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ftn Associates Ltd.
water resources / environmental consultants
124 W Sunbridge Drive, Suite 3 • Fayetteville, AR 72703 • (479) 571-3334 • FAX (479) 571-3338

November 6, 2018

Ms. Maria Matoska
Solid Waste Management Division
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

RE: Submittal of Construction Quality Assurance (CQA) Report for Bottom Liner System for Cell 1-2, Craighead County Solid Waste Disposal Authority Class 1 Legacy Landfill, Permit No. 0254-S1-R4
FTN Project No. 04469-1869-001

Dear Ms. Matoska:

On behalf of Craighead County Solid Waste Disposal Authority, FTN Associates, Ltd., is submitting the enclosed compact disk that contains an electronic copy of the Construction Quality Assurance (CQA) report for the bottom liner system construction of Cell 1-2 at the Legacy Landfill. The CQA report is in Adobe PDF format.

The construction of the new disposal area began in July 2018 and was completed in October 2018. The construction was conducted in accordance with the project construction documents (March 2018) and the facility permit.

If you have any questions or concerns regarding this submittal, please feel free to contact me at (479) 571-3334 or Paul Crawford, PE, PG, at (501) 225-7779.

Sincerely,
FTN ASSOCIATES, LTD.

Nick Schoggin, PE

NVS/tas

Enclosure

cc: Robert Hendrix, PE, Craighead County Solid Waste Disposal Authority

PWC

S:\PROJECTS\04469-1869-001\TECH\CQA REPORT\2018-11-06 FTN TL TO ADEQ SUBMITTAL OF LEGACY LANDFILL CELL 1-2 CQS REPORT.DOCX

ftn Associates Ltd.
water resources / environmental consultants

# CONSTRUCTION QUALITY ASSURANCE CERTIFICATION REPORT

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY LEGACY LANDFILL CELL 1/2 BOTTOM LINER SYSTEM CONSTRUCTION

**NOVEMBER 6, 2018**

# CONSTRUCTION QUALITY ASSURANCE CERTIFICATION REPORT

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY LEGACY LANDFILL CELL 1/2 BOTTOM LINER SYSTEM CONSTRUCTION

Prepared for

Craighead County Solid Waste Disposal Authority
Legacy Landfill
238 County Road 476
Jonesboro, AR 72404

Prepared by

FTN Associates, Ltd.
124 W. Sunbridge Dr., Suite 3
Fayetteville, AR 72703

FTN No. 04469-1869-001

November 6, 2018

# PROFESSIONAL ENGINEERING CERTIFICATION

"I certify that, to the best of my professional engineering judgment, Cell 1/2 of the Legacy Class 1 Landfill (Permit No. 0254-S1-R4) was constructed in accordance with the project plans and specifications, the facility permit documents, and Arkansas Pollution Control and Ecology Commission Regulation No. 22. This Construction Quality Assurance (CQA) Report has been prepared based upon my (or my designated representative's) observations of construction and the constructed facility, survey data provided by Ridge Surveying & Consulting, PLLC., and materials testing data provided by B & W Engineering Laboratories, Inc. and Golder Associates, Inc. This certification is contingent on the fact that all information supplied, up to the date of this certification, is unquestionably accurate and was provided in good faith."







Nick Schoggin, PE
Arkansas PE License #14268

November 6, 2018
Date

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# 1.0 INTRODUCTION

## 1.1 General

Craighead County Solid Waste Disposal Authority (CCSWDA) owns and operates a solid waste landfill (Legacy Landfill) near Jonesboro, Arkansas. The landfill is permitted by the Arkansas Department of Environmental Quality (ADEQ) under Solid Waste Permit No. 0254-S1-R4 (November 2017). The facility is permitted for disposal of Class 1 wastes. The site consists of 520 acres, of which 297 acres are permitted for disposal of Class 1 wastes.

The Legacy Landfill site is located approximately 5 miles south of Jonesboro on Highway 1. Figure 1 (all figures are located in Appendix A) presents the location of the landfill facility on an Arkansas Department of Transportation highway map.

CCSWDA contracted with FTN Associates, Ltd. (FTN) to provide Construction Quality Assurance (CQA) services associated with the construction of the bottom liner system for Cell 1/2.

This document summarizes the construction activities associated with the development of a new waste disposal area in the Class 1 landfill. This includes excavation and preparation of the subgrade, installation of geocomposite and landfill gas extraction trench system, construction of the compacted clay liner, installation of the geomembrane liner, installation of the protective cover layer, installation of leachate collection and transmission system, construction of soil berms, and stormwater conveyances for the new disposal cell. Correspondence, quality control testing results, and certifications associated with the construction are also provided. This document is intended to satisfy the requirements of Arkansas Pollution Control and Ecology Commission (APCEC) Regulation No. 22, §22.428(i).

## 1.2 Site Description

The total permitted area of the CCSWDA Legacy Landfill is approximately 297 acres. Cell 1/2 is situated over a closed Class 1 disposal area that operated in the early 1990s. The original topography of the landfill site was gently rolling hills that sloped westward. As shown on Figure 2, CCSWDA has already developed 4 disposal areas permitted for Class 1 wastes. CCSWDA borrows soil for daily and intermediate cover from excavation of future

cells immediately west of the active disposal area and in another borrow area north of the permitted disposal area. The facility has four stormwater detention ponds that flow in series, and they are located west and southwest of the disposal area. Leachate from Cells 1 through 4 is collected in each disposal area's collection system and drains via a leachate collection pipe to corresponding sumps. From the sumps, the leachate is pumped to various holding tanks located near the southern and western boundaries of the landfill. The leachate is then removed from the tank and transported offsite.

At the time of the construction project, the active disposal area was located in portions of Cells 2 and 3, which still have some remaining disposal capacity.

## 1.3 Project Description

This project involved the construction and CQA monitoring of the bottom liner system, leachate collection and transmission, and stormwater controls for Cell 1/2, which covers approximately 12.7 acres. As shown on Figure 3, the project included preparation of the new disposal area, construction of the leachate collection and transmission system for the new disposal area, and construction of stormwater control facilities.

The sequence of construction activities included:

1. Surveying construction area prior to excavation;
2. Excavation to the designed subgrade for the disposal area and general site preparation;
3. Installation of geocomposite over subgrade and landfill gas cutoff trenches on the eastern and western sides of the new disposal area;
4. Exposure of the tie-in of the bottom liner system between the existing Cell 2 and the proposed Cell 1/2;
5. Preparation, installation, and testing of compacted clay liner;
6. Construction of drainage ways and earthen berms;
7. Installation and testing of textured 60-mil high density polyethylene (HDPE) geomembrane liner;
8. Installation of 12-inch thick soil protective cover layer;
9. Installation of leachate drainage pipe and trench;

10. Installation of expansion berm on the north side of the disposal area;
11. Installation of leachate transmission system including side-slope riser pipe, pump, pump control system, and dual-contained leachate transmission piping; and
12. Installation of stormwater control facilities such as ditches and culverts.

Appendix B provides a photographic log of the construction project, and a daily field log of construction activities is included as Appendix C.

## 1.4 Project Personnel

**Owner:**

CCSWDA
Project Manager: Robert Hendrix, PE

**Design Engineer:**

FTN Associates, Ltd.
Project Manager/Engineer: Mr. Nick Schoggin, PE

**Construction Quality Assurance Consultant:**

FTN Associates, Ltd.

| | |
|---|---|
| Project Manager/Engineer: | Mr. Nick Schoggin, PE |
| CQA Monitor: | Mr. Robert Gregory |
| Survey Control: | Ridge Surveying & Consulting, PLLC. (Ridge)<br>Mr. Jason Beard, PS<br>Mr. Joshua Neely, PS |
| Field Soil Testing: | B & W Engineering Laboratories, Inc. (B&W) |
| Geotechnical Laboratory and Geomembrane Conformance Testing: | Golder Associates, Inc. (Golder) |

**Earthwork Contractor:**

Dumey Contracting, Inc. (Dumey)
Project Manager: Mr. Mike Smith

**Geomembrane Contractor:**

Plastic Fusion Fabricators, Inc. (Plastic Fusion)
Project Manager: Mr. Paul Elliot

Construction Foreman: Mr. Albert Corbitt

**HDPE Piping and Leachate Pumping System Contractor:**

Plastic Fusion Fabricators, Inc. (Plastic Fusion)
Project Manager: Mr. Paul Elliot

## 1.5 Project Documents

The construction of the new disposal area and associated facilities was conducted in accordance with the following documents:

1. "Craighead County Solid Waste Disposal Authority, Legacy Landfill, Cell 1 South /2 North Construction Project" (Specifications and Contract Documents), FTN, March 2018.
2. "Craighead County Solid Waste Disposal Authority, Legacy Landfill Cell 1 South /2 North Construction" (Drawings), FTN, March 2018.
3. "Construction Quality Assurance and Quality Control Plan," FTN, November 2015.
4. "Regulation Number 22, Solid Waste Management", APCEC, March 28, 2007.

# 2.0 SUBGRADE PREPARATION

## 2.1 Clearing and Grubbing

### 2.1.1 Project Specifications

The project specifications required that the construction area be cleared and grubbed. This included removing exposed brush, grass, and other vegetative material resting on or protruding through the ground surface in those areas delineated for the disposal cell, soil borrow area, soil stockpile areas, and stormwater facilities on the construction drawings. Figure 3 shows the proposed construction plan for Cell 1/2.

### 2.1.2 Construction Procedures

From July 5, 2018 to July 9, 2018, the existing grass and other vegetative materials in the proposed Cell 1/2 area was removed and disposed of as stated in the specifications.

## 2.2 Excavation and Subgrade Preparation

### 2.2.1 Project Specifications

Project specifications required that overburden soils and areas of unsatisfactory materials within the project limits be excavated. Unsatisfactory materials include soft or compressible soils or materials judged by the CQA Consultant to be unsuitable for foundations or the placement of compacted soils. Any Class 1 wastes that were encountered in this process from the underlying closed landfill were to be excavated and hauled to the active Class 1 landfill for disposal. Suitable soils for construction were to be stockpiled separately from the unsuitable soils.

Specifications required the subgrade to have a smooth surface free from irregular surface changes and slope grades to prevent surface water from ponding. Subgrade elevations were to be verified through an independent survey. In addition, the subgrade surface was required to be scarified and compacted to 90% of the Standard Proctor density.

### 2.2.2 Subgrade Construction Procedures

The subgrade excavation and preparation for compacted clay liner occurred from July 9, 2018 to July 24, 2018. During this period, the construction activities consisted of excavating or

filling to the proposed subgrade surface for the entire disposal area and preparation of the subgrade surface for installation of the clay liner. The subgrade elevations were verified by an independent survey conducted by Ridge on July 20, 2018, July 23, 2018, and July 24, 2018.

Figure 4 shows final subgrade grid elevations of the disposal area. In general, the subsurface was prepared in accordance with the Permit, CQA Plan, and construction plans.

Photos 1 through 6 in Appendix B present subgrade preparation activities.

### 2.2.3 Subgrade Testing

The subgrade surface was tested for its conformance with project specifications for compaction using the "proof-roll" test method. According to the proof-roll testing, the subgrade surface met the project specifications.

## 2.3 Gas Collection System

Since Cell 1/2 is located over a closed Class 1 disposal site, a passive gas collection system was installed between the subgrade and the compacted clay liner, which consisted of a double-sided geocomposite that extended into gas collection trenches. The gas collection trenches run along the eastern and western cell boundaries and consisted of a 6-inch perforated HDPE pipe encased in washed, non-calcium carbonate gravel, wrapped in a double-sided geocomposite, which was covered with 24 inches of compacted clay. A gas vent was installed within each section of the gas collection trenches for future connection to the existing active gas collection system.

Copies of the geocomposite manufacturer's certificates and conformance test results are included as Appendix D and Appendix E, respectively. Photos 7 through 10 included in Appendix B present construction of the gas collection system.

# 3.0 COMPACTED CLAY LINER INSTALLATION

This section of the report summarizes the construction activities associated with the compacted clay liner. Since Dumey had the required previous experience, construction of a test pad in accordance with the CQA Plan was not necessary. Documentation of the previous experience of Dumey is included in Appendix F.

Clay liner construction began on July 24, 2018 and was completed on August 22, 2018, and consisted of placement of approximately 43,300 cubic yards of clay soil.

## 3.1 Project Specifications

The project specifications required that a 24-inch thick compacted clay liner be constructed within the disposal area limits. Since Cell 1/2 is located over existing waste, the first lift was a 12-inch compacted bridge lift followed by two uniform 6-inch compacted lifts.

The clay liner material and completed clay liner had to meet the following requirements:

1. Unified Soil Classification System (USCS) classification of CL, CH, or SC;
2. A minimum of 30% passing the #200 U.S. Standard Sieve;
3. A Plasticity Index (PI) greater than or equal to 10;
4. Each lift compacted to a minimum 95% of the maximum dry density with a corresponding moisture content 0 to 6% above the OMC, as determined by the Standard Proctor test (ASTM D 698);
5. The in-place permeability of 1 x $10^{-7}$ cm/sec or less for each lift; and
6. The final surface graded to the top of liner elevations shown on the project drawings (Appendix G).

## 3.2 Clay Liner Material Conformance Testing

Prior to construction of the disposal cell, three soil samples (PC-1B, PC-2, and PC-3) of the clay liner material were obtained from the borrow area. These samples were submitted to Golder for analysis. The samples met the requirements for the clay liner material and were used for the project. In addition, to meet the requirement for one construction sample per 5,000 cy of

clay liner material used in construction, nine construction samples (C-1 through C-9) were obtained from the borrow soils as they were excavated.

Table 3.1 presents a summary of the test results of the pre-construction samples, and Table 3.2 presents a summary of the test results of the construction samples. Based on the pre-construction and construction test results, the soils from the borrow area excavation met the project specifications. Laboratory test summaries of the pre-construction and construction soil samples are included as Appendices H and I, respectively.

Table 3.1. Clay liner material pre-construction test summary.

| Sample ID | USCS Classification | % Passing #200 Sieve | Atterberg Limits | | | Dry Density (lbs/ft$^3$) | OMC (%) | Coefficient of Permeability (cm/sec) |
|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | |
| **Specification** | **CL, CH or SC** | **>30%** | **N/A** | **N/A** | **≥10** | **N/A** | **N/A** | **≤1.0 x 10$^{-7}$** |
| PC-1B | CH | 99.2 | 55 | 19 | 36 | 102.2 | 20.3 | 1.6 x 10$^{-8}$ |
| PC-2 | CL | 98.9 | 40 | 22 | 18 | 100.5 | 20.8 | 2.6 x 10$^{-8}$ |
| PC-3 | CL | 99.4 | 44 | 24 | 20 | 97.0 | 21.6 | 9.9 x 10$^{-9}$ |

Table 3.2. Clay liner material construction test summary.

| Sample ID | USCS Classification | % Passing #200 Sieve | Atterberg Limits | | | Dry Density (lbs/ft$^3$) | OMC (%) | Coefficient of Permeability (cm/sec) |
|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | |
| **Specification** | **CL, CH or SC** | **>30%** | **N/A** | **N/A** | **≥10** | **N/A** | **N/A** | **≤1.0 x 10$^{-7}$** |
| C-1 | CL | 98.6 | 41 | 25 | 16 | 98.9 | 19.6 | 3.0 x 10$^{-8}$ |
| C-2 | CL | 98.4 | 39 | 25 | 14 | 98.5 | 22.5 | 1.3 x 10$^{-8}$ |
| C-3 | CL | 98.6 | 43 | 24 | 19 | 98.3 | 22.0 | 3.7 x 10$^{-8}$ |
| C-4 | CL | 97.6 | 44 | 18 | 26 | 103.6 | 17.9 | 1.4 x 10$^{-8}$ |
| C-5 | CL | 97.9 | 45 | 19 | 26 | 104.5 | 18.4 | 1.4 x 10$^{-8}$ |
| C-6 | CL | 97.7 | 45 | 18 | 27 | 103.6 | 19.5 | 1.4 x 10$^{-8}$ |
| C-7 | CL | 97.9 | 46 | 17 | 29 | 104.5 | 20.0 | 1.5 x 10$^{-8}$ |
| C-8 | CL | 98.0 | 43 | 19 | 24 | 104.4 | 18.5 | 1.5 x 10$^{-8}$ |
| C-9 | CL | 98.1 | 47 | 18 | 29 | 104.1 | 20.0 | 1.9 x 10$^{-8}$ |

## 3.3 Compacted Clay Liner Construction Procedures

In accordance with the project specifications, the soils were placed and compacted in three lifts to the top of liner elevations. The first lift was a 12-inch thick compacted bridge lift

and was followed by two uniform 6-inch thick compacted lifts. Photos 11 through 16 in Appendix B present construction activities of the compacted clay liner.

## 3.4 Compacted Clay Liner Testing

Construction testing was conducted at the rate of one test per 10,000 square feet of completed clay liner lift according to project specifications and Regulation No. 22 requirements.

A total of 56 construction tests (density and moisture using densitometer) were taken per lift. Table 3.3 presents a summary range of field test measurements of each of the three compacted lifts of the clay liner and the results of the tests. Summaries of the field test results are included as Appendix J.

Table 3.3. Summary of compacted clay liner field tests.

| Lift Number | Number of Tests | Range of Measured Compaction (%) | Range of Measured Moisture above OMC (%) | Results of Tests |
|---|---|---|---|---|
| Bridge Lift (Lifts 1 and 2) | 56 | 96.3 – 100+ | 0.1 – 6.0 | All tests passed. |
| Lift 3 | 56 | 95.7 – 100+ | 0.1 – 6.0 | All tests passed. |
| Lift 4 | 56 | 95.2 – 100+ | 0.1 – 5.8 | All tests passed. |

Note: Project specifications required compaction of 95% of Standard Proctor density and a moisture 0 to 6% above OMC.

Performance testing was conducted at the rate of one test per 40,000 square feet of completed clay liner lift in accordance with the project specifications and Regulation No. 22, but the 12-inch bridge lift samples were divided into a lower six-inch sample “lift one” and an upper six-inch sample “lift two”. Twenty-eight Shelby tube samples were collected for the 12-inch bridge lift and 14 Shelby tube samples for lifts 3 and 4, for a total of 56 samples. The samples were submitted to Golder for permeability analysis. Table 3.4 presents a summary of the permeability test results for each of the three lifts of the compacted clay liner. Summaries of the in-place permeability test results are included as Appendix K.

Table 3.4. Summary of compacted clay liner in-place permeability results.

| Sample ID | Lift Number | Measured Permeability (cm/s) | Comment |
|---|---|---|---|
| P-1-1A | 1 | $3.8 \times 10^{-8}$ | Pass |
| P-1-2A | 1 | $3.3 \times 10^{-8}$ | Pass |
| P-1-3A | 1 | $3.9 \times 10^{-8}$ | Pass |
| P-1-4A | 1 | $1.5 \times 10^{-8}$ | Pass |
| P-1-5A | 1 | $1.6 \times 10^{-8}$ | Pass |
| P-1-6A | 1 | $3.6 \times 10^{-8}$ | Pass |
| P-1-7A | 1 | $2.9 \times 10^{-8}$ | Pass |
| P-1-8A | 1 | $1.5 \times 10^{-8}$ | Pass |
| P-1-9A | 1 | $2.9 \times 10^{-8}$ | Pass |
| P-1-10A | 1 | $3.7 \times 10^{-8}$ | Pass |
| P-1-11A | 1 | $7.0 \times 10^{-8}$ | Pass |
| P-1-12A | 1 | $2.0 \times 10^{-8}$ | Pass |
| P-1-13A | 1 | $1.0 \times 10^{-7}$ | Pass |
| P-1-14A | 1 | $2.5 \times 10^{-8}$ | Pass |
| P-2-1A | 2 | $4.9 \times 10^{-8}$ | Pass |
| P-2-2A | 2 | $2.5 \times 10^{-8}$ | Pass |
| P-2-3A | 2 | $3.9 \times 10^{-8}$ | Pass |
| P-2-4A | 2 | $1.0 \times 10^{-8}$ | Pass |
| P-2-5A | 2 | $3.3 \times 10^{-8}$ | Pass |
| P-2-6A | 2 | $2.6 \times 10^{-8}$ | Pass |
| P-2-7A | 2 | $4.7 \times 10^{-8}$ | Pass |
| P-2-8A | 2 | $6.1 \times 10^{-8}$ | Pass |
| P-2-9A | 2 | $2.9 \times 10^{-8}$ | Pass |
| P-2-10A | 2 | $4.1 \times 10^{-8}$ | Pass |
| P-2-11A | 2 | $3.5 \times 10^{-8}$ | Pass |
| P-2-12A | 2 | $3.1 \times 10^{-8}$ | Pass |
| P-2-13A | 2 | $2.4 \times 10^{-8}$ | Pass |
| P-2-14A | 2 | $2.8 \times 10^{-8}$ | Pass |
| P-3-1A | 3 | $4.2 \times 10^{-8}$ | Pass |
| P-3-2A | 3 | $2.7 \times 10^{-8}$ | Pass |
| P-3-3A | 3 | $2.0 \times 10^{-8}$ | Pass |
| P-3-4A | 3 | $3.5 \times 10^{-8}$ | Pass |
| P-3-5A | 3 | $2.4 \times 10^{-8}$ | Pass |
| P-3-6A | 3 | $2.9 \times 10^{-8}$ | Pass |
| P-3-7A | 3 | $3.4 \times 10^{-8}$ | Pass |
| P-3-8A | 3 | $3.2 \times 10^{-8}$ | Pass |
| P-3-9A | 3 | $5.2 \times 10^{-8}$ | Pass |
| P-3-10A | 3 | $8.2 \times 10^{-8}$ | Pass |
| P-3-11A | 3 | $3.8 \times 10^{-8}$ | Pass |
| P-3-12A | 3 | $3.2 \times 10^{-8}$ | Pass |
| P-3-13A | 3 | $2.7 \times 10^{-8}$ | Pass |
| P-3-14A | 3 | $2.7 \times 10^{-8}$ | Pass |
| P-4-1A | 4 | $4.1 \times 10^{-8}$ | Pass |
| P-4-2A | 4 | $2.1 \times 10^{-8}$ | Pass |
| P-4-3A | 4 | $3.0 \times 10^{-8}$ | Pass |

| Sample ID | Lift Number | Measured Permeability (cm/s) | Comment |
|---|---|---|---|
| P-4-4A | 4 | $1.4 \times 10^{-8}$ | Pass |
| P-4-5A | 4 | $4.9 \times 10^{-8}$ | Pass |
| P-4-6A | 4 | $2.4 \times 10^{-8}$ | Pass |
| P-4-7A | 4 | $2.5 \times 10^{-8}$ | Pass |
| P-4-8A | 4 | $8.6 \times 10^{-8}$ | Pass |
| P-4-9A | 4 | $4.7 \times 10^{-8}$ | Pass |
| P-4-10A | 4 | $2.8 \times 10^{-8}$ | Pass |
| P-4-11A | 4 | $4.4 \times 10^{-8}$ | Pass |
| P-4-12A | 4 | $4.2 \times 10^{-8}$ | Pass |
| P-4-13A | 4 | $5.7 \times 10^{-8}$ | Pass |
| P-4-14AE | 4 | $5.1 \times 10^{-8}$ | Pass |

Figures 5, 6, and 7 present the field testing and permeability sampling locations during the construction of the clay liner for each lift. The final elevations of the completed clay liner were verified through an independent survey conducted by Ridge on August 22, 2018.

Figure 8 presents the survey certification grid and elevations for the clay liner, and Figure 9 is a record drawing of the final grades of the clay liner. Based on the survey, the top of the clay liner was constructed to meet the required minimum two-foot thickness.

# 4.0 GEOMEMBRANE LINER INSTALLATION

This section of the report summarizes the construction activities associated with the installation and testing of the geomembrane liner. Geomembrane construction activities consisted of the installation and testing of 605,600 square feet of textured 60-mil HDPE liner material. Installation of the geomembrane liner began on August 22, 2018, and was completed on September 5, 2018. Photos 17 through 22 in Appendix B present geomembrane installation activities.

## 4.1 Project Specifications

The project specifications required that a 60-mil textured HDPE geomembrane liner be installed over the disposal area. The geomembrane was to be installed as shown on the project drawings and in accordance with the project specifications.

## 4.2 Submittals

### 4.2.1 Manufacturer's Quality Control Certificates

In accordance with the project specifications, the geomembrane installation company, Plastic Fusion Fabricators, Inc. (Plastic Fusion), submitted their company's qualifications for review by FTN. This included the company's experience, representative projects, experience of the field superintendent and master seamer, installation procedures, and approval by the geomembrane manufacturer to install their materials. The information provided by Plastic Fusion demonstrated their qualifications to perform the work, and they were approved by FTN. A copy of Plastic Fusion's submittal information is included as Appendix L.

Manufacturer's quality control certificates (roll certification reports) were submitted by Plastic Fusion for comparison of the materials to be installed with the project specifications. Copies of the manufacturer's certificates for the geomembrane material supplied for the project are included as Appendix M, and an inventory of the geomembrane rolls sent to the project site are included as Appendix N. Based on the information supplied by Plastic Fusion, the material was approved for shipment to the project.

### 4.2.2 Material Conformance Testing

After acceptance of the roll certification reports, conformance test samples of the textured geomembrane material were sent directly from the manufacturing facility (GSE Lining Technology, Inc.) to Golder laboratory in Atlanta, Georgia, for compliance testing. A copy of the laboratory test results is included as Appendix O. Based on the conformance test results, the geomembrane materials were approved for installation.

## 4.3 Construction Procedures

### 4.3.1 Deployment of Geomembrane

Prior to installation of the geomembrane liner, the Plastic Fusion field superintendent and the FTN CQA Monitor reviewed the clay liner surface. Any defects in the surface were repaired prior to installation. Once the surface was reviewed and approved, both parties accepted the subgrade. Copies of the subgrade acceptance forms are included as Appendix P.

Deployment of the geomembrane was accomplished using a front-end loader and manual labor to transport each geomembrane panel into place. A FTN employee monitored and documented the deployment of the geomembrane panels. The panels were reviewed, and any defects were noted for repair. All panels were temporarily anchored with sandbags to prevent wind damage. The panels were seamed and then permanently anchored on the east and west sides of the disposal cell. The daily deployment logs for the geomembrane installation are included as Appendix Q. Figure 10 is a panel layout of the disposal cell.

### 4.3.2 Trial Seam Testing

In accordance with the project specifications, the fusion and extrusion welder operators were required to prepare trial seams before the startup of each seaming period. Coupons were cut from the trial seam and were tested in the field on a gauged tensiometer to check for seaming machine failures or operator errors. The trial seams were tested for peel and shear strength, and had to exhibit a film tear bond (FTB) and meet the project requirements for strength to be deemed acceptable. If the trial seam met the peel and shear strength requirements, the operator was allowed to begin seaming. A summary of the trial seam logs is included in Appendix R.

### 4.3.3 Geomembrane Seaming

The principle method for joining the geomembrane panels was through the use of an automated double-track fusion welder. Extrusion welders were used for seaming patches, repairs, intersections of seams, and seam reconstruction.

A FTN employee monitored and documented the seaming activities. Duties included visual observation of the seaming process, visual examination of the completed seam, and verification and documentation that the seam was welded for its entire length. Any seaming imperfections were marked by the FTN CQA Monitor or the Plastic Fusion field superintendent and were repaired in accordance with the project specifications. The geomembrane production seaming log, which includes information on the geomembrane panel, seam number, seam length, and welding information, is included as Appendix S.

## 4.4 Testing Procedures

### 4.4.1 Non-Destructive Seam Testing and Repairing

All seams, seam repairs, and patches were non-destructively tested for continuity by the installer, using an air pressure test for fusion welds or vacuum box techniques for extrusion welds. A FTN employee monitored and documented all field testing of the geomembrane seams to ensure that the tests were performed in accordance with the project specifications. The seaming continuity test log is presented with the production seaming log in Appendix S.

The location, size, and testing results of all seam repairs, patches, and defects were documented by a FTN employee. Information on the repairs made to the liner is included in the geomembrane liner defect and repair log which is included as Appendix T. Locations of liner repairs and patches are shown on Figure 10.

### 4.4.2 Destructive Seam Strength Testing

In accordance with the project specifications, destructive samples were obtained at a minimum frequency of one sample per 500 linear feet of completed seam. Each destructive sample was divided into three equal-sized sections: one for field testing, one for laboratory

testing, and one to be archived. Prior to shipment of the laboratory samples to Golder, the field test sample was tested by Plastic Fusion on their tensiometer for peel and shear strength to determine the seam's conformance with the project specifications.

All the field samples and laboratory samples passed. Summaries of the field and laboratory destructive seam strength testing are included as Appendix U. Locations of destructive seam samples are shown on Figure 10.

# 5.0 LEACHATE COLLECTION SYSTEM INSTALLATION

## 5.1 Protective Cover Layer

### 5.1.1 Project Specifications

The project construction documents required the installation of a 12-inch thick protective cover layer over the entire waste cell. An alternate gravel material was suggested and approved for the project. The approved protective cover material was specified to be classified as a GW or GP in accordance with the USCS and a maximum of 2% passing the No. 200 Standard Sieve. In addition, the protective cover was to have a maximum calcium carbonate content of 15% and a minimum permeability of 1 x $10^{-3}$ cm/sec.

Placement of the protective cover layer was specified to be done with low ground pressure equipment to minimize pressure on the underlying geosynthetic materials. Equipment was not to be operated over the geosynthetic materials with less than 12 inches of protective cover. The completed surface was to be surveyed for verification of the thickness of the material.

### 5.1.2 Construction Procedures

Prior to installation of the protective cover, one soil sample (DL-1) of the protective cover material was obtained from an offsite borrow source. The sample was submitted to Golder and Grubbs, Hoskyn, Barton & Wyatt, Inc. for analysis. Table 5.1 presents a summary of the test results of the pre-construction sample. The laboratory test summary of the pre-construction soil sample is included in Appendix V.

Table 5.1. Protective cover material pre-construction test summary.

| Sample ID | % Passing #200 Sieve | Carbonate Content | Coefficient of Permeability (cm/sec) |
|---|---|---|---|
| **Specification** | **<2%** | **<15%** | **>1.0 x $10^{-3}$** |
| DL-1 | <0.8% | 0.1% | 1.3 x $10^{-1}$ |

The protective cover layer was installed in accordance with the project drawings and specifications. Dumey installed the layer starting September 10, 2018 and completed the installation on September 20, 2018. Prior to installation of the protective cover, an 8-oz non-woven geotextile was installed over the geomembrane liner to provide a cushion for the protective cover. During the initial phase, Dumey spread the soil across the disposal cell except in the leachate trench and sump areas. Dumey then installed the leachate piping and sump materials followed by the installation of the soil protective cover layer on the side slopes of the disposal cell.

The Owner elected to install two rain flaps/berms perpendicular to the leachate collection trench which subdivide the disposal area into three subareas. Blind flanges were installed in the leachate collection pipe upgradient of the berms to prevent stormwater from entering the leachate collection system. Future trapped stormwater in the unused subsection areas of the disposal area will be pumped to the stormwater ponds. This will allow the landfill facility to minimize leachate production.

The final elevations of the completed protective cover layer were verified through an independent survey conducted by Ridge Surveying on October 9, 2018. Figure 11 presents the protective cover layer certification grid and recorded elevations and Figure 12 is a record drawing of the final grades of the protective cover layer. Based on the survey, the top of the protective cover layer was constructed with a minimum thickness of 1 ft.

Photos 23 through 27 in Appendix B present the protective cover layer construction activities.

## 5.2 Leachate Collection Trench and Sump

### 5.2.1 Project Specifications

The project specifications required the leachate collection trench to consist of a 6-inch diameter SDR 17 HDPE perforated pipe to be placed in a washed gravel bed and wrapped in an 8-ounce non-woven geotextile fabric. The perforated pipe was specified to have 3/8-inch diameter holes spaced on 6-inch centers. The washed gravel was specified to be less than 3 inches in diameter, with a calcium carbonate content of less than 15%, and a maximum of 5% passing the No. 8 Standard Sieve.

On each end (east and west) of the disposal cell, a 6-inch diameter solid wall SDR 17 HDPE leachate collection cleanout riser pipe was to be connected to the perforated collection pipe. The cleanout riser pipes were specified to be installed into concrete headwalls to be constructed at the top of the waste cell slopes.

An 18-inch diameter SDR 17 HDPE leachate pump riser pipe was specified to be installed on the western slope of the landfill and to rest in the base of the leachate collection sump. The lower 3 feet of the riser pipe was specified to be perforated with 3/4-inch diameter holes on 12-inch centers. The leachate pump riser pipe was to be installed into the concrete headwall along with the cleanout riser pipe.

### 5.2.2 Construction Procedures

Plastic Fusion submitted information on the leachate collection piping and based on this information, FTN approved the piping material for shipment to the project site.

Prior to installation of the collection trench, samples of the washed gravel and geotextile fabric were submitted for conformance testing. Both materials met the requirements of the project specifications and were approved for shipment to the project site. Results of the washed gravel analyses are included as Appendix V and the results of the geotextile fabric material testing are included as Appendix W.

Construction of the leachate collection trench was conducted from September 15, 2018 through October 12, 2018. The leachate collection trench was constructed in accordance with the project drawings and specifications. Initially, Dumey placed the geotextile fabric in the base of the collection trench and the collection sump over the geomembrane liner, and then placed approximately 6 inches of gravel on top of the geotextile. Plastic Fusion then welded the leachate collection pipe together (including the solid wall cleanout pipes at the ends of the pipeline) and Dumey placed the pipe in the trench. Dumey then installed the 18-inch diameter HDPE leachate pump riser pipe in the collection sump and covered the collection pipe and sump with gravel up to the required depth. The geotextile was then wrapped over the top of the gravel in both the sump and the trench.

Photos 28 through 32 in Appendix B present the construction of the leachate collection trench and sump.

## 5.3 Leachate Pump System

### 5.3.1 Project Specifications

The project specifications required the installation of a side-slope riser pumping system for the leachate collection sump. The pumping system was to be installed in the 18-inch diameter HDPE side-slope riser pipe in the sump on the western perimeter berm of the waste disposal area. The pump was designed to discharge into a dual-contained pipeline that was to be installed to the existing leachate storage system located southwest of the project area.

### 5.3.2 Construction Procedures

The approved leachate pumping system was manufactured by Advanced Fluid Technologies (AFT). The submittal information for pumping system can be found in Appendix X. Installation of the leachate pumping system was performed in accordance with the project drawings and specifications. Plastic Fusion installed the dual-contained HDPE pipeline from the concrete headwall to the existing leachate storage system. In accordance with the project specifications, the dual-contained pipeline was air-tested for potential leaks, and the pipeline met the project requirements. Photos 33 through 38 in Appendix B present the installation of the leachate transmission pipeline and the riser pipe headwall.

AFT installed pumping system starting October 8, 2018 and completed the installation on October 9, 2018. Figure 13 illustrates the leachate sump pump control settings for Cell 1/2. The system was successfully tested and performs as specified.

