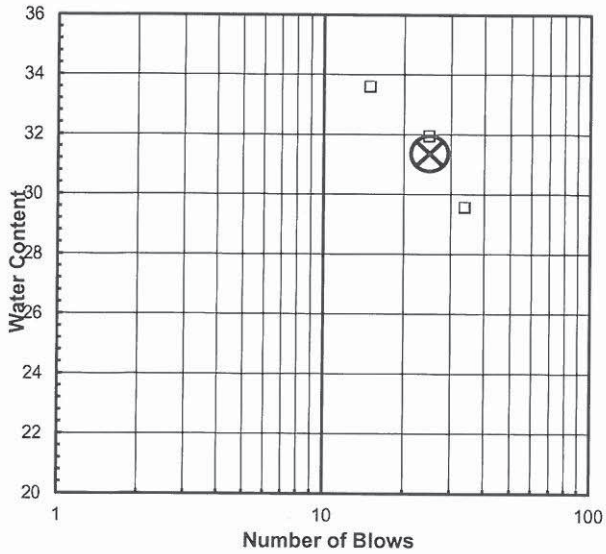
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B1	A-T	A-P	MULTIPOINT
Wt. of Tare & WS (gm)	30.37	31.87	31.69	
Wt. of Tare & DS (gm)	27.01	27.93	27.64	
Wt. of Tare (gm)	15.64	15.59	15.58	
Wt. of Water (gm)	3.4	3.9	4.1	
Wt. of DS (gm)	11.4	12.3	12.1	
Moisture Content (%)	**29.6**	**31.9**	**33.6**	
Number of Blows	**34**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	Q	O	
Wt. of Tare & WS (gm)	23.36	21.63	
Wt. of Tare & DS (gm)	21.97	20.57	
Wt. of Tare (gm)	15.12	15.21	
Wt. of Water (gm)	1.4	1.1	
Wt. of DS (gm)	6.9	5.4	
Moisture Content (%)	**20.3**	**19.8**	**0.5**

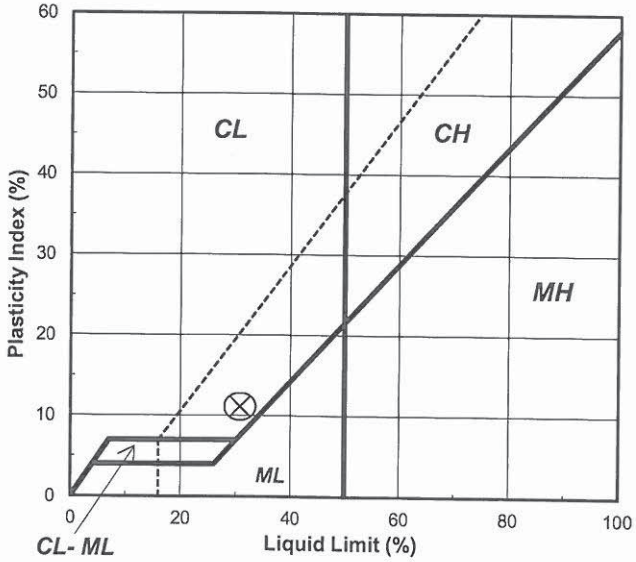
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**31**
Plastic Limit (%)	**20**
Plasticity Index (%)	**11**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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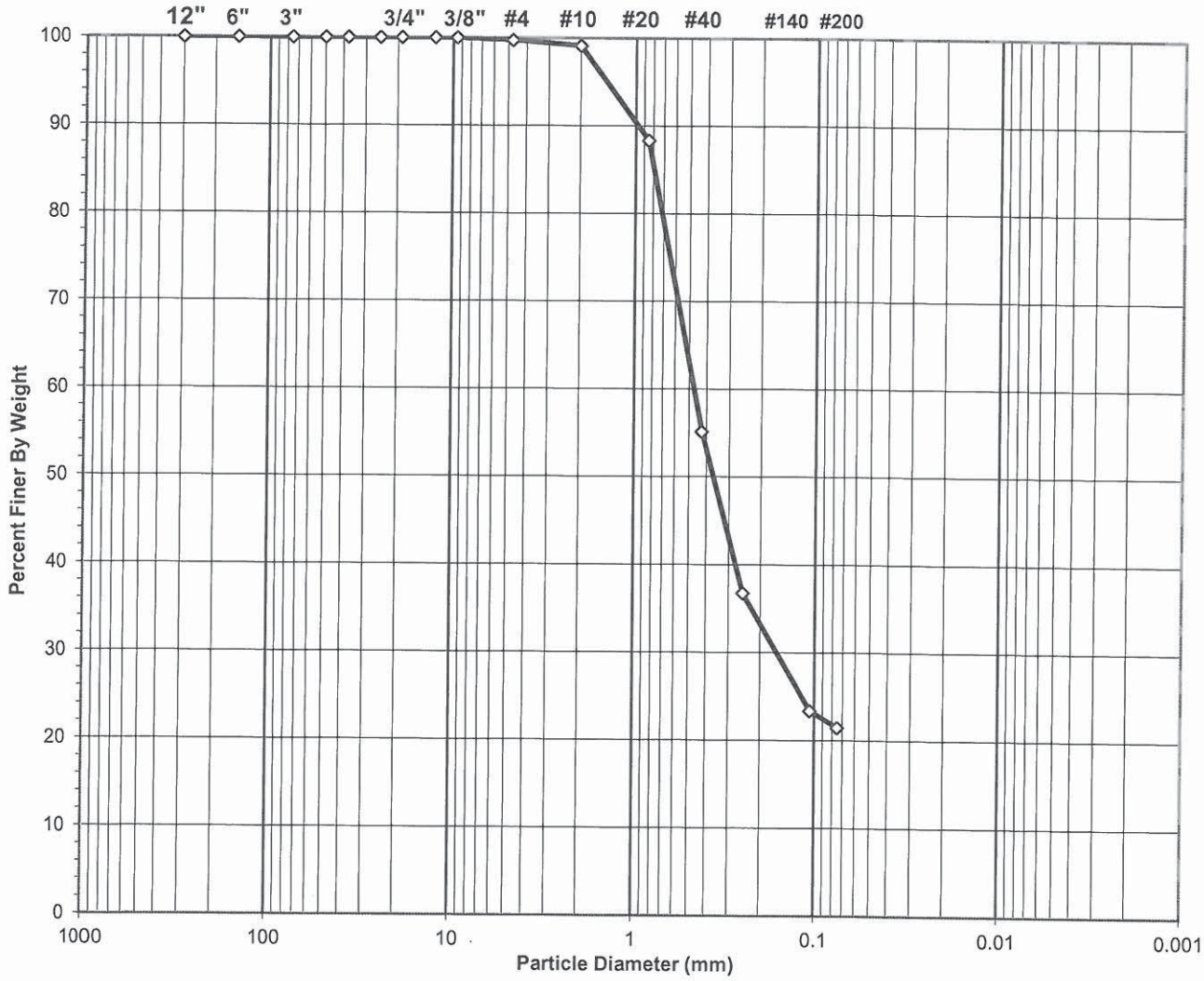
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT.BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	BAG-1
Lab ID	2012-718-01-06	Soil Color	**ORANGE BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SC, TESTED***

USCS Classification CLAYEY SAND

Tested By JBD Date 8/23/2012 Checked By GEM Date 8-27-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-06 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT.BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	BAG-1
Lab ID	2012-718-01-06	Soil Color	**ORANGE BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	830	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	787.45	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	713.92	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	258.21	Weight of Tare (gm)	NA
Weight of Water (gm)	73.53	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	455.71	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**16.1**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	455.71
Dry Weight - 3/4" Sample (gm)	357.8	Weight of minus #200 material (gm)	97.87
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	357.84
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	1.18	0.3	0.3	99.7	**99.7**
#10	2.00	2.78	0.6	0.9	99.1	**99.1**
#20	0.850	49.10	10.8	11.6	88.4	**88.4**
#40	0.425	151.21	33.2	44.8	55.2	**55.2**
#60	0.250	83.94	18.4	63.2	36.8	**36.8**
#140	0.106	60.99	13.4	76.6	23.4	**23.4**
#200	0.075	8.64	1.9	78.5	21.5	**21.5**
Pan	-	97.87	21.5	100.0	-	**-**

Tested By JBD Date 8/23/2012 Checked By GZM Date 8-27-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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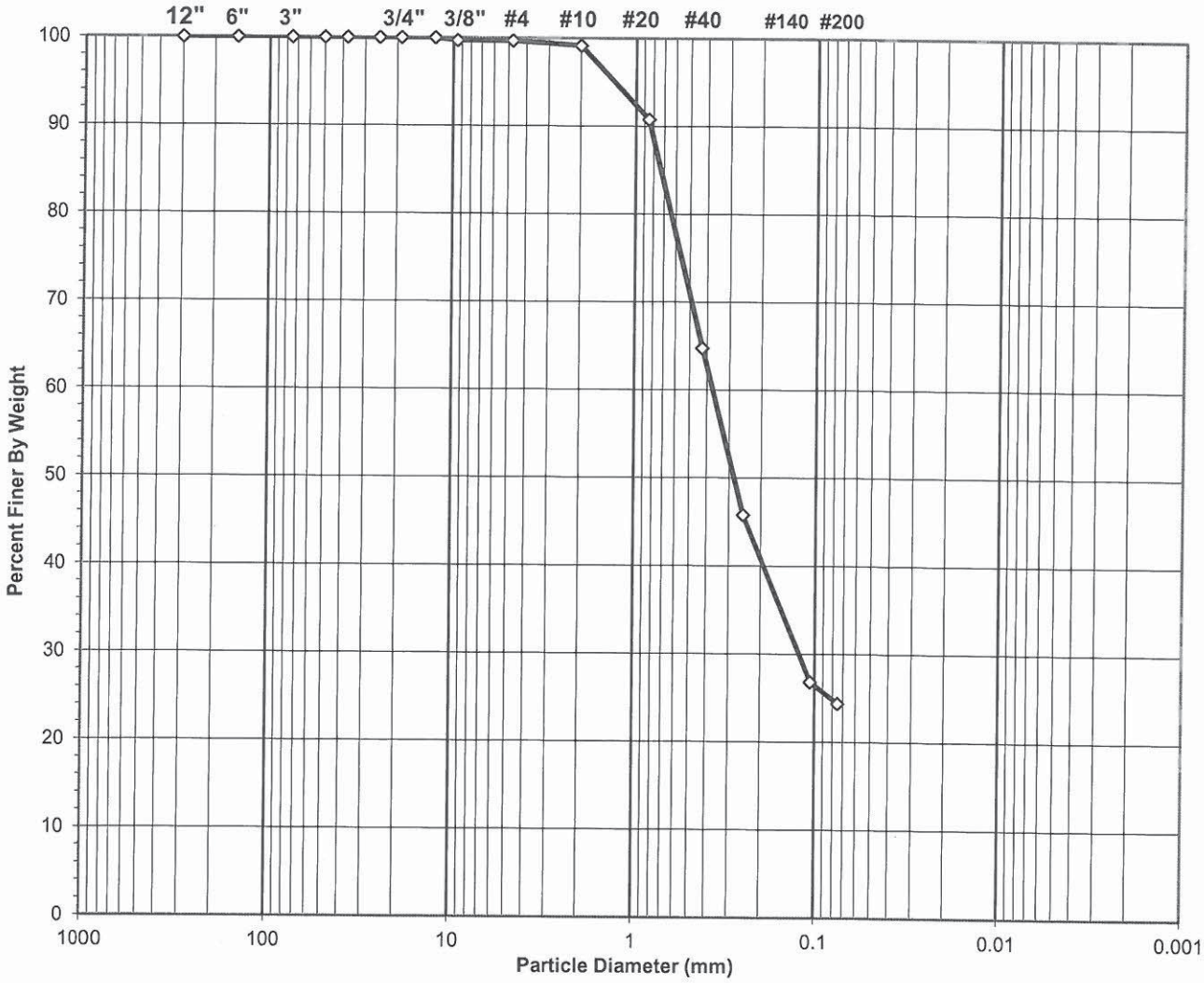
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT.BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	BAG-2
Lab ID	2012-718-01-07	Soil Color	**ORANGE BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SC, TESTED***