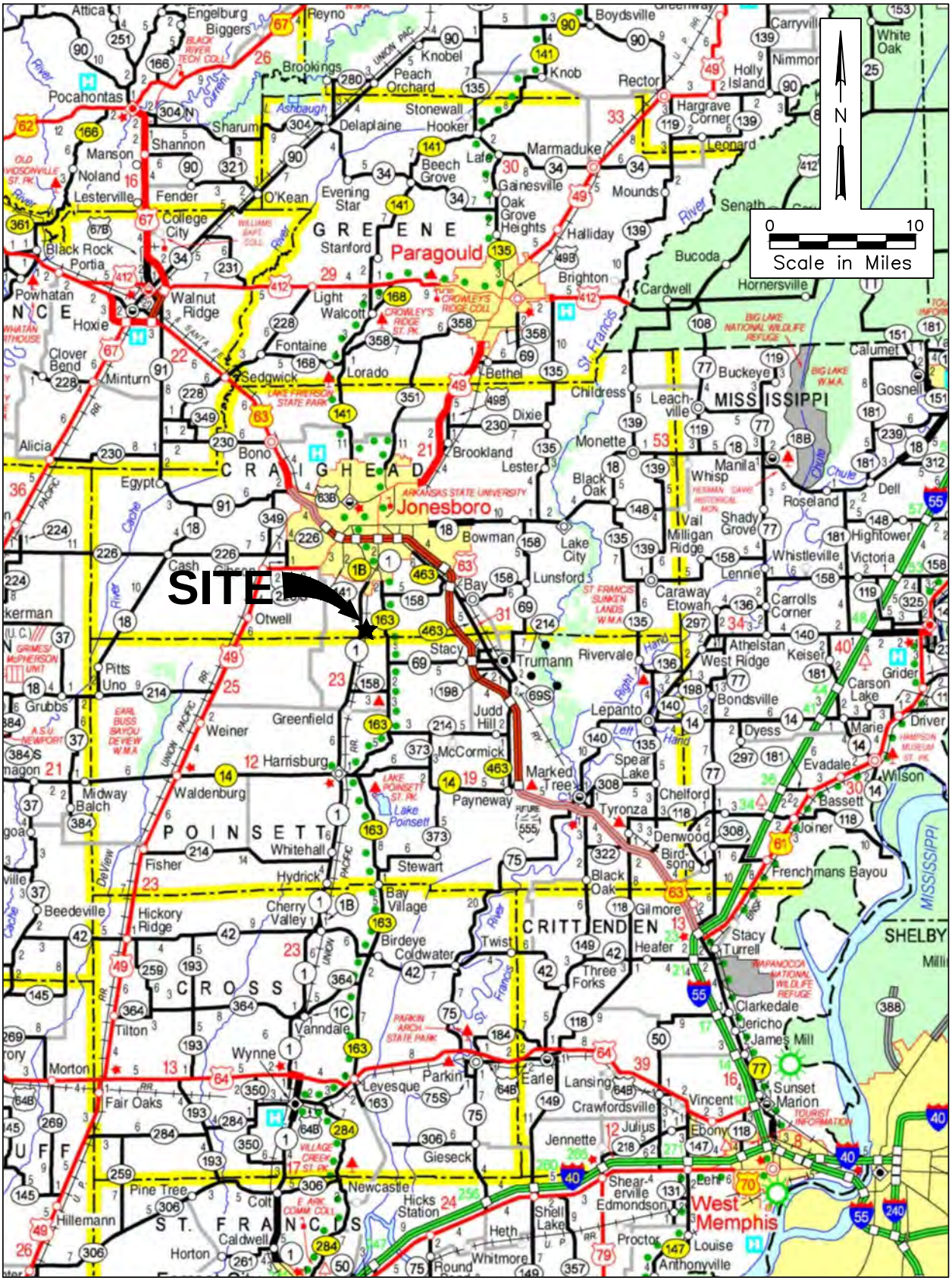
# 6.0 CONCLUSIONS

Construction of Cell 1/2 of the CCSWDA Legacy Landfill began in July 2018 and was substantially complete on October 24, 2018. The disposal area was constructed according to the project specifications, the facility CQA Plan, and APCEC Regulation No. 22. Required field and laboratory testing was performed and successfully completed as detailed in this report. Elevations of respective components of the cell liner system were within the project specifications as indicated on the Record Drawings.

The Professional Engineering certification for the construction of Cell 1/2 of the landfill is included at the beginning of this report.

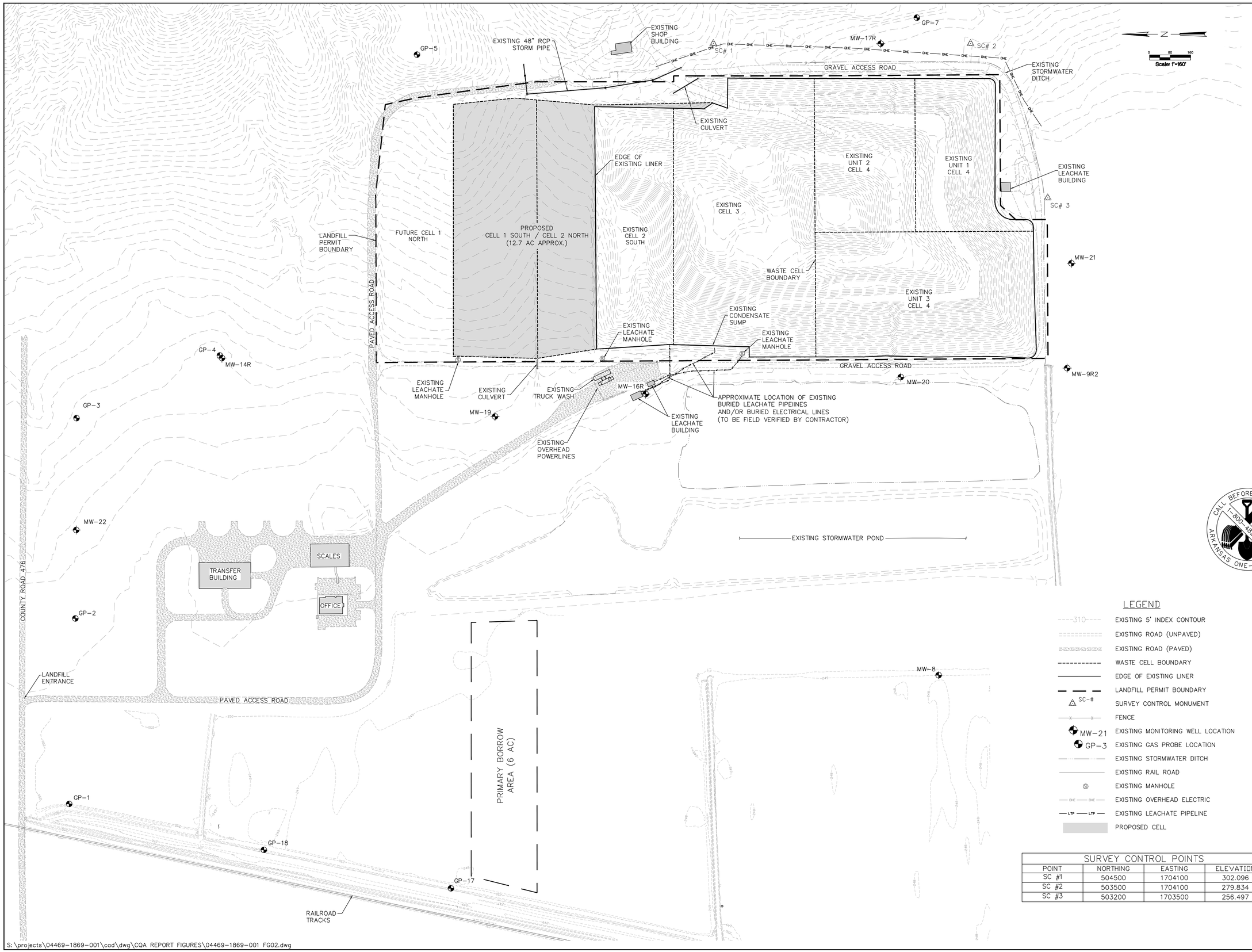
# APPENDIX A

**Figures**




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Figure 1. Legacy Landfill site location map.




CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

## LEGEND

- 310 — EXISTING 5' INDEX CONTOUR
- EXISTING ROAD (UNPAVED)
- EXISTING ROAD (PAVED)
- WASTE CELL BOUNDARY
- EDGE OF EXISTING LINER
- LANDFILL PERMIT BOUNDARY
- SC-# — SURVEY CONTROL MONUMENT
- FENCE
- MW-21 — EXISTING MONITORING WELL LOCATION
- GP-3 — EXISTING GAS PROBE LOCATION
- EXISTING STORMWATER DITCH
- EXISTING RAIL ROAD
- EXISTING MANHOLE
- OHE — EXISTING OVERHEAD ELECTRIC
- LTP — EXISTING LEACHATE PIPELINE
- PROPOSED CELL

### SURVEY CONTROL POINTS

| POINT | NORTHING | EASTING | ELEVATION |
|---|---|---|---|
| SC #1 | 504500 | 1704100 | 302.096 |
| SC #2 | 503500 | 1704100 | 279.834 |
| SC #3 | 503200 | 1703500 | 256.497 |

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FTN Associates, Ltd. — water resources / environmental consultants

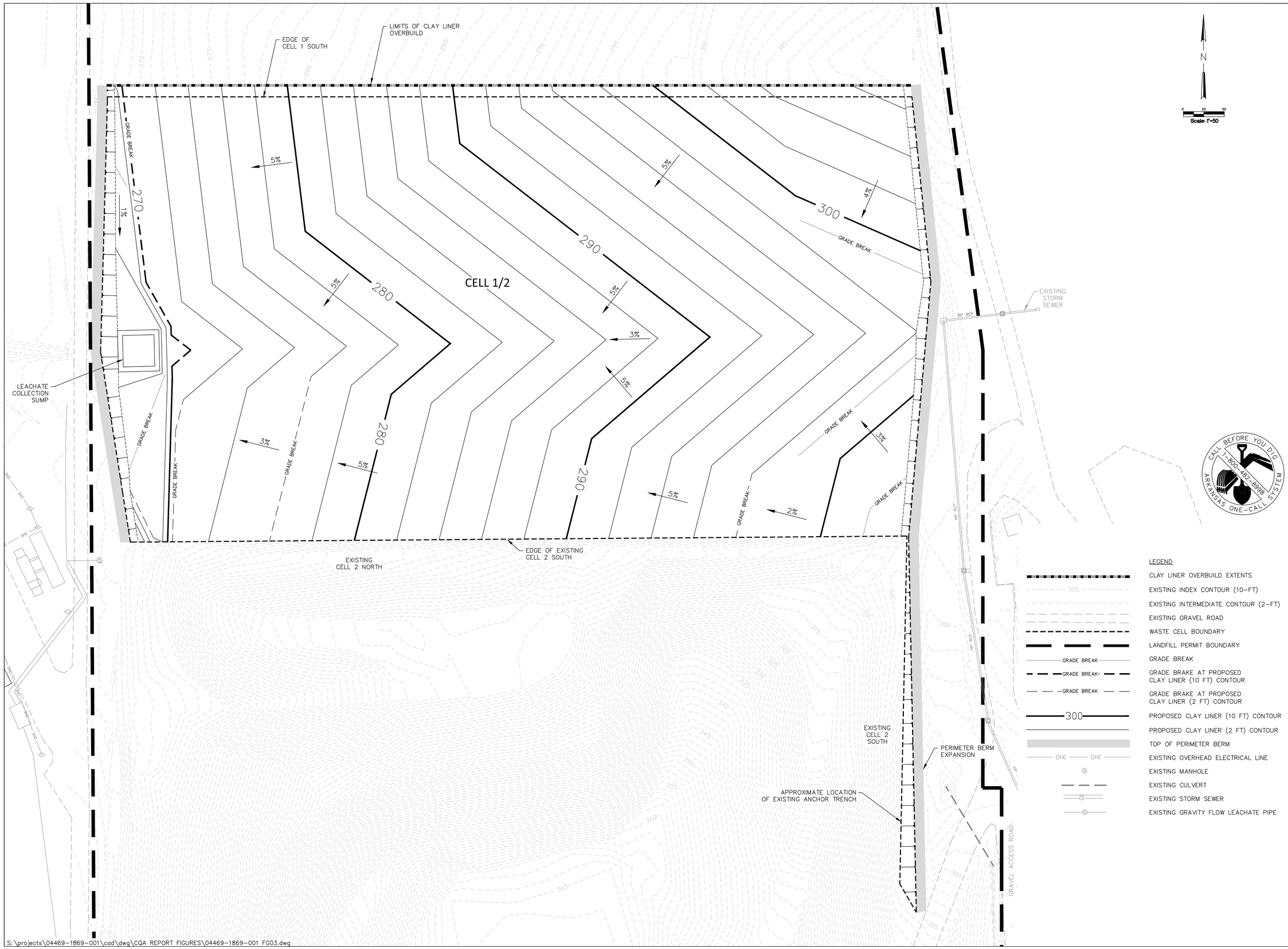
CERTIFICATE OF AUTHORIZATION — FTN Associates, Ltd. — No. 63 — ENGINEER — ARKANSAS

STATE OF ARKANSAS — LICENSED PROFESSIONAL ENGINEER — NICHOLAS A. TAUSCH — No. 14036 — November 6, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## FIGURE 2
## SITE PLAN
## PRE-CONSTRUCTION CONDITIONS

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG02.dwg |
| APPROVED: NAT | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 160' | DATE: 11/06/18 |
| SHEET NO. 2 OF 13 | |




LEGEND

- CLAY LINER OVERBUILD EXTENTS
- EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BRAKE AT PROPOSED CLAY LINER (10 FT) CONTOUR
- GRADE BRAKE AT PROPOSED CLAY LINER (2 FT) CONTOUR
- PROPOSED CLAY LINER (10 FT) CONTOUR
- PROPOSED CLAY LINER (2 FT) CONTOUR
- TOP OF PERIMETER BERM
- EXISTING OVERHEAD ELECTRICAL LINE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING GRAVITY FLOW LEACHATE PIPE

FTN Associates, Ltd. water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION NUMBER ARKANSAS ENGINEERING No. 63 FTN Associates, Ltd.

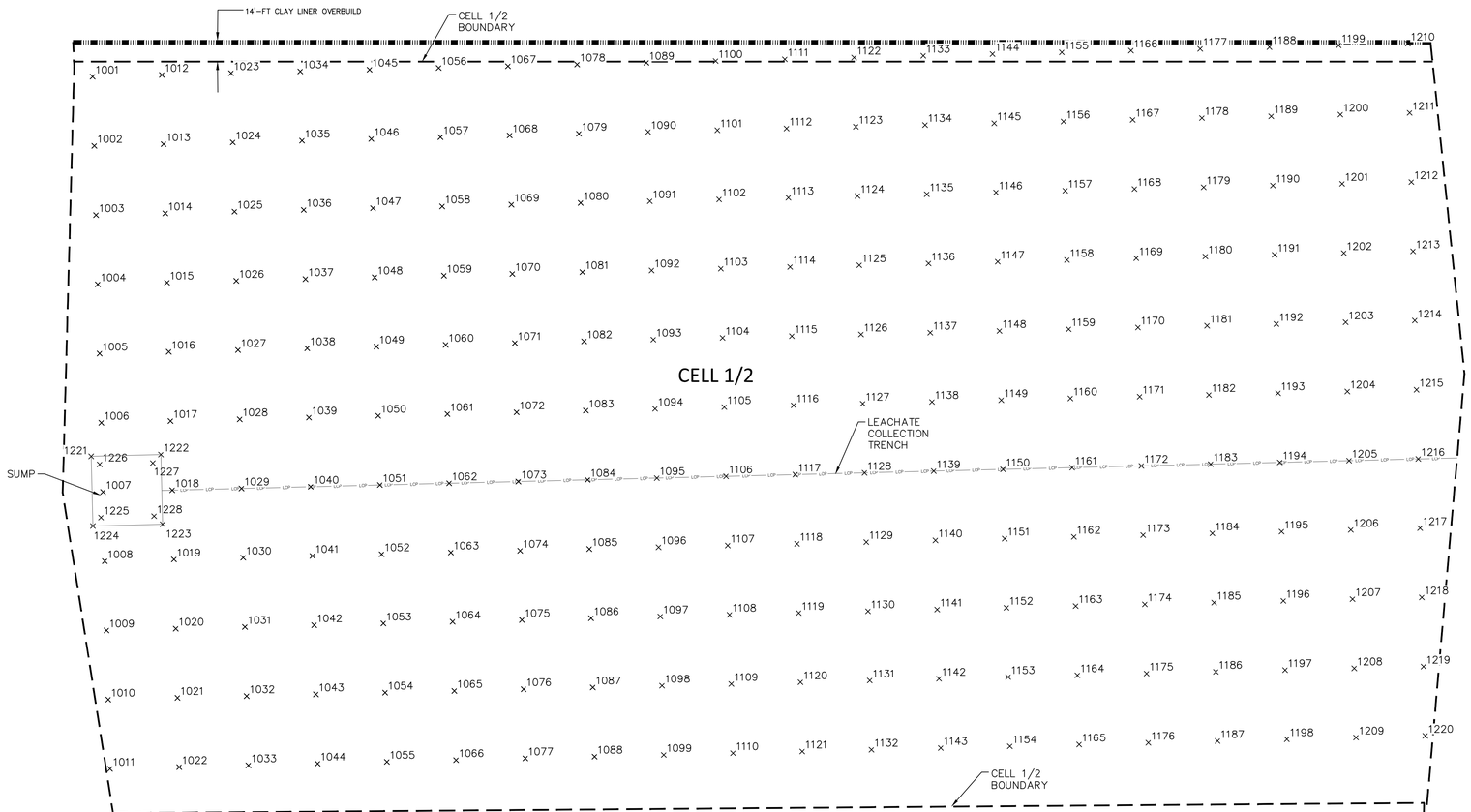
STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER NICHOLAS J. VAUGHN No. 14284 November 6, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## FIGURE 3
## CONSTRUCTION PLAN

| | |
|---|---|
| DRAWN BY: gwm | FILE NAME: FG03.DWG |
| APPROVED: njvs | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 3 OF 13 | |

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| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation |
| 1001 | 505485.78 | 1702897.57 | 266.1 |
| 1002 | 505435.80 | 1702898.83 | 266.0 |
| 1003 | 505385.82 | 1702900.08 | 264.9 |
| 1004 | 505335.83 | 1702901.34 | 264.9 |
| 1005 | 505285.85 | 1702902.59 | 263.9 |
| 1006 | 505235.86 | 1702903.85 | 263.4 |
| 1007 | 505185.88 | 1702905.10 | 261.1 |
| 1008 | 505135.90 | 1702906.36 | 264.1 |
| 1009 | 505085.91 | 1702907.61 | 265.0 |
| 1010 | 505035.93 | 1702908.86 | 265.7 |
| 1011 | 504985.94 | 1702910.12 | 265.0 |
| 1012 | 505487.04 | 1702947.56 | 270.1 |
| 1013 | 505437.06 | 1702948.81 | 269.9 |
| 1014 | 505387.07 | 1702950.07 | 269.6 |
| 1015 | 505337.09 | 1702951.32 | 269.4 |
| 1016 | 505287.10 | 1702952.58 | 269.2 |
| 1017 | 505237.12 | 1702953.83 | 268.6 |
| 1018 | 505187.13 | 1702955.08 | 265.4 |
| 1019 | 505137.15 | 1702956.34 | 266.0 |
| 1020 | 505087.17 | 1702957.60 | 266.6 |
| 1021 | 505037.18 | 1702958.85 | 267.5 |
| 1022 | 504987.20 | 1702960.10 | 268.4 |
| 1023 | 505488.29 | 1702997.54 | 272.6 |
| 1024 | 505438.31 | 1702998.80 | 272.4 |
| 1025 | 505388.33 | 1703000.05 | 272.2 |
| 1026 | 505338.34 | 1703001.30 | 271.8 |
| 1027 | 505288.36 | 1703002.56 | 271.6 |
| 1028 | 505238.37 | 1703003.82 | 270.5 |
| 1029 | 505188.39 | 1703005.07 | 268.7 |
| 1030 | 505138.40 | 1703006.32 | 270.6 |
| 1031 | 505088.42 | 1703007.58 | 271.1 |
| 1032 | 505038.44 | 1703008.83 | 271.5 |
| 1033 | 504988.45 | 1703010.09 | 271.8 |
| 1034 | 505489.55 | 1703047.52 | 275.0 |
| 1035 | 505439.56 | 1703048.78 | 274.9 |
| 1036 | 505389.58 | 1703050.03 | 274.7 |
| 1037 | 505339.60 | 1703051.29 | 274.3 |
| 1038 | 505289.61 | 1703052.54 | 274.0 |
| 1039 | 505239.63 | 1703053.80 | 272.1 |
| 1040 | 505189.64 | 1703055.05 | 270.2 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation |
| 1041 | 505139.66 | 1703056.31 | 272.1 |
| 1042 | 505089.68 | 1703057.56 | 272.5 |
| 1043 | 505039.69 | 1703058.82 | 272.9 |
| 1044 | 504989.71 | 1703060.07 | 273.3 |
| 1045 | 505490.80 | 1703097.51 | 277.6 |
| 1046 | 505440.82 | 1703098.76 | 277.3 |
| 1047 | 505390.84 | 1703100.02 | 277.1 |
| 1048 | 505340.85 | 1703101.27 | 276.9 |
| 1049 | 505290.87 | 1703102.53 | 275.7 |
| 1050 | 505240.88 | 1703103.78 | 273.7 |
| 1051 | 505190.90 | 1703105.04 | 271.7 |
| 1052 | 505140.91 | 1703106.29 | 273.5 |
| 1053 | 505090.93 | 1703107.55 | 273.8 |
| 1054 | 505040.95 | 1703108.80 | 274.2 |
| 1055 | 504990.96 | 1703110.06 | 274.7 |
| 1056 | 505492.06 | 1703147.49 | 280.1 |
| 1057 | 505442.07 | 1703148.75 | 279.8 |
| 1058 | 505392.09 | 1703150.00 | 279.6 |
| 1059 | 505342.11 | 1703151.26 | 279.1 |
| 1060 | 505292.12 | 1703152.51 | 277.2 |
| 1061 | 505242.14 | 1703153.77 | 275.2 |
| 1062 | 505192.15 | 1703155.02 | 273.3 |
| 1063 | 505142.17 | 1703156.28 | 275.1 |
| 1064 | 505092.18 | 1703157.53 | 275.6 |
| 1065 | 505042.20 | 1703158.79 | 276.1 |
| 1066 | 504992.22 | 1703160.04 | 276.7 |
| 1067 | 505493.31 | 1703197.48 | 282.5 |
| 1068 | 505443.33 | 1703198.73 | 282.3 |
| 1069 | 505393.35 | 1703199.99 | 282.1 |
| 1070 | 505343.35 | 1703200.66 | 280.6 |
| 1071 | 505293.38 | 1703202.50 | 278.8 |
| 1072 | 505243.39 | 1703203.75 | 276.9 |
| 1073 | 505193.41 | 1703205.01 | 274.9 |
| 1074 | 505143.42 | 1703206.26 | 276.9 |
| 1075 | 505093.44 | 1703207.52 | 277.6 |
| 1076 | 505043.46 | 1703208.77 | 278.0 |
| 1077 | 504993.47 | 1703210.03 | 278.7 |
| 1078 | 505494.57 | 1703247.46 | 285.0 |
| 1079 | 505444.58 | 1703248.72 | 284.8 |
| 1080 | 505394.60 | 1703249.97 | 284.3 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation |
| 1081 | 505344.62 | 1703251.23 | 282.4 |
| 1082 | 505294.63 | 1703252.48 | 280.5 |
| 1083 | 505244.65 | 1703253.74 | 278.5 |
| 1084 | 505194.66 | 1703254.99 | 276.4 |
| 1085 | 505144.68 | 1703256.24 | 278.5 |
| 1086 | 505094.69 | 1703257.50 | 279.5 |
| 1087 | 505044.71 | 1703258.76 | 280.0 |
| 1088 | 504994.73 | 1703260.01 | 280.6 |
| 1089 | 505495.82 | 1703297.45 | 287.5 |
| 1090 | 505445.84 | 1703298.70 | 287.2 |
| 1091 | 505395.85 | 1703299.96 | 285.9 |
| 1092 | 505345.87 | 1703301.21 | 284.0 |
| 1093 | 505295.89 | 1703302.46 | 282.0 |
| 1094 | 505245.90 | 1703303.72 | 280.1 |
| 1095 | 505195.92 | 1703304.98 | 278.0 |
| 1096 | 505145.93 | 1703306.23 | 280.0 |
| 1097 | 505095.95 | 1703307.48 | 281.4 |
| 1098 | 505045.97 | 1703308.74 | 281.9 |
| 1099 | 504995.98 | 1703309.99 | 282.5 |
| 1100 | 505497.08 | 1703347.43 | 290.0 |
| 1101 | 505447.09 | 1703348.68 | 289.4 |
| 1102 | 505397.11 | 1703349.94 | 287.3 |
| 1103 | 505347.13 | 1703351.20 | 285.5 |
| 1104 | 505297.14 | 1703352.45 | 283.6 |
| 1105 | 505247.16 | 1703353.70 | 281.6 |
| 1106 | 505197.17 | 1703354.96 | 279.7 |
| 1107 | 505147.19 | 1703356.21 | 281.6 |
| 1108 | 505097.20 | 1703357.47 | 283.3 |
| 1109 | 505047.22 | 1703358.72 | 283.9 |
| 1110 | 504997.24 | 1703359.98 | 284.4 |
| 1111 | 505498.33 | 1703397.41 | 292.5 |
| 1112 | 505448.35 | 1703398.67 | 290.9 |
| 1113 | 505398.36 | 1703399.92 | 288.9 |
| 1114 | 505348.38 | 1703401.18 | 287.1 |
| 1115 | 505298.40 | 1703402.43 | 285.1 |
| 1116 | 505248.41 | 1703403.69 | 283.2 |
| 1117 | 505198.43 | 1703404.94 | 281.3 |
| 1118 | 505148.44 | 1703406.20 | 283.3 |
| 1119 | 505098.46 | 1703407.45 | 285.1 |
| 1120 | 505048.47 | 1703408.71 | 285.7 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation |
| 1121 | 504998.49 | 1703409.96 | 286.3 |
| 1122 | 505499.59 | 1703447.40 | 294.4 |
| 1123 | 505449.60 | 1703448.65 | 292.5 |
| 1124 | 505399.62 | 1703449.91 | 290.5 |
| 1125 | 505349.64 | 1703451.16 | 288.6 |
| 1126 | 505299.65 | 1703452.42 | 286.7 |
| 1127 | 505249.67 | 1703453.67 | 284.7 |
| 1128 | 505199.68 | 1703454.93 | 282.8 |
| 1129 | 505149.70 | 1703456.18 | 284.8 |
| 1130 | 505099.71 | 1703457.44 | 286.7 |
| 1131 | 505049.73 | 1703458.69 | 287.6 |
| 1132 | 504999.75 | 1703459.95 | 288.3 |
| 1133 | 505500.84 | 1703497.38 | 296.0 |
| 1134 | 505450.86 | 1703498.64 | 294.1 |
| 1135 | 505400.87 | 1703499.89 | 292.2 |
| 1136 | 505350.89 | 1703501.15 | 290.2 |
| 1137 | 505300.91 | 1703502.40 | 288.2 |
| 1138 | 505250.92 | 1703503.66 | 286.2 |
| 1139 | 505200.94 | 1703504.91 | 284.4 |
| 1140 | 505150.95 | 1703506.17 | 286.4 |
| 1141 | 505100.97 | 1703507.42 | 288.3 |
| 1142 | 505050.98 | 1703508.68 | 289.7 |
| 1143 | 505001.00 | 1703509.93 | 290.2 |
| 1144 | 505502.10 | 1703547.37 | 297.6 |
| 1145 | 505452.11 | 1703548.62 | 295.6 |
| 1146 | 505402.13 | 1703549.88 | 293.8 |
| 1147 | 505352.14 | 1703551.13 | 291.8 |
| 1148 | 505302.16 | 1703552.39 | 289.9 |
| 1149 | 505252.18 | 1703553.64 | 288.0 |
| 1150 | 505202.19 | 1703554.90 | 286.0 |
| 1151 | 505152.21 | 1703556.15 | 287.9 |
| 1152 | 505102.22 | 1703557.41 | 289.9 |
| 1153 | 505052.24 | 1703558.66 | 291.6 |
| 1154 | 505002.26 | 1703559.92 | 292.1 |
| 1155 | 505503.35 | 1703597.35 | 299.2 |
| 1156 | 505453.37 | 1703598.61 | 297.2 |
| 1157 | 505403.38 | 1703599.86 | 295.3 |
| 1158 | 505353.40 | 1703601.12 | 293.4 |
| 1159 | 505303.42 | 1703602.37 | 291.4 |
| 1160 | 505253.43 | 1703603.63 | 289.5 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation |
| 1161 | 505203.45 | 1703604.88 | 287.5 |
| 1162 | 505153.46 | 1703606.14 | 289.5 |
| 1163 | 505103.48 | 1703607.39 | 291.4 |
| 1164 | 505053.49 | 1703608.64 | 293.4 |
| 1165 | 505003.51 | 1703609.90 | 294.0 |
| 1166 | 505504.61 | 1703647.34 | 300.8 |
| 1167 | 505454.62 | 1703648.59 | 298.7 |
| 1168 | 505404.64 | 1703649.84 | 296.9 |
| 1169 | 505354.65 | 1703651.10 | 295.0 |
| 1170 | 505304.67 | 1703652.36 | 292.9 |
| 1171 | 505254.69 | 1703653.61 | 291.1 |
| 1172 | 505204.70 | 1703654.86 | 289.1 |
| 1173 | 505154.72 | 1703656.12 | 291.0 |
| 1174 | 505104.73 | 1703657.37 | 293.0 |
| 1175 | 505054.75 | 1703658.63 | 294.9 |
| 1176 | 505004.76 | 1703659.88 | 295.9 |
| 1177 | 505505.86 | 1703697.32 | 302.2 |
| 1178 | 505455.88 | 1703698.58 | 300.4 |
| 1179 | 505405.89 | 1703699.83 | 298.4 |
| 1180 | 505355.91 | 1703701.08 | 296.5 |
| 1181 | 505305.93 | 1703702.34 | 294.6 |
| 1182 | 505255.94 | 1703703.59 | 292.6 |
| 1183 | 505205.96 | 1703704.85 | 290.7 |
| 1184 | 505155.97 | 1703706.10 | 292.6 |
| 1185 | 505105.99 | 1703707.36 | 294.6 |
| 1186 | 505056.00 | 1703708.61 | 296.4 |
| 1187 | 505006.02 | 1703709.87 | 296.9 |
| 1188 | 505507.12 | 1703747.30 | 303.1 |
| 1189 | 505457.13 | 1703748.56 | 301.3 |
| 1190 | 505407.15 | 1703749.81 | 299.5 |
| 1191 | 505357.16 | 1703751.07 | 297.7 |
| 1192 | 505307.18 | 1703752.32 | 296.0 |
| 1193 | 505257.20 | 1703753.58 | 294.2 |
| 1194 | 505207.21 | 1703754.83 | 292.3 |
| 1195 | 505157.23 | 1703756.09 | 294.2 |
| 1196 | 505107.24 | 1703757.34 | 296.1 |
| 1197 | 505057.26 | 1703758.60 | 297.6 |
| 1198 | 505007.27 | 1703759.85 | 297.8 |
| 1199 | 505508.37 | 1703797.29 | 304.0 |
| 1200 | 505458.39 | 1703798.54 | 302.2 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation |
| 1201 | 505408.40 | 1703799.80 | 300.3 |
| 1202 | 505358.42 | 1703801.05 | 298.6 |
| 1203 | 505308.43 | 1703802.31 | 296.8 |
| 1204 | 505258.45 | 1703803.56 | 295.7 |
| 1205 | 505208.47 | 1703804.82 | 293.9 |
| 1206 | 505158.48 | 1703806.07 | 295.8 |
| 1207 | 505108.50 | 1703807.33 | 297.4 |
| 1208 | 505058.51 | 1703808.58 | 298.2 |
| 1209 | 505008.53 | 1703809.84 | 298.8 |
| 1210 | 505509.63 | 1703847.27 | 304.9 |
| 1211 | 505459.64 | 1703848.53 | 303.2 |
| 1212 | 505409.66 | 1703849.78 | 301.3 |
| 1213 | 505359.67 | 1703851.04 | 299.5 |
| 1214 | 505309.69 | 1703852.29 | 297.7 |
| 1215 | 505259.71 | 1703853.55 | 296.4 |
| 1216 | 505209.72 | 1703854.80 | 295.5 |
| 1217 | 505159.74 | 1703856.06 | 297.2 |
| 1218 | 505109.75 | 1703857.31 | 298.1 |
| 1219 | 505059.77 | 1703858.57 | 299.0 |
| 1220 | 505009.78 | 1703859.82 | 300.1 |
| 1221 | 505211.61 | 1702896.52 | 262.9 |
| 1222 | 505212.88 | 1702946.86 | 262.9 |
| 1223 | 505162.53 | 1702948.12 | 262.9 |
| 1224 | 505161.27 | 1702897.78 | 262.8 |
| 1225 | 505167.42 | 1702903.63 | 261.0 |
| 1226 | 505205.76 | 1702902.66 | 261.1 |
| 1227 | 505206.73 | 1702941.01 | 261.0 |
| 1228 | 505168.38 | 1702941.98 | 261.1 |

LEGEND

- 1023 — SUBGRADE 50' GRID POINT
- CLAY LINER OVERBUILD LIMITS
- CELL 1/2 BOUNDARY
- LEACHATE COLLECTION TRENCH

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CERTIFICATE OF AUTHORIZATION
FTN Associates, Ltd.
No. 63
JONESBORO, ARKANSAS