USCS Classification CLAYEY SAND

Tested By JBD Date 8/23/2012 Checked By GEM Date 8-24-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-718 HDR\[2012-718-01-07 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	NA
Client Reference	FT.BRAGG PHASE 1 CLOSURE	Depth (ft)	NA
Project No.	2012-718-01	Sample No.	BAG-2
Lab ID	2012-718-01-07	Soil Color	**ORANGE BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	839	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	698.87	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	650.39	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	257.67	Weight of Tare (gm)	NA
Weight of Water (gm)	48.48	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	392.72	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**12.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	392.72
Dry Weight - 3/4" Sample (gm)	297.0	Weight of minus #200 material (gm)	95.75
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	296.97
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	1.20	0.3	0.3	99.7	**99.7**
#4	4.75	0.00	0.0	0.3	99.7	**99.7**
#10	2.00	2.05	0.5	0.8	99.2	**99.2**
#20	0.850	32.93	8.4	9.2	90.8	**90.8**
#40	0.425	102.06	26.0	35.2	64.8	**64.8**
#60	0.250	74.57	19.0	54.2	45.8	**45.8**
#140	0.106	74.52	19.0	73.2	26.8	**26.8**
#200	0.075	9.64	2.5	75.6	24.4	**24.4**
Pan	-	95.75	24.4	100.0	-	**-**

Tested By JBD Date 8/23/2012 Checked By GEM Date 8-24-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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Construction and Demolition Landfill
Phase 1 Closure

APPENDIX B

CQA Testing (HDR, GEOTECHNICS)

Topsoil Layer

HDR

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INTEGRITY IN TESTING

pH OF SOILS
ASTM D 4972-01
(SOP- S36)

Client	HDR ENGINEERING
Client Reference	FT. BRAGG C&D LF PH2
Project No.	2012-627-02

Lab ID		03
Boring No.		NA
Depth (ft)		NA
Sample No.		TS-1
Drying Tare No.		PH10
Testing Tare No.		PH10
Temperature (°C)		24
pH of Sample	***Test 1***	**5.9**
	Test 2	**5.9**
Agreement (+/- 0.2 units)		0.0

Meter Calibration

Buffer pH	Meter Reading	Meter Model
4.00	4.0	ORION 720A
7.00	7.01	
10.0	10.0	

pH of Distilled Water (Acceptable range 6.5-7.5)	7.3

Tested By KBL Date 7/25/12 Checked By CAL Date 7-26-12

DCN: CT-S36 DATE 2/25/10 REVISION: 4

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INTEGRITY IN TESTING

Moisture, Ash, and Organic Matter (Loss on Ignition)

ASTM D 2974-07a, AASHTO T 267-86 (SOP - S8)

Client	HDR ENGINEERING
Client Reference	FT. BRAGG C&D LF PH2
Project No.	2012-627-02

Moisture Content (Oven Dried, minus #10 Sieve Material)

Lab ID	03
Boring No.	TS-1
Depth(ft).	NA
Sample No.	NA
Tare Number	24+12
Wt. Tare & WS (gm)	113.66
Wt. Tare & DS (gm)	108.09
Wt. Tare (gm)	38.12
Wt. Water (gm)	5.57
Wt. DS (gm)	69.97
Moisture Content	**8.0%**

Ash Content, Organic Matter

Furnace Temperature ° C	440
Wt. Tare & Ash (gm)	106.49
Wt. Volatiles (gm)	1.60
Wt. Ash (gm)	68.37
Ash Content	**97.7%**
Organic Matter	**2.3%**

Tested By PC *Date* 7/24/12 *Checked By* KS *Date* 7-25-12

DCN: CT-S8 DATE: 11/15/10 REVISION:4

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INTEGRITY IN TESTING

Moisture, Ash, and Organic Matter (Loss on Ignition)

ASTM D 2974-07a, AASHTO T 267-86 (SOP - S8)

Client	HDR ENGINEERING
Client Reference	FT BRAGG PHASE 1 CLOSURE
Project No.	2012-718-01

Moisture Content (Oven Dried, minus #10 Sieve Material)

Lab ID	06	07
Boring No.	BAG-1	BAG-2
Depth(ft).	NA	NA
Sample No.	NA	NA
Tare Number	P+X	16+14
Wt. Tare & WS (gm)	142.41	123.46
Wt. Tare & DS (gm)	127.65	116.19
Wt. Tare (gm)	37.32	37.36
Wt. Water (gm)	14.76	7.27
Wt. DS (gm)	90.33	78.83
Moisture Content	**16.3%**	**9.2%**

Ash Content, Organic Matter

Furnace Temperature ° C	440	440
Wt. Tare & Ash (gm)	126.59	115.29
Wt. Volatiles (gm)	1.06	0.90
Wt. Ash (gm)	89.27	77.93
Ash Content	**98.8%**	**98.9%**
Organic Matter	**1.2%**	**1.1%**