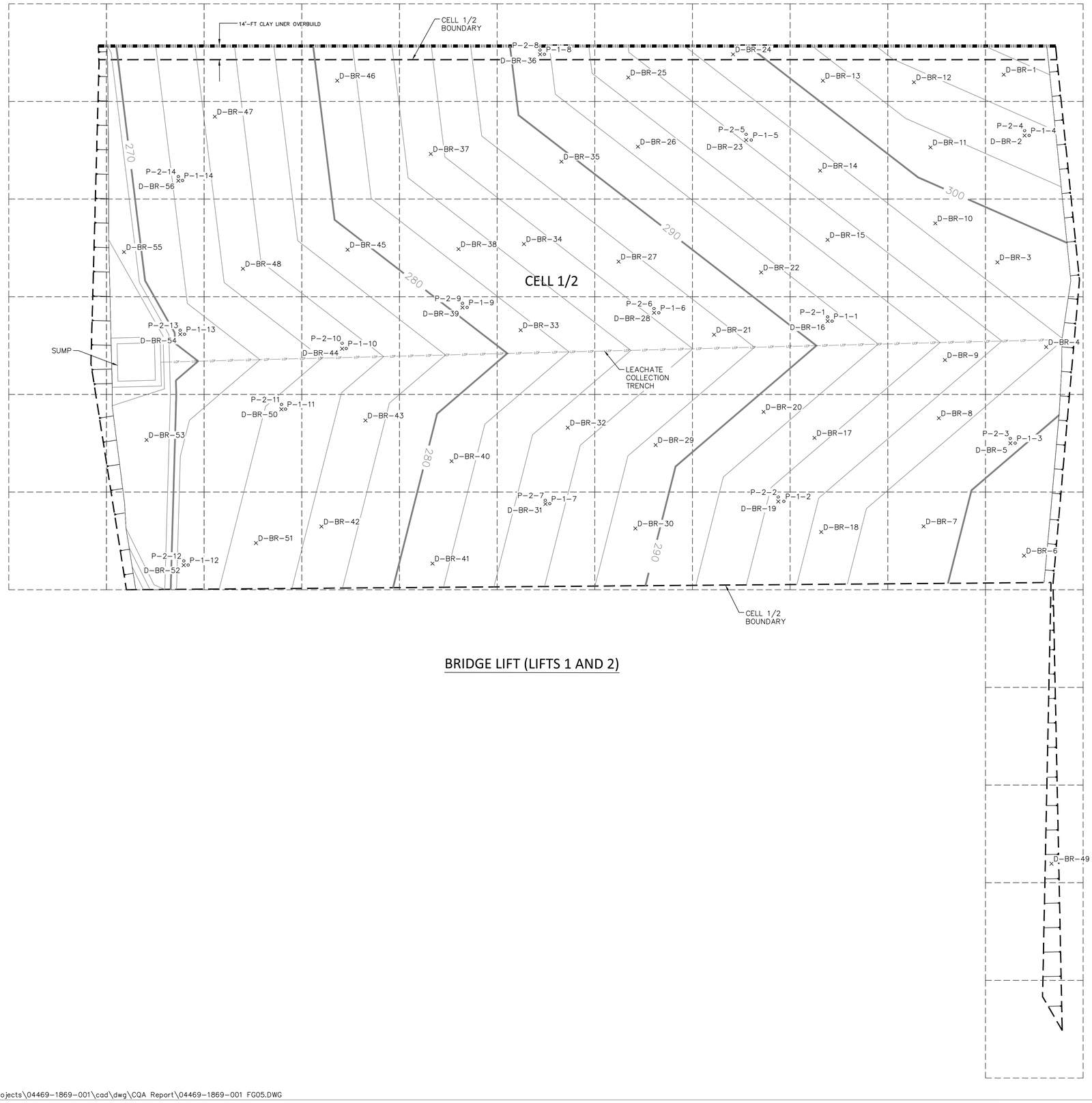
STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
NICHOLAS D. VAUGHN
No. 14288
November 6, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## LEGACY LANDFILL CELL CONSTRUCTION 2018
## JONESBORO, ARKANSAS

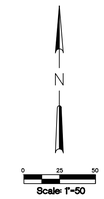
# FIGURE 4
# SUBGRADE SURVEY GRID

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG04.DWG |
| APPROVED: NDS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 4 of 13 | |

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BRIDGE LIFT (LIFTS 1 AND 2)




LEGEND

| | |
|---|---|
| P-1-7 | PERMEABILITY TEST LOCATION (PERMEABILITY-LIFT NO.-TEST NO.) |
| D-BR-31 | DENSITY TEST LOCATION (DENSITY-BRIDGE LIFT-TEST NO.) |
| | CLAY LINER OVERBUILD LIMITS |
| | CELL 1/2 BOUNDARY |
| | PERMEABILITY 100-FT GRID |
| | LEACHATE COLLECTION TRENCH |
| 300 | PROPOSED TOP OF CLAY LINER (10 FT) CONTOUR |
| | PROPOSED TOP OF CLAY LINER (2 FT) CONTOUR |
| | SLOPE INDICATOR |
| | TOE OF SLOPE |

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CERTIFICATE OF AUTHORIZATION
FTN Associates, Ltd.
No. 63
ARKANSAS ENGINEERING

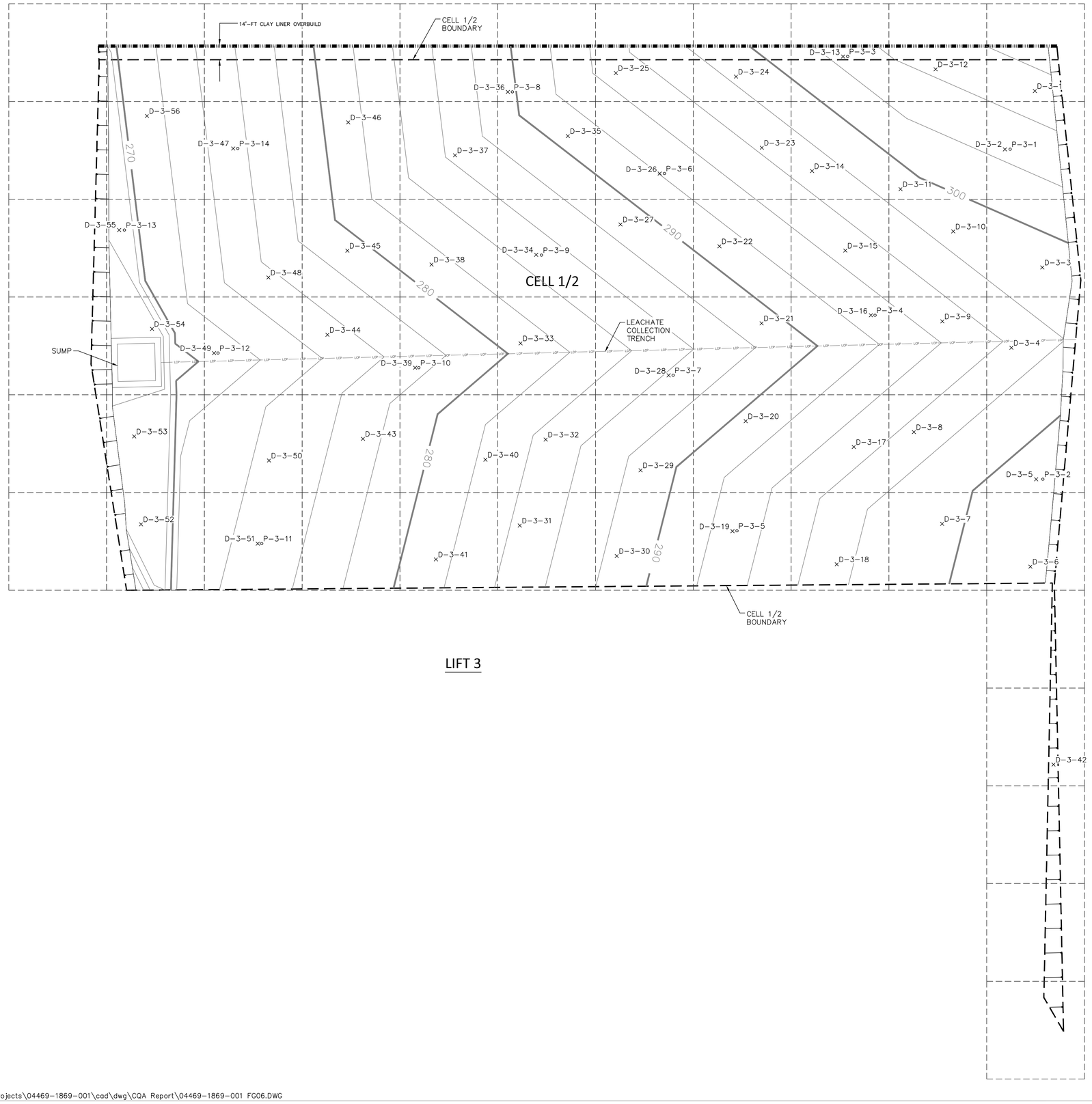
STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
NICHOLAS D. VAUGHN
No. 14088
November 6, 2018

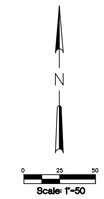
# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## LEGACY LANDFILL CELL CONSTRUCTION 2018
## JONESBORO, ARKANSAS

# FIGURE 5
# CLAY LINER TEST LOCATIONS BRIDGE LIFT (LIFTS 1 AND 2)

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG05.DWG |
| APPROVED: NDS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 5 of 13 | |

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LEGEND

| | |
|---|---|
| P-3-7 | PERMEABILITY TEST LOCATION (PERMEABILITY–LIFT NO.–TEST NO.) |
| D-3-31 | DENSITY TEST LOCATION (DENSITY–LIFT NO.–TEST NO.) |
| | CLAY LINER OVERBUILD LIMITS |
| | CELL 1/2 BOUNDARY |
| | PERMEABILITY 100–FT GRID |
| LCP | LEACHATE COLLECTION TRENCH |
| 300 | PROPOSED TOP OF CLAY LINER (10 FT) CONTOUR |
| | PROPOSED TOP OF CLAY LINER (2 FT) CONTOUR |
| | SLOPE INDICATOR |
| | TOE OF SLOPE |

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CERTIFICATE OF AUTHORIZATION
FTN Associates, Ltd.
No. 63
ENGINEER
ARKANSAS

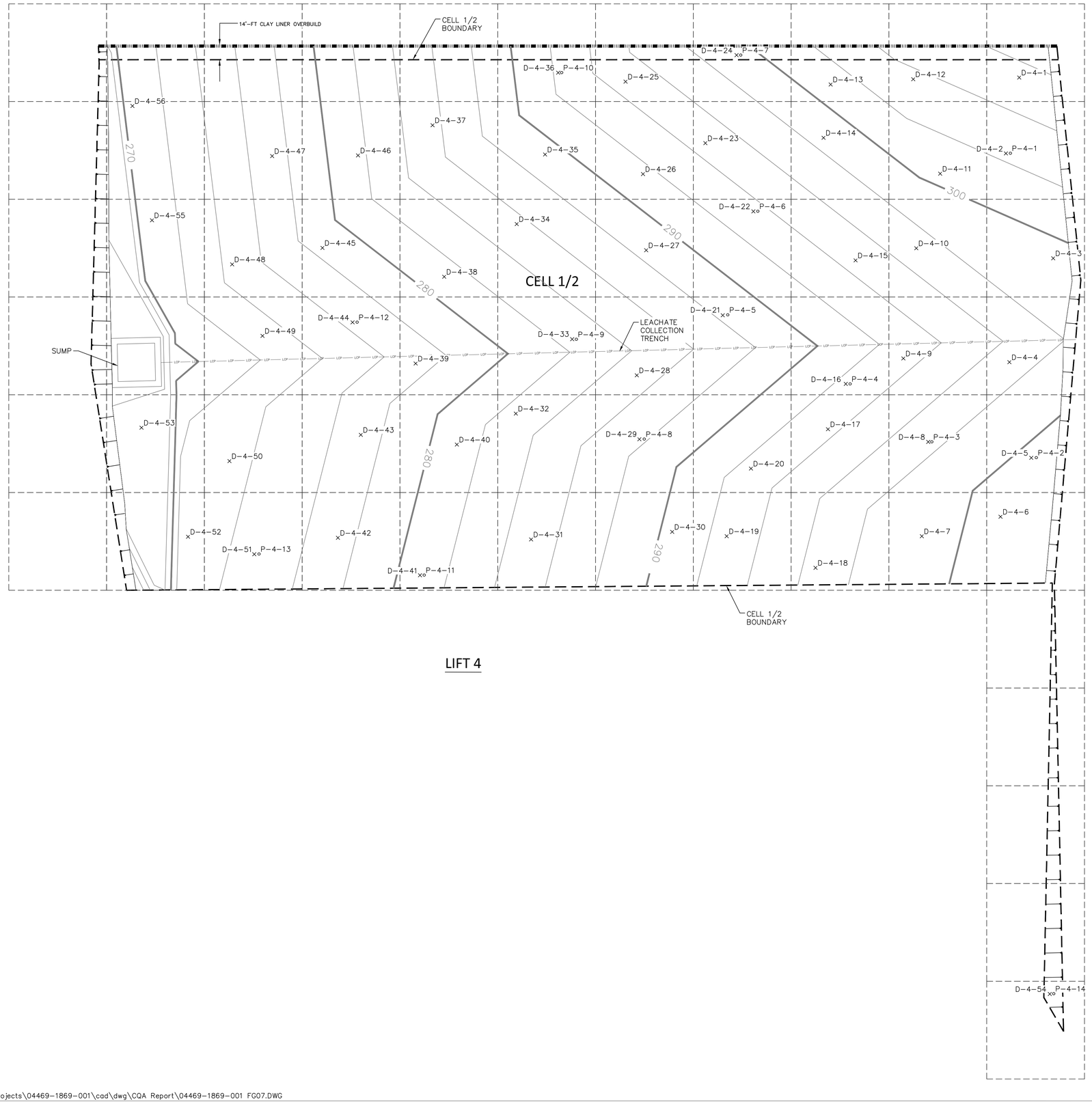
STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
NICHOLAS W. VAUGHN
No. 14288
November 6, 2018

**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**LEGACY LANDFILL CELL CONSTRUCTION 2018**
**JONESBORO, ARKANSAS**

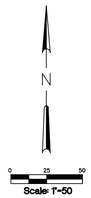
**FIGURE 6**
**CLAY LINER TEST LOCATIONS**
**LIFT 3**

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG06.DWG |
| APPROVED: NWS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 6 of 13 | |

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LIFT 4




LEGEND

- P-4-7 — PERMEABILITY TEST LOCATION (PERMEABILITY–LIFT NO.–TEST NO.)
- D-4-31 — DENSITY TEST LOCATION (DENSITY–LIFT NO.–TEST NO.)
- CLAY LINER OVERBUILD LIMITS
- CELL 1/2 BOUNDARY
- PERMEABILITY 100–FT GRID
- LEACHATE COLLECTION TRENCH
- 300 — PROPOSED TOP OF CLAY LINER (10 FT) CONTOUR
- PROPOSED TOP OF CLAY LINER (2 FT) CONTOUR
- SLOPE INDICATOR
- TOE OF SLOPE

FTN ASSOCIATES, Ltd.
water resources/environmental consultants





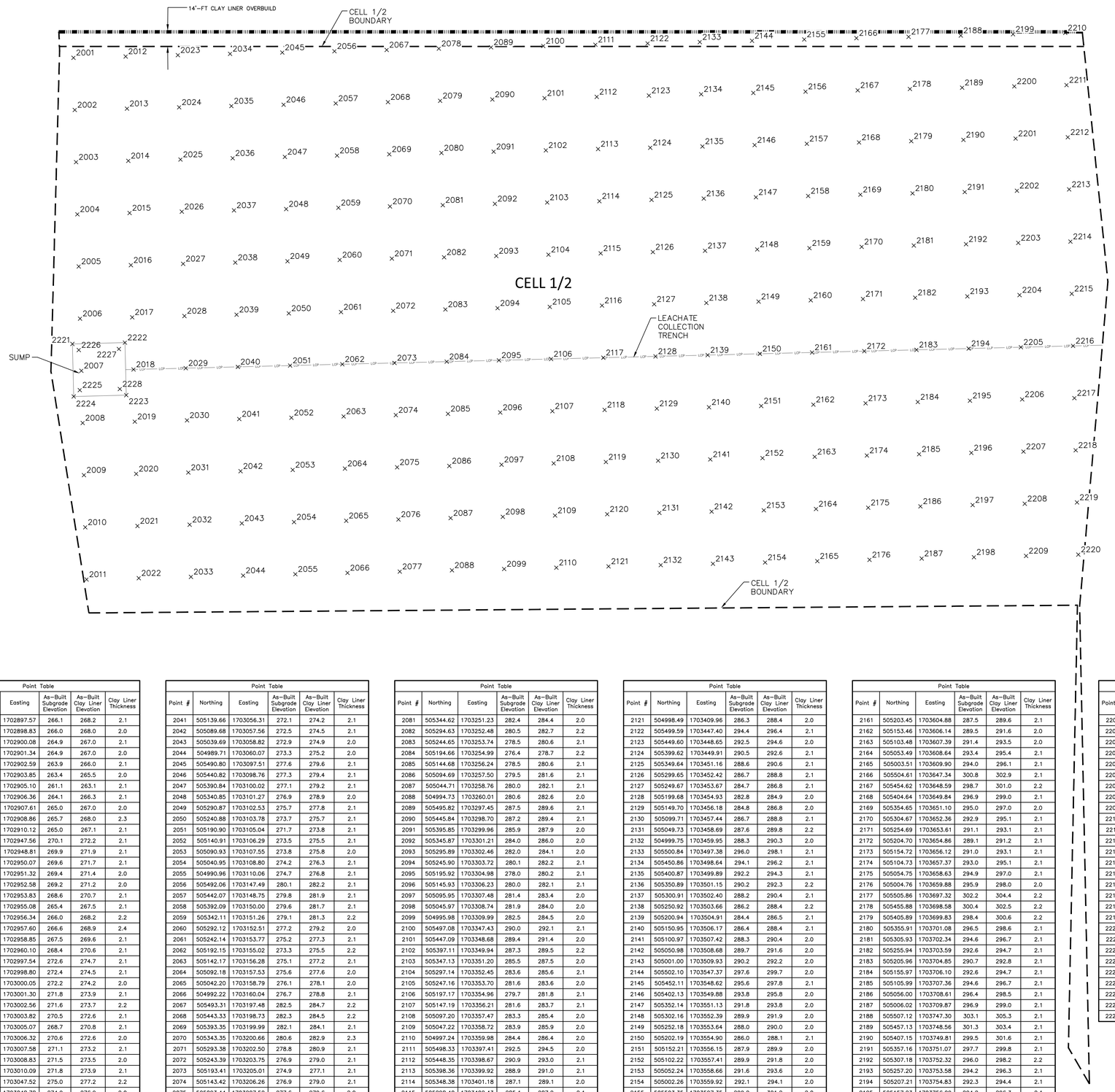


**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**LEGACY LANDFILL CELL CONSTRUCTION 2018**
**JONESBORO, ARKANSAS**

**FIGURE 7**
**CLAY LINER TEST LOCATIONS**
**LIFT 4**

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG07.DWG |
| APPROVED: NDS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 7 of 13 | |

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N

0 25 50
Scale: 1"=50

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation | As-Built Clay Liner Elevation | Clay Liner Thickness |
| 2001 | 505485.78 | 1702897.57 | 266.1 | 268.2 | 2.1 |
| 2002 | 505435.80 | 1702898.83 | 266.0 | 268.0 | 2.0 |
| 2003 | 505385.82 | 1702900.08 | 264.9 | 267.0 | 2.1 |
| 2004 | 505335.83 | 1702901.34 | 264.9 | 267.0 | 2.0 |
| 2005 | 505285.85 | 1702902.59 | 263.9 | 266.0 | 2.1 |
| 2006 | 505235.86 | 1702903.85 | 263.4 | 265.5 | 2.0 |
| 2007 | 505185.88 | 1702905.10 | 261.1 | 263.1 | 2.1 |
| 2008 | 505135.90 | 1702906.36 | 264.1 | 266.3 | 2.1 |
| 2009 | 505085.91 | 1702907.61 | 265.0 | 267.0 | 2.0 |
| 2010 | 505035.93 | 1702908.86 | 265.7 | 268.0 | 2.3 |
| 2011 | 504985.94 | 1702910.12 | 265.0 | 267.1 | 2.1 |
| 2012 | 505487.04 | 1702947.56 | 270.1 | 272.2 | 2.1 |
| 2013 | 505437.06 | 1702948.81 | 269.9 | 271.9 | 2.1 |
| 2014 | 505387.07 | 1702950.07 | 269.6 | 271.7 | 2.1 |
| 2015 | 505337.09 | 1702951.32 | 269.4 | 271.4 | 2.0 |
| 2016 | 505287.10 | 1702952.58 | 269.2 | 271.2 | 2.0 |
| 2017 | 505237.12 | 1702953.83 | 268.6 | 270.7 | 2.1 |
| 2018 | 505187.13 | 1702955.08 | 265.4 | 267.5 | 2.1 |
| 2019 | 505137.15 | 1702956.34 | 266.0 | 268.2 | 2.2 |
| 2020 | 505087.17 | 1702957.60 | 266.6 | 268.9 | 2.4 |
| 2021 | 505037.18 | 1702958.85 | 267.5 | 269.6 | 2.1 |
| 2022 | 504987.20 | 1702960.10 | 268.4 | 270.6 | 2.1 |
| 2023 | 505488.29 | 1702997.54 | 272.6 | 274.7 | 2.1 |
| 2024 | 505438.31 | 1702998.80 | 272.4 | 274.5 | 2.1 |
| 2025 | 505388.33 | 1703000.05 | 272.2 | 274.2 | 2.0 |
| 2026 | 505338.34 | 1703001.30 | 271.8 | 273.9 | 2.1 |
| 2027 | 505288.36 | 1703002.56 | 271.6 | 273.7 | 2.2 |
| 2028 | 505238.37 | 1703003.82 | 270.5 | 272.6 | 2.1 |
| 2029 | 505188.39 | 1703005.07 | 268.7 | 270.8 | 2.1 |
| 2030 | 505138.40 | 1703006.32 | 270.6 | 272.6 | 2.0 |
| 2031 | 505088.42 | 1703007.58 | 271.1 | 273.2 | 2.1 |
| 2032 | 505038.44 | 1703008.83 | 271.5 | 273.5 | 2.0 |
| 2033 | 504988.45 | 1703010.09 | 271.8 | 273.9 | 2.1 |
| 2034 | 505489.55 | 1703047.52 | 275.0 | 277.2 | 2.2 |
| 2035 | 505439.56 | 1703048.78 | 274.9 | 276.9 | 2.0 |
| 2036 | 505389.58 | 1703050.03 | 274.7 | 276.7 | 2.1 |
| 2037 | 505339.60 | 1703051.29 | 274.3 | 276.5 | 2.2 |
| 2038 | 505289.61 | 1703052.54 | 274.0 | 276.1 | 2.1 |
| 2039 | 505239.63 | 1703053.80 | 272.1 | 274.2 | 2.0 |
| 2040 | 505189.64 | 1703055.05 | 270.2 | 272.3 | 2.2 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation | As-Built Clay Liner Elevation | Clay Liner Thickness |
| 2041 | 505139.66 | 1703056.31 | 272.1 | 274.2 | 2.1 |
| 2042 | 505089.68 | 1703057.56 | 272.5 | 274.5 | 2.1 |
| 2043 | 505039.69 | 1703058.82 | 272.9 | 274.9 | 2.0 |
| 2044 | 504989.71 | 1703060.07 | 273.3 | 275.2 | 2.0 |
| 2045 | 505490.80 | 1703097.51 | 277.6 | 279.6 | 2.1 |
| 2046 | 505440.82 | 1703098.76 | 277.3 | 279.4 | 2.1 |
| 2047 | 505390.84 | 1703100.02 | 277.1 | 279.2 | 2.1 |
| 2048 | 505340.85 | 1703101.27 | 276.9 | 278.9 | 2.0 |
| 2049 | 505290.87 | 1703102.53 | 275.7 | 277.8 | 2.1 |
| 2050 | 505240.88 | 1703103.78 | 273.7 | 275.7 | 2.1 |
| 2051 | 505190.90 | 1703105.04 | 271.7 | 273.8 | 2.1 |
| 2052 | 505140.91 | 1703106.29 | 273.5 | 275.5 | 2.1 |
| 2053 | 505090.93 | 1703107.55 | 273.8 | 275.8 | 2.0 |
| 2054 | 505040.95 | 1703108.80 | 274.2 | 276.3 | 2.1 |
| 2055 | 504990.96 | 1703110.06 | 274.7 | 276.8 | 2.1 |
| 2056 | 505492.06 | 1703147.49 | 280.1 | 282.2 | 2.1 |
| 2057 | 505442.07 | 1703148.75 | 279.8 | 281.9 | 2.1 |
| 2058 | 505392.09 | 1703150.00 | 279.6 | 281.7 | 2.1 |
| 2059 | 505342.11 | 1703151.26 | 279.1 | 281.3 | 2.2 |
| 2060 | 505292.12 | 1703152.51 | 277.2 | 279.2 | 2.0 |
| 2061 | 505242.14 | 1703153.77 | 275.2 | 277.3 | 2.1 |
| 2062 | 505192.15 | 1703155.02 | 273.3 | 275.5 | 2.2 |
| 2063 | 505142.17 | 1703156.28 | 275.1 | 277.2 | 2.1 |
| 2064 | 505092.18 | 1703157.53 | 275.6 | 277.6 | 2.0 |
| 2065 | 505042.20 | 1703158.79 | 276.1 | 278.1 | 2.0 |
| 2066 | 504992.22 | 1703160.04 | 276.7 | 278.8 | 2.1 |
| 2067 | 505493.31 | 1703197.48 | 282.5 | 284.7 | 2.2 |
| 2068 | 505443.33 | 1703198.73 | 282.3 | 284.5 | 2.2 |
| 2069 | 505393.35 | 1703199.99 | 282.1 | 284.1 | 2.1 |
| 2070 | 505343.35 | 1703200.66 | 280.6 | 282.9 | 2.3 |
| 2071 | 505293.38 | 1703202.50 | 278.8 | 280.9 | 2.1 |
| 2072 | 505243.39 | 1703203.75 | 276.9 | 279.0 | 2.1 |
| 2073 | 505193.41 | 1703205.01 | 274.9 | 277.1 | 2.1 |
| 2074 | 505143.42 | 1703206.26 | 276.9 | 279.0 | 2.1 |
| 2075 | 505093.44 | 1703207.52 | 277.6 | 279.6 | 2.0 |
| 2076 | 505043.46 | 1703208.77 | 278.0 | 280.2 | 2.2 |
| 2077 | 504993.47 | 1703210.03 | 278.7 | 280.9 | 2.2 |
| 2078 | 505494.57 | 1703247.46 | 285.0 | 287.2 | 2.1 |
| 2079 | 505444.58 | 1703248.72 | 284.8 | 286.9 | 2.1 |
| 2080 | 505394.60 | 1703249.97 | 284.3 | 286.3 | 2.0 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation | As-Built Clay Liner Elevation | Clay Liner Thickness |
| 2081 | 505344.62 | 1703251.23 | 282.4 | 284.4 | 2.0 |
| 2082 | 505294.63 | 1703252.48 | 280.5 | 282.7 | 2.2 |
| 2083 | 505244.65 | 1703253.74 | 278.5 | 280.6 | 2.1 |
| 2084 | 505194.66 | 1703254.99 | 276.4 | 278.7 | 2.2 |
| 2085 | 505144.68 | 1703256.24 | 278.5 | 280.6 | 2.1 |
| 2086 | 505094.69 | 1703257.50 | 279.5 | 281.6 | 2.1 |
| 2087 | 505044.71 | 1703258.76 | 280.0 | 282.1 | 2.1 |
| 2088 | 504994.73 | 1703260.01 | 280.6 | 282.6 | 2.0 |
| 2089 | 505495.82 | 1703297.45 | 287.5 | 289.6 | 2.1 |
| 2090 | 505445.84 | 1703298.70 | 287.2 | 289.4 | 2.1 |
| 2091 | 505395.85 | 1703299.96 | 285.9 | 287.9 | 2.0 |
| 2092 | 505345.87 | 1703301.21 | 284.0 | 286.0 | 2.0 |
| 2093 | 505295.89 | 1703302.46 | 282.0 | 284.1 | 2.0 |
| 2094 | 505245.90 | 1703303.72 | 280.1 | 282.2 | 2.1 |
| 2095 | 505195.92 | 1703304.98 | 278.0 | 280.2 | 2.1 |
| 2096 | 505145.93 | 1703306.23 | 280.0 | 282.1 | 2.1 |
| 2097 | 505095.95 | 1703307.48 | 281.4 | 283.4 | 2.0 |
| 2098 | 505045.97 | 1703308.74 | 281.9 | 284.0 | 2.0 |
| 2099 | 504995.98 | 1703309.99 | 282.5 | 284.5 | 2.0 |
| 2100 | 505497.08 | 1703347.43 | 290.0 | 292.1 | 2.1 |
| 2101 | 505447.09 | 1703348.68 | 289.4 | 291.4 | 2.0 |
| 2102 | 505397.11 | 1703349.94 | 287.3 | 289.5 | 2.2 |
| 2103 | 505347.13 | 1703351.20 | 285.5 | 287.5 | 2.0 |
| 2104 | 505297.14 | 1703352.45 | 283.6 | 285.6 | 2.1 |
| 2105 | 505247.16 | 1703353.70 | 281.6 | 283.6 | 2.0 |
| 2106 | 505197.17 | 1703354.96 | 279.7 | 281.8 | 2.1 |
| 2107 | 505147.19 | 1703356.21 | 281.6 | 283.7 | 2.1 |
| 2108 | 505097.20 | 1703357.47 | 283.3 | 285.4 | 2.0 |
| 2109 | 505047.22 | 1703358.72 | 283.9 | 285.9 | 2.0 |
| 2110 | 504997.24 | 1703359.98 | 284.4 | 286.4 | 2.0 |
| 2111 | 505498.33 | 1703397.41 | 292.5 | 294.5 | 2.0 |
| 2112 | 505448.35 | 1703398.67 | 290.9 | 293.0 | 2.1 |
| 2113 | 505398.36 | 1703399.92 | 288.9 | 291.0 | 2.1 |
| 2114 | 505348.38 | 1703401.18 | 287.1 | 289.1 | 2.0 |
| 2115 | 505298.40 | 1703402.43 | 285.1 | 287.2 | 2.1 |
| 2116 | 505248.41 | 1703403.69 | 283.2 | 285.3 | 2.1 |
| 2117 | 505198.43 | 1703404.94 | 281.3 | 283.4 | 2.2 |
| 2118 | 505148.44 | 1703406.20 | 283.3 | 285.3 | 2.1 |
| 2119 | 505098.46 | 1703407.45 | 285.1 | 287.2 | 2.1 |
| 2120 | 505048.47 | 1703408.71 | 285.7 | 287.8 | 2.1 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation | As-Built Clay Liner Elevation | Clay Liner Thickness |
| 2121 | 504998.49 | 1703409.96 | 286.3 | 288.4 | 2.0 |
| 2122 | 505499.59 | 1703447.40 | 294.4 | 296.4 | 2.1 |
| 2123 | 505449.60 | 1703448.65 | 292.5 | 294.6 | 2.0 |
| 2124 | 505399.62 | 1703449.91 | 290.5 | 292.6 | 2.1 |
| 2125 | 505349.64 | 1703451.16 | 288.6 | 290.6 | 2.1 |
| 2126 | 505299.65 | 1703452.42 | 286.7 | 288.8 | 2.1 |
| 2127 | 505249.67 | 1703453.67 | 284.7 | 286.8 | 2.1 |
| 2128 | 505199.68 | 1703454.93 | 282.8 | 284.9 | 2.0 |
| 2129 | 505149.70 | 1703456.18 | 284.8 | 286.8 | 2.0 |
| 2130 | 505099.71 | 1703457.44 | 286.7 | 288.8 | 2.1 |
| 2131 | 505049.73 | 1703458.69 | 287.6 | 289.8 | 2.2 |
| 2132 | 504999.75 | 1703459.95 | 288.3 | 290.3 | 2.0 |
| 2133 | 505500.84 | 1703497.38 | 296.0 | 298.1 | 2.1 |
| 2134 | 505450.86 | 1703498.64 | 294.1 | 296.2 | 2.1 |
| 2135 | 505400.87 | 1703499.89 | 292.2 | 294.3 | 2.1 |
| 2136 | 505350.89 | 1703501.15 | 290.2 | 292.3 | 2.2 |
| 2137 | 505300.91 | 1703502.40 | 288.2 | 290.4 | 2.1 |
| 2138 | 505250.92 | 1703503.66 | 286.2 | 288.4 | 2.2 |
| 2139 | 505200.94 | 1703504.91 | 284.4 | 286.5 | 2.1 |
| 2140 | 505150.95 | 1703506.17 | 286.4 | 288.4 | 2.1 |
| 2141 | 505100.97 | 1703507.42 | 288.3 | 290.4 | 2.0 |
| 2142 | 505050.98 | 1703508.68 | 289.7 | 291.6 | 2.0 |
| 2143 | 505001.00 | 1703509.93 | 290.2 | 292.2 | 2.0 |
| 2144 | 505502.10 | 1703547.37 | 297.6 | 299.7 | 2.0 |
| 2145 | 505452.11 | 1703548.62 | 295.6 | 297.8 | 2.1 |
| 2146 | 505402.13 | 1703549.88 | 293.8 | 295.8 | 2.0 |
| 2147 | 505352.14 | 1703551.13 | 291.8 | 293.8 | 2.0 |
| 2148 | 505302.16 | 1703552.39 | 289.9 | 291.9 | 2.0 |
| 2149 | 505252.18 | 1703553.64 | 288.0 | 290.0 | 2.0 |
| 2150 | 505202.19 | 1703554.90 | 286.0 | 288.1 | 2.1 |
| 2151 | 505152.21 | 1703556.15 | 287.9 | 289.9 | 2.0 |
| 2152 | 505102.22 | 1703557.41 | 289.9 | 291.8 | 2.0 |
| 2153 | 505052.24 | 1703558.66 | 291.6 | 293.6 | 2.0 |
| 2154 | 505002.26 | 1703559.92 | 292.1 | 294.1 | 2.0 |
| 2155 | 505503.35 | 1703597.35 | 299.2 | 301.2 | 2.0 |
| 2156 | 505453.37 | 1703598.61 | 297.2 | 299.3 | 2.1 |
| 2157 | 505403.38 | 1703599.86 | 295.3 | 297.4 | 2.1 |
| 2158 | 505353.40 | 1703601.12 | 293.4 | 295.5 | 2.1 |
| 2159 | 505303.42 | 1703602.37 | 291.4 | 293.5 | 2.1 |
| 2160 | 505253.43 | 1703603.63 | 289.5 | 291.6 | 2.0 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation | As-Built Clay Liner Elevation | Clay Liner Thickness |
| 2161 | 505203.45 | 1703604.88 | 287.5 | 289.6 | 2.1 |
| 2162 | 505153.46 | 1703606.14 | 289.5 | 291.6 | 2.0 |
| 2163 | 505103.48 | 1703607.39 | 291.4 | 293.5 | 2.0 |
| 2164 | 505053.49 | 1703608.64 | 293.4 | 295.4 | 2.1 |
| 2165 | 505003.51 | 1703609.90 | 294.0 | 296.1 | 2.1 |
| 2166 | 505504.61 | 1703647.34 | 300.8 | 302.9 | 2.1 |
| 2167 | 505454.62 | 1703648.59 | 298.7 | 301.0 | 2.2 |
| 2168 | 505404.64 | 1703649.84 | 296.9 | 299.0 | 2.1 |
| 2169 | 505354.65 | 1703651.10 | 295.0 | 297.0 | 2.0 |
| 2170 | 505304.67 | 1703652.36 | 292.9 | 295.1 | 2.1 |
| 2171 | 505254.69 | 1703653.61 | 291.1 | 293.1 | 2.1 |
| 2172 | 505204.70 | 1703654.86 | 289.1 | 291.2 | 2.1 |
| 2173 | 505154.72 | 1703656.12 | 291.0 | 293.1 | 2.1 |
| 2174 | 505104.73 | 1703657.37 | 293.0 | 295.1 | 2.1 |
| 2175 | 505054.75 | 1703658.63 | 294.9 | 297.0 | 2.1 |
| 2176 | 505004.76 | 1703659.88 | 295.9 | 298.0 | 2.0 |
| 2177 | 505505.86 | 1703697.32 | 302.2 | 304.4 | 2.2 |
| 2178 | 505455.88 | 1703698.58 | 300.4 | 302.5 | 2.2 |
| 2179 | 505405.89 | 1703699.83 | 298.4 | 300.6 | 2.2 |
| 2180 | 505355.91 | 1703701.08 | 296.5 | 298.6 | 2.1 |
| 2181 | 505305.93 | 1703702.34 | 294.6 | 296.7 | 2.1 |
| 2182 | 505255.94 | 1703703.59 | 292.6 | 294.7 | 2.1 |
| 2183 | 505205.96 | 1703704.85 | 290.7 | 292.8 | 2.1 |
| 2184 | 505155.97 | 1703706.10 | 292.6 | 294.7 | 2.1 |
| 2185 | 505105.99 | 1703707.36 | 294.6 | 296.7 | 2.1 |
| 2186 | 505056.00 | 1703708.61 | 296.4 | 298.5 | 2.1 |
| 2187 | 505006.02 | 1703709.87 | 296.9 | 299.0 | 2.1 |
| 2188 | 505507.12 | 1703747.30 | 303.1 | 305.3 | 2.1 |
| 2189 | 505457.13 | 1703748.56 | 301.3 | 303.4 | 2.1 |
| 2190 | 505407.15 | 1703749.81 | 299.5 | 301.6 | 2.1 |
| 2191 | 505357.16 | 1703751.07 | 297.7 | 299.8 | 2.1 |
| 2192 | 505307.18 | 1703752.32 | 296.0 | 298.2 | 2.2 |
| 2193 | 505257.20 | 1703753.58 | 294.2 | 296.3 | 2.1 |
| 2194 | 505207.21 | 1703754.83 | 292.3 | 294.4 | 2.1 |
| 2195 | 505157.23 | 1703756.09 | 294.2 | 296.3 | 2.1 |
| 2196 | 505107.24 | 1703757.34 | 296.1 | 298.3 | 2.1 |
| 2197 | 505057.26 | 1703758.60 | 297.6 | 299.6 | 2.1 |
| 2198 | 505007.27 | 1703759.85 | 297.8 | 299.9 | 2.1 |
| 2199 | 505508.37 | 1703797.29 | 304.0 | 306.0 | 2.1 |
| 2200 | 505458.39 | 1703798.54 | 302.2 | 304.2 | 2.0 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Subgrade Elevation | As-Built Clay Liner Elevation | Clay Liner Thickness |
| 2201 | 505408.40 | 1703799.80 | 300.3 | 302.4 | 2.1 |
| 2202 | 505358.42 | 1703801.05 | 298.6 | 300.6 | 2.0 |
| 2203 | 505308.43 | 1703802.31 | 296.8 | 298.9 | 2.1 |
| 2204 | 505258.45 | 1703803.56 | 295.7 | 297.8 | 2.1 |
| 2205 | 505208.47 | 1703804.82 | 293.9 | 295.9 | 2.1 |
| 2206 | 505158.48 | 1703806.07 | 295.8 | 297.8 | 2.1 |
| 2207 | 505108.50 | 1703807.33 | 297.4 | 299.4 | 2.0 |
| 2208 | 505058.51 | 1703808.58 | 298.2 | 300.3 | 2.1 |
| 2209 | 505008.53 | 1703809.84 | 298.8 | 300.8 | 2.0 |
| 2210 | 505509.63 | 1703847.27 | 304.9 | 306.9 | 2.0 |
| 2211 | 505459.64 | 1703848.53 | 303.2 | 305.1 | 2.0 |
| 2212 | 505409.66 | 1703849.78 | 301.3 | 303.3 | 2.1 |
| 2213 | 505359.67 | 1703851.04 | 299.5 | 301.5 | 2.1 |
| 2214 | 505309.69 | 1703852.29 | 297.7 | 299.7 | 2.0 |
| 2215 | 505259.71 | 1703853.55 | 296.4 | 298.5 | 2.1 |
| 2216 | 505209.72 | 1703854.80 | 295.5 | 297.5 | 2.0 |
| 2217 | 505159.74 | 1703856.06 | 297.2 | 299.2 | 2.0 |
| 2218 | 505109.75 | 1703857.31 | 298.1 | 300.2 | 2.0 |
| 2219 | 505059.77 | 1703858.57 | 299.0 | 300.9 | 2.0 |
| 2220 | 505009.78 | 1703859.82 | 300.1 | 302.2 | 2.1 |
| 2221 | 505211.61 | 1702896.52 | 262.9 | 265.1 | 2.2 |
| 2222 | 505212.88 | 1702946.86 | 262.9 | 265.2 | 2.4 |
| 2223 | 505162.53 | 1702948.12 | 262.9 | 265.2 | 2.3 |
| 2224 | 505161.27 | 1702897.78 | 262.8 | 265.3 | 2.5 |
| 2225 | 505167.42 | 1702903.63 | 261.0 | 263.3 | 2.4 |
| 2226 | 505205.76 | 1702902.66 | 261.1 | 263.5 | 2.5 |
| 2227 | 505206.73 | 1702941.01 | 261.0 | 263.2 | 2.2 |
| 2228 | 505168.38 | 1702941.98 | 261.1 | 263.6 | 2.5 |