Tested By PC *Date* 8/22/12 *Checked By* KC *Date* 8-29-12

DCN: CT-S8 DATE: 11/15/10 REVISION:4

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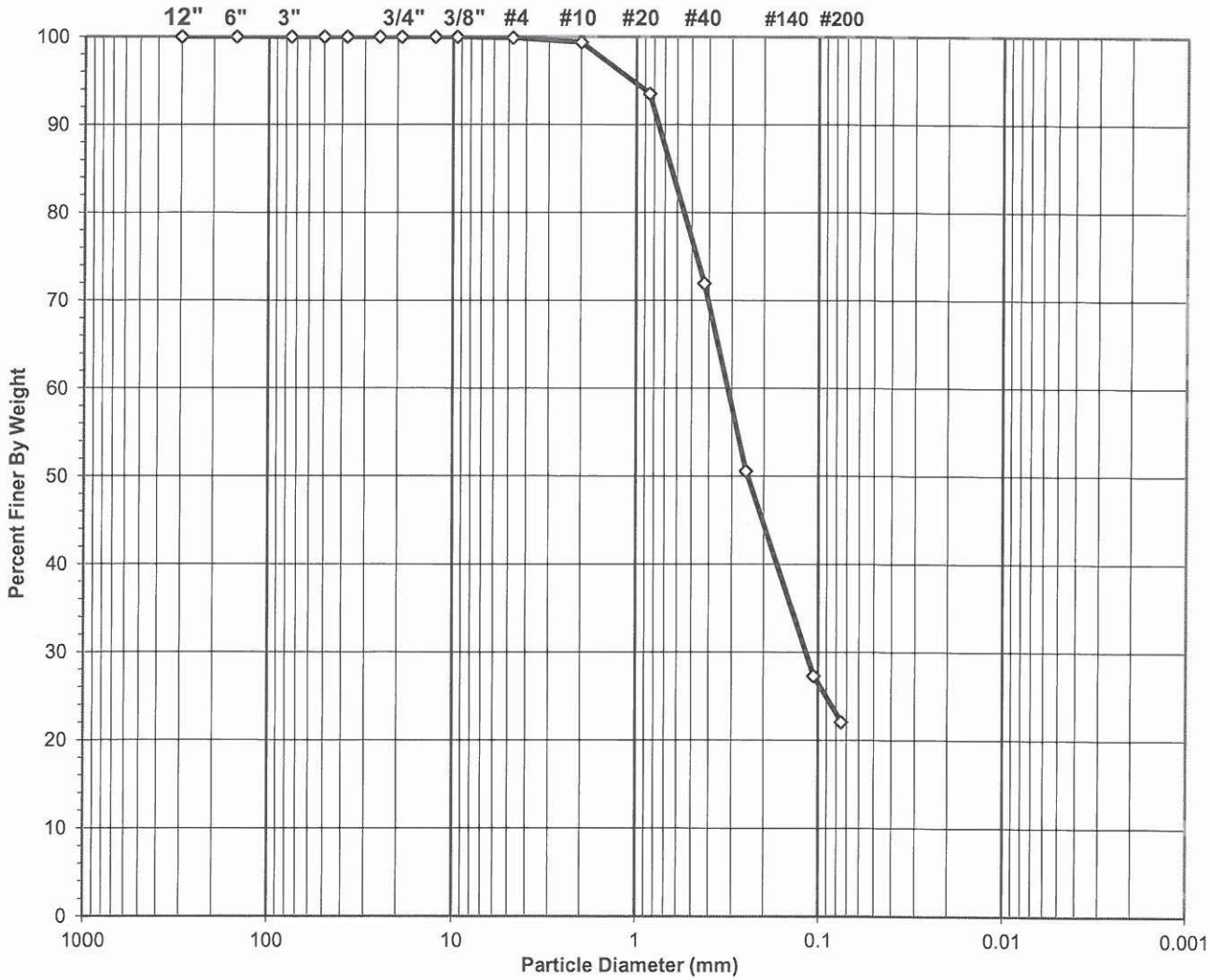
INTEGRITY IN TESTING

SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	TS-1
Client Reference	FT. BRAGG C&D LF PHASE 2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-03	Soil Color	**DARK GRAY**

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



USCS Symbol ***sm, ASSUMED***

USCS Classification SILTY SAND

Tested By SFS Date 7/23/2012 Checked By [illegible] Date 7/24

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-627 HDR\[2012-627-02-03 SIEVON REV 4 wHeader.xls]Sheet1*

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	HDR ENGINEERING, INC.	Boring No.	TS-1
Client Reference	FT. BRAGG C&D LF PHASE 2	Depth (ft)	NA
Project No.	2012-627-02	Sample No.	NA
Lab ID	2012-627-02-03	Soil Color	**DARK GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	201	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	586.04	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	550.33	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	147.58	Weight of Tare (gm)	NA
Weight of Water (gm)	35.71	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	402.75	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**8.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	402.75
Dry Weight - 3/4" Sample (gm)	313.8	Weight of minus #200 material (gm)	88.98
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	313.77
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	0.37	0.1	0.1	99.9	**99.9**
#10	2.00	2.08	0.5	0.6	99.4	**99.4**
#20	0.850	23.46	5.8	6.4	93.6	**93.6**
#40	0.425	87.03	21.6	28.0	72.0	**72.0**
#60	0.250	85.97	21.3	49.4	50.6	**50.6**
#140	0.106	93.77	23.3	72.7	27.3	**27.3**
#200	0.075	21.09	5.2	77.9	22.1	**22.1**
Pan	-	88.98	22.1	100.0	-	**-**

Tested By SFS Date 7/23/2012 Checked By [illegible] Date 7/24

DCN: CT-S3C DATE 6-25-98 REVISION: 2

Z:\2012 PROJECTS\2012-627 HDR\[2012-627-02-03 SIEVON REV 4 wHeader.xls]Sheet1

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

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As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX B

CQA Testing (HDR, GEOTECHNICS)

Field Reports

HDR

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Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: June 27, 2012	Day: 1
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 90's	Min. 80's	Clear X	Other	None

Contractor's Employees:		**Subcontractor's Employees:**		
No.	Craft	No.	Name	Craft
4	See attached preconstruction meeting sign-in sheet.	1	F&R	CQC
		1	Sanderson	Trucking
		1	Strother Surveying	Surveying
			Grand Total	3

Work Being Done

Work Observed: Purpose of this site visit was to attend a preconstruction meeting with DPW, COE, Contractor, and subcontractors. No field work was taking place today.

Work Not Observed, But in Progress: N/A

Requested Revisions and/or Interpretations (over) N/A

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day N/A

Remarks (over)

Contractor indicated he intended to put down clay quickly and cover with soil as soon as possible to prevent drying due to hot weather. He understood this was at his own risk given perm test results would not be available prior to covering the clay. Contractor intends to begin work on Monday, July 2. Test pad will be placed on southernmost point of cell and is anticipated to take place on July 8. Contractor requests that all visitors check in prior to entering site. All visitors must wear safety vest, steel toed boots, eye protection, and hard hats.

HDR Field Representative: *Thomas M. Yanoschak*

Distribution: ☒ File ☐ Project Manager ☐ Resident

Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: July 9, 2012	Day: 1
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 100	Min. 85	Clear X	Other	None

Contractor's Employees:		**Subcontractor's Employees:**		
No.	Craft	No.	Name	Craft
±10	Earthwork/Supervisory.	2	F&R	CQC
		3	Strother Land Surveying	Surveying
			Grand Total	15

Work Being Done

Work Observed: Installation of gas vents, fine grading of subgrade, clay test pad.

Work Not Observed, But in Progress: N/A

Requested Revisions and/or Interpretations (over) Confirmed with Scott Ballard (SES PM) that test pad subgrade preparation/testing was up to contractor per spec and CQA Plan. Scott indicated he would not run tests on subgrade after proofrolling.

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day N/A

Remarks (over)

Was on site from approximately 0900-1300. Observed beginning of clay test pad installation. Pad is located near SW corner of closure area with approximately half on level area and half on slope. Contractor has already placed clay on SE slope at his risk pending receipt of test results. Monitoring well MW-6 located near SE slope will have to be raised based on converstion between DPW staff and Geoff Little of NCDENR. Surveyor convirmed that top of landfill after placement of cap will be 1 to 2 feet above design grades. Excess waste/soil will not Be removed prior to placement of cap. Instructed F&R to obtain two perm test tubes to split with them. They will deliver to me.