LEGEND

2023 — CLAY LINER 50' GRID POINT

CLAY LINER OVERBUILD LIMITS

CELL 1/2 BOUNDARY

LEACHATE COLLECTION TRENCH


FTN Associates, Ltd.
water resources/environmental consultants


CERTIFICATE OF AUTHORIZATION
FTN Associates, Ltd.
No. 63
ENGINEER ARKANSAS

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
NICHOLAS D. VAUGHN
No. 14288
November 6, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY

## LEGACY LANDFILL CELL CONSTRUCTION 2018

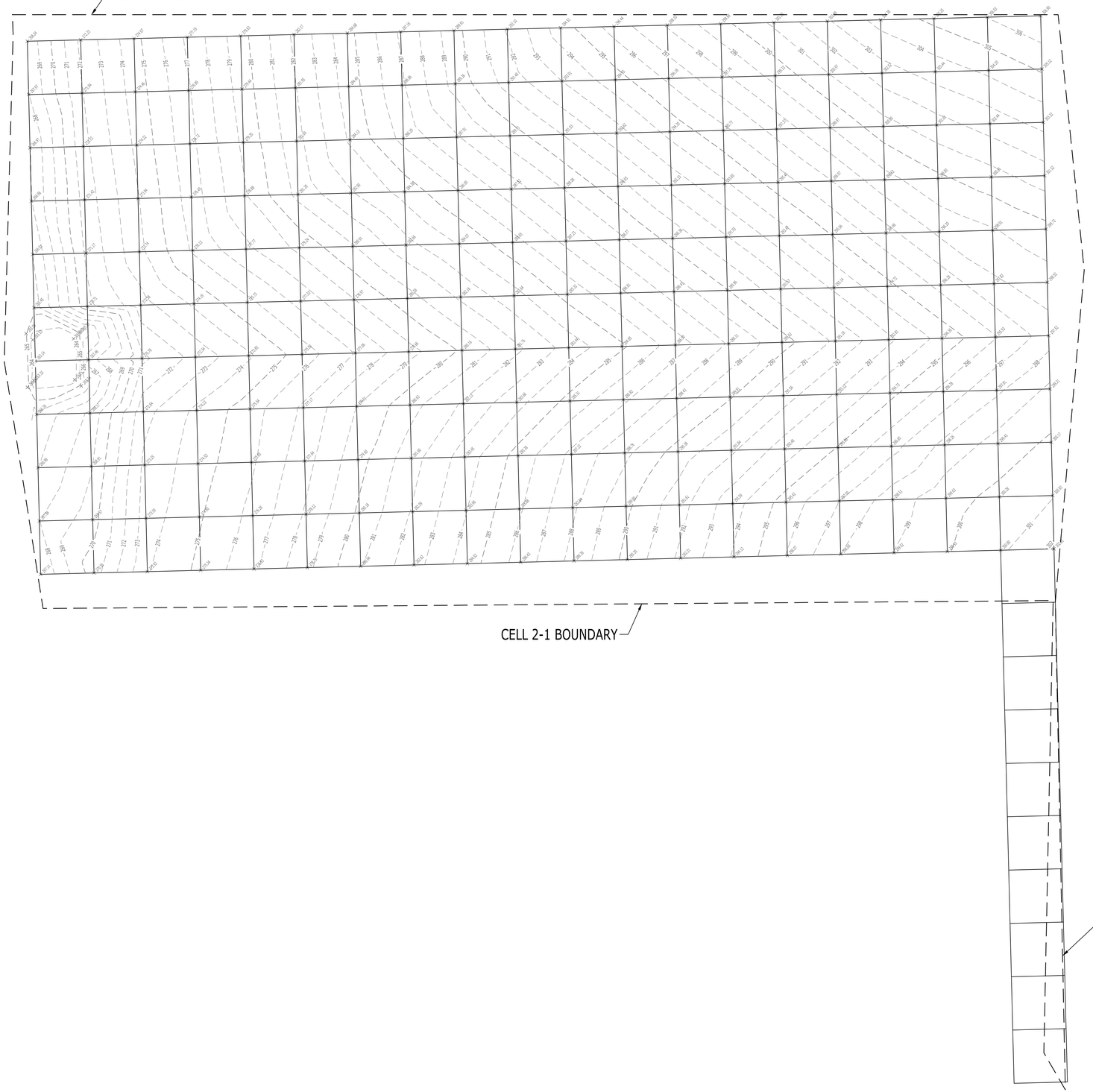
## JONESBORO, ARKANSAS

# FIGURE 8

## CLAY LINER SURVEY GRID

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG08.DWG |
| APPROVED: NDS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 8 of 13 | |

S:\projects\04469-1869-001\cad\dwg\CQA Report\04469-1869-001 FG08.DWG




50 0 50 100

GRAPHIC SCALE 1" = 100'

# FIGURE 9 CLAY LINER AS-BUILT

BEARINGS BASED ON ARKANSAS STATE PLANE GRID NORTH ZONE (0301)

# FIGURE 9 CLAY LINER AS-BUILT

CLIENT: CCSWDA

CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
LEGACY LANDFILL
CRAIGHEAD COUNTY, ARKANSAS

RIDGE SURVEYING & CONSULTING PLLC
311 S. Church St., Suite H
Jonesboro, AR 72401
870-203-9940
www.ridgesurveying.net

DRAWING INFO

| | |
|---|---|
| DRAWN BY: | JJN |
| DATE: | 10/18/2018 |
| SCALE: | 1" = 50' |
| JOB NO: | 18038-ASBUILT-CL |

REVISIONS

| DATE | BY | DESCRIPTION |
|---|---|---|
| | | |
| | | |
| | | |

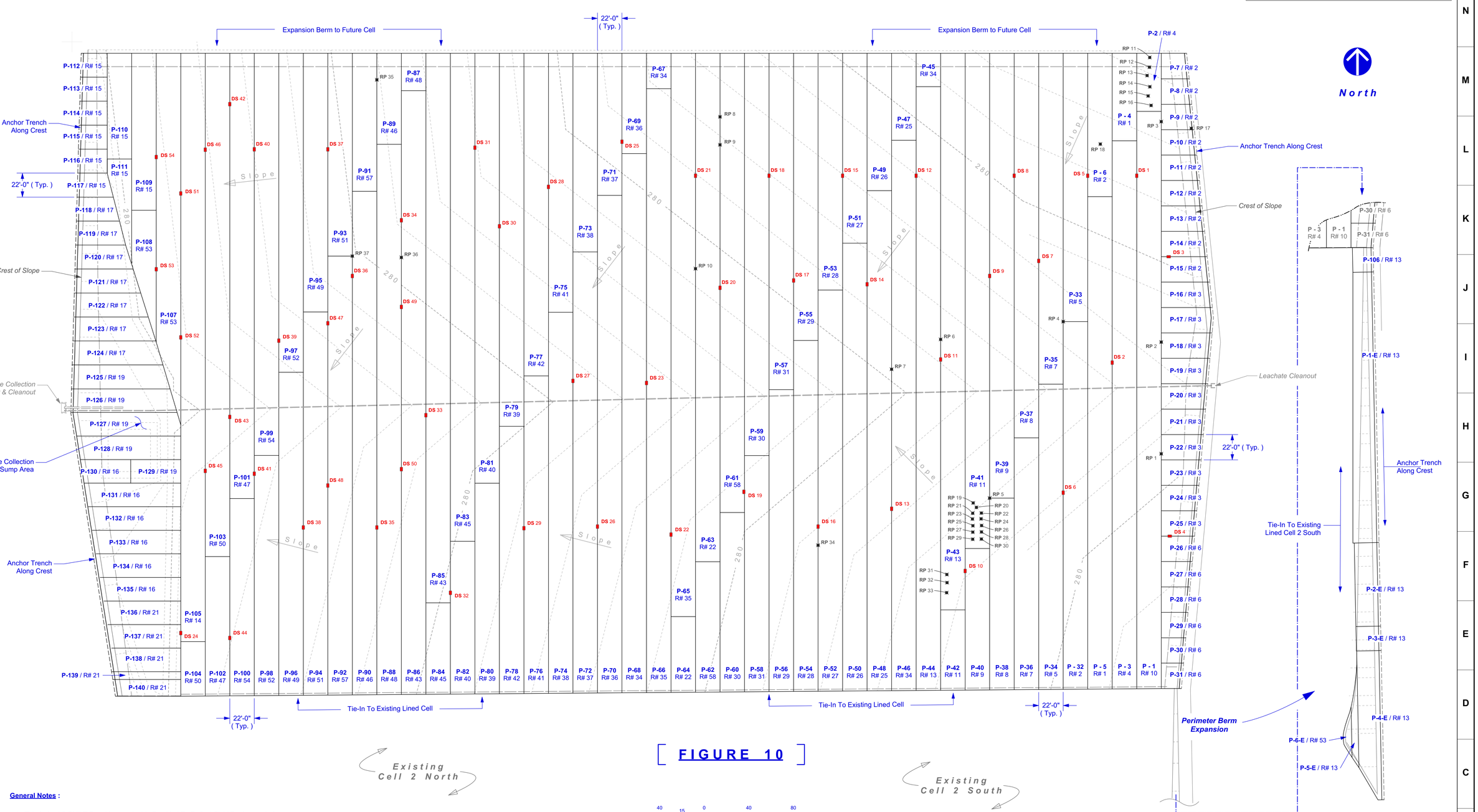
CERTIFICATE OF AUTHORIZATION
RIDGE SURVEYING & CONSULTING PLLC
No. 2946
ARKANSAS

RIDGE SURVEYING & CONSULTING, PLLC.
ARKANSAS - 2946

REGISTERED PROFESSIONAL SURVEYOR
STATE OF ARKANSAS
P.S. 1691
SIGNATURE
JASON D. BEARD
10/18/2018

JASON D. BEARD - SURVEYOR
ARKANSAS - P.S. 1691

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# FIGURE 10

Scale 1" = 40'

**General Notes :**

1. This Is An AS-BUILT Panel Layout And Is Provided To Reflect Field Deployment of The HDPE Geomembrane Installed By Plastic Fusion Fabricators Personnel.
2. Flexible Membrane Liner Material Consists Of 60 mil HDPE GSE® Geomembrane, Textured Both Sides, ( *Supplied In 22'-6" Wide x 520-ft Long Rolls* ). FML Was Anchored Into A Trench Or Tied-In To Existing In It's Respective Areas.
3. Following FML Installation, A Layer Of 8-oz Non-Woven Geotextile Fabric Was Deployed Overlaying The Entire FML Area. The Material Consists Of SKAPS GE-180 Geotextile ( *Supplied In 15' Wide x 690-ft / Rolls* ).

**P #'s** = **Panel Deployment Sequence Numbers**
R #'s = Material Roll Reference Numbers
RP #'s = Repair Patch Numbers
DS #'s = Destructive Sample Numbers

**AS - BUILT**

| NO. | DATE | REVISIONS | BY |
|---|---|---|---|
| A | 10-15-18 | Corrected Location Of Several DS #'s | JY |
| --- | 10-1-18 | Entered Information To Reflect Field Deployment | JY |

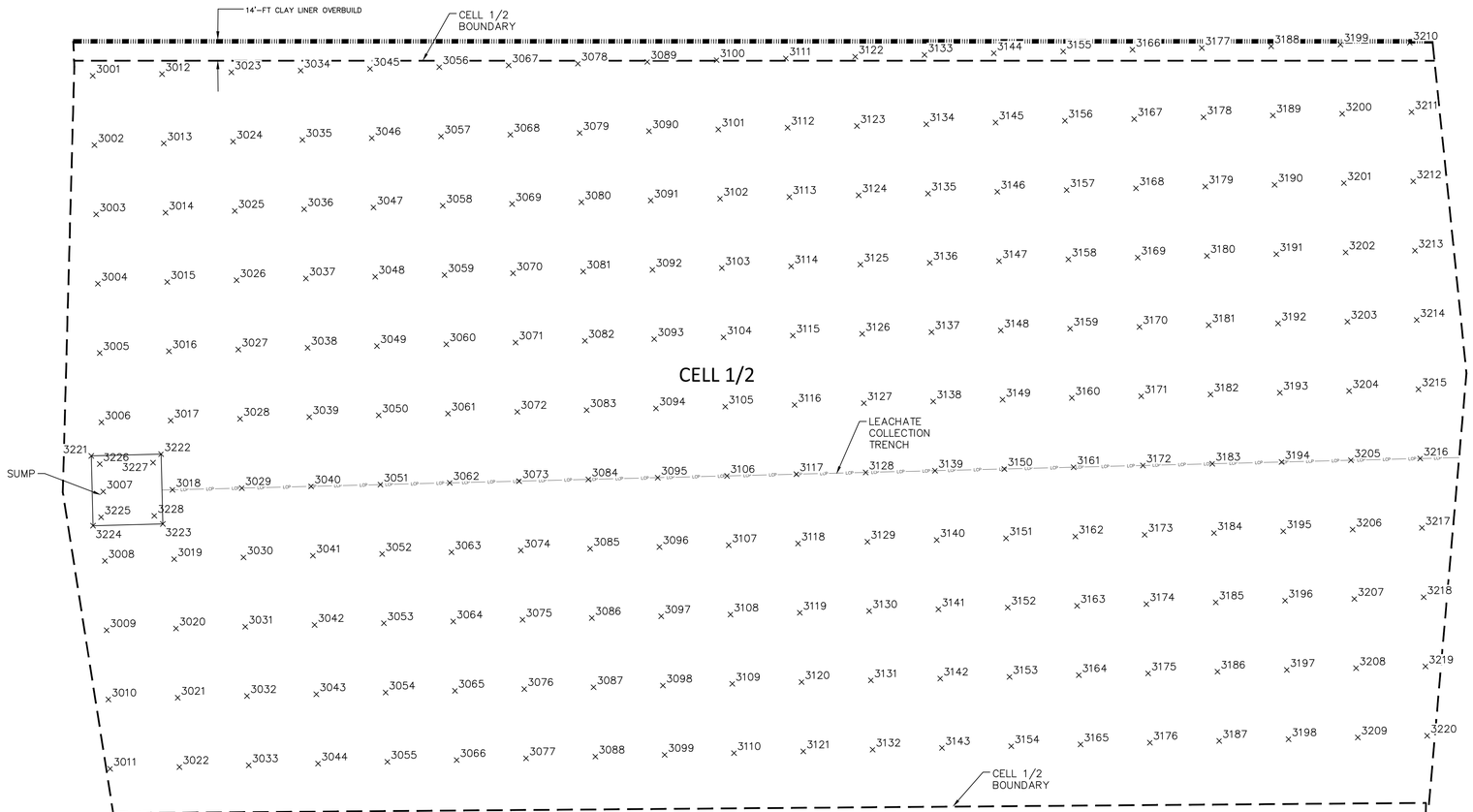
| | | |
|---|---|---|
| Drawn By: J. Yoder ( Draftsman / Designer ) | Date: 5-28-2018 | |
| Technician: | Date: | |
| PFF Estimator: | Date: | |
| Q/C: | Date: | |
| Customer Approval: | Date: | |

PFF Plastic Fusion Fabricators, Inc.
Your Total Containment Resource
3455 Stanwood Blvd. - Huntsville, Alabama 35811
Tel: 256-852-0378 / Fax: 256-852-0388 / http://www.plasticfusion.com

Dumey Contracting, Inc. - Craighead Co. Solid Waste Disposal
Legacy Landfill, Cell 1 South / Cell 2 North - Jonesboro, AR
AS-BUILT Panel Layout For HDPE Flexible Geomembrane

| | | |
|---|---|---|
| PFF Drawing No: 03368-090 | Scale: 1" = 40' | Rev. A |
| PFF Job No: C-18090 | Sheet: 1 of 1 | |

PFF Drawing Form E ( 24 x 36 )







| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Clay Liner Elevation | As-Built Protective Cover Elevation | Protective Cover Thickness |
| 3001 | 505485.78 | 1702897.57 | 268.2 | 269.2 | 1.0 |
| 3002 | 505435.80 | 1702898.83 | 268.0 | 269.0 | 1.0 |
| 3003 | 505385.82 | 1702900.08 | 267.0 | 268.0 | 1.0 |
| 3004 | 505335.83 | 1702901.34 | 267.0 | 268.1 | 1.1 |
| 3005 | 505285.85 | 1702902.59 | 266.0 | 267.0 | 1.0 |
| 3006 | 505235.86 | 1702903.85 | 265.5 | 266.5 | 1.1 |
| 3007 | 505185.88 | 1702905.10 | 263.1 | 266.5 | 3.3 |
| 3008 | 505135.90 | 1702906.36 | 266.3 | 267.3 | 1.0 |
| 3009 | 505085.91 | 1702907.61 | 267.0 | 268.0 | 1.0 |
| 3010 | 505035.93 | 1702908.86 | 268.0 | 269.0 | 1.0 |
| 3011 | 504985.94 | 1702910.12 | 267.1 | 268.3 | 1.2 |
| 3012 | 505487.04 | 1702947.56 | 272.2 | 273.2 | 1.0 |
| 3013 | 505437.06 | 1702948.81 | 271.9 | 273.0 | 1.0 |
| 3014 | 505387.07 | 1702950.07 | 271.7 | 272.7 | 1.0 |
| 3015 | 505337.09 | 1702951.32 | 271.4 | 272.5 | 1.0 |
| 3016 | 505287.10 | 1702952.58 | 271.2 | 272.3 | 1.1 |
| 3017 | 505237.12 | 1702953.83 | 270.7 | 271.7 | 1.0 |
| 3018 | 505187.13 | 1702955.08 | 267.5 | 269.3 | 1.8 |
| 3019 | 505137.15 | 1702956.34 | 268.2 | 269.2 | 1.0 |
| 3020 | 505087.17 | 1702957.60 | 268.9 | 269.9 | 1.0 |
| 3021 | 505037.18 | 1702958.85 | 269.6 | 270.6 | 1.0 |
| 3022 | 504987.20 | 1702960.10 | 270.6 | 271.6 | 1.0 |
| 3023 | 505488.29 | 1702997.54 | 274.7 | 275.8 | 1.2 |
| 3024 | 505438.31 | 1702998.80 | 274.5 | 275.5 | 1.0 |
| 3025 | 505388.33 | 1703000.05 | 274.2 | 275.2 | 1.0 |
| 3026 | 505338.34 | 1703001.30 | 273.9 | 275.0 | 1.1 |
| 3027 | 505288.36 | 1703002.56 | 273.7 | 274.7 | 1.0 |
| 3028 | 505238.37 | 1703003.82 | 272.6 | 273.6 | 1.0 |
| 3029 | 505188.39 | 1703005.07 | 270.8 | 273.2 | 2.4 |
| 3030 | 505138.40 | 1703006.32 | 272.6 | 273.6 | 1.0 |
| 3031 | 505088.42 | 1703007.58 | 273.2 | 274.2 | 1.0 |
| 3032 | 505038.44 | 1703008.83 | 273.5 | 274.6 | 1.1 |
| 3033 | 504988.45 | 1703010.09 | 273.9 | 274.9 | 1.0 |
| 3034 | 505489.55 | 1703047.52 | 277.2 | 278.6 | 1.4 |
| 3035 | 505439.56 | 1703048.78 | 276.9 | 277.9 | 1.0 |
| 3036 | 505389.58 | 1703050.03 | 276.7 | 277.8 | 1.0 |
| 3037 | 505339.60 | 1703051.29 | 276.5 | 277.5 | 1.0 |
| 3038 | 505289.61 | 1703052.54 | 276.1 | 277.2 | 1.1 |
| 3039 | 505239.63 | 1703053.80 | 274.2 | 275.2 | 1.1 |
| 3040 | 505189.64 | 1703055.05 | 272.3 | 274.6 | 2.3 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Clay Liner Elevation | As-Built Protective Cover Elevation | Protective Cover Thickness |
| 3041 | 505139.66 | 1703056.31 | 274.2 | 275.2 | 1.0 |
| 3042 | 505089.68 | 1703057.56 | 274.5 | 275.6 | 1.0 |
| 3043 | 505039.69 | 1703058.82 | 274.9 | 275.9 | 1.0 |
| 3044 | 504989.71 | 1703060.07 | 275.2 | 276.3 | 1.1 |
| 3045 | 505490.80 | 1703097.51 | 279.6 | 281.5 | 1.9 |
| 3046 | 505440.82 | 1703098.76 | 279.4 | 280.5 | 1.1 |
| 3047 | 505390.84 | 1703100.02 | 279.2 | 280.2 | 1.0 |
| 3048 | 505340.85 | 1703101.27 | 278.9 | 280.0 | 1.1 |
| 3049 | 505290.87 | 1703102.53 | 277.8 | 278.8 | 1.0 |
| 3050 | 505240.88 | 1703103.78 | 275.7 | 276.8 | 1.0 |
| 3051 | 505190.90 | 1703105.04 | 273.8 | 276.2 | 2.3 |
| 3052 | 505140.91 | 1703106.29 | 275.5 | 276.5 | 1.0 |
| 3053 | 505090.93 | 1703107.55 | 275.8 | 276.9 | 1.0 |
| 3054 | 505040.95 | 1703108.80 | 276.3 | 277.3 | 1.0 |
| 3055 | 504990.96 | 1703110.06 | 276.8 | 277.8 | 1.0 |
| 3056 | 505492.06 | 1703147.49 | 282.2 | 284.5 | 2.3 |
| 3057 | 505442.07 | 1703148.75 | 281.9 | 283.0 | 1.0 |
| 3058 | 505392.09 | 1703150.00 | 281.7 | 282.7 | 1.0 |
| 3059 | 505342.11 | 1703151.26 | 281.3 | 282.3 | 1.0 |
| 3060 | 505292.12 | 1703152.51 | 279.2 | 280.2 | 1.0 |
| 3061 | 505242.14 | 1703153.77 | 277.3 | 278.4 | 1.1 |
| 3062 | 505192.15 | 1703155.02 | 275.5 | 278.1 | 2.6 |
| 3063 | 505142.17 | 1703156.28 | 277.2 | 278.2 | 1.0 |
| 3064 | 505092.18 | 1703157.53 | 277.6 | 278.7 | 1.0 |
| 3065 | 505042.20 | 1703158.79 | 278.1 | 279.2 | 1.1 |
| 3066 | 504992.22 | 1703160.04 | 278.8 | 279.8 | 1.0 |
| 3067 | 505493.31 | 1703197.48 | 284.7 | 287.7 | 3.0 |
| 3068 | 505443.33 | 1703198.73 | 284.5 | 285.8 | 1.4 |
| 3069 | 505393.35 | 1703199.99 | 284.1 | 285.6 | 1.5 |
| 3070 | 505343.35 | 1703200.66 | 282.9 | 284.2 | 1.3 |
| 3071 | 505293.38 | 1703202.50 | 280.9 | 282.0 | 1.1 |
| 3072 | 505243.39 | 1703203.75 | 279.0 | 280.0 | 1.1 |
| 3073 | 505193.41 | 1703205.01 | 277.1 | 279.6 | 2.5 |
| 3074 | 505143.42 | 1703206.26 | 279.0 | 280.0 | 1.0 |
| 3075 | 505093.44 | 1703207.52 | 279.6 | 280.6 | 1.0 |
| 3076 | 505043.46 | 1703208.77 | 280.2 | 281.2 | 1.1 |
| 3077 | 504993.47 | 1703210.03 | 280.9 | 281.9 | 1.0 |
| 3078 | 505494.57 | 1703247.46 | 287.2 | 290.0 | 2.8 |
| 3079 | 505444.58 | 1703248.72 | 286.9 | 287.9 | 1.1 |
| 3080 | 505394.60 | 1703249.97 | 286.3 | 287.3 | 1.0 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Clay Liner Elevation | As-Built Protective Cover Elevation | Protective Cover Thickness |
| 3081 | 505344.62 | 1703251.23 | 284.4 | 285.4 | 1.0 |
| 3082 | 505294.63 | 1703252.48 | 282.7 | 283.7 | 1.0 |
| 3083 | 505244.65 | 1703253.74 | 280.6 | 281.6 | 1.0 |
| 3084 | 505194.66 | 1703254.99 | 278.7 | 281.3 | 2.6 |
| 3085 | 505144.68 | 1703256.24 | 280.6 | 281.6 | 1.0 |
| 3086 | 505094.69 | 1703257.50 | 281.6 | 282.6 | 1.0 |
| 3087 | 505044.71 | 1703258.76 | 282.1 | 283.1 | 1.0 |
| 3088 | 504994.73 | 1703260.01 | 282.6 | 284.6 | 2.0 |
| 3089 | 505495.82 | 1703297.45 | 289.6 | 293.0 | 3.4 |
| 3090 | 505445.84 | 1703298.70 | 289.4 | 290.4 | 1.0 |
| 3091 | 505395.85 | 1703299.96 | 287.9 | 288.9 | 1.0 |
| 3092 | 505345.87 | 1703301.21 | 286.0 | 287.0 | 1.0 |
| 3093 | 505295.89 | 1703302.46 | 284.1 | 285.1 | 1.1 |
| 3094 | 505245.90 | 1703303.72 | 282.2 | 283.2 | 1.0 |
| 3095 | 505195.92 | 1703304.98 | 280.2 | 282.2 | 2.1 |
| 3096 | 505145.93 | 1703306.23 | 282.1 | 283.1 | 1.0 |
| 3097 | 505095.95 | 1703307.48 | 283.4 | 284.5 | 1.0 |
| 3098 | 505045.97 | 1703308.74 | 284.0 | 285.0 | 1.0 |
| 3099 | 504995.98 | 1703309.99 | 284.5 | 285.6 | 1.1 |
| 3100 | 505497.08 | 1703347.43 | 292.1 | 295.1 | 3.0 |
| 3101 | 505447.09 | 1703348.68 | 291.4 | 292.4 | 1.0 |
| 3102 | 505397.11 | 1703349.94 | 289.5 | 290.5 | 1.0 |
| 3103 | 505347.13 | 1703351.20 | 287.5 | 288.6 | 1.0 |
| 3104 | 505297.14 | 1703352.45 | 285.6 | 286.7 | 1.0 |
| 3105 | 505247.16 | 1703353.70 | 283.6 | 284.7 | 1.1 |
| 3106 | 505197.17 | 1703354.96 | 281.8 | 284.2 | 2.4 |
| 3107 | 505147.19 | 1703356.21 | 283.7 | 284.7 | 1.0 |
| 3108 | 505097.20 | 1703357.47 | 285.4 | 286.4 | 1.0 |
| 3109 | 505047.22 | 1703358.72 | 285.9 | 286.9 | 1.0 |
| 3110 | 504997.24 | 1703359.98 | 286.4 | 287.5 | 1.1 |
| 3111 | 505498.33 | 1703397.41 | 294.5 | 297.7 | 3.2 |
| 3112 | 505448.35 | 1703398.67 | 293.0 | 294.0 | 1.0 |
| 3113 | 505398.36 | 1703399.92 | 291.0 | 292.1 | 1.1 |
| 3114 | 505348.38 | 1703401.18 | 289.1 | 290.1 | 1.1 |
| 3115 | 505298.40 | 1703402.43 | 287.2 | 288.3 | 1.0 |
| 3116 | 505248.41 | 1703403.69 | 285.3 | 286.4 | 1.1 |
| 3117 | 505198.43 | 1703404.94 | 283.4 | 285.4 | 2.0 |
| 3118 | 505148.44 | 1703406.20 | 285.3 | 286.4 | 1.1 |
| 3119 | 505098.46 | 1703407.45 | 287.2 | 288.3 | 1.1 |
| 3120 | 505048.47 | 1703408.71 | 287.8 | 288.9 | 1.0 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Clay Liner Elevation | As-Built Protective Cover Elevation | Protective Cover Thickness |
| 3121 | 504998.49 | 1703409.96 | 288.4 | 289.4 | 1.0 |
| 3122 | 505499.59 | 1703447.40 | 296.4 | 299.4 | 3.0 |
| 3123 | 505449.60 | 1703448.65 | 294.6 | 295.6 | 1.0 |
| 3124 | 505399.62 | 1703449.91 | 292.6 | 293.6 | 1.0 |
| 3125 | 505349.64 | 1703451.16 | 290.6 | 291.7 | 1.1 |
| 3126 | 505299.65 | 1703452.42 | 288.8 | 289.8 | 1.0 |
| 3127 | 505249.67 | 1703453.67 | 286.8 | 287.9 | 1.1 |
| 3128 | 505199.68 | 1703454.93 | 284.9 | 287.3 | 2.4 |
| 3129 | 505149.70 | 1703456.18 | 286.8 | 288.0 | 1.2 |
| 3130 | 505099.71 | 1703457.44 | 288.8 | 289.9 | 1.1 |
| 3131 | 505049.73 | 1703458.69 | 289.8 | 290.9 | 1.1 |
| 3132 | 504999.75 | 1703459.95 | 290.3 | 291.3 | 1.0 |
| 3133 | 505500.84 | 1703497.38 | 298.1 | 301.0 | 2.9 |
| 3134 | 505450.86 | 1703498.64 | 296.2 | 297.2 | 1.1 |
| 3135 | 505400.87 | 1703499.89 | 294.3 | 295.3 | 1.0 |
| 3136 | 505350.89 | 1703501.15 | 292.3 | 293.3 | 1.0 |
| 3137 | 505300.91 | 1703502.40 | 290.4 | 291.4 | 1.0 |
| 3138 | 505250.92 | 1703503.66 | 288.4 | 289.5 | 1.1 |
| 3139 | 505200.94 | 1703504.91 | 286.5 | 289.0 | 2.5 |
| 3140 | 505150.95 | 1703506.17 | 288.4 | 289.5 | 1.1 |
| 3141 | 505100.97 | 1703507.42 | 290.4 | 291.4 | 1.1 |
| 3142 | 505050.98 | 1703508.68 | 291.6 | 292.7 | 1.1 |
| 3143 | 505001.00 | 1703509.93 | 292.2 | 293.4 | 1.2 |
| 3144 | 505502.10 | 1703547.37 | 299.7 | 302.6 | 2.9 |
| 3145 | 505452.11 | 1703548.62 | 297.8 | 298.8 | 1.0 |
| 3146 | 505402.13 | 1703549.88 | 295.8 | 296.8 | 1.0 |
| 3147 | 505352.14 | 1703551.13 | 293.8 | 294.9 | 1.0 |
| 3148 | 505302.16 | 1703552.39 | 291.9 | 292.9 | 1.0 |
| 3149 | 505252.18 | 1703553.64 | 290.0 | 291.0 | 1.0 |
| 3150 | 505202.19 | 1703554.90 | 288.1 | 289.9 | 1.7 |
| 3151 | 505152.21 | 1703556.15 | 289.9 | 291.0 | 1.1 |
| 3152 | 505102.22 | 1703557.41 | 291.8 | 292.8 | 1.0 |
| 3153 | 505052.24 | 1703558.66 | 293.6 | 294.6 | 1.0 |
| 3154 | 505002.26 | 1703559.92 | 294.1 | 295.8 | 1.7 |
| 3155 | 505503.35 | 1703597.35 | 301.2 | 303.9 | 2.7 |
| 3156 | 505453.37 | 1703598.61 | 299.3 | 300.4 | 1.1 |
| 3157 | 505403.38 | 1703599.86 | 297.4 | 298.4 | 1.1 |
| 3158 | 505353.40 | 1703601.12 | 295.5 | 296.5 | 1.0 |
| 3159 | 505303.42 | 1703602.37 | 293.5 | 294.6 | 1.1 |
| 3160 | 505253.43 | 1703603.63 | 291.6 | 292.6 | 1.1 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Clay Liner Elevation | As-Built Protective Cover Elevation | Protective Cover Thickness |
| 3161 | 505203.45 | 1703604.88 | 289.6 | 292.0 | 2.4 |
| 3162 | 505153.46 | 1703606.14 | 291.6 | 292.6 | 1.0 |
| 3163 | 505103.48 | 1703607.39 | 293.5 | 294.6 | 1.1 |
| 3164 | 505053.49 | 1703608.64 | 295.4 | 296.5 | 1.1 |
| 3165 | 505003.51 | 1703609.90 | 296.1 | 297.1 | 1.0 |
| 3166 | 505504.61 | 1703647.34 | 302.9 | 304.9 | 2.0 |
| 3167 | 505454.62 | 1703648.59 | 301.0 | 302.0 | 1.0 |
| 3168 | 505404.64 | 1703649.84 | 299.0 | 300.1 | 1.1 |
| 3169 | 505354.65 | 1703651.10 | 297.0 | 298.1 | 1.1 |
| 3170 | 505304.67 | 1703652.36 | 295.1 | 296.2 | 1.2 |
| 3171 | 505254.69 | 1703653.61 | 293.1 | 294.3 | 1.1 |
| 3172 | 505204.70 | 1703654.86 | 291.2 | 293.6 | 2.4 |
| 3173 | 505154.72 | 1703656.12 | 293.1 | 294.2 | 1.1 |
| 3174 | 505104.73 | 1703657.37 | 295.1 | 296.1 | 1.0 |
| 3175 | 505054.75 | 1703658.63 | 297.0 | 298.0 | 1.0 |
| 3176 | 505004.76 | 1703659.88 | 298.0 | 299.0 | 1.0 |
| 3177 | 505505.86 | 1703697.32 | 304.4 | 305.7 | 1.4 |
| 3178 | 505455.88 | 1703698.58 | 302.5 | 303.6 | 1.0 |
| 3179 | 505405.89 | 1703699.83 | 300.6 | 301.7 | 1.1 |
| 3180 | 505355.91 | 1703701.08 | 298.6 | 299.6 | 1.0 |
| 3181 | 505305.93 | 1703702.34 | 296.7 | 297.8 | 1.1 |
| 3182 | 505255.94 | 1703703.59 | 294.7 | 295.9 | 1.1 |
| 3183 | 505205.96 | 1703704.85 | 292.8 | 295.1 | 2.3 |
| 3184 | 505155.97 | 1703706.10 | 294.7 | 295.8 | 1.0 |
| 3185 | 505105.99 | 1703707.36 | 296.7 | 297.7 | 1.0 |
| 3186 | 505056.00 | 1703708.61 | 298.5 | 299.5 | 1.0 |
| 3187 | 505006.02 | 1703709.87 | 299.0 | 300.0 | 1.0 |
| 3188 | 505507.12 | 1703747.30 | 305.3 | 306.3 | 1.1 |
| 3189 | 505457.13 | 1703748.56 | 303.4 | 304.5 | 1.1 |
| 3190 | 505407.15 | 1703749.81 | 301.6 | 302.7 | 1.1 |
| 3191 | 505357.16 | 1703751.07 | 299.8 | 300.9 | 1.1 |
| 3192 | 505307.18 | 1703752.32 | 298.2 | 299.3 | 1.1 |
| 3193 | 505257.20 | 1703753.58 | 296.3 | 297.4 | 1.1 |
| 3194 | 505207.21 | 1703754.83 | 294.4 | 296.4 | 2.0 |
| 3195 | 505157.23 | 1703756.09 | 296.3 | 297.4 | 1.1 |
| 3196 | 505107.24 | 1703757.34 | 298.3 | 299.4 | 1.1 |
| 3197 | 505057.26 | 1703758.60 | 299.6 | 300.6 | 1.0 |
| 3198 | 505007.27 | 1703759.85 | 299.9 | 301.1 | 1.1 |
| 3199 | 505508.37 | 1703797.29 | 306.0 | 307.2 | 1.2 |
| 3200 | 505458.39 | 1703798.54 | 304.2 | 305.4 | 1.2 |

| Point Table | | | | | |
|---|---|---|---|---|---|
| Point # | Northing | Easting | As-Built Clay Liner Elevation | As-Built Protective Cover Elevation | Protective Cover Thickness |
| 3201 | 505408.40 | 1703799.80 | 302.4 | 303.5 | 1.1 |
| 3202 | 505358.42 | 1703801.05 | 300.6 | 301.8 | 1.2 |
| 3203 | 505308.43 | 1703802.31 | 298.9 | 299.9 | 1.0 |
| 3204 | 505258.45 | 1703803.56 | 297.8 | 299.0 | 1.2 |
| 3205 | 505208.47 | 1703804.82 | 295.9 | 298.4 | 2.5 |
| 3206 | 505158.48 | 1703806.07 | 297.8 | 298.9 | 1.1 |
| 3207 | 505108.50 | 1703807.33 | 299.4 | 300.6 | 1.1 |
| 3208 | 505058.51 | 1703808.58 | 300.3 | 301.4 | 1.2 |
| 3209 | 505008.53 | 1703809.84 | 300.8 | 302.0 | 1.2 |
| 3210 | 505509.63 | 1703847.27 | 306.9 | 308.6 | 1.7 |
| 3211 | 505459.64 | 1703848.53 | 305.1 | 306.1 | 1.0 |
| 3212 | 505409.66 | 1703849.78 | 303.3 | 304.4 | 1.1 |
| 3213 | 505359.67 | 1703851.04 | 301.5 | 302.5 | 1.0 |
| 3214 | 505309.69 | 1703852.29 | 299.7 | 300.8 | 1.1 |
| 3215 | 505259.71 | 1703853.55 | 298.5 | 299.6 | 1.1 |
| 3216 | 505209.72 | 1703854.80 | 297.5 | 299.7 | 2.2 |
| 3217 | 505159.74 | 1703856.06 | 299.2 | 300.4 | 1.1 |
| 3218 | 505109.75 | 1703857.31 | 300.2 | 301.3 | 1.1 |
| 3219 | 505059.77 | 1703858.57 | 300.9 | 302.0 | 1.1 |
| 3220 | 505009.78 | 1703859.82 | 302.2 | 303.2 | 1.0 |
| 3221 | 505211.61 | 1702896.52 | 265.1 | 266.1 | 1.0 |
| 3222 | 505212.88 | 1702946.86 | 265.2 | 266.5 | 1.2 |
| 3223 | 505162.53 | 1702948.12 | 265.2 | 267.5 | 2.3 |
| 3224 | 505161.27 | 1702897.78 | 265.3 | 266.6 | 1.2 |
| 3225 | 505167.42 | 1702903.63 | 263.3 | 266.7 | 3.3 |
| 3226 | 505205.76 | 1702902.66 | 263.5 | 266.1 | 2.5 |
| 3227 | 505206.73 | 1702941.01 | 263.2 | 266.6 | 3.4 |
| 3228 | 505168.38 | 1702941.98 | 263.6 | 267.4 | 3.8 |

LEGEND

3023 — PROTECTIVE COVER 50' GRID POINT

CLAY LINER OVERBUILD LIMITS

CELL 1/2 BOUNDARY

LEACHATE COLLECTION TRENCH

FTN Associates, Ltd.
water resources/environmental consultants

CERTIFICATE OF AUTHORIZATION
FTN Associates, Ltd.
No. 63
ENGINEER ARKANSAS

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
NICHOLAS D. VAUGHN
No. 14288
November 6, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY

## LEGACY LANDFILL CELL CONSTRUCTION 2018

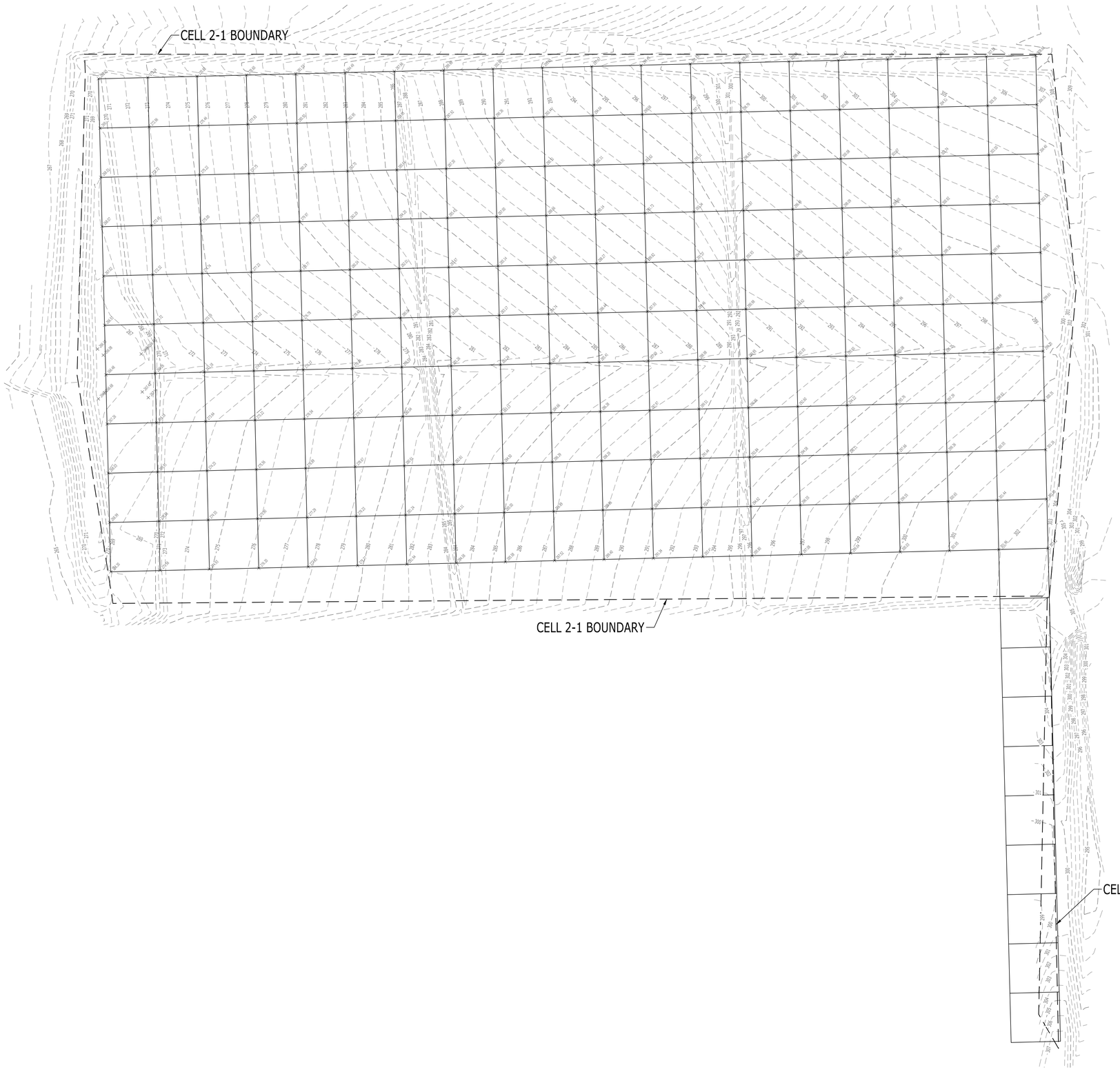
JONESBORO, ARKANSAS

## FIGURE 11

## PROTECTIVE COVER SURVEY GRID

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: FG011.DWG |
| APPROVED: NDS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 50' | DATE: 11/06/18 |
| SHEET NO. 11 of 13 | |

S:\projects\04469-1869-001\cad\dwg\CQA Report\04469-1869-001 FG011.DWG




50 0 50 100

GRAPHIC SCALE 1" = 50'

# FIGURE 12 PROTECTIVE COVER AS-BUILT

BEARINGS BASED ON ARKANSAS STATE PLANE GRID NORTH ZONE (0301)

# FIGURE 12 PROTECTIVE COVER AS-BUILT

CLIENT: CCSWDA

CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
LEGACY LANDFILL
CRAIGHEAD COUNTY, ARKANSAS

RIDGE SURVEYING & CONSULTING PLLC
311 S. Church St., Suite H
Jonesboro, AR 72401
870-203-9940
www.ridgesurveying.net

DRAWING INFO

| | |
|---|---|
| DRAWN BY: | JSN |
| DATE: | 10/18/2018 |
| SCALE: | 1" = 50' |
| JOB NO: | 18208-ASBUILT.DWG |

REVISIONS

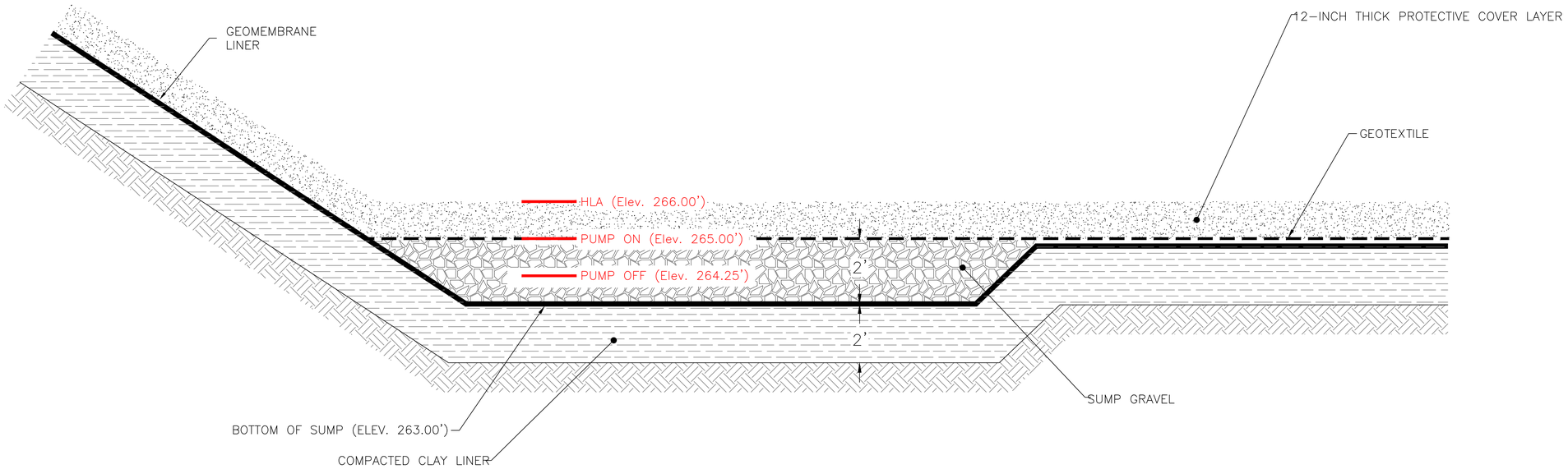
| DESCRIPTION | BY | DATE |
|---|---|---|
| | | |
| | | |
| | | |

CERTIFICATE OF AUTHORIZATION
RIDGE SURVEYING & CONSULTING PLLC
No. 2946
ARKANSAS

RIDGE SURVEYING & CONSULTING, PLLC.
ARKANSAS - 2946

REGISTERED PROFESSIONAL SURVEYOR
STATE OF ARKANSAS
P.S. 1691
SIGNATURE
JASON D. BEARD
10/18/2018

JASON D. BEARD - SURVEYOR
ARKANSAS - P.S. 1691




# LEACHATE SUMP PUMP CONTROL SETTINGS

NOTE:
HLA=HIGH LEVEL ALARM.

FTN Associates, Ltd. water resources environmental consultants

CERTIFICATE OF AUTHORIZATION ENGINEER ARKANSAS No. 63 FTN Associates, Ltd.

STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER NICHOLAS E. VAUGHN No. 14284 November 6, 2018

**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**LEGACY LANDFILL CELL CONSTRUCTION 2018**
**JONESBORO, ARKANSAS**

**FIGURE 13**
**LEACHATE SUMP PUMP CONTROL SETTINGS**

| | |
|---|---|
| DRAWN BY: SWM | FILE NAME: FG13 |
| APPROVED: NEVS | PROJECT NO. 04469-1869-001 |
| SCALE: 1" = 40' | DATE: 11/06/18 |
| SHEET NO. 13 of 13 | |

S:\projects\04469-1869-001\cad\dwg\CQA REPORT FIGURES\04469-1869-001 FG13

# APPENDIX B

**Photographic Log**



Photo 1. Looking northwest at preparation of subgrade.



Photo 2. Looking northeast at preparation of subgrade.



Photo 3. Looking southwest at preparation of subgrade.



Photo 4. Looking east at exposure of existing Cell 2 South liner system.



Photo 5. Looking north at preparation of subgrade for the sump.



Photo 6. Looking west at the completed subgrade.



Photo 7. Looking south at the installation of double-sided geocomposite for the gas collection system.




Photo 8. Looking south at trenching for the gas collection trench.




Photo 9. Looking south at installation of washed gravel in the gas collection trench.



Photo 10. Looking south at installation of the gas collection trench, collection pipe, and gas vent.



Photo 11. Looking southwest at installation of clay liner over the gas collection system.



Photo 12. Looking east at installation of clay liner over the gas collection system.



Photo 13. Looking south at grading of clay liner.



Photo 14. Looking northwest at clay liner construction.



Photo 15. Looking east at clay liner construction.



Photo 16. Looking west at clay liner construction.




Photo 17. Looking south at installation of geomembrane liner.




Photo 18. Looking west at installation of geomembrane.




Photo 19. Air pressure testing of geomembrane liner seam.




Photo 20. Fusion welding of geomembrane liner.




Photo 21. Looking north at the extrusion weld of geomembrane liner to existing Cell 2 South Liner along the western perimeter berm.




Photo 22. Installation of leachate collection pipe boot at rain flap.




Photo 23. Looking south at installation of non-woven geotextile.




Photo 24. Looking northwest at installation of protective cover layer.




Photo 25. Looking south at installation of protective cover layer.



Photo 26. Looking south at grading protective cover layer.




Photo 27. Looking southeast at the completed protective cover layer surface.




Photo 28. Looking east at the construction of the leachate collection trench.



Photo 29. Construction of the leachate collection trench.




Photo 30. Looking west at the construction of the leachate collection trench.




Photo 31. Looking east at the construction of the sump.




Photo 32. Looking west at the construction of the sump.




Photo 33. Trenching for leachate transmission pipeline.



Photo 34. Looking west at the installation of the valve vault box for the leachate transmission pipeline.



Photo 35. Installation of dual-contained leachate transmission pipeline.




Photo 36. Looking east at the installation of the riser pipe headwall on the western perimeter berm.




Photo 37. Looking southeast at the installation of the riser pipe headwall on the western perimeter berm.




Photo 38. Looking south at the installation of the clean-out headwall on the eastern perimeter berm.

# APPENDIX C

**Daily Field Logs**

# PROJECT DAILY FIELD REPORT

**Date** 7/2/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 1 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 0 | | | | NONE | |
| FTN | | 0 | 0 | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 80 | 0 | ✓ | | | ✓ | | 0 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| | 0630 - ARRIVED AT SITE, LOCATED 4 MONUMENTS NO DUMEY EQUIPMENT OR PERSONEL ON SITE |
| | |
| 0830 | 0830 - NO ONE ON SITE |
| | |
| 1040 | CALLED NICK |
| 1100 | LEFT SITE, RETURNED TO LITTLE ROCK |

Signature: Robert Rogers

# PROJECT DAILY FIELD REPORT

**Date** 7/5/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 2 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 3 | | | | TRACTORS | 2 |
| FTN | 0 | 0 | 0 | 0 | | |
| | | | | | SCRAPERS | 2 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| | CREW WORKE APPROX (3) HRS REMOVING TOP SOIL FROM CELLS |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/6/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 3 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 3 | | | | 2 TRACTORS | 2 |
| FTN | 0 | | | | | |
| | | | | | 2 SCRAPERS | 2 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| | EARLY PART OF DAY WAS SPENT COMPLETING REMOVAL OF TOPSOIL IN CELLS 1 SOUTH & 2 NORTH. REST OF THE DAY WAS SPENT REMOVING TOP SOIL IN BORROW AREA AND CONSTRUCTING HAUL ROAD |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/7/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 4 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 3 | | | | TRACTORS | 2 |
| FTN | 0 | 0 | 0 | 0 | | |
| | | | | | SCRAPERS | 2 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| | CREW SPENT ALL THE DAY STRIPING BORROW AREA & WORKING ON HAUL ROAD CONSTRUCTION. |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/9/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 5 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | 0 | 0 | |
| CLINE CONST | 4 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| BOBCAT | 1 |
| SCRAPPERS | 2 |
| DOZER | 1 |
| EXCAVATORS | 2 |
| FRONT END LOADER | 1 |
| | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 77 | | | ✓ | | ✓ | | 0 |
| Weather | pm | 90 | | | ✓ | | ✓ | | 0 |

NOTE: SEE PAGE 4, BK #1 FOR ENC. PIPE BORING DETAIL

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, CONTRACTOR HAS STRIPPED TOP SOIL & STOCK PILED, INSTALLED GRADE STAKS, SILT FENCE & HALL ROAD FROM BORROW AREA |
| 0630 | CONTRACTOR CONTINUE TO GRADE CELL |
| 0730 | PHOTO 237 – 238 LOOKING NORTH DURING ECAVATION TO SUB-GRADE. |
| 0800 | MINI-EXCAVATOR DELIVERED. CLINE CREW ARRIVED WITH BORING EQUIPMENT TO BORE 12" ENCASEMENT PIPE UNDER ENT. ROAD |
| 0830 | DOZER DELIVERED, CLINE CREW PREPING FOR BORE DUMEY WORKING ON HALL ROAD |
| 1100 | DUMEY UNCOVERING GEOMEMBRANE OF CELL 2-SOUTH |
| 1330 | ALL WORK CONTINUES AS PER 0800 ENTRY |
| 1700 | DUMEY ALMOST DONE UNCOVERING GEOMEMBRANE OF CELL 2 SOUTH CLINE CREW PULLING 12" HDPE PIPE |
| 1800 | ALL WORK CONTINUES AS PER 1700 ENTRY |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/10/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 4 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | 0 | 0 | |
| CLINE CONST. | 5 | | | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 2 |
| SCRAPERS | 2 |
| BOBCAT | 1 |
| DOZER | 1 |
| EXCAVATORS | 2 |
| FRONT END LOADER | 1 |
| | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 77 | | | ✓ | | ✓ | | 0 |
| Weather | pm | 92 | | | ✓ | | ✓ | | 0 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, CONTRACTOR PREPING FOR WORK |
| 0700 | DUMEY CONTINUES TO GRADE TO SUB-GRADE, SOME TRASH UNCOVERED, ALSO EXPOSING GEOMEMBRANE OF CELL 2-SOUTH CLINE CONST.-CONTINUE TO WORK ON 12" HDPE ENCASEMENT PIPE BORING UNDER ROAD |
| 0830 | CLINE CONST.-COMPLETED PIPE INSTALL, DUMEY WORK CONTINUES AS PER 0700 ENTRY |
| 1000 | WORK CONTINUES AS PER 0700 ENTRY, ALSO 6" PERF. PIPE FOR GAS TRENCH ARRIVED PHOTO 251 |
| 1030 | DUMEY UNCOVERING GEOMEMBRANE ON EAST SIDE OF CELL 2-SOUTH, SERVICE TRUCK ON SITE (DUMEY) |
| 1130 | DUMEY CONTINUES GRADING AND NOW HAULING DIRT FROM UNCOVERING GEOMEMBRANE OF CELL 2-SOUTH TO ACTIVE DUMP AREA FOR COVER |
| 1300 | ALL WORK AS PER 1130 ENTRY |
| 1600 | WORK SAME |
| 1800 | ALL WORK SAME AS 1130 ENTRY, ALSO EXCAVING DIRT TO EXPOSE TRASH IN NE CORN. OF CELL |

1900 LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/11/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 7 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | 0 | 0 | |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| SCRAPERS | 2 |
| TRACTORS | 2 |
| BOBCAT | 1 |
| DOZER | 1 |
| EXCAVATORS (MINI) | 1 |
| BACK HOE | 1 |
| TRACK HOE | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 83 | | ✓ | | | ✓ | | 0 |
| Weather | pm | 94 | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. DUMEY PREPING TO START WORK |
| 0630 | DUMEY CONTINUES TO GRADE CELLS 2N/1S AND UNCOVERING TRASH IN N.E. CORNER OF CELL 1-SOUTH PHOTO 258 |
| 0830 | ALL WORK AS PER 0630 ENTRY, ALSO 27 ROLLS OF 2-SIDED GEOCOMPOSITE ARRIVED. |
| | NOTE: SEE SHT. 8 & 9 FOR GEOCOMPOSITE ROLLS LIST |
| 0930 | ALL WORK CONTINUES AS PER 0830 ENTRY, ALSO ONE SCRAPER DOWN. |
| 1020 | 27 MORE GEOCOMPOSITE ARRIVE |
| 1100 | UNLOADING GEOCOMPOSITE (SITE VISIT KEN SULLIVAN) |
| 1300 | DUMEY CONTINUES TO EXPOSE TRASH IN N.E. COR. OF CELL SHAPING BERM ON EAST SIDE PHOTO 259-260 |
| 1500 | WORK SAME AS 1300 ENTRY, 8X4 DUEL CONT. & 18" PIPE ARRIVES |
| 1700 | DUMEY CUTTING 6" OFF TOP OF HAUL ROAD, GRADING CONTINUES |
| 1800 | ALL WORK CONTINUES AS PER 1300 ENTRY |

1900 LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/12/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | 0 | Work Day # | 8 |
|---|---|---|---|
| | | Total Day # | |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | 0 | 0 | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| [illegible] | 1 |
| EXCAVATORS (MINI) | 2 |
| BACK HOE | 1 |
| DOZER | 1 |
| WATER TRUCK | 1 |
| DUMP TRUCK | 1 |
| TRACK HOE | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 79 | | | ✓ | | ✓ | | NO |
| Weather | pm | 93 | | | ✓ | | ✓ | | LIGHT |

| Time | |
|---|---|
| 0630 | ARRIVED AT SITE, MEASURED APPROX AREA OF TRASH REMOVAL (170 x 210) |
| 0700 | DUMEY EXCAVATING LECHATE SUMP AREA PHOTO 263, ALSO SMALL AREA OF TRASH EXPOSED NEAR SUMP, GRADING OF CELL CONTINUES |
| 0800 | ALL WORK CONTINUES AS PER 0700 ENTRY, REPAIR TRUCK ARRIVES FOR DOWN SCRAPPER, SURVEYOR ARRIVES ALSO |
| 0900 | DUMEY EXCAVATING TRASH TO DUMP SITE. PHOTO 264-265 |
| 1200 | LUNCH - ALL WORK CONTINUES |
| 1300 | DUMEY CONTINUES TO WORK ON TRASH REMOVAL FROM CELL 1-SOUTH & GRADING CELL |
| 1500 | DUMEY CONTINUES WORK ON TRASH REMOVAL, ALSO STRIPPING SOIL FROM CLAY BORROW AREA FOR FILL IN CELL 2-NORTH |
| 1700 | ALL WORK CONTINUES (SITE VISIT DAVID PASSMORE) |
| 1800 | ALL WORK AS PER 1300 ENTRY |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/13/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 9 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | 0 | 0 | 0 |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| | |
| EXCAVATOR (MINI) | 2 |
| WATER TRUCK | 1 |
| DOZER | 1 |
| TRACK HOE | 1 |
| SKY TRACK | 1 |
| DUMP TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 79 | | ✓ | | | ✓ | | 0 |
| Weather | pm | 95 | | | ✓ | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE., DUMEY HAVE STARTED HAULING TRASH FROM CELL 2-NORTH, OTHER CREW PREPING FOR WORK (NOTE: SCRAPER STILL NOT WORKING) |
| 0700 | CONTRACTOR CONTINUES TO HAUL TRASH & 80% COMPLETE GRADING (APPROX) EXCAVATED AREA APPROX 1' BELOW SUB-GRADE |
| 0900 | WORK CONTINUES AS PER 0700 ENTRY PHOTO 266-267, BOTH SCRAPPERS RUNNING |
| 1000 | BI-WEEKLY MEETING (DUMEY STAFF ON SITE) |
| 1200 | LUNCH - ALSO 27 ROLLS OF GEOCOMPOSITE DELIVERED. |
| 1400 | DUMEY CONTINUES TO HAUL TRASH FROM CELL, ALSO SUMP AREA BEING GRADED PHOTO 268, RIDGE SURVEYOR ARRIVES ON SITE, 27 MORE ROLLS OF GEOCOMPOSITE AND DUMEY DELIVERED 1-BACK HOE |
| 1500 | DUMEY FILLING IN TRASH REMOVAL AREA THAT SURVEYOR SHOT FOR VOLUME |
| 1700 | DUMEY CONTINUES TO BACK FILL & GRADE TRASH REMOVAL AREA |
| 1800 | WORK CONTINUES AS PER 1700 ENTRY |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/14/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 10 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | 0 | 0 | 0 |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| MINI EXCAVATORS | 2 |
| WATER TRUCK | 1 |
| TRACK HOE | 1 |
| SKY TRACK | 1 |
| DUMP TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 81 | | ✓ | | | ✓ | | 0 |
| Weather | pm | 90 | | ✓ | | | ✓ | | 0 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY READING TO WORK |
| 0700 | DUMEY GRADING SUMP AREA & FILLING & GRADING IN TRASH REMOVAL AREA PHOTO 271-272 |
| 0800 | ALL WORK CONTINUES AS PER 0700 ENTRY<br>SKY TRACK DELIVERED & BACK HOE PICKED UP |
| 1000 | DUMEY CONTINUES TO WORK AS PER 0700 ENTRY |
| 1130 | DUMEY GRADING ALONG WEST SIDE OF CELL NEAR BERM SLOPE HAULING TO TRASH REMOVAL AREA<br>NOTE: UNCOVERED TRASH PHOTO 274 |
| 1200 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/16/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 11 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | 0 | 0 | 0 |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| SCRAPERS | 2 |
| TRACTORS. | 2 |
| MINI-EXCAVATORS | 2 |
| DOZER | 1 |
| WATER TRUCK | 1 |
| DUMP TRUCK | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 78 | 0 | | ✓ | ✓ | | | 0 |
| Weather | pm | 90 | 0 | | ✓ | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0600 | DUMEY PREPING FOR WORK. |
| 0700 | DUMEY CHECKING GRADES IN CLAY BORROW AREA, TO DRAIN FOR RAIN. STOCKPILE TO NORTH |
| 0800 | WORK CONTINUES AS PER 0700 ENTRY |
| 0930 | CONTRACTOR GRADING CELL (DOZER), TRACK HOE WAITING FOR HAUL TRUCK, SCRAPER GRADING IN BORROW AREA |
| 1000 | TRACK HOE STARTING TO LOAD 2 TRUCKS PROVIDED BY LAND FILL (PHOTO 275) ALSO MINI EXCAVATOR UNCOVERING MORE OF GEOMEM BEANE OF CELL 2-SOUTH S.W. CORNER |
| 1230 | CONTRACTOR WORK SAME AS 1000 ENTRY ALSO REMOVING TRASH FROM N.E. CORNER OF CELL 1-SOUTH, THIRD TRUCK SITE VISIT KEN (DUMEY) PHOTO 277 - BACK FILLING EXCAVATION |
| 1600 | PREP SAMPLES DL-1 & G1 FOR FED-X |
| 1700 | CONTRACTOR COMPLETING BACK FILL OF TRASH EXCAVATION (PHOTO 278) |
| 1730 | LEFT SITE, TO FED-X |
| 1800 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/17/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | 0 | Work Day # | 12 |
|---|---|---|---|
| | | Total Day # | |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | 1 | 0 | 0 |

| Equipment on Site: | Ea. |
|---|---|
| SCRAPERS | 2 |
| TRACTORS | 2 |
| MINI - EXCAVATORS | 2 |
| WATER TRUCK | 1 |
| TRACK HOE | 1 |
| HAUL TRUCK | 1 |
| DOZER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76 | | ✓ | | ✓ | | | 0 |
| Weather | pm | 93 | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY CREW PREPING FOR WORK<br>TRASH REMOVAL IN N. W. CORNER OF CELL 2-NORTH PHOTO 279 |
| 0800 | PHOTO 280-281 EXPOSED GEOMEMBRANE OF CELL 2-SOUTH<br>CONTRACTOR HAULING TRASH FROM N. W. CORNER OF CELL 2-NORTH<br>CUTTING BORROW AREA DOWN TO GOOD CLAY (3 TRUCKS HAUL-<br>ING PROVIDED BY LAND FILL) |
| 1000 | DUMEY CONTINUES TO HAUL TRASH, CUT IN BORROW AREA, UN-<br>COVER GEOMEMBRANE & GRADE IN SUMP AREA |
| 1200 | DUMEY HAULING TRASH FROM CUTTING BERM IN N.E. CORNER OF<br>CELL 1-SOUTH (AS PER 1000 ENTRY) |
| 1300 | CONTRACTOR CONTINUES TO CUT BORROW AREA, EXPOSE GEOMEMBRANE<br>& GRADE SUMP AREA (NO HAULING SINCE LUNCH) |
| 1400 | ALL WORK AS PER 1300 ENTRY PHOTO 282-283 LOOKING SOUTH<br>TOWARD LEACH, SUMP |
| 1500 | SURVEYOR ON SITE TO CHECK GRADES IN SUMP AREA FOR VOLUME<br>PHOTO 284 |
| 1600 | COVERING EXPOSED TRASH IN SUMP AREA TO GRADE, CELL 2-GEO. UNCOVER |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/18/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 13 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | 0 | 0 | 0 |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| MINI-EXCAVATORS | 2 |
| WATER TRUCK | 1 |
| DOZER | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 82 | | | ✓ | ✓ | | | 0 |
| Weather | pm | 90 | | | ✓ | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0730 | ONLY ONE SCRAPER RUNNING IN BORROW AREA, TRACK HOE GRADING STORM WATER DITCH, MINI-EXCAV. UNCOVERING GEOMEMBRANE OF CELL 2-SOUTH, DOZER GRADING IN S.E. CORNER OF CELL, SKY TRACK MOVING GEOCOMPOSITE ROLLS |
| 0900 | WORK CONTINUES AS PER 0730 ENTRY, PHOTO 285 IS SUMP AREA 286 LOOKING SOUTH, 287 LOOKING NORTH |
| 1100 | DUMEY GRADING CELL 2-NORTH & 1-SOUTH, CONTINUE TO UNCOVER CELL 2-SOUTH GEOMEMBRANE, ALSO UNCOVERING EAST SIDE |
| 1200 | LUNCH |
| 1300 | DUMEY WORK CONTINUES AS PER 1100 ENTRY (FUNNEL CLOUD SITED) |
| 1345 | PHOTO 290 TRASH UNCOVERED ON EAST SIDE OF CELL 2-SOUTH LOOKING FOR GEOMEMBRANE LOCATION |
| | RAIN, THUNDER, LIGHTNING |
| 1410 | LEFT SITE STORMING |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/19/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 14 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 0 | | | |
| FTN | 1 | | | |
| | | | | |
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| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 2 |
| SCRAPER | 2 |
| MINI EXCAVATOR | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | |
| | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 75 | | ✓ | | ✓ | | | 0 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, SUMP FULL FROM APPROX 2" OF RAIN YESTERDAY |
| 0630 | CALLED KEN TO GET MIKE SMITH #, THEY WILL ONLY PUMP OUT SUMP |
| 0700 | MIKE ARRIVED ON SITE THEY WILL NOT WORK TODAY |
| | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/20/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 15 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | 0 | 0 | 0 |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPER | 1 |
| MINI-EXCAVATOR | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| TRACK HOE | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 79° | 0 | | ✓ | ✓ | | | 0 |
| Weather | pm | | YES | | ✓ | ✓ | | | 5-10 |

THUNDER & LIGHTNING

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, NOTE 2 DUMEY EMPLOY. WORKED APPROX. 7 HRS 7/19/18 |
| NOTE | PHOTO 291-292 TRASH REMOVAL DURING LOC OF GEO. ON 7/19/18 ALSO RAMP TO ACTIVE CELL RELOCATED |
| 0700 | TRACK HOE & MINI-EXCAVATOR WORKING ON EAST SIDE OF CELL 2-SOUTH UNCOVERING GEOMEMBRANE |
| 0800 | DOZER DELIVERED TO SITE WORK CONTINUES AS PER 0700 ENTRY |
| 1000 | DUMEY CHECKING GRADES FOR QAQC. 1005 RAIN, THUNDER ETC. |
| 1200 | DUMEY CONTINUES GRADING, MOVING TRASH FROM CELL 2 SOUTH |
| 1330 | WORK CONTINUES AS PER 1200 ENTRY, 1400 SURVEYOR ARRIVES (BOARD) |
| 1500 | ALL WORK SAME AS 1200 ENTRY, SURVEYOR CHK. GRADES ON 1/3 OF EAST SIDE OF CELL OTHER 2/3 NOT COMPLETED. 1520 SURVEYOR LEFT |
| 1600 | PHOTO 295-297 EAST SIDE TRASH REMOVAL AREA, CELL 2-SOUTH, DUMEY SURVEYOR LAYING OUT GAS TRENCH & VENT LOCATIONS, 1630 SAND ARRIVES |
| 1800 | ALL WORK CONTINUE |
| 1830 | LEFT SITE |

Signature: Robert A Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/21/16

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 16 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 2 | | | | TRACTOR | 1 |
| FTN | 1 | | | | SCRAPER | 1 |
| | | | | | MINI-EXCAVATOR | 2 |
| | | | | | HAUL TRUCK | 1 |
| | | | | | SKY TRACK | 1 |
| | | | | | WATER TRUCK | 1 |
| | | | | | TRACK HOE | 1 |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 80 | 0 | | ✓ | ✓ | | | 0-5 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY CREW HAS STARTED WORKING ON GRADING WEST 2/3 OF CELLS 2N & 1S, ALSO HAULING FROM EAST SIDE OF CELL 2-SOUTH. |
| 0700 | HAULING FROM TRASH REMOVAL ON EAST SIDE OF CELL 2-SOUTH & GRADING CELL WEST 2/3 |
| 0800 | WORK ON CELL 2-SOUTH HAULING IS COMPLETED |
| 0930 | DOZER BEING SERVICED, 2 CREW MEMBERS LEFT TO PICK UP MORE EQUP |
| 1000 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/23/19

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 17 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | | | |
| PLAS. FUSION FAB. | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| MINI-EXCAVATORS | 2 |
| TRACK HOES | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| DOZER | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 80 | 0 | ✓ | | ✓ | | | 0 |
| Weather | pm | 90 | 0 | ✓ | | | ✓ | | 0-5 |

PLASTIC FUSION FAB. INSTALLED 36 ROLLS (14'X 255') APPROX.