HDR Field Representative: *Thomas M. Yanoschak*

Distribution: ☒ File ☐ Project Manager ☐ Resident

Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: August 7, 2012	Day: 1
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 80's	Min. 70's	Clear	Other Cloudy	None Light Rain

Contractor's Employees:		**Subcontractor's Employees:**		
No.	Craft	No.	Name	Craft
2	Supervisory.		None	
			Grand Total	2

Work Being Done

Work Observed: No work being performed today due to rain.

Work Not Observed, But in Progress: N/A

Requested Revisions and/or Interpretations (over) Scott Ballard and Dan Messier requested that a temporary access road on west slope be left in place and converted into a slope swale for operations. I indicated that if slope of swale was greater than 1 to 2%, flow velocity might cause erosion. Scott indicated he would measure slope and get back with me.

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day N/A

Remarks (over)

Attended meeting in site office with Sid Williamson and Dan Messier (DPW), Mike Batten (HDR), and Scott Ballard and Lester Barnes (SES). Discussed construction progress and future plans. Schedule has been impacted by rain. It typically takes a day for clay to dry out before equipment can get back on it. SES has completed clay placement on entire east slope and about 2/3 of west slope. No clay on top yet. Three gas vents have been installed. Protective cover soil has just started to be placed on west slope. Scott indicated that organic

HDR Field Representative: *Thomas M. Yanoschak*

Distribution: ☒ File ☐ Project Manager ☐ Resident

Date: August 7, 2012

Content tests indicated that on-site topsoil stockpile does not meet spec requirements. He has identified an off-site source that he thinks Will meet the spec requirements but is not sure there is enough material available.

Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: 8/14/12	Day: Tuesday
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 91	Min. 72	Clear X	Other	0”

Contractor's Employees:		**Subcontractor's Employees:**		
No.	Craft	No.	Name	Craft
8	Earthwork	1	CT Inc. Trucking	Hauling
		1	LB Hauling	Hauling
		2	Sanco Trucking	Hauling
		2	Strother	Surveying
			Grand Total	6

Work Being Done

Work Observed: Hauling and placement of cover soil on Western Slope. Hauling and stockpiling clay liner soil on southwest corner adjacent to cell entrance haul road. Clay liner being compacted with the 815 on the top of the cell. No density tests or permeability samples taken while HDR on-site.

Work Not Observed, But in Progress: 9 out of 10 vents installed. Last vent is staked and stone is on-site for backfill use. SES is taking a break from 8/15/12 through 8/19/12 and placement of clay liner soil will resume during the week of 8/20/12. There is one more split sample UD tube requested by HDR that has not been sampled by F&R because this section of clay liner has not been completed. It will be sampled after the section is completed.

Requested Revisions and/or Interpretations (over)

None

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day

None

Remarks (over)

Soil bag sample taken from cover soil hauled in today at the top of the Western Slope (Bag-1) and taken at the north end of the top where existing stockpile cover soil is located (Bag-2). SES noted that the clay liner is near completion, but will not be completed until the stockpiles have been moved in select areas.

HDR Field Representative: Mike G. Batten

Distribution: ☒ File ☐ Project Manager ☐ Resident

Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: 8/24/12	Day: Friday
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 79	Min. 64	Clear	Other Cloudy/Light Rain	<0.1"

Contractor's Employees:

No.	Craft
5	Earthwork
3	Earthwork supervisors

Subcontractor's Employees:

No.	Name	Craft
3	Sanco Hauling	Hauling
1	Strother	Land Surveying
1	F&R	QC Testing
	Grand Total	13

Work Being Done

Work Observed:

Placement of cover soil, placement of berm along the south slope, hauling in cover soil, surveying berm alignment

Work Not Observed, But in Progress:

Placement of clay liner

Requested Revisions and/or Interpretations (over)

None

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day

None

Remarks (over)

SES notes approximately 90% completion of clay liner placement. HDR requested documentation of verification of extent of waste limits. Final split permeability sample has not been taken by F&R because this area has not been covered in clay liner yet.

HDR Field Representative: Mike Batten, EI

Distribution: ☒ File ☐ Project Manager ☐ Resident

Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: 9/12/2012	Day: Wednesday
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 75	Min. 65	Clear X	Other	0”

Contractor's Employees:		**Subcontractor's Employees:**		
No.	Craft	No.	Name	Craft
8	Earthwork and laying out matting	2	Sanco Trucking	Hauling
2	Earthworks upervisors			
			Grand Total	12

Work Being Done

Work Observed:

Installation of fiber matting in channel on west side slope, hauling in topsoil, placing and spreading “red soil” erosion layer on west side slope

Work Not Observed, But in Progress:

Placement of topsoil on landfill top

Requested Revisions and/or Interpretations (over)

None

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day

None

Remarks (over)

On-site topsoil used for majority of topsoil placement at the request of DPW. Contractor expects completion in approximately two weeks.
12 inches of “red soil” erosion layer nearly complete, clay liner complete, and majority of topsoil has been placed.

HDR Field Representative: Mike Batten, EI

Distribution: ☒ File ☐ Project Manager ☐ Resident

Daily Field Report

Project Name: Fort Bragg C&D Landfill Phase 1 Closure	Date: 9/25/2012	Day: Tuesday
Project Owner: Fort Bragg DPW	Contractor: SES Construction and Fuel Services LLC	
HDR Project No. 00018 120265 003	Address: Lamont Road, Fort Bragg, NC	

Weather Conditions:

Temperature		Phenomena		Precipitation
Max. 70	Min. 60	Clear X	Other	0”

Contractor's Employees:		**Subcontractor's Employees:**		
No.	Craft	No.	Name	Craft
1	Supervisor	1	Strother Surveying	Surveying
		1	F&R	CQC Testing
			Grand Total	12

Work Being Done

Work Observed: Purpose of visit was to conduct substantial completion inspection. All work appeared to be in good condition and installed in general accordance with the drawings and specifications. Work appeared to be complete except for some hydroseeding of the slopes which is the responsibility of the DPW.