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | PLASTIC FUSION FABRICATORS ARRIVE ON SITE TO INSTALL GEO. |
| 0800 | (AL CORBITT) FAB CREW SANDBAGING & PREPING TO WORK |
| | DUMEY CREW CUTTING GAS TRENCH ON EAST SIDE OF CELL, GRADING |
| | EAST SIDE OF CELL 2-SOUTH (27 ROLLS OF GEOCOMP. DELIVERED) |
| 1000 | DUMEY CONTINUES TO CUT TRENCH, FABRICATORS INSTALLING GEOMEM. |
| 1100 | ALL WORK AS PER 1000 ENTRY 1220 - 27 MORE ROLLS OF GEOCOMPOSITE |
| | ARRIVES 1130 - SURVEYOR ON SITE (BEARD) |
| 1300 | DUMEY CONTINUES TO CUT TRENCH, GRADE SUMP AREA, & SMOOTH ROLL |
| | CELL, FABRICATORS CONTINUE TO INSTALL GEOCOMPOSITE, WINDY 0-5 |
| 1400 | ALL WORK AS PER 1300 ENTRY |
| 1630 | DUMEY CORRECTING GRADES IN SUMP AREA & SMOOTH ROLLING CELL |
| | FAB HAVE LEFT SITE |
| 1800 | ALL WORK AS PER 1630 ENTRY, LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/24/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 18 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | 0 | 0 | 0 |
| PLAS. FUSION. FAB | 9 | | | |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| MINI-EXCAVATORS | 2 |
| TRACK HOES | 1 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| DOZER | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 79 | | ✓ | | ✓ | | | 0 |
| Weather | pm | 90 | | ✓ | | | ✓ | | 0-5 |

PLASTIC FUSION FAB. INSTALLED APPROX. 25 ROLLS (14x225)

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY SMOOTH ROLLING CELL ON WEST SIDE & HAULING DIRT INTO SUMP AREA & GRADING, FABRICATORS INSTALLING GEOCOMPOSITE PHOTO 310 |
| 0900 | FAB. CONTINUES TO INSTALL GEOCOMPOSITE, DUMEY GRADING SUMP AREA, & SMOOTH ROLLING |
| 1000 | ALL WORK AS PER 0900 ENTRY |
| 1100 | DUMEY HAULING ROCK TO SUMP PHOTO 314 FABRICATORS INSTALLING GEOCOMPOSITE ON EAST SIDE OVER GAS TRENCH |
| 1300 | SURVEYOR ARRIVES ON SITE (BEARD), DUMEY COMPLETED HAULING ROCK SURVEYOR CHECKING GRADES |
| 1400 | FAB STARTING TO SEW & BOND SEAMS (PHOTO 315-316) IN N.E. CORNER TO SOUTH ACROSS GAS TRENCH |
| 1530 | DUMEY HAULING ROCK FOR GAS TRENCH, FAB CONT TO BOND SEAMS PHOTO 319 |
| 1630 | DUMEY INSTALLING ROCK IN GAS TRENCH PHOTO 319-322 |
| 1800 | DUMEY HAULING CLAY FROM BORROW AREA TO CELL |
| 1900 | LEFT SITE |

Signature: Robert Wagner

# PROJECT DAILY FIELD REPORT

**Date** 7/25/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 19 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| PLAS. FUSION FAB | 9 | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 2 |
| MINI-EXCAVATORS | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| DOZER | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 95 | | ✓ | | ✓ | | | 0 |
| Weather | pm | 93 | | ✓ | | | ✓ | | 0-5 |

PLASTIC FUSION FAB. INSTALLED APPROX. 34 ROLLS (14X225)

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY SMOOTHING ROCK IN GAS TRENCH ON EAST SIDE TO INSTALL 6" PERF, HAULING CLAY FROM BORROW AREA FABRICATORS BONDING SEAMS OF GEOCOMPOSITE |
| 0800 | DUMEY INSTALLING CLAY MATERIAL, FAB. CONTINUE TO INSTALL GEO COMPOSITE |
| 1000 | SCHEDULED DENSITY TEST FRIDAY, B & W ENGIN. JOHN WALTON |
| 1100 | ALL WORK CONTINUES AS PER 0800 ENTRY 27 ROLLS OF GEOTEXTILE DELIVERED |
| 1230 | DUMEY CONTINUES TO HAUL CLAY, FAB. CREW INSTALLING GEO COM. FAB. WELDER ARRIVES TO WELD 6" PERF PIPE FOR GAS TRENCH |
| 1430 | WORK CONTINUES AS PER 1230 ENTRY, FAB LINER CREW LEFT SITE |
| 1630 | DUMEY CONTINUES TO HAUL CLAY, & WATER NOTE: PIPE WELDER HAVING PROBLEMS WITH WELDER |
| 1700 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/26/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | 0 | Work Day # | 20 |
|---|---|---|---|
| | | Total Day # | |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | 0 | 0 | 0 |
| PLAS. FUSION FAB | 8 | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 3 |
| SCRAPER | 3 |
| MIN-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| DOZER | 1 |
| ORUM ROLLER | 1 |
| SKY TRACK | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 75 | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 94 | | ✓ | | | ✓ | | 0-5 |

PLASTIC FUSION FAB. INSTALLED APPROX. 49 ROLLS (14 x 225)

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY HAULING CLAY & WELDING PIPE (6" PERF.) FABRICATORS LAYING GEOCOMPOSITE NEAR SUMP |
| 0830 | ONLY 2 SCRAPERS HAULING CLAY. (TEST SCHED. TOMORROW) FAB. INSTAL. LINER GEOCOMPOSITE, PIPE WELDER WELDING 6" PERF. & SOLID PIPE PHOTO 329-330 NOTE: VENT PIPE DETAIL SKETCH ON PAGE 33 BOOK #1 |
| 0900 | ALL WORK CONTINUES AS PER 0830 ENTRY. 54 ROLLS OF GEOTEXTILE ARRIVES |
| 1100 | GEOMEMBRANE ARRIVED ON SITE UNLOADING PHOTOS 333-334(48) |
| 1300 | DUMEY HAULING CLAY, WATERING, & INSTALLING 6" GAS PIPE PHOTO 336. FAB CREW THERMAL BONDING SEAMS, DUMEY ALSO WELDING MORE 6" PIPE |
| 1430 | ALL WORK CONTINUES AS PER 1300 ENTRY. FAB CREW LEFT SITE |
| 1530 | DUMEY CONTINUES TO HAUL CLAY & INSTALL GAS PIPE IN TRENCH PHOTO 337 |
| 1630 | ALL WORK AS PER 1530 ENTRY |
| 1730 | LEFT SITE |

Signature: Robert Gallegos

# PROJECT DAILY FIELD REPORT

**Date** 7/27/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 21 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 10 | | | |
| FTN | 1 | 13 | 12 | 0 |
| PLAS. FUS. FAB | 11 | | | |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 5 |
| SCRAPERS | 5 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| DOZER | 2 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 74 | LIGHT | ✓ | | ✓ | | | 0 |
| Weather | pm | 95 | | ✓ | | | ✓ | | 0 |

PLASTIC FUSION FAB. INSTALLED APPROX 23 ROLLS (14 X 225)

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE (LIGHT RAIN), DUMEY UNLOADING GEOMEMBRANE (11 ROLLS). FABRICATOR CREW LAYING GEOCOMPOSITE |
| 0730 | DUMEY UNLOADING GEOMEMBRANE, FAB. CREW REPLACING GEO. THAT WIND BLEW OVER |
| 0800 | DUMEY CUTTING GAS TRENCH ON WEST SIDE OF CELL & WELDING PIPE FAB CREW INSTALLING GEO. 11 ROLLS OF GEOMEM. ARRIVES |
| 1000 | COMPLETED 13 DENSITY & MOISTURE TESTS (B&W ENG) SCOTT, DUMEY CONTINUES TO HAUL CLAY, CUT TRENCH & WELD PIPE. |
| 1306 | FED-X 12 PERMS P-1-1 A&B, P-2-1 A&B, P-1-2 A&B, P-2-2 A&B, P-1-3 A&B P-2-3 A&B, P-2-3 A&B. DUMEY CONTINUES TO HAUL CLAY, CUT TRENCH ON WEST SIDE OF CELL & WELD PIPE |
| 1400 | ALL WORK AS PER 1300 ENTRY, FAB. CREW WORKING IN SUMP AREA |
| 1436 | FAB CREW LEFT SITE |
| 1500 | DUMEY OPERATOR HIT 10" HDPE PIPE WHILE TRENCHING WEST SIDE GAS TRENCH PHOTO 341-342 |
| 1730 | PACHED 10" & 2" HDPE LINE, WILL REPAIR MONDAY |
| 1800 | DUMEY RUNNING 5 SCRAPERS 1/2 OF CELL COVERED LEFT SITE |

18

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/28/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 22 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 9 | | | |
| FTN | 1 | 0 | 0 | 0 |
| PLAS. FUSION FAB | 10 | | | |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 5 |
| SCRAPERS | 5 |
| DOZERS | 2 |
| MINI-EXCAVATORS | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| HAUL TRUCK | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 7.2 | 0 | ✓ | | ✓ | | | 0 |
| Weather | pm | | | | | | | | |

PLASTIC FUSION FAB. INSTALLED APPROX. 7 ROLLS (14X225) TOTAL 174 ±

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE. DUMEY CREW PREPING TO WORK / FABRICATORS LAYING GEOCOMPOSITE IN SUMP AREA. |
| 0700 | DUMEY CREW HAULING & WATERING CLAY & WELDING PIPE FOR WEST TRENCH. FAB. CREW INSTALLING GEOCOMPOSITE IN SUMP AREA PHOTO 346, DUMEY SHAPING EXPANSION BERM ON NORTH SIDE |
| 0830 | ALL WORK CONTINUES AS PER 0700 ENTRY |
| 0930 | FAB CREW BONDING & SEWING SEAMS IN SUMP ARE & HOUSE KEEPING AREA. DUMEY HAULING CLAY & WELDING PIPE ALSO BACK FILLING GAS TRENCH WITH WASH ROCK. PHOTO 348 |
| 1030 | ALL WORK AS PER 0930 ENTRY |
| 1130 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 7/29/16

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 23 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 9 | | | | TRACTORS | 2 |
| FTN | 0 | | | | SCRAPERS | 2 |
| | | | | | DOZERS | 2 |
| | | | | | MINI-EXCAVATOR | 2 |
| | | | | | TRACK HOE | 1 |
| | | | | | WATER TRUCK | 1 |
| | | | | | HAUL TRUCK | 1 |
| | | | | | DRUM ROLLER | 1 |
| | | | | | SKY TRAK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | DUMEY WORKE 14 HRS THIS DAY AS PER JAMES |

Signature: Robert Haegny

# PROJECT DAILY FIELD REPORT

**Date** 7/31/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 24 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 7 | | | | TRACTORS | 5 |
| FTN | 1 | 23 | 20 | | SCRAPERS | 5 |
| | | | | | DOZERS | 2 |
| | | | | | MINI-EXCAVATORS | 2 |
| | | | | | TRACK HOE | 2 |
| | | | | | WATER TRUCK | 1 |
| | | | | | HAUL TRUCK | 1 |
| | | | | | SKY TRACK | 1 |
| | | | | | DRUM ROLLER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 72° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 83° | | | ✓ | | ✓ | | 0-5 |

NOTE: 10" & 2" HDPE DAMAGE REPAIR FROM 7/27/18 SKETCH ON P38 BOOK #1

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, NO ONE HAS ARRIVED. |
| 0700 | DUMEY DRAINING SUMP BY DIPING WATER OUT & PUMPING, IN BORROW AREA MOVING CLAY MATERIAL & STOCK PILING |
| 0800 | B&W ENG. ARRIVES ON SITE TO DO MOISTURE & DENSITY TEST COMPLETED 23 TESTS. |
| 1030 | DUMEY CREW CONTINUES TO MOVE CLAY IN BORROW AREA COMPLETED COLLECTING PERM TUBES (20) |
| 1300 | ALL WORK SAME AS 0700, (1330) FED-X 20 SHELBY TUBES P-1-4 A/B, P-2-4 A/B, P-1-5 A/B, P-2-5 A/B, P-1-6 A/B, P-2-6 A/B P-1-7 A/B, P-2-7 A/B, P-1-8 A/B, P-2-8 A/B |
| 1500 | DUMEY GRADING IN BORROW AREA CUTTING DOWN TO GOOD CLAY, ALSO WORKING ON SUMP AREA TO DRY OUT. |
| 1600 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/1/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 25 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | | | |
| | | | | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 4 |
| TRAK HOES | 2 |
| MINI-EXCAVATOR | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| DOZERS | 2 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 65° | | ✓ | | ✓ | | | 0 |
| Weather | pm | 85° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING FOR WORK, TODAY THEY WILL BE HAULING CLAY FROM BORROW AREA TO BERM ON EAST SIDE OF CELL |
| 0800 | ALL WORK SAME AS 0600 ENTRY, ALSO PREPING TO INSTALL GEOCOMPOSITE ON WEST SIDE |
| 0900 | WASH ROCK ARRIVES FOR GAS TRENCH. PHOTO 357-358 DUMEY HEAT BONDING & ZIP TIEING GEO. SEAMS |
| 1130 | DUMEY CONTINUES TO HAUL TO BERM. PHOTO 359 AND INSTALL GEO. ON WEST SIDE |
| 1300 | ALL WORK AS PER 1130 ENTRY. SCHED DENSITY/MOIST. TEST AM PHOTO 360 INSTALL GEO ON WEST SIDE |
| 1500 | DUMEY HAULING TO EAST & WEST BERMS, GEO. INSTALL CONTIN. |
| 1630 | WORK SAME AS 1500 ENTRY PHOTO 361-362 SHOWS INSTALL OF WASH ROCK IN TRENCH SEE DETAIL OF PIPE INSTALL ON P. 42 BOOK 1 |
| 173 | DUMEY HAULING CLAY FOR 2ND LIFT PHOTO 363 NO PERM RESULTS FROM FIRST LIFT |
| 1830 | COLLECTED 2-1-GAL BAGS OF PROTECTIVE COVER MATERIAL |
| 1900 | LEFT SITE |

Signature: Robert Bragg

# PROJECT DAILY FIELD REPORT

**Date** 8/2/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) 0 | Work Day # 26 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | 20 | 24 | |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 4 |
| SCRAPER | 4 |
| TRACK HOE | 2 |
| MINI-EXCAVATORS | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| DOZERS | 2 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 67° | | ✓ | | ✓ | | | 0 |
| Weather | pm | 88° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY PREPING TO CONTINUE HAULING CLAY ON 2ND LIFT (6") |
| 0800 | DUMEY HAULING CLAY ON 2ND LIFT, & BACK FILLING TRENCH ON WEST SIDE PHOTO 366 |
| 0830 | B & W ENG. ARRIVE ON SITE FOR MOISTURE/DENSITY TEST (20) TEST COMPLETED, FED-X 24 PERM TUBES. LEG-P-1-9AB, LEG-P-2-9 AB, LEG-P-1-10 AB, LEG-P-2-10AB, LEG-P-1-11 AB LEG-P-2-11 AB, LEG-P-1-12 AB, LEG-P-2-12 AB, LEG-P-1-13 AB LEG-P-2-13 AB, LEG-P-1-14 AB, LEG-P-2-14 AB |
| 1600 | DUMEY CUTTING GAS TRENCH ON EAST SIDE SOUTH OF CELL |
| 1700 | ALL WORK AS PER 1600 ENTRY |
| 1800 | DUMEY CONTINUES TO HAUL CLAY & PROCESS 2ND LIFT |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/3/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 27 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | 30 | 14 | |
| | | | | |
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| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 4 |
| TRACK HOES | 2 |
| DOZERS | 2 |
| MINI-EXCAVATORS | 2 |
| DRUM ROLLER | 1 |
| WATER TRUCK | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 69° | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 91° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY PREPING TO WORK, TODAY CREW WILL CONTINUE TO HAUL CLAY TO CELL |
| 0700 | DUMEY HAULING & INSTALLING GEOCOMPOSITE IN GAS TRENCH ON EAST SIDE, SOUTH OF CELL |
| 0830 | B & W ENG. ARRIVE TO TEST DENSITY & MOISTURE COMPLETED 30 TEST |
| 1130 | PROCESSED PERMS LEG-P-2-1AB, LEG-P-2-2AB, LEG-P-2-3AB LEG-P-2-4AB, LEG-P-2-5AB, LEG-P-2-6AB, LEG-P-2-7AB |
| 1330 | DUMEY GRADING TO EVEN CELL SURFACE & SMOOTH ROLLING, ALSO WORKING ON GAS TRENCH EAST SIDE PHOTO 373-374 BACKFILLING TRENCH EAST SIDE |
| 1500 | ALL WORK AS PER 1330 ENTRY |
| 1600 | DUMEY HAULING INTO SUMP TO GRADE & WORKING ON BERMS |
| 1730 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/6/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 28 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | | | |
| PFF | 1 | | | |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 4 |
| TRACK HOE | 2 |
| DOZERS | 2 |
| MINI-EXCAVATORS | 3 |
| DRUM ROLLER | 1 |
| WATER TRUCK | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 75° | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 90° | | | ✓ | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK, RAINED OVER THE WEEKEND |
| 0700 | DUMEY EXCAVATING AROUND STORMWATER DROP INLET ON EAST SIDE OF CELL TO EXTEND. ALSO GRADING IN SUMP & HAULING CLAY TO SHAPE BERMS ON EAST SIDE SOUTH OF CELL 2N, 1S. PHOTO 375 SHOWS DROP INLET TO BE EXTENDED ON EAST SIDE. |
| 0900 | ALL WORK CONTINUES AS PER 0700 ENTRY |
| 1100 | DUMEY HAULING TO EAST SIDE & LAYING A STRIP ALONG TOE OF CELL 2 SOUTH NORTH SIDE TO LAY OUT EXISTING GEOMEMBRANE. STRIP IS 3RD LIFT |
| 1300 | DUMEY FRAMING DROP INLET EXTENSION, HAULING CONTINUES TO EAST SIDE FOR BERM, AND UNFOLDING GEO. ON CELL 2 SOUTH |
| 1500 | ALL WORK AS PER 1300 ENTRY. PHOTO 378 - 381 EAST SIDE BERM CONSTRUCTION |
| 1700 | STARTING 3RD LIFT (6") ALSO PFF ON SITE TO WELD 6" PIPE |
| 1800 | WORK CONTINUES AS PER 1700 ENTRY |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/2/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 29 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 8 | | | |
| FTN | 1 | 26 | 14 | — |
| PFF | 6 | | | |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 4 |
| TRACK HOE | 2 |
| DOZERS | 2 |
| MINI-EXCAVATOR | 1 |
| DRUM ROLLER | 1 |
| WATER TRUCK | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76 | — | ✓ | | ✓ | | | 5-10 |
| Weather | pm | 92 | — | ✓ | | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK, |
| 0700 | DUMEY HAULING CLAY FOR 3RD LIFT, PFF WELDING 6" PERF & 8-4 DUEL CONTAIN PIPE. ALSO WORKING ON FRAMING DROP INLET ON EAST SIDE TO EXTEND |
| 1000 | DUMEY WORK CONTINUES AS PER 0700 ENTRY, COMPLETED 26 MOISTURE / DENSITY TESTS, PUSHED TUBES P-3-8 AB, P-3-9 AB, P-3-10 AB, P-3-11 AB, P-3-12 AB, P-3-13 AB, P-3-14 AB |
| 1300 | COMPLETED PACKING TUBES FOR SHIPING (FED-X) DUMEY CONTINUES TO HAUL CLAY ON 3RD LIFT, & WELDING 8"-4" DUEL CONTAIN |
| 1500 | DUMEY CONTINUES TO HAUL CLAY TO 3RD LIFT, PFF WELDING DUEL CONTAIN ALSO FRAMING OF EAST SIDE DROP INLET CONTINUES PHOTO 385-386 |
| 1700 | ALL WORK AS PER 1500 ENTRY |
| 1600 | DUMEY CONTINUES TO HAUL CLAY |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/9/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 30 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 5 | | | | TRACTOR | 4 |
| FTN | 1 | 24 | 14 | | SCRAPER | 4 |
| PFF | 1 | | | | TRACK HOE | 2 |
| | | | | | DOZER | 2 |
| | | | | | MINI-EXCAVATOR | 2 |
| | | | | | DRUM ROLLER | 1 |
| | | | | | WATER TRUCK | 1 |
| | | | | | SKY TRACK | 1 |
| | | | | | HAUL TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 75 | 0-1 | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 91 | 0-1 | | ✓ | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY PUMPING WATER OUT OF SUMP & WELDING 8-4 DUEL CONTAIN HDPE PIPE, DRAGING BORROW AREA TO DRY OUT CLAY, NOTE: DENSITY MOISTURE TEST SCHED @ 8:30 |
| 0830 | B&W ARRIVED TO TEST MOISTURE COMPLETED 24 TEST, PUSHED 14 PERMS, P-4-1AB, P-4-2AB, P-4-3AB, P-4-4AB, P-4-5AB, P-4-6 AB, P-4-7AB, P-4-8AB 0945 RAIN (LIGHT) |
| 1200 | DUMEY STOCKPILING LOADS OF PROTECTIVE COVER TO NORTH OF CELL PFF CONTINUES TO WELD PIPE. 1230 DELIVER PERMS TO FED-X |
| 1400 | DUMEY WORK SAME AS 1200 ENTRY (LIGHT RAIN) PHOTO 387 STOCK PILING PROTECTIVE COVER |
| 1600 | DUMEY DRYING OUT BORROW AREA & CONTINUES TO STOCK PILE PROTECTIVE COVER, ALSO PREPING TO INSTALL A SECTION OF GAS PIPE (PERF.) & TRENCH ACROSS HAUL ROAD RAMP |
| 1730 | ALL WORK AS PER 1400 ENTRY, LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/10/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 31 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 8 | | | |
| FTN | 1 | | | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 3 |
| BOX BLADE | 1 |
| MINI-EXCAVATOR | 2 |
| DOZERS | 1 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| SKY TRACK | 1 |
| HALL TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 70 | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 86 | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK. |
| 0700 | DUMEY HAULING CLAY TO COMPLETE 3RD & FINAL LIFT, ALSO FRAMING OF DROP INLET ON EAST SIDE CONTINUES. |
| 0900 | DUMEY CONTINUES TO HAUL CLAY TO 3RD LIFT, UNCOVERING & UNFOLDING GEOMEMBRANE OF CELL 2 SOUTH, ALSO FRAMING EAST SIDE DROP INLET TO EXTEND. |
| 1100 | ALL WORK CONTINUES AS PER 0900 ENTRY PHOTO 391-392 IS FRAMING EAST SIDE DROP INLET |
| 1300 | DUMEY HAULING CLAY, FRAMING EAST DROP INLET & STACKPILING PROTECTIVE COVER NORTH OF CELL |
| 1500 | ALL WORK AS PER 1300 ENTRY |
| 1700 | ALL WORK AS PER 1300 ENTRY, ALSO DUMEY REMOVING HAUL ROAD RAMP TO INSTALL BERM & GAS TRENCH |
| 1800 | ALL WORK AS PER 1300 ENTRY |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/11/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 32 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | | 25 | 10 | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 3 |
| BOX BLADE | 1 |
| DOZER | 1 |
| MINI EXCAVATORS | 2 |
| HAUL TRUCK | 1 |
| DRUM ROLLER | 1 |
| WATER TRUCK | 1 |
| SKY TRACK | 1 |
| TRACK HOE | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73 | – | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 86 | – | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK, |
| 0700 | DUMEY HAULING TO FINISH 3RD LIFT, & WORKING ON REMOVING HAUL RAMP TO INSTALL BERM AND GAS PIPE TRENCH |
| 1030 | DUMEY CONTINUES TO WORK AS PER 0700 ENTRY, ALSO COMPLETED PUSHING 10 TUBES P-4-8 AB, P-4-9 AB, P-4-10 AB P-4-11 AB, P-4-12 AB |
| 1130 | DUMEY HAULING CLAY TO 3RD LIFT, INSTALLING GEOCOMPOSITE 6" PERF PIPE AND WASH ROCK IN TRENCH ON S.E. SIDE. DELIVER PERMS TO FED-X. PHOTO 397 TRENCH BACK FILL |
| 1230 | LEFT SITE |

Signature: Robert Bragg

# PROJECT DAILY FIELD REPORT

**Date** 8/13/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 33 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 8 | | | |
| FTN | 1 | 7 | 4 | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 3 |
| BOX BLADE | 1 |
| DOZER | 1 |
| MINI-EXCAVATOR | 2 |
| HAUL TRUCK | 1 |
| DRUM ROLLER | 1 |
| WATER TRUCK | 1 |
| SKY TRACK | 1 |
| TRACK HOE | 2 |
| 1-ROAD GRADER | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 74° | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 86 | | | ✓ | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0660 | ARRIVED AT SITE, DUMEY HAULING CLAY TO COMPLETE 3RD LIFT |
| 0700 | DUMEY HAULING CLAY & GRADING FOR TOP OF CLAY ELEV. CHECK BY SURVEYOR |
| 0800 | B & W ARRIVE TO TEST MOISTURE / DENSITY (7) ALSO PUSHED (4) PERMS P-4-13 AB, P-4-14 AE, BE (E = EAST SIDE) |
| 1100 | DUMEY HALLING CLAY TO LIFT 3, WATERING AND COMPACTING, ALSO LOCATING GEOMEMBRANE IN N.W. CORNER OF CELL 2 SOUTH. PERMS TO FED-X, STARTED FINAL GRADING IN CELL |
| 1300 | DUMEY CONTINUES TO HAUL CLAY & COMPACT, ALSO STARTING TO CUT ANCHOR TRENCH ON EAST BERM, NO QA/QC CHECK DONE ON CELL. PHOTO 406 SHOWS EAST ANCHOR TRENCH 2'x2'. |
| 1500 | ALL WORK AS PER 1300 ENTRY |
| 1700 | DUMEY CONTINUES TO HAUL CLAY. COMPLETED EAST BERM ANCHOR TRENCH ALSO GRADING (FINAL) IN CELL AND SUMP CONTINUES |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/14/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 34 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 9 | | | |
| FTN | 1 | | | |
| | | | | |
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| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 4 |
| SCRAPERS | 3 |
| BOX BLADE | 1 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| DOZERS | 2 |
| HAUL TRUCK | 1 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| SKID TRACK | 1 |
| ROAD GRADER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76° | | | ✓ | ✓ | | | 0 |
| Weather | pm | 85° | | | ✓ | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY CONTINUES TO FRAME EAST SIDE DROP INLET TO EXTEND FIVE FEET. ALSO GRADING WITH ROAD GRADER CONTINUES AND SOME GRADING ON S.E. SIDE OF CELL |
| 0900 | DUMEY GRADING CELL, SUMP AREA AND S.E. SIDE OF CELL, ALSO FRAMING OF EAST DROP INLET CONTINUES. DUMEY SURVEYOR ON SITE CHECKING TOP OF CLAY ELEV. |
| 1100 | ALL WORK AS PER 0900 ENTRY |
| 1300 | DUMEY HAULING TO NORTH EXPANSION BERM AREA, AND CONTINUES TO GRADE CELL FOR SURVEY (BEARD) QAQC |
| 1500 | DUMEY HAULING TO NORTH BERM AREA, GRADING CELL AND COMPLETED EAST DROP INLET FRAMING PHOTO 415 |
| 1700 | DUMEY CONTINUES TO HAUL TO NORTH EXPANSION BERM AREA GRADING CELL AND SUMP AREA CONTINUES. |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/15/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 35 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| DOZERS | 2 |
| MINI-EXCAVATOR | 1 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | 1 |
| ROAD GRADER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 81 | | | ✓ | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY HAULING TO NORTH BERM AREA, GRADING CELL AND SUMP AREA, ALSO CUTTING GAS TRENCH ON S.W. SIDE OF CELL 2 SOUTH |
| 0900 | ALL WORK AS PER 0700 ENTRY, SEE PAGE 58 BOOK 14 FOR DETAIL OF 6" PERF PIPE CLEARANCE UNDER 10" REPAIRED HDPE |
| 1100 | DUMEY HAULING, GRADING CELL & SUMP AREA, ALSO SURVEYOR (DUMEY) CHECKING GRADE ELEV, DUMEY COMPLETED GAS TRENCH ON S.W. SIDE OF CELL 2 SOUTH |
| 1300 | DUMEY CONTINUES WORK AS PER 1100 ENTRY ALSO STOCKPILING PROTECTIVE COVER NORTH OF CELL |
| 1500 | DUMEY INSTALLING GEOCOMPOSITE ON S.W. AREA CELL 2 SOUTH ALL OTHER WORK SAME AS 1100 ENTRY |
| 1700 | DUMEY GRADING CONTINUES WITH ROAD GRADER & DOZER IN CELL & SUMP, ALSO INSTALLING GEOCOMPOSITE & WASH ROCK S.W. SIDE OF CELL 2 SOUTH PHOTO 417 |
| 1800 | ALL WORK AS PER 1700 ENTRY |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/21/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 36 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | | | |
| | | | | |
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| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| DOZER | 2 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 71° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 82° | | | ✓ | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO START PUMPING WATER OUT SUMP & EAST SIDE BERM AREA (S.E.) OF CELL |
| 0730 | DUMEY PUMPING WATER OUT OF SUMP AND EAST SIDE BERM AREA |
| 1000 | DUMEY PUMPING WATER CONTINUES AS PER 0730 ENTRY DUMIES SURVEYOR ON SITE TO CHECK GRADE ELEV. FOR QAQC |
| 1100 | DUMEY CONTINUES TO PUMP WATER, CHECK GRADES, & BOX BLADE CELL |
| 1300 | DUMEY CONTINUES TO PUMP WATER, BOX BLADE & GRADE CELL IN NEEDED AREAS A SMALL LOAD OF CLAY MATERIAL IS HAULED TO DRY OUT. PFF ON SITE TO DROP OFF TRAILER WILL MOBALIZE IN THE MORNING |
| 1500 | DUMEY HAS STOPED PUMPING & CONTINUES TO BOX BLADE CELL AND FINISHED DIGING TRENCH ON S.W. SIDE OF CELL 2 SOUTH PHOTO 421 SHOWS GEOCOMPOSITE HAS BEEN BLOWN OVER & SILTED IN BY RAINS AND WIND |
| 1680 | ALL WORK AS PER 1500 ENTRY |
| 1650 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/22/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 37 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 2 |
| SCRAPERS | 1 |
| DOZERS | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | 1 |
| BOX BLADE | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 68° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 72° | | | ✓ | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0730 | DUMEY REMOVING SILT FROM GEOMEMBRANE OF CELL 2 SOUTH FOR WELDING, ALSO REMOVING SILT FROM SUMP AND BOX BLADING CELL. |
| NOTE: | NO QA QC BY BEARD (RIDGE SURVEYING) DONE. PFF ON SITE PREPING FOR WORK, FILLING SAND BAGS. |
| 0830 | ALL WORK SAME AS 0730 ENTRY. ALSO RIDGE SURVEYING ON SITE TO QAQC TOP OF CLAY |
| 0900 | S.W. SIDE OF CELL 2 SOUTH GAS TRENCH GEOCOMPOSITE PARTIALY INSTALLED AND WASH ROCK HAS BEEN REMOVED, TO REMOVE SILT FROM RAIN IN TRENCH PHOTO 425 GEOCOMPOSITE |
| 1100 | DUMEY CONTINUES TO WORK ON S.E. TRENCH OF CELL 2 SOUTH, DRUM ROLLING, CELL & DRESSING UP STOCK PILE. PFF CONTINUE TO SAND BAG, AND PREP TO INSTALL GEOMEMBRANE |
| 1400 | DUMEY CREW AND PFF CREW SPENT TIME PREPING GEOMEMBRANE ON NORTH SIDE OF CELL 2 SOUTH FOR EXTRUSION WELD |
| 1600 | DUMEY GRADING ON EAST SIDE, SOUTH OF CELL FOR LINER INSTALL PFF LEFT SITE |
| 1700 | ALL WORK AS PER 1600 ENTRY |

1800 LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/23/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 38 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 1 |
| SCRAPER | 1 |
| DOZERS | 2 |
| TRACK HOE | 2 |
| WATER TRUCK | 1 |
| DRUM ROLLER | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | 1 |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 65° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 84 | | ✓ | | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY AND PFF PREPING FOR WORK. TODAY MOST WORK WILL BE INSTALLING GEO MEMBRANE |
| 1400 | PFF FROM 0600 TO 1400 INSTALLED PANELS P-1 TO P-33 (SEE PANEL LAYOUT DWG) |
| 1630 | PFF FROM 1400 TO 1600 INSTALLED PANELS P-33 - P-35 (SEE PANEL LAYOUT DWG) LEFT SITE AT 1630 |
| 1800 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/24/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 39 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 1 |
| SCRAPERS | 1 |
| DOZERS | 2 |
| TRACK HOG | 2 |
| DRUM ROLLER | |
| SKID TRACK | |
| HAUL TRUCK | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 71 | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 85 | | ✓ | | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE: DUMEY AND PFF PREPING TO WORK PFF WILL CONTINUE TO INSTALL GEOMEMBRANE LINER |
| 1700 | PFF FROM 0600 TO 1700 INSTALLED PANELS P-36 - P-53 (SEE PANEL LAYOUT DWG.) PFF LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/25/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 40 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 1 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| TRACK HOE | 1 |
| MINI-EXCAVATOR | 1 |
| HAUL TRUCK | 1 |
| SKY TRACK | 1 |
| DOZER | 2 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 70 | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 90 | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE PFF PREPING TO WORK, DUMEY IS STOCK PILING POTECTIVE COVER |
| 1300 | PFF FROM 0630 TO 1300 INSTALLED PANELS P-53 TO P-59 (SEE PANEL LAYOUT DWG) |
| 1530 | PFF FROM 1300 TO 1530 INSTALLED PANELS P-60 TO P-69 (SEE PANEL LAYOUT DWG) |
| 1400 | LEFT SITE DUMEY NOT ON SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/26/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 41 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests (DESTRUCT) | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 0 | 24 | | |
| FTN | 1 | | | |
| PFF | 16 | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 1 |
| SCRAPERS | 1 |
| DOZERS | 2 |
| TRACK HOE | 2 |
| MINI-EXCAVATOR | 2 |
| SKY TRACK | 1 |
| DRUM ROLLER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 95° | | ✓ | | | ✓ | | 0-5 |

DESTRUCTS DS-1 – DS-24 FED-X 8/27/18

| Time | |
|---|---|
| 0630 | ARRIVED AT SITE DUMEY NOT ON SITE, PFF PREPING TO CONTINUE TO INSTALL GEOCOMPOSITE LINER |
| 1200 | PFF SINCE 0630 HAVE BEEN, CUTTING DESTRUCT SAMPLES, AND FIELD TESTING WITH PEELS & SHEARS, ALSO GRINDING, WELDING & BEADING ALL PATCHES |
| 1440 | PFF WORK IS SAME AS 1200 ENTRY, CQA VACUME TESTS, AND PREPED SAMPLES (DESTRUCTS) FOR FED-X DS-1 – DS-23 |
| 1600 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/27/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 42 |
|---|---|
| | Total Day # |

DESTRUCT

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | 24 | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTORS | 1 |
| SCRAPERS | 1 |
| MINI-EXCAVATORS | 2 |
| DOZERS | 2 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| DRUM ROLLER | 1 |
| HAUL TRUCK | 1 |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 80° | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 95° | | ✓ | | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING FOR WORK (CREW 5) PFF PREPING TO WORK ON TIEING GEOMEMBRANE LINER TO CELL 2 SOUTH |
| 1050 | DELIVERED BOXES (5) TO FED-X (DS-1 – DS-24) PFF WELDING GEOMEMBRANE TO CELL 2 SOUTH GEOMEMBRANE |
| 1200 | PFF CONTINUES TO WELD TO CELL 2 SOUTH GEOMEMBRANE AND VACUM TEST. DUMEY IS ASSISTING WITH UNCOVERING LINER (CELL 2 SOUTH) EAST AND WEST HEADWALLS AND VALVE BOX ARRIVED ON SITE |
| 1600 | PFF TODAY SPENT ALL DAY (0600–1630), CLEANING, PATCHING (P22–P44) AND WELDING CELL 2N TO 2S GEOMEMBRANE LEFT SITE 1610 |
| 1700 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/28/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 43 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| TRACK HOES | 2 |
| DOZERS | 2 |
| MINI- EXCAVATOR | 12 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 78 | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 90 | | | ✓ | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY & PFF PREPING TO WORK |
| 1220 | PFF SINCE 0630 INSTALLED PANELS P-70 - P-81 (SEE PANEL LAYOUT DWG). DUMEY (CREW 5) EXCAVATING TO INSTALL VALVE BOX AND 8 x 4 DUEL CONTAIN PIPE |
| 1630 | PFF FROM 1220 TO 1630 INSTALLED PANELS P-82 - P89 (SEE PANEL LAYOUT DWG). DUMEY NOT ON SITE. |
| 1730 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

Date 8/29/18

Project Legacy Landfill Cell 1-2 Construction

General Contractor: Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 44 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| DOZER | 2 |
| TRACK HOE | 2 |
| MINI-EXCAVATOR | 2 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 77 | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 85 | | | ✓ | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY & PFF PREPING TO WORK |
| | PFF WILL CONTINUE TO INSTALL GEOMEMBRANE |
| | |
| 1500 | PFF SPENT ALL DAY 0600-1500 INSTALLING GEOMEM-BRANE, PANELS P-90 - P-105 (SEE PANEL LAYOUT DWG) |
| | 1130 SITE VISIT ROBERT, DAVID (CCLF) PAUL, NICK (FTN) |
| | MIKE COLMEY, ADJUSTMENTS TO WEST STORMWATER DITCH WAS |
| | SUGGESTED |
| | |
| 1500 | LEFT SITE |

Signature: Robert J Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/30/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 45 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | ✓ | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| DOZER | 1 |
| TRACK HOE | 2 |
| MINI-EXCAVATOR | 1 |
| HAUL TRUCK | 1 |
| SKY TRAK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 81° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY & PFF PREPING FOR WORK |
| 0700 | PFF TODAY WILL TIE GEOMEMBRANE TO CELL 2 SOUTH PATCH & VACCUM TEST. DUMEY DRAINING SUMP & WORKING ON STOCK PILEING PROTECTIVE COVER AND UNCOVERING CELL 2 SOUTH GEOMEMBRANE FROM RAIN |
| 1200 | PFF SINCE 0630 – 1200 HAVE BEEN CLEANING, GRINDING & WELDING GEOMEMBRANE OF CELL 2 NORTH TO CELL 2 SOUTH. DUMEY DEMUCKING SUMP TO GRADE |
| 1500 | PFF SINCE 1200 ENTRY HAVE BEEN CLEANING, PATCHING, GRINDING & WELDING GEOMEMBRANE TO CELL 2 SOUTH GEOMEMBRANE, LEFT SITE (PFF). DUMEY CONTINUES TO DEMUCK SUMP FROM RAIN, HAULING TO BORROW AREA |
| 1600 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 8/31/11

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 40 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PPP | 10 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| MINI-EXCAVATOR | 2 |
| DOZER | 2 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73 | | ✓ | ✓ | ✓ | | | 0-5 |
| Weather | pm | 81 | ✓ | | | | | | 0-5 |

(NO DESTRUCT SENT HAVE NOT COMPLETED TESTS)

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE DUMEY & PFF PREPING FOR WORK |
| 0700 | DUMEY DRAINING SUMP AND STOCK PILING PROTECTIVE COVER PFF CUTTING DESTRUCTS AND TESTING (DS-25-DS-46) |
| 1300 | PFF SINCE 0700 HAVE BEEN CUTTING DESTRUCTS AND TESTING DUMEY REMOVING MUD FROM SUMP & STOCK PILING PROTECTIVE COVER |
| 1400 | RAIN DOWN POUR LEFT SITE |

Signature: Robert Rogers

# PROJECT DAILY FIELD REPORT

**Date** 9/2/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 97 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | | | | |
| FTN | 0 | | | |
| PPF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPERS | 1 |
| DOZERS | 2 |
| MINI-EXCAVATORS | 2 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0660 | PPF INSTALLED AN AREA OF 250'x560' OF GEOTEXTILE |
| | |
| 1400 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/3/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 48 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 2 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| DOZER | 2 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| | |
| | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 79° | | ✓ | | ✓ | | | 0-5 |
| Weather | pm | 84° | | | ✓ | ✓ | | | 0-5 |

WILL SEND DS-25 - DS-46 TOMORROW 9/4/18

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY DRAINING WATER OUT OF SUMP. PFF PREPING FOR WORK |
| 0700 | MARKED DS-47 - DS-50. PFF CONTINUES TO INSTALL GEO-TEXTILE, DUMEY REMOVING RAMP ON EAST SIDE TO INSTALL GEOMEMBRANE. |
| 0800 | WORK SAME AS 0700 ENTRY |
| 0830 | PREPED BOXES FOR FED-X DELIVERY, WILL SEND DS-25 - DS-46. PFF CONTINUES TO INSTALL GEOTEXTILE |
| 0930 | PFF WORKING ON EAST SIDE, SOUTH OF CELL 2 NORTH PREPING TO INSTALL GEOMEMBRANE. DUMEY CUTTING ANCHOR TRENCH |
| 1200 | PFF CONTINUES TO CLEAN, GRIND & EXTRUSION WELD GEOMEMBRANE TO CELL 2 SOUTH LINER. DUMEY NOT ON SITE |
| 1500 | PFF CONTINUES TO INSTALL GEOMEMBRANE ON EAST SIDE PANELS P-1E - P-3E |
| 1630 | LEFT SITE |
| | |
| | |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/4/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 49 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 5 | | | | TRACTOR | 1 |
| FTN | 1 | | | | SCRAPER | 1 |
| PFF | 9 | | | | TRACK HOE | 2 |
| | | | | | MINI-EXCAVATOR | 2 |
| | | | | | DOZER | 1 |
| | | | | | HAUL TRUCK | 1 |
| | | | | | SKY TRACK | 1 |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76 | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 91 | | | ✓ | | ✓ | | 5-10 |

FED-X DS-25 – DS-46 AND DS-47 – DS-54

| Time | |
|---|---|
| 0600 | PFF & DUMEY PREPING TO WORK, PFF WILL CONTINUE TO INSTALL GEOMEMBRANE ON EAST SIDE OF CELL 2 SOUTH |
| 1000 | PFF COMPLETED GEOMEMBRANE INSTALLATION ON EAST SIDE OF CELL 2 SOUTH PANELS P-1E – P-6E (SEE PANEL LAYOUT DWG) |
| 1030 | PFF INSTALLING GEOMEMBRANE ON CELL 2 NORTH, DUMEY WORKING ON SUMP (FED-X DS-25 – DS-46) |
| 1200 | PFF SEAMING PANELS, MARKED DS-51 – DS-54. DUMEY WORKING ON SUMP AND STOCK PILING PROTECTIVE COVER. DUMEY HAULING FROM BORROW AREA TO BACKFILL ANCHOR TRENCH |
| 1530 | PFF COMPLETED EAST SIDE OF CELL 2 SOUTH, ADDED PANELS P-107 – P-109 TO CELL 2 NORTH, ALSO BEARD ON SITE (RIDGE SURVEYING) CHECKING GRADES IN SUMP AREA DUMEY CUTTING ANCHOR TRENCH IN WEST BERM AND HAULING CLAY MATERIAL TO EAST SIDE TO BACK FILL ANCHOR TRENCH ALSO WILL FED-X DS-47 – DS-54 |
| 1630 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/5/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 50 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| MINI-EXCAVATOR | 2 |
| DOZERS | 1 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 91° | | ✓ | | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | PFF AND DUMEY PREPING FOR WORK |
| 0700 | PFF TODAY WILL BE INSTALLING GEOMEMBRANE IN SUMP AREA |
| 1200 | PFF INSTALLED PANELS P-112 - P-140, (SEE PANEL LAYOUT DWG) SEAMED AND AIR TESTED SLOPE SEAMS. DUMEY HAULING CLAY MATERIAL TO BACK FILL ANCHOR TRENCH AND ON EAST SIDE OF CELL 2 SOUTH |
| 1430 | DUMEY COVERING OUTSIDE SLOPES AND INSIDE OF BERM WITH CLAY MATERIAL AND STOCK PILING PROTECTIVE COVER PFF CONTINUES TO WORK ON GRINDING & WELDING PATCHES & T'S SEAMS |
| 1600 | PFF FINISHING UP GRINDING AND WELDING, PATCHES & CROSS T'S BEADS LEFT SITE. DUMEY CONTINUES TO HAUL FROM BORROW AREA TO EAST SIDE OF CELL 2 SOUTH |
| 1630 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/6/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 51 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| TRACK HOE | 2 |
| HAUL TRUCK | 2 |
| DOZER | 1 |
| MINI-EXCAVATOR | 2 |
| SK 4 TRACK | 1 |
| | |
| | |

| | | Temp. | Rain (0.5") | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 78° | | | ✓ | | | ✓ | 5-10 |
| Weather | pm | 79 | ✓ | | ✓ | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. PFF & DUMEY PREPING FOR WORK |
| 0700 | PFF INSTALLING GEOTEXTILE. DUMEY PUMPING SUMP AND STOCKPILING PROTECTIVE COVER |
| 1000 | PFF INSTALLING GEOTEXTILE (14 ROLLS) DUMEY STOCKPILING PROTECTIVE COVER & PUMPING SUMP |
| 1200 | PFF INSTALLED APPROX. 19 ROLLS OF GEOTEXTILE (350 x 568) DUMEY PUMPING SUMP, STOCKPILING PROTECTIVE COVER AND SHAPING BERM ON EAST SIDE OF CELL 2 NORTH |
| 1300 | PFF CLEANING UP AREA OF TRASH PREPING FOR RAIN DUMEY CONTINUES TO PUMP SUMP |
| 1400 | ALL WORK SAME AS 1300 ENTRY<br>'RAIN' LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/10/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 52 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 5 | | | | TRACTOR | 1 |
| FTN | 1 | | | | SCRAPER | 1 |
| PFF | 9 | | | | HAUL TRUCK | 2 |
| | | | | | TRACK HOE | 2 |
| | | | | | DOZER | 1 |
| | | | | | MINI-EXCAVATOR | 2 |
| | | | | | SKY TRACK | 1 |
| | | | | | | |
| | | | | | | |

2.15"

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 63 | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 78 | | | ✓ | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE DUMEY & PFF PREPING FOR WORK. |
| 0700 | DUMEY PUMPING OUT SUMP, PFF INSTALLING GEOTEXTILE |
| 0800 | DUMEY PUMPING OUT SUMP, & HAULING PROTECTIVE COVER ON TOP OF GEOTEXTILE IN N.E. CORNER OF CELL; PFF CONTINUES TO INSTALL GEOTEXTILE |
| 1030 | PFF CONTINUES TO INSTALL GEOTEXTILE, DUMEY CONTINUES TO HAUL PROTECTIVE COVER IN CELL |
| 1200 | ALL WORK SAME AS 1030 ENTRY. PFF HAS INSTALLED APPROX. 14 ROLLS OF GEOTEXTILE |
| 1400 | PFF CONTINUES TO INSTALL GEOTEXTILE, DUMEY HAULING AND SPREADING PROTECTIVE COVER |
| 1600 | PFF TODAY INSTALLED A TOTAL OF 22 ROLLS OF GEOTEXTILE DUMEY CONTINUES TO HAUL PROTECTIVE COVER AND PUMP OUT SUMP (PFF LEFT SITE) |
| 1630 | ALL WORK AS PER 1600 ENTRY |
| 1700 | LEFT SITE. |
| | |
| | |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/4/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 53 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| TRACK HOE | 2 |
| DOZER | 1 |
| MINI-EXCAVATOR | 2 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 65° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 78° | | | ✓ | ✓ | | | 0-5 |

NOTE: PFF INSTALLED (5) ROLLS OF GEOTEXTILE

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, PFF AND DUMEY PREPING FOR WORK. |
| 0700 | PFF WILL CONTINUE TO INSTALL GEOTEXTILE, ALSO WILL INSTALL RUB SHEETS IN SUMP. DUMEY WILL CONTINUE TO HAUL PROTECTIVE COVER ON SOUTH SIDE OF LEACHATE DITCH |
| 0930 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER AND PUMP SUMP TO INSTALL RUB SHEETS. PFF CONTINUES TO INSTALL GEOTEXTILE, BOND & SEW SLOPES IN SUMP AREA. (MARKED DS-24A) LABLED DS-24 SENT TO LAB. |
| 1130 | ALL WORK AS PER 0930 ENTRY |
| 1300 | DUMEY HAULING CLAY TO CONSTRUCT A RAMP OVER BERM INTO CELL TO HAUL PROTECTIVE COVER., PFF PREPING SUMP BOTTOM TO INSTALL RUB SHEETS (2) AND MAKING TIES TO CELL 2-SOUTH GEOMEMBRANE |
| 1500 | PHOTO 50-51 SHOWS TIES OF GEOMEMBRANE OF P-139 AND P-140 TO CELL 2 SOUTH, THESE ARE ALL EXTRUSION WELDS DUMEY HAULING PROTECTIVE COVER. PHOTO 52 CONSTRUCTING RUB SHEETS (66 X 57) |
| 1600 | PFF CONSTRUCTED 1-RUB SHEET AND COMPLETED TIES TO CELL 2 SOUTH. DUMEY HAULING & SPREADING PROTECTIVE COVER |
| 1700 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/12/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 54 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| TRACK HOE | 2 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 2 |
| DOZER | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 66° | ✓ | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 71° | | | ✓ | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. DUMEY & PFF PREPING TO WORK. |
| 0700 | DUMEY TODAY WILL CONTINUE TO HAUL PROTECTIVE COVER |
| | PFF WILL CONSTRUCT AND INSTALL RUB SHEETS |
| 0830 | (LIGHT RAIN) PFF LEFT SITE NEVER GOT STARTED WORKING |
| | DUMEY CONTINUES TO HAUL PROTECTIVE COVER. |
| 1000 | DUMEY CONTINUES TO HAUL AND SPREAD PROTECTIVE COVER |
| 1130 | ALL WORK CONTINUES AS PER 1000 ENTRY (RAIN STOPED) |
| 1400 | DUMEY CONSTRUCT RAMP TO INSTALL PROTECTIVE COVER ON WEST |
| | SIDE OF PROPOSED CONTAINMENT BERM AREA (PHOTO 57). DUMEY SURV- |
| | EYOR ON SITE |
| 1600 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER & SPREAD |
| 1700 | DUMEY WORK CONTINUES AS PER 1600 ENTRY. LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/13/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 55 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| TRACK HOE | 2 |
| MINI-EXCAVATOR | 2 |
| DOZER | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 70° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 93° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, PFF & DUMEY PREPING FOR WORK |
| 0700 | DUMEY CONTINUES TO HAUL & SPREAD PROTECTIVE COVER. PFF INSTALLING GEOMEMBRANE RAIN FLAPS, CONSTRUCT & INSTALL RUB SHEETS IN SUMP. (SEE BOOK 2, PAGE 23 FOR GEO. RAIN FLAP INFO.) |
| 0900 | DUMEY HAULING PROTECTIVE COVER. (PHOTO 61) PFF INSTALLING GEO-MEMBRANE RAIN FLAP # 1 AB |
| 1100 | ALL WORK AS PER 0900 ENTRY |
| 1230 | PFF COMPLETED INSTALL OF GEOMEMBRANE RAIN FLAP # 1 AB WILL WORK ON CONSTRUCTING 2ND RUB SHEET AND INSTALL. DUMEY CONTINUES TO HAUL & SPREAD PROTECTIVE COVER. RUB SHEET 1 = 63'X53', RUB SHEET 2 = |
| 1500 | DUMEY HAULING PROTECTIVE COVER. PFF INSTALLING RUB SHEETS IN SUMP |
| 1530 | DUMEY HAULING PROTECTIVE COVER. PFF COMPLETED INSTALLING 1-RUB SHEET AND INSTALLED GEOMEMBRANE RAIN FLAP #1. LEFT SITE |
| 1630 | DUMEY CONTINUES TO HAUL PROT. COVER. AND CUTT S.W. DITCH ON EAST SIDE OF CELL 2 SOUTH |

1730 LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/14/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 56 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| PFF | 9 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 2 |
| DOZER | 1 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 74° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 86 | | | ✓ | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY & PFF PREPING FOR WORK. |
| 0700 | TODAY PFF WILL INSTALL GEOMEMBRANE RAIN FLAP # 2 AB AND 2ND RUB SHEET. DUMEY HAULING PROTECTIVE COVER |
| 0830 | PFF CONTINUES TO INSTALL GEOMEMBRANE RAIN FLAP # 2AB DUMEY HAULING AND SPREADING PROTECTIVE COVER |
| 0940 | PATCH AT TEMP. RAMP AREA (PHOTO 68) NEXT TO EAST BERM INSIDE SLOPE TOE. (10'X6') EXTRUSION WELD (P70) REPAIRED 9/14/18 VAC. TESTED 9/15/18. |
| 1100 | DUMEY HAULING PROT. COVER TO BUILD CONT. BERM. PFF CONTINUES TO INSTALL GEO. RAIN FLAP # 2AB AND CONST. 2ND RUB-SHEET IN SUMP |
| 1400 | DUMEY STOCKPILING WASH ROCK FOR LEACHATE COLLECTION. PFF COMPLETED GEO. RAIN FLAP # 2 AB ALSO CONST. 2ND RUB SHEET STARTING TO REPAIR WITH PATCH TEAR IN LINER (P70) NEAR EAST BERM TOE (PHOTO 68) |
| 1500 | DUMEY HAULING PROTECTIVE COVER & CONSTRUCTING CONT. BERM. PFF COMPLETED REPAIRING PATCH TO WILL VAC. TEST TOMORROW |
| 1700 | DUMEY CONTINUES TO WORK. |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/15/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 57 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| | 9 | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCKS | 3 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| DOZER | 1 |
| SKY TRACK | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 77° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 81 | | ✓ | | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE BOTH CREWS PFF & DUMEY PREPING FOR WORK |
| 0700 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER. PFF INSTALLING PIPE BOOTS ON CONTAINMENT BERM PIPE AND INSTALLING 2ND RUB SHEET IN SUMP |
| 0900 | ALL WORK CONTINUES AS PER 0700 ENTRY PFF INSTALLING GEOTEXTILE IN SUMP. DUMEY HAULING AND CUTTING TRENCH FOR 8x4 DUEL CONTAIN. PIPE TO LEACHATE TANK. ALSO CONST. CONT. BERM # 1 (PHOTOS 75-76) |
| 1030 | PFF COMPLETED BOOT INSTALL ON 6" PIPE UNDER CONT. BERM # 2. DUMEY HAULING PROTECTIVE COVER. PFF COMPLETED GEOTEXTILE INSTALL IN SUMP (SEE PAGE 29 BOOK 2 FOR BOOT DETAIL) |
| 1130 | ALL WORK AS PER 1030 ENTRY, LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/17/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 58 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 8 | | | |
| FTN | 1 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| DOZER | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 91° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING FOR WORK. PPF COMPLETED WORK GONE FROM SITE |
| 0700 | DUMEY WILL CONTINUE TO HAUL PROTECTIVE COVER AND MOVE WASH ROCK NEXT TO INSTALL AREA (LEACHATE COLLECTION PIPE) |
| 0800 | DUMEY HAULING PROT. COVER, INSTALLING GEOTEXTILE IN SUMP FOR WASH ROCK INSTALL, ALSO CUTTING DITCH FOR DUEL CONTAIN (8x4) (START OF LEACHATE COLLECTION INSTALL) |
| 1000 | DUMEY CONTINUES TO HAUL. PROT. COVER, INSTALLING GEO-TEXTILE IN SUMP & COTTING DUEL CONT. PIPE TRENCH |
| 1200 | DUMEY NOT HAULING ALL POTECT. COVER HAS BEEN INSTALLED WILL HAVE MORE TOMOROW. INSTALLING GEOTEXTILE IN LEA-CHATE PIPE AREA (CBURETO) AND CUTTING DUEL CONT. TRENCH |
| 1400 | ALL WORK AS PER 1200 ENTRY, NO PROT. COVER, HAULING WASH ROCK TO INSTALL AREA, INSTALLING DUEL CONTAIN PIPE IN TRENCH UNDER ENT. ROAD (GRAVEL) (SEE PAGE 29, BOOK 2 FOR DUEL CONTAIN PIPE AND VALVE BOX LOCATION) |
| 1600 | ALL WORK AS PER 1400 ENTRY |
| 1700 | DUMEY LOCATING M.H. ELECT LINE |

1730 LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/18/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 54 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 7 | | | | TRACTOR | 1 |
| FTN | 1 | | | | SCRAPER | 1 |
| PFF | 1 | | | | HAUL TRUCK | 2 |
| | | | | | MINI-EXCAVATOR | 2 |
| | | | | | TRACK HOE | 2 |
| | | | | | DOZER | 1 |
| | | | | | SKY TRACK | 1 |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 81° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. DUMEY PREPING FOR WORK |
| 0700 | DUMEY HAULING WASH ROCK TO INSTALL AREA NEAR LEACHATE PIPE INSTALL, ALSO PLASTIC FUSION FABRICATORS (PFF) PERSON ON SITE TO WELD 8X4 DUEL CONTAIN. PIPE |
| 0730 | DUMEY HAULING EXCESS PROTECTIVE COVER TO WEST SIDE OF CELL. NO NEW PROTECTIVE COVER HAS ARRIVED |
| 0830 | NEW PROTECTIVE COVER ARRIVED, DUMEY HAULING AND STOCKPILING, PFF HAVING TROUBLE WITH GENERATOR DUMEY ALSO CUTTING TRENCH TO HEAD WALL LOCATION FOR 6X3 DUEL CONTAIN. |
| 1030 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER, CUT DUEL CONTAIN TRENCH, PFF WELDING DUEL CONTAIN 8X4 |
| 1230 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER, PFF WELDING DUEL CONTAIN 8X4 ON WEST SIDE OF ENTRANCE ROAD |
| 1500 | PHOTOS 91-95 DUMEY INSTALLING 9X5 VAULT BOX. |
| 1700 | DUMEY & PFF INSTALLING 90° SWEEP IN 8X4 DUEL CONT. PHOTO 96 ALSO HAULING PROT. COVER |
| 1800 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/19/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 60 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | | | |
| PFF | 1 | | | |
| AFT | 2 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 2 |
| DOZER | 1 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 78° | | ✓ | | | ✓ | | 0-5 |

AFT= ADVANCED FLUID TECHNOLOGIES

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING FOR WORK |
| 0700 | PFF INSTALLING PIPING (3x6) INSIDE OF VALVE BOX, DUMEY INSTALLING 2ND CONTAINMENT BERM #2 AB FOLDING GEOMEMBRANE RAIN FLAP BACK |
| 0900 | PFF (SHAWN) WELDING DUEL CONTAIN (3x6), DUMEY HAULING CLAY FROM BORROW AREA TO CONSTRUCT NORTH EXPANSION BERM. AFT ON SITE INSTALLING 1" CONDUIT TO RUN ELECT. TO CONTROL PANEL |
| 1100 | DUMEY HAULING TO NORTH EXP. BERM. PFF WELDING (3x6) DUEL CONTAIN. AFT WILL TRY TO RUN 2-1" CONDUIT INSIDE OF ENCASEMENT WITH 8x4 UNDER ROAD |
| 1360 | DUMEY CONTINUES TO HAUL CLAY TO BERM. PFF INSTALLING (3x6) DUEL CONTAIN, AFT WAITING FOR DELISON ON CONDUIT INSTALL LEFT SITE. |
| 1500 | PHOTO 101 SHOWS NORTH EXP. BERM CONST. DUMEY CONTINUES TO HAUL PROT. COVER. PFF (SHAWN) COMPLETED WELDING (3x6) |
| 1600 | DUMEY HAULING PROT. COVER. PFF INSTALL. BLIND FLANGES ON PIPE UNDER CONT. BERM |
| 1730 | DUMEY NOT HAULING. SEE PAGE 33, BOOK 2 FOR BLIND FLANGE LINER GASKET DETAIL |

1800 LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/20/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 61 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | | | |
| PFF | 2 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPERS | 1 |
| HAUL TRUCK | 2 |
| MIN-EXCAVATOR | 2 |
| DOZER | 1 |
| TRACK HOE | 2 |
| SKY TRACK | 1 |
| | |
| | |

PFF = PLASTIC FUSION FABRICATORS

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 77° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 78° | | ✓ | | | ✓ | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. DUMEY PREPING FOR WORK |
| 0700 | NO PROTECTIVE COVER OR WASH ROCK DELIVERED TODAY. DUMEY HAULING CLAY FROM BORROW AREA TO NORTH EXPANSION BERM. PFF (SHAWN) WILL CONTINUE TO WELD PIPE |
| 0900 | DUMEY INSTALLING WASH ROCK ON GEOTEXTILE FOR LEACHATE COLLECTION PIPE TRENCH. PFF WELDING 6" SOLID TO 6" PERF. PIPE INTO SUMP |
| 1200 | DUMEY NOT HAULING (NO ROCK OR PROTECTIVE COVER) INSTALLING ROCK PLACED NEAR LEACHATE PIPE (BURETO) PHOTO 110-111. PFF INSTALLING BLIND FLANGES ON 6" SOLID PIPE UNDER CONTAINMENT BERM # 2 AB |
| 1400 | DUMEY HAULING PROT. COVER EXCESS TO WEST SIDE OF CELL NEAR SUMP. PFF FUSION WELDING DOWN FLOW SIDE OF PIPE UNDER CONT. BERM # 1 AB |
| 1680 | DUMEY HAULING TO NORTH BERM. PFF WELDING TO EXISTING 6" CLEAN OUT EAST SIDE OF CELL 2 SOUTH TO EXTEND PIPE. DUMEY INSTALLING ROCK PHOTO 113-114 |
| 1730 | DUMEY CONTINUES TO INSTALL ROCK. PFF CONTINES WELDING EAST SIDE. |
| 1900 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/21/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 62 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | | | |
| PFF | 2 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| TRACK HOE | 1 |
| MINI-EXCAVATOR | 2 |
| SKY TRACK | |
| | |
| | |
| | |

LIGHT SHOWER

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 76° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 87° | ✓ | | ✓ | | | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING FOR WOR |
| 0700 | DUMEY COMPLETED ROCK INSTALL IN SUMP & WRAPPED WITH GEOTEXTILE (PHOTO 119), ALSO HAULING ROCK TO LEA. PIPE INSTALL AREA. PFF CONTINUES TO WORK ON EXT. 6" PIPE ON EAST SIDE OF CELL 2 SOUTH. DUMEY ALSO INSTALLING EAST PIPE HEADWALL PHOTO 120-123 |
| 0900 | DUMEY INSTALLING WASH ROCK ON TOP OF GEOTEXTILE IN LEACHATE PIPE TRENCH, ALSO BACKFILLING TO PLACE WEST HEADWALL. PFF PREPING TO LEAK TEST (3x6) DUEL CONT. (SEE PAGE 36, BOOK 2 FOR TEST RESULTS) |
| 1100 | DUMEY CONTINUES TO INSTALL WASH ROCK ON GEOTEXTILE, PFF PREPING TO LEAK TEST |
| 1200 | DUMEY COMPLETED INSTALL OF BERM LAB PHOTO 129, ALSO 2 ROLLS OF GEOTEXTILE ARRIVED #0438, #0465 |
| 1400 | DUMEY HAULING CLAY FROM BORROW AREA TO NORTH EXP. BERM PFF PREP TO LEAK TEST (1430) |
| 1500 | DUMEY INSTALLING WEST PIPE HEADWALL WITH 18" & 6" PIPES PFF LEAK TESTING (4x8) DUEL CONT. FROM VAULT TO LEA. TANK |
| 1600 | PFF LEAK TESTING (3x6), DUMEY INSTALLING WEST HEADWALL (132-136) |
| 1700 | DUMEY INSTALLING EXISTING HDWL ON EAST SIDE OF CELL 2 SOUTH |
| 1800 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/22/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 63 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 2 | | | |
| FTN | 1 | | | |
| PFF | 2 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| DOZER | 1 |
| MINI-EXCAVATOR | 2 |
| TRACK HOE | 2 |
| SKY TRACK | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 69° | Heavy ✓ | | ✓ | | | | 10-20 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. LIGHT RAIN. MIKE (DUMEY) WILL HELP WITH LEAK TEST (WATER TRUCK) PFF (SHAWN) WILL LEAK TEST (3x6) DUEL CONTAIN FROM VAULT TO WEST PIPE HEADWALL. |
| 0700 | (RAIN) PFF PREPING TO LEAK TEST. DUMEY GRADING ROAD FOR WATER TRUCK (RAIN) (WIND 10-15) |
| 0745 | STARTED LEAK TEST (PFF) RAIN! |
| 0845 | PRESSURE STABALIZED. END TEST (HEAVY RAIN) |
| 0945 | PFF LOADING EQUIP. |
| 1000 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/26/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 64 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 4 | | | |
| FTN | 1 | | | |
| PFF | 1 | | | |
| CLINE CONST. | 3 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 1 |
| DOZER | 1 |
| TRACK HOE | 1 |
| SKY TRAK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 74° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 78° | | | ✓ | | | ✓ | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PUMPING WATER FROM BEHIND CONTAINMENT BERM #3 AB TO SUMP. (PHOTO 192) IS SUMP AFTER PUMPING OUT WATER. |
| 0900 | DUMEY CONTINUES TO PUMP OUT SUMP AND BLADE HAUL ROAD, ALSO DELIVERY OF PROTECTIVE COVER HAS STARTED. |
| 1100 | DUMEY INSTALLING ROCK ON GEOTEXTILE AND LEACHATE PIPE TO WRAP BURRITO, ALSO PUMPING OUT TRENCH ON WEST SIDE OF ENTRANCE ROAD SO CLINE CAN INSTALL 4" ENCASEMENT PIPE |
| 1400 | DUMEY CONTINUES TO INSTALL WASH ROCK ON GEOTEXTILE & PIPE, STOCK PILE PROTECTIVE COVER, ALSO SHAWN (PFF) ARRIVED TO UNSSTALL PIPING IN VAULT AND CONNECT TO 18", CLINE CONST. ARRIVED ON SITE TO BORE 4" ENCASEMENT PIPE UNDER ENTRANCE ROAD |
| 1530 | DUMEY COMPLETED ROCK INSTALL AND CONTINUES TO STOCK PILE PROT. COVER. PFF CONTINUES TO WELD 3X6 TO 18", CLINE CREW STARTING TO BORE UNDER ROAD PHOTO - 199 |
| 1700 | PFF CONTINUES TO CONNECT 3" PIPE TO SIDE OF 18" AND CAP TO 6" CLEAN OUT, CLINE CREW CONTINUES TO INSTALL 4" ENCAS- PIPE |
| 1800 | LEFT SITE |