Work Not Observed, But in Progress: N/A

Requested Revisions and/or Interpretations (over)

None

Construction Deficiencies Reported to Gen. Contractor This Day and/or Corrected This Day

None

Remarks (over) N/A

HDR Field Representative: *Thomas M. Yaneschak*

Distribution: ☒ File ☐ Project Manager ☐ Resident

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX C

As-Built Drawings

As Built Survey

Density Test Location Map

Closure Plan Modifications

HDR

As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX C

As Built Drawings

As Built Survey

HDR

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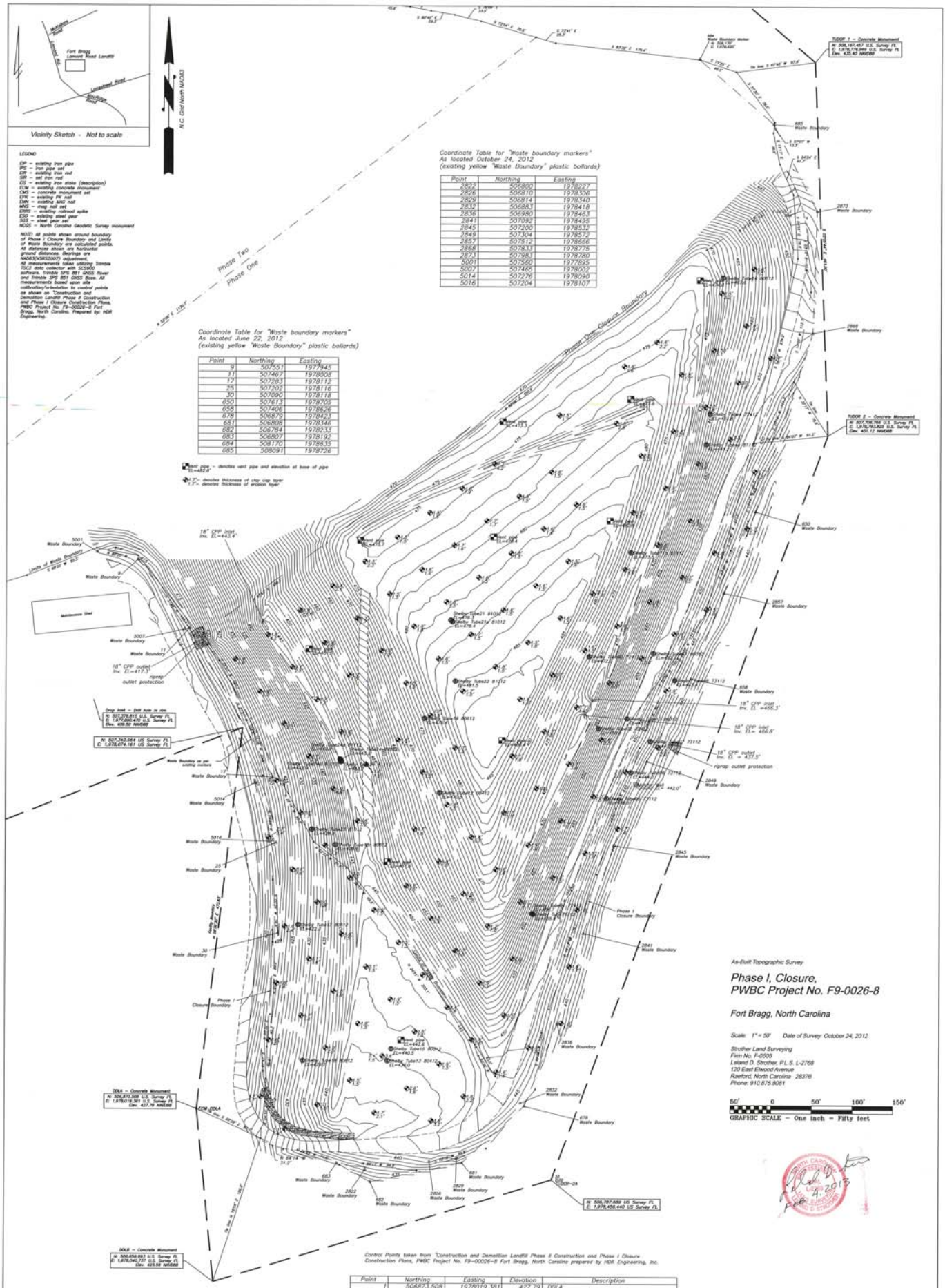

Coordinate Table for "Waste boundary markers"
As located October 24, 2012
(existing yellow "Waste Boundary" plastic bollards)

Point	Northing	Easting
2822	506800	1978227
2826	506810	1978306
2829	506814	1978340
2832	506883	1978418
2836	506980	1978463
2841	507092	1978495
2845	507200	1978532
2849	507304	1978572
2857	507512	1978666
2868	507833	1978775
2873	507983	1978780
5001	507560	1977895
5007	507465	1978002
5014	507276	1978090
5016	507204	1978107

Coordinate Table for "Waste boundary markers"
As located June 22, 2012
(existing yellow "Waste Boundary" plastic bollards)

Point	Northing	Easting
9	507551	1977945
11	507467	1978008
17	507283	1978112
25	507203	1978116
30	507090	1978118
650	507613	1978705
658	507406	1978626
678	506879	1978423
681	506808	1978346
682	506784	1978233
683	506807	1978192
684	508170	1978635
685	508091	1978726

Vent pipe – denotes vent pipe and elevation at base of pipe
1.5' – denotes thickness of chip cap layer
1.5' – denotes thickness of erosion layer

As-Built Topographic Survey

Phase I, Closure, PWBC Project No. F9-0026-8

Fort Bragg, North Carolina

Scale: 1" = 50' Date of Survey: October 24, 2012

Strother Land Surveying
Firm No. F-0505
Leland D. Strother, P.L.S. L-2768
120 East Elwood Avenue
Raeford, North Carolina 28376
Phone: 910.875.8081

50' 0 50' 100' 150'
GRAPHIC SCALE – One inch = Fifty feet

Control Points taken from "Construction and Demolition Landfill Phase II Construction and Phase I Closure Construction Plans, PWBC Project No. F9-00026-8 Fort Bragg, North Carolina prepared by HDR Engineering, Inc.

Point	Northing	Easting	Elevation	Description
1	506871.508	1978019.381	427.79	DDLA
2	506659.993	1978040.737	423.56	DDLB
3	508167.457	1978776.969	435.40	TUDOR1
4	507706.768	1978793.825	451.12	TUDOR2
6	506956.200	1977092.845	353.34	LCID1
7	508591.787	1976605.880	356.53	LCID2
8	508932.370	1977376.232	358.09	LCID3
100	507178.815	1977990.470	409.50	SDIY BM
101	507361.185	1977586.885	407.60	SSMH BM

Strother Land Surveying
120 East Elwood Avenue
Raeford, North Carolina 28376
Leland D. Strother, PLS L-2768
Phone/FAX: 910.875.8081
Email: leland@strotherlandsurveying.com
www.strotherlandsurveying.com

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As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX C

As Built Drawings

Density Test Location Map

HDR

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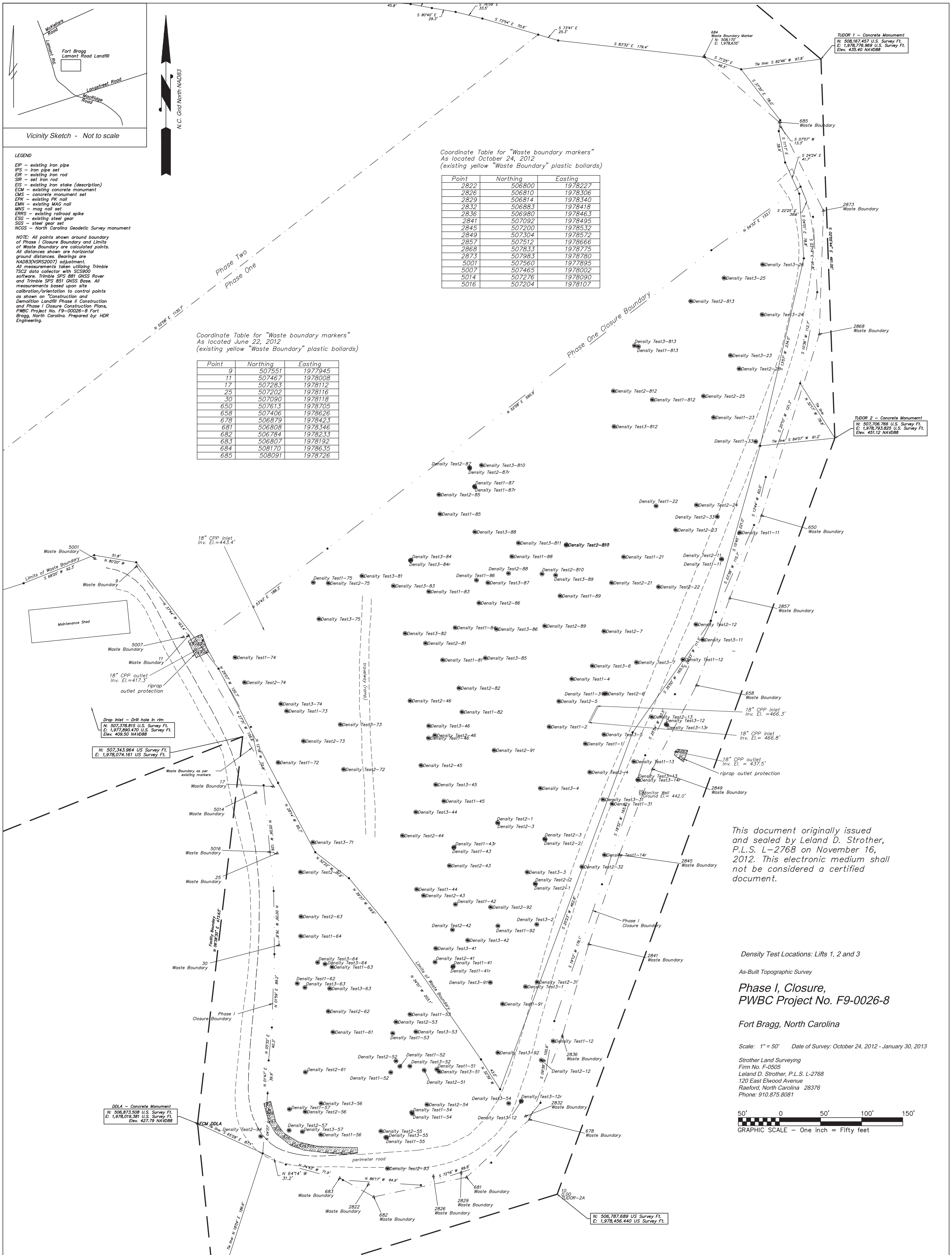

LEGEND

EIP – existing iron pipe
IPS – iron pipe set
EIR – existing iron rod
SIR – set iron rod
EIS – existing iron stake (description)
ECM – existing concrete monument
CMS – concrete monument set
EPK – existing PK nail
EMN – existing MAG nail
MNS – mag nail set
ERRS – existing railroad spike
ESG – existing steel gear
SGS – steel gear set
NCGS – North Carolina Geodetic Survey monument

NOTE: All points shown around boundary of Phase i Closure Boundary and Limits of Waste Boundary are calculated points. All distances shown are horizontal ground distances. Bearings are NAD83(NSRS2007) adjustment. All measurements taken utilizing Trimble TSC2 data collector with SCS900 software. Trimble SPS 881 GNSS Rover and Trimble SPS 851 GNSS Base. All measurements based upon site calibration/orientation to control points as shown on "Construction and Demolition Landfill Phase II Construction and Phase I Closure Construction Plans, PWBC Project No. F9-00026-8 Fort Bragg, North Carolina. Prepared by: HDR Engineering.

Coordinate Table for "Waste boundary markers"
As located October 24, 2012
(existing yellow "Waste Boundary" plastic bollards)

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2822	506800	1978227
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2832	506883	1978418
2836	506980	1978463
2841	507092	1978495
2845	507200	1978532
2849	507304	1978572
2857	507512	1978666
2868	507833	1978775
2873	507983	1978780
5001	507560	1977895
5007	507465	1978002
5014	507276	1978090
5016	507204	1978107

Coordinate Table for "Waste boundary markers"
As located June 22, 2012
(existing yellow "Waste Boundary" plastic bollards)

Point	Northing	Easting
9	507551	1977945
11	507467	1978008
17	507283	1978112
25	507202	1978116
30	507090	1978118
650	507613	1978705
658	507406	1978626
678	506879	1978423
681	506808	1978346
682	506784	1978233
683	506807	1978192
684	508170	1978635
685	508091	1978726

This document originally issued and sealed by Leland D. Strother, P.L.S. L–2768 on November 16, 2012. This electronic medium shall not be considered a certified document.

Density Test Locations: Lifts 1, 2 and 3

As-Built Topographic Survey

Phase I, Closure, PWBC Project No. F9-0026-8

Fort Bragg, North Carolina

Scale: 1" = 50'   Date of Survey: October 24, 2012 - January 30, 2013

Strother Land Surveying
Firm No. F-0505
Leland D. Strother, P.L.S. L-2768
120 East Elwood Avenue
Raeford, North Carolina 28376
Phone: 910.875.8081

50' 0 50' 100' 150'
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7	508591.787	1976605.880	356.53	LCID2
8	508932.370	1977376.232	358.09	LCID3
100	507378.815	1977890.470	409.50	SDYI BM
101	507361.185	1977586.885	407.62	SSMH BM

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As-Built Documentation and Certification Report

Construction and Demolition Landfill
Phase 1 Closure

APPENDIX C

As Built Drawings

Closure Plan Modifications

HDR

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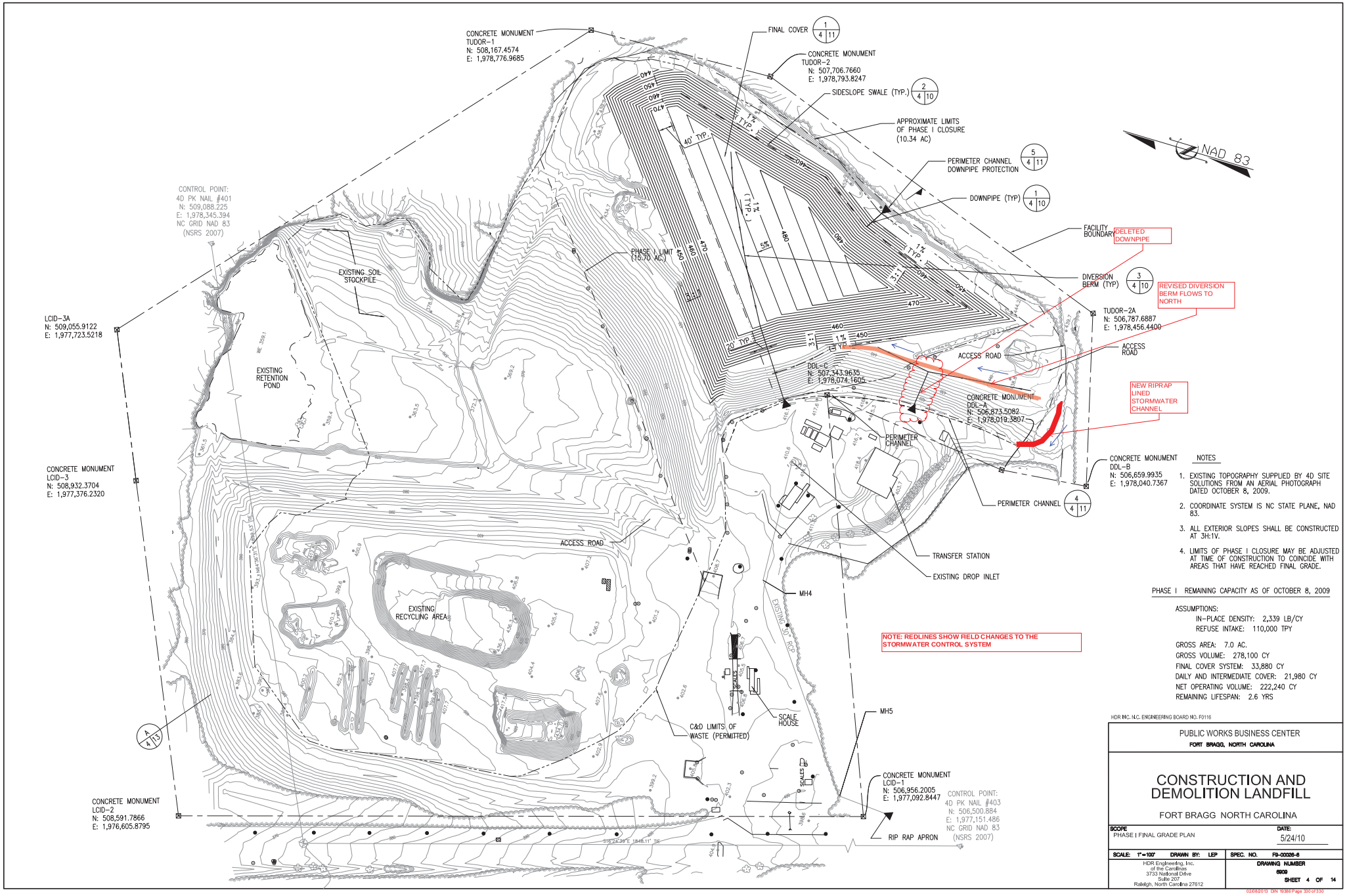

NOTE: REDLINES SHOW FIELD CHANGES TO THE STORMWATER CONTROL SYSTEM

NOTES

1. EXISTING TOPOGRAPHY SUPPLIED BY 4D SITE SOLUTIONS FROM AN AERIAL PHOTOGRAPH DATED OCTOBER 8, 2009.
2. COORDINATE SYSTEM IS NC STATE PLANE, NAD 83.
3. ALL EXTERIOR SLOPES SHALL BE CONSTRUCTED AT 3H:1V.
4. LIMITS OF PHASE I CLOSURE MAY BE ADJUSTED AT TIME OF CONSTRUCTION TO COINCIDE WITH AREAS THAT HAVE REACHED FINAL GRADE.

PHASE I REMAINING CAPACITY AS OF OCTOBER 8, 2009

ASSUMPTIONS:
IN-PLACE DENSITY: 2,339 LB/CY
REFUSE INTAKE: 110,000 TPY

GROSS AREA: 7.0 AC.
GROSS VOLUME: 278,100 CY
FINAL COVER SYSTEM: 33,880 CY
DAILY AND INTERMEDIATE COVER: 21,980 CY
NET OPERATING VOLUME: 222,240 CY
REMAINING LIFESPAN: 2.6 YRS

HDR INC. N.C. ENGINEERING BOARD NO. F0116

PUBLIC WORKS BUSINESS CENTER
FORT BRAGG, NORTH CAROLINA

CONSTRUCTION AND DEMOLITION LANDFILL

FORT BRAGG NORTH CAROLINA

SCOPE: PHASE I FINAL GRADE PLAN
DATE: 5/24/10

SCALE: 1"=100' DRAWN BY: LEP
SPEC. NO. F9-00026-6

HDR Engineering, Inc.
of the Carolinas
3733 National Drive
Suite 207
Raleigh, North Carolina 27612

DRAWING NUMBER
6909
SHEET 4 OF 14

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