Signature: Robert Gregg

# PROJECT DAILY FIELD REPORT

**Date** 9/28/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 65 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| PFF | 1 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| DOZER | 1 |
| TRACK HOE | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 56° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 74° | | ✓ | | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE "FOG" DUMEY PREPING TO PUMP WATER FROM CONTAINMENT BERM #1 AB |
| | |
| 0700 | DUMEY PUMPING WATER. PFF (SHAWN) ON SITE TO INSTALL PIPING IN VAULT & CONNECT 4" TO LEACHATE TANK. CLINE CREW COMPLETED INSTALL OF 4" ENCASEMENT PIPE UNDER ENTRANCE ROAD, DUMEY STOCK PILING PROTECTIVE COVER |
| | |
| 1000 | DUMEY PUMPING WATER, STOCK PILING PROT. COVER. PFF CONNECTING 3" PIPE TO 18" (PHOTO 146-147) |
| | |
| 1500 | DUMEY PUMPING WATER OUT SUMP AND STOCK PILING PROTECTIVE COVER. PFF INSTALLING PIPE IN VAULT |
| | |
| 1600 | DUMEY INSTALLING LINK SEAL GASKET ON 3X6 AND 4X8 DUCT CONTAIN INTO VAULT, ALSO CONTINUES TO STOCKPILE PROT. COVER PFF CONTINUES TO INSTALL PIPING IN VAULT |
| | |
| 1700 | DUMEY STOCK PILING PROTECTIVE COVER. PFF CONTINUES TO INSTALL PIPING IN VAULT |
| 1730 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 9/29/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 66 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 0 | | | |
| PFF | 1 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| DOZER | 1 |
| TRACK HOE | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | TODAY DUMEY ASSISTED PFF(SHAWN) WITH INSTALLING PIPE IN VAULT AND CONNECTION TO LEACHATE TANK. |
| | NOTE: I WAS NOT ON SITE (SEE PHOTOS 152-155) |

Signature: Robert Bragg

# PROJECT DAILY FIELD REPORT

**Date** 10/1/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 07 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| DOZER | 1 |
| HAUL TRUCK | 2 |
| TRACK HOE | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 70° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 81 | | ✓ | | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE DUMEY PREPING FOR WORK |
| 0700 | DUMEY HAULING AND SPREADING PROTECTIVE COVER & GRADING VAULT AREA |
| 0830 | DUMEY BACKFILLING AROUND VAULT TO SUPPORT PIPING & HAULING PROTECTIVE COVER |
| 1030 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER & SPREAD ALSO PREPING TO INSTALL CONTAINMENT BERM # 2AB |
| 1230 | DUMEY WORK CONTINUES AS PER 1030 ENTRY |
| 1430 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER & SPREAD |
| 1600 | DUMEY INSTALLING GEOTEXTILE UNDER 6" PERF PIPE IN LEACHATE TRENCH |
| 1730 | DUMEY INSTALLING ROCK ON TOP OF 6" PERF. PIPE AND WRAPING GEOTEXTILE THEN ADDING ROCK ON TOP. ALSO BUILT A BRIDGE TO CONTINUE INSTALLING PROTECTIVE COVER |
| 1830 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER LEFT SITE |
| | |
| | |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/2/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 68 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| TRACK HOE | 1 |
| SKY TRACK | |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 71° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 73° | | ✓ | ✓ | ✓ | | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY HAULING CLAY FROM BORROW AREA TO COMPLETE NORTH EXPANSION BERM, STOCK PILING PROTECTIVE COVER (PHOTO 159) |
| 1000 | DUMEY HAULING CLAY TO NORTH BERM AND SUMP AREA, ALSO HAULING PROTECTIVE COVER TO CELL |
| 1200 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER TO CELL. |
| 1430 | DUMEY HAULING CLAY FROM BORROW AREA TO SUMP AREA AND SLOPES (PHOTO 160), PLYWOOD FOR NORTH EXPANSION BERM ARRIVES ON SITE |
| 1700 | DUMEY HAULING PROTECTIVE COVER, ALSO PUMPING OUT FRAMED AREA OF EASTSIDE DROP INLET EXTENSION |
| 1800 | DUMEY HAULING WASH ROCK CLOSE TO LEACHATE PIPE AREA TO INSTALL LATER |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/3/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 69 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each |
|---|---|
| Dumey | 6 |
| FTN | 1 |
| | |
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| D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|
| | | |
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| | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCKS | 2 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| TRACK HOE | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 73° | | | V | V | | | 5-10 |
| Weather | pm | 76° | | | V | | V | | 5-15 |

SITE VISIT MIKE CLAYTON (FTN)

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY PREPING FOR WORK |
| 0700 | DUMEY ADJUSTING RAIN FLAP OF BERM 2 AB |
| 1000 | DUMEY STOPED RAIN FLAP ADJUSTMENT TO HAUL PROTECTIVE COVER AND GROUTING AROUD 6" PIPE IN EAST HEADWALL |
| 1200 | ALL WORK AS PER 1000 ENTRY |
| 1400 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER AND INSTALL WASH ROCK ON TOP OF GEOTEXTILE WRAPED WASH ROCK, ALSO SHAPING NORTH EXPANSION BERM |
| 1600 | DUMEY CONTINUES TO HAUL PROTECTIVE COVER AND INSTALL WASH ROCK ON WRAPED WASH ROCK |
| 1800 | DUMEY HAULING & SPREADING PROTECTIVE COVER AND STARTING TO SHAPE CONTAINMENT BERM # 2 AB |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/4/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 70 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| TRACK HOE | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 74° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 77° | | | ✓ | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY PREPING FOR WORK |
| 0700 | DUMEY HAULING CLAY TO SUMP AREA & SLOPES, CONTINUE TO SHAPE #2 AB CONTAINMENT BERM, AND PREPING TO PAINT GAS VENT RISER PIPE (YELLOW) |
| 0800 | ALL WORK AS PER 0700 ENTRY, ALSO RIP RAP FOR CHECK DAMS ARRIVE ON SITE, DUMEY BACK FILLING WITH CLAY AROUND 18" RISER PIPE (PHOTO 162-163) |
| 1100 | DUMEY BACK TO HAULING PROTECTIVE COVER AND CONSTRUCTING CONTAINMENT BERM 2 AB, ALSO PAINTING GAS VENT PIPES CONTINUES |
| 1330 | DUMEY HAULING PROTECTIVE COVER (95% COMPLETED) SHAPING CONTAINMENT BERM #2 AB, ALSO PAINTING VENTS CONTINUES |
| 1630 | DUMEY COMPLETED CONSTRUCTING CONTAINMENT BERM #2 AB, CONTINUES TO HAUL PROTECTIVE COVER, ALSO INSTALLED GEOTEXTILE, WASH ROCK AND WRAPED 18" PIPE UP SLOPE (PHOTO 166-168) |
| 1700 | DUMEY HAULING PROTECTIVE COVER |
| 1730 | LEFT SITE |
| | |
| | |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/5/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 71 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 1 |
| DOZER | 1 |
| TRACK HOE | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 74° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 91° | | | ✓ | | ✓ | | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY REMOVING HAUL ROAD (PROTECTIVE COVER) TO BOTTOM OF SUMP NO MORE PROTECTIVE COVER DELIVERY, ALSO PAINTING GAS VENT PIPES |
| 1000 | DUMEY COLLECTING AND HAULING EXCESS PROTECTIVE COVER TO BOTTOM OF SUMP |
| 1300 | DUMEY COMPLETED PROTECTIVE COVER INSTALL AND NOW FINAL GRADING FOR QA/QC (BEARD), ALSO DRESSING UP AND INSTALLING WOOD BOXES OVER FLANGES CONNECTING 6" PERF & SOLID PIPE, BOTH BERMS (SEE PAGE 49 FIELD BOOK # 2) |
| 1500 | DUMEY HAULING CLAY TO WEST SLOPE OF SUMP TO COMPLETE SUMP COVER ALSO GRADING PERIMETER TO INSTALL STORM WATER DITCHES AND BERM |
| 1700 | ALL WORK CONTINUES AS PER 1500 ENTRY DUMEY HAULING CLAY TO HOLD DOWN EDGE OF RAIN FLAP LEFT SITE |
| 1800 | LEFT SITE |
| | |
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| | |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/6/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 72 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 4 | | | | | |
| FTN | 0 | | | | | |
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| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | | | | | | | | |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | MOST OF THE DAY WAS SPENT HAULING CLAY TO NORTH BERM AND INSTALLING CLAY ALONG EDGE OF BOTH CONTAINMENT BERMS TO PREVENT WIND BLOWING UNDER |

Signature: Robert Bryan

# PROJECT DAILY FIELD REPORT

**Date** 10/8/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 73 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 7 | | | |
| FTN | 1 | | | |
| AFT | 2 | | | |
| RIDGE SURVEYING | 2 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 2 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 1 |
| TRACK HOE | 1 |
| DOZER | 1 |
| SKY TRACK | 1 |
| | |
| | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 72° | | | ✓ | ✓ | | | 0-5 |
| Weather | pm | 82° | | ✓ | | | ✓ | | 10-15 |

AFT = ADVANCED FLUID TECHNOLOGIES

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING FOR WORK |
| 0700 | DUMEY COMPLETING NORTH EXPANSION BERM AND PREPING TO INSTALL 4X8X½ PLYWOOD. |
| 0900 | DUMEY SHAPING SLOPES ON WEST SIDE OF CELL, ALSO INSTALLING 4X8X½ PLYWOOD ON OUT SIDE EXPANSION BERM SLOPE (PHOTO 3-5) |
| 1100 | DUMEY CONTINUES TO INSTALL PLYWOOD ON NORTH EXPANSION BERM AND GRADE WEST BERM ALONG STORMWATER DITCH AREA (PHOTO 8-9) |
| 1230 | DUMEY CONTINUES TO INSTALL PLYWOOD ON NORTH BERM AND GRADE S.W. DITCH AREA. AFT ON SITE INSTALLING CONDUIT AND ELECT. IN TRENCH |
| 1500 | DUMEY BACKFILLING OVER PLYWOOD ON NORTH BERM (PHOTO 7) HAULING CLAY FOR COVER. AFT INSTALLING ELECT. TO CONTROL PANEL, ALSO RIDGE SURVEYING (BEARD) ON SITE CHECKING TOP OF PROTECTIVE COVER ELEV. |
| 1730 | DUMEY CONTINUES TO WORK ON SHAPING NORTH SLOPE |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/9/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 74 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 5 | | | |
| FTN | 1 | | | |
| AFT | 3 | | | |
| RIDGE SURVEY | 2 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 2 |
| MINI-EXCAVATOR | 1 |
| TRACK HOE | 1 |
| DOZER | 1 |
| SKY TRAK | 1 |
| HYDRO SEEDER | 1 |
| | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 70° | | | ✓ | ✓ | | | 5-10 |
| Weather | pm | 84° | | | ✓ | | ✓ | | 15-20 |

SITE VISIT DAVID PAISMORE (LLF)

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE. DUMEY PREPING FOR WORK |
| | |
| 0700 | DUMEY WILL CONTINUE SHAPING NORTH BERM AND BACK FILLING i... TRENCHES. AFT WILL CONTINUE TO INSTALL PUMP, ELECT. & CONTROL PANEL |
| | |
| 0900 | DUMEY GRADING AND CLEANING UP BORROW AREA AND SHAPING STORM WATER BERM ON NORTH SIDE OF CELL. AFT NOT ON SITE. RIDGE SURVEYING (JASON BEARD) ON SITE TO COMPLETE QAQL TOP ELEV. OF PROTECTIVE COVER |
| | |
| 1200 | DUMEY CONTINUES TO SHAPE STORMWATER BERM AND BACKFILLING 3X6 AND 4X8 DUEL CONTAIN TRENCHES, AFT ON SITE INSTALLING PUMP CONTROL PANEL, METERS & VALVES |
| | |
| 1400 | DUMEY SHAPING S.W. BERM, BACKFILLING DUEL CONTAIN TRENCHES AFT CONTINUES TO INSTALL PUMP (PHOTO 10-13) |
| | |
| 1600 | DUMEY SHAPING BERM AND INSTALLING ROCK CHECK DAMS IN STORM-WATER DITCH (PHOTO 14) AFT INSTALLING CONTROL PANEL IN LEACHATE BUILDING (PHOTOS 19-21) |
| | |
| 1700 | DUMEY COMPLETED CHECK DAMS INSTALL, CONTINUE TO GRADE DITCH AREA ON WEST SIDE, AFT LEFT SITE, DUMEY HYDROSEEDER ARRIVES |
| | |
| 1730 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/11/18

**Project** Legacy Landfill Cell 1-2 Construction

**General Contractor:** Dumey Contracting, Inc.

| Rainfall (in) | Work Day # 75 |
|---|---|
| | Total Day # |

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HAUL TRUCK | 1 |
| TRACK HOE | 1 |
| HYDRO SEEDER | 1 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | 1 |
| HAY MULCHER | 1 |
| TRACTOR/SEEDER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 53° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | 60 | | ✓ | | ✓ | | | 5-10 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE. DUMEY PREPING TO WORK |
| 0700 | DUMEY PUMPING WATER OUT OF FORMS TO POUR WALLS TO EXTEND DROP INLET ON EAST SIDE OF CELL, ALSO MARKING LOCATION TO CUT EXISTING STORM WATER DITCH, GRADING WEST AREA TO CUT STORM WATER DITCH (PHOTO 22) |
| 1000 | DUMEY CUTING STORM WATER DITCH ALONG WEST BERM (PHOTO 23) PHOTO 24 SHOWS ELECT. & LEACHATE LINE CUT WHILE TRENCHING |
| 1300 | DUMEY STOPED CUTING WEST S.W. DITCH AFTER CUTING ELECT. & LEACH. LINE, STARTED CUTING EAST SIDE STORM WATER DITCH, ALSO PREPING DISTURBED AREAS (DRAGING) TO HYDO SEED AND MULCH WITH HAY |
| 1400 | MR HENDRIX, DAVID (LEGACY) SITE VISIT WITH MIKE (DUMEY) TO DISCUSS CUT ELECT. & LEACH. LINE, MR HENDRIX WILL RE-STAKE POINTS FROM NICK (FTN) WITH HIS TRIMBLE UNIT TO CHECK STAKING. |
| 1600 | DUMEY CUTING DITCH ON EAST SIDE OF CELL, HAULING TO BORROW AREA, CENTERLINE OF DITCH ON WEST SIDE RE STAKED BY MR HENDRIX |
| 1800 | DUMEY CONT. TO CUT DITCH, HAULING CLAY TO LAY DOWN AREA WHERE WASH ROCK PROTECTIVE COVER WAS STORED (4") FOR SEED BED |
| 1830 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/12/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 76 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | | | | |
| FTN | | | | |
| | | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACK HOE | 1 |
| SCRAPER | 1 |
| TRACK HOE | 1 |
| HYDROSEEDER | 1 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| MULCHER | 1 |
| TRACTOR SEEDER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 48° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | 55° | | | ✓ | | | ✓ | 0-5 |

| Time | |
|---|---|
| 0600 | ARRIVED ON SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY FINISHING UP DITCH ON EAST SIDE OF CELL, ALSO CONTINUE TO HAUL CLAY TO LAY DOWN AREA (9") WHERE PROTECTIVE COVER AND WASH ROCK WAS STOCKPILED, ALSO TYING WEST BERM TO EXISTING CELL 2 SOUTH |
| 0930 | DUMEY CONNECTING DUEL CONTAIN (1X2) THAT WAS CUT WHILE TRENCHING WEST S.W. DITCH (PHOTO 27-29), ALSO ELECTRICIAN ARRIVES TO REPAIR CUT ELECT. AND CONDUIT, GROUTING 18" RISER PIPE IN HEADWALL (PHOTO 31-33) PHOTO 34-35 SHOWS EAST S.W. DITCH LOOKING SOUTH, THEN NORTH |
| 1100 | DUMEY CUTTING WEST DITCH TO SOUTH ELECTRICIAN LEFT SITE. AFT ON SITE CONECTING CONTROL PANEL IN LEACHATE BUILDING |
| 1300 | DUMEY HAULING CLAY TO LAY DOWN AREA, COMPLETED TRENCHING WEST DITCH TO SOUTH, ELECTRICIAN BACK ON SITE TO REPAIR LINE FROM M.H. |
| 1500 | DUMEY FERT. AND PREPING TO SEED LAY DOWN AREA, ELECTRICIAN CONTINUES TO LOCATE ELECT. BREAK IN CONDUIT & REPAIR, AFT CONTINUES TO INSTALL AND TEST CONTROL PANEL AND PUMP |
| 1700 | DUMEY SEEDING LAY DOWN AREA, ELECT. PULLING WIRE. AFT COMPLETED INSTALL OF PUMP, CONT. PANEL AND TEST. |

1830 - LEFT SITE

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/13/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 77 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 6 | | | |
| FTN | 1 | | | |
| | | | | |
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| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| TRACK HOE | 1 |
| HYDROSEEDER | 1 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| MULCHER | 1 |
| TRACTOR/SEEDER | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 55° | | | ✓ | | | ✓ | 0-5 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0600 | ARRIVED AT SITE, DUMEY PREPING TO WORK |
| 0700 | DUMEY COMPLETING WEST STORMWATER DITCH, GRADING AND CLEANING UP AREA, ALSO PREPING TO SEED AND APPLY LIME TO ALL DISTURBED AREAS, FERTILIZE & MULCH WITH HAY |
| 0930 | DUMEY CONTINUES TO WORK AS PER 0700 ENTRY, ALSO PREPING TO INSTALL THRUST BLOCKING AT VAULT AND AT SWEEPING 90° ON WEST SIDE OF ROAD TO LEACHATE TANK. SEE DETAILS PAGE 57 OF FIELD BOOK # 2 |
| 1030 | DUMEY CONTINUES TO GRADE AREA (PARKING) AND SEED ALL AREAS NEEDED, AND INSTALL THRUST BLOCKING |
| 1130 | ALL WORK CONTINUES AS PER 1030 ENTRY |
| 1200 | LEFT SITE |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/17/18

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 78 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number |
|---|---|---|---|---|
| Dumey | 8 | | | |
| FTN | 1 | | | |
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| | | | | |

| Equipment on Site: | Ea. |
|---|---|
| TRACTOR | 1 |
| SCRAPER | 1 |
| HYDRO SEEDER | 1 |
| TRACK HOE | 1 |
| DOZER | 1 |
| MINI-EXCAVATOR | 1 |
| SKY TRACK | 1 |
| HAUL TRUCK | 1 |
| MULCHER TRACTOR/SEEDER | 1 |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 54° | | ✓ | | | | ✓ | 0-5 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0700 | TODAYS TIME WAS SPENT REVIEWING MY FIELD NOTES SUB-GRADE INSTALL NOTES, CLAY LINER INSTALL, GEOCOMPOSITE, AND GEOMEMBRANE, FORMS, AND NOTES, LEACH AIR COLLECTION SYSTEM INSTALL NOTES AND FORMS. ALSO CHECKED MY PUNCH LIST FOR COMPLETION, INSTALL OF BOLLARDS AROUND VAULT AND POURING DROP INLET EXTENSION ON EAST SIDE OF CELL NOT COMPLETED AS OF TODAY CHECKED AREAS FOR LIMING, FERTILIZING, SEEDING AND MULCH. INSTALL, SUCH AS BERMS, SLOPES AND ALL DISTURBED AREAS. ALSO CHECKED EROSION CONTROL DEVICES, SILT FENCE (NEED REPAIRS) AND ROCK CHECK DAMS, ALSO CHECKED FOR PROPER CLEAN UP AND STORAGE OF EXTRA MATERIAL, THIS MAY BE LAND FILL DECISION. |

Signature: Robert Gregory

# PROJECT DAILY FIELD REPORT

**Date** 10/24/10

**Project** Legacy Landfill Cell 1-2 Construction

| Rainfall (in) | Work Day # 79 |
|---|---|
| | Total Day # |

**General Contractor:** Dumey Contracting, Inc.

| Personnel on Site: | Each | D&M Tests | Shelby Tubes | Photo Number | Equipment on Site: | Ea. |
|---|---|---|---|---|---|---|
| Dumey | 2 | | | | | |
| FTN | 1 | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | Temp. | Rain | Clear | Cloudy | Warm | Hot | Cool | Wind |
|---|---|---|---|---|---|---|---|---|---|
| Weather | am | 45° | | ✓ | ✓ | | | ✓ | 5-10 |
| Weather | pm | | | | | | | | |

| Time | |
|---|---|
| 0800 | ARRIVED AT SITE TO POUR CONCRETE TO EXTEND DROP INLET WALLS |
| 0930 | CONCRETE TRUCK ARRIVES, NO SLUMP TEST DONE, NOR SLEVE DONE. CONCRETE WAS VIBRATED AS POURED PHOTO 52-64 |
| 0940 | STARTED POUR REINFORCING NEEDED MOVING IN PLACE WHILE POURING. APPROX 3 GAL OF WATER WAS ADDED. NORTH AND SOUTH WALL IS BOWED A BIT (PHOTO 63) |
| 1010 | COMPLETED POUR |
| 1020 | POURING 4 BOLLARDS AT VAULT PHOTOS 65-69 |
| 1105 | COMPLETED BOLLARDS |
| 1200 | LEFT SITE |

Signature: Robert Gregory

# APPENDIX D

**Geocomposite QC Certificates**

July 6, 2018
Plastic Fusion Fabricators, Inc.
3455 Stanwood Blvd
Huntsville, AL, 35811

**Ref. : Legacy Landfill- Dumey Contracting**
**Customer P.O. # P17536**
**Product : TN 220-2-6**

We hereby certify that the TN 220-2-6 drainage geocomposite, meets or exceeds the project requirements as stated in the specifications. The properties listed in this section are:

| Property | Test Method | Unit | Value | Qualifier |
|---|---|---|---|---|
| **Geonet**[3] | | | | |
| Thickness | ASTM D 5199 | mil | 200 | MAV[6] |
| Carbon Black | ASTM D 4218 | % | 2.0 | MAV |
| Tensile Strength | ASTM D 7179 | lbs/in | 32 | MAV |
| Melt Flow | ASTM D 1238[2] | g/10 min | 1.0 | Maximum |
| Density | ASTM D 1505 | $g/cm^3$ | 0.94 | MAV |
| Transmissivity[1b] | ASTM D 4716 | $m^2/sec$ | $1.0 \times 10^{-3}$ | MAV |
| **Composite** | | | | |
| Ply Adhesion | ASTM D 7005 | lb/in | 1.0 | MAV |
| Transmissivity[1a] | ASTM D 4716 | $m^2/sec$ | $1.0 \times 10^{-4}$ | MAV |
| **Geotextile**[3 & 4] | | | | |
| Fabric Weight | ASTM D 5261 | $oz/yd^2$ | 6.0 | MARV[5] |
| Grab Strength | ASTM D 4632 | lbs | 160 | MARV |
| Grab Elongation | ASTM D 4632 | % | 50 | MARV |
| Trap Tear Strength | ASTM D 4533 | lbs | 60 | MARV |
| CBR Puncture | ASTM D 6241 | lbs | 450 | MARV |
| Permittivity | ASTM D 4491 | $sec^{-1}$ | 1.30 | MARV |
| AOS | ASTM D 4751 | US Sieve | 70 | MaxARV |
| UV Resistance | ASTM D 4355 | %/hrs | 70/500 | MARV |

**Notes:**

*1a. Transmissivity measured using water at 21 ± 2 °C (70 ± 4 °F) with a gradient of 0.1 and a confining pressure of 10,000 psf between steel plates after 15 minutes.*
*1b. Transmissivity measured using water at 21 ± 2 °C (70 ± 4 °F) with a gradient of 1.0 and a confining pressure of 10,000 psf between steel plates after 1 hour.*
*2. Condition 190/2.16*
*3. Geotextile and Geonet properties are prior to lamination.*
*4. Geotextile data is provided by the supplier.*
*5. MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.*
*6. Minium average value*

Sincerely,
Rajesh Patel
Rajesh Patel
QA Manager

APPROVED 5 QA

*571 Industrial Parkway, Commerce, GA 30529 * Ph : 706-336-7000 * Fax : 706-336-7007 * Email : contact@skaps.com*

**Product:** TN 220-2-6
**Project :** Legacy Landfill- Dumey Contracting

We hereby certify the following test results for the above referenced product/project :

| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010001 | 4.32 | 4.65 | $2.79 \times 10^{-4}$ | ECUX 887898 | 0.9529 | 223 | 2.21 | 53 | $1.19 \times 10^{-3}$ |
| 83271010002 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010003 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010004 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010005 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010006 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010007 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010008 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010009 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010010 | 2.90 | 3.90 | | ECUX 887898 | 0.9533 | 213 | 2.45 | 55 | |
| 83271010011 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010012 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010013 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010014 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010015 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010016 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010017 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010018 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010019 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010020 | 3.98 | 1.84 | | ECUX 887898 | 0.9536 | 216 | 2.38 | 52 | |
| 83271010021 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010022 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010023 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010024 | | | | ECUX 887898 | 0.9536 | | | | |

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**Product:** TN 220-2-6
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We hereby certify the following test results for the above referenced product/project :

| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density (g/$cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010025 | | | $2.87 \times 10^{-4}$ | ECUX 887898 | 0.9536 | | | | $1.27 \times 10^{-3}$ |
| 83271010026 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010027 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010028 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010029 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010030 | 4.73 | 4.53 | | ECUX 887898 | 0.9532 | 218 | 2.28 | 57 | |
| 83271010031 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010032 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010033 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010034 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010035 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010036 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010037 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010038 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010039 | | | | ECUX 887898 | 0.9532 | | | | |
| 83271010040 | 1.87 | 2.33 | | ECUX 887898 | 0.9534 | 212 | 2.44 | 54 | |
| 83271010041 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010042 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010043 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010044 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010045 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010046 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010047 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010048 | | | | ECUX 887898 | 0.9534 | | | | |

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| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010049 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010050 | 3.55 | 4.20 | $2.62 \times 10^{-4}$ | ECUX 887898 | 0.9530 | 215 | 2.25 | 58 | $1.14 \times 10^{-3}$ |
| 83271010051 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010052 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010053 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010054 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010055 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010056 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010057 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010058 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010059 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010060 | 1.88 | 4.01 | | ECUX 887898 | 0.9528 | 224 | 2.70 | 51 | |
| 83271010061 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010062 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010063 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010064 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010065 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010066 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010067 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010068 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010069 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010070 | 3.50 | 2.51 | | ECUX 887898 | 0.9535 | 221 | 2.23 | 59 | |
| 83271010071 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010072 | | | | ECUX 887898 | 0.9535 | | | | |

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| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010073 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010074 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010075 | | | $3.06 \times 10^{-4}$ | ECUX 887898 | 0.9535 | | | | $1.25 \times 10^{-3}$ |
| 83271010076 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010077 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010078 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010079 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010080 | 3.29 | 4.43 | | ECUX 887898 | 0.9527 | 219 | 2.56 | 55 | |
| 83271010081 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010082 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010083 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010084 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010085 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010086 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010087 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010088 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010089 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010090 | 1.89 | 1.48 | | ECUX 887898 | 0.9531 | 214 | 2.48 | 52 | |
| 83271010091 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010092 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010093 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010094 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010095 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010096 | | | | ECUX 887898 | 0.9531 | | | | |

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| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010097 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010098 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010099 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010100 | 3.35 | 4.34 | $2.84 \times 10^{-4}$ | ECUX 887898 | 0.9535 | 222 | 2.72 | 59 | $1.33 \times 10^{-3}$ |
| 83271010101 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010102 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010103 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010104 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010105 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010106 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010107 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010108 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010109 | | | | ECUX 887898 | 0.9535 | | | | |
| 83271010110 | 4.04 | 2.01 | | ECUX 887898 | 0.9529 | 217 | 2.67 | 54 | |
| 83271010111 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010112 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010113 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010114 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010115 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010116 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010117 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010118 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010119 | | | | ECUX 887898 | 0.9529 | | | | |
| 83271010120 | 3.14 | 1.65 | | ECUX 887898 | 0.9536 | 220 | 2.51 | 56 | |

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**Product:** TN 220-2-6
**Project :** Legacy Landfill- Dumey Contracting

We hereby certify the following test results for the above referenced product/project :

| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010121 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010122 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010123 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010124 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010125 | | | $3.18 \times 10^{-4}$ | ECUX 887898 | 0.9536 | | | | $1.16 \times 10^{-3}$ |
| 83271010126 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010127 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010128 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010129 | | | | ECUX 887898 | 0.9536 | | | | |
| 83271010130 | 2.40 | 4.57 | | ECUX 887898 | 0.9534 | 213 | 2.63 | 58 | |
| 83271010131 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010132 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010133 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010134 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010135 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010136 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010137 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010138 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010139 | | | | ECUX 887898 | 0.9534 | | | | |
| 83271010140 | 3.51 | 2.84 | | ECUX 887898 | 0.9528 | 222 | 2.71 | 53 | |
| 83271010141 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010142 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010143 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010144 | | | | ECUX 887898 | 0.9528 | | | | |

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**Product:** TN 220-2-6
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We hereby certify the following test results for the above referenced product/project :

| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010145 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010146 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010147 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010148 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010149 | | | | ECUX 887898 | 0.9528 | | | | |
| 83271010150 | 1.93 | 3.55 | $2.91 \times 10^{-4}$ | ECUX 887898 | 0.9530 | 217 | 2.35 | 57 | $1.3 \times 10^{-3}$ |
| 83271010151 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010152 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010153 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010154 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010155 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010156 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010157 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010158 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010159 | | | | ECUX 887898 | 0.9530 | | | | |
| 83271010160 | 2.58 | 2.05 | | ECUX 887898 | 0.9527 | 219 | 2.24 | 51 | |
| 83271010161 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010162 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010163 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010164 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010165 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010166 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010167 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010168 | | | | ECUX 887898 | 0.9527 | | | | |

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**Product:** TN 220-2-6
**Project :** Legacy Landfill- Dumey Contracting

We hereby certify the following test results for the above referenced product/project :

| Geocomposite | | | | Geonet | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Roll Number | Ply Adhesion (lb/in) | | Transmissivity ($m^2$/sec) | Resin Lot Number | Density ($g/cm^3$) | Thickness (mils) | Carbon Black (%) | Tensile Strength MD (lb/in) | Transmissivity ($m^2$/sec) |
| | Side "A" | Side "B" | | | | | | | |
| 83271010169 | | | | ECUX 887898 | 0.9527 | | | | |
| 83271010170 | 1.99 | 2.98 | | ECUX 887898 | 0.9533 | 223 | 2.42 | 58 | |
| 83271010171 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010172 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010173 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010174 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010175 | | | $2.67 \times 10^{-4}$ | ECUX 887898 | 0.9533 | | | | $1.22 \times 10^{-3}$ |
| 83271010176 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010177 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010178 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010179 | | | | ECUX 887898 | 0.9533 | | | | |
| 83271010180 | 2.14 | 2.45 | | ECUX 887898 | 0.9531 | 221 | 2.33 | 54 | |
| 83271010181 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010182 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010183 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010184 | | | | ECUX 887898 | 0.9531 | | | | |
| 83271010185 | | | | ECUX 887898 | 0.9531 | | | | |

*571 Industrial Parkway, Commerce, GA 30529 * Ph : 706-336-7000 * Fax : 706-336-7007 * Email : contact@skaps.com*

# POLYETHYLENE RESIN CERTIFICATION

**Customer Name :** Plastic Fusion Fabricators, Inc.
**Project Name :** Legacy Landfill- Dumey Contracting
**Geocomposite Manufacturer :** SKAPS Industries
**Geocomposite Production Plant :** Commerce, GA
**Geocomposite Brand Name :** TN 220-2-6

We hereby certify the following test results for the above referenced product/project:

| Resin Manufacturer | Resin Lot Number | Property | Test Method | Units | Resin Manufacturer Value | Tested Value* |
|---|---|---|---|---|---|---|
| ExxonMobil Chemical | ECUX 887898 | Density | ASTM D1505 | $g/cm^3$ | 0.9480 | 0.9482 |
| | | Melt flow Index | ASTM D1238[(a)] | g/10 min | 0.12 | 0.15 |

(a) Condition 190/2.16

* Data from SKAPS Quality Control

*571 Industrial Parkway, Commerce, GA 30529 * Ph : 706-336-7000 * Fax : 706-336-7007 * Email : contact@skaps.com*

# Geotextile Certification

**Product:** TN 220-2-6
**Project :** Legacy Landfill- Dumey Contracting

We hereby certify the following test results for the above referenced product/project :

| GEOCOMP ROLL# | FABRIC SIDE | WEIGHT oz/yd$^2$ | GRAB lbs. (MD) | GRAB ELG % (MD) | GRAB lbs. (XMD) | GRAB ELG % (XMD) | TRAP lbs. (MD) | TRAP lbs. (XMD) | CBR PUNCTURE lbs | AOS us sieve | PERM-ITY sec$^{-1}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 83271010001 | Side A | 6.30 | 164 | 71 | 174 | 82 | 78 | 80 | 468 | 70 | 1.76 |
| | Side B | 6.67 | 163 | 70 | 173 | 85 | 75 | 81 | 462 | 70 | 1.75 |
| 83271010020 | Side A | 6.58 | 165 | 65 | 170 | 81 | 77 | 82 | 454 | 70 | 1.76 |
| | Side B | 6.51 | 170 | 72 | 179 | 75 | 72 | 83 | 499 | 70 | 1.75 |
| 83271010040 | Side A | 6.27 | 161 | 68 | 175 | 78 | 70 | 87 | 461 | 70 | 1.78 |
| | Side B | 6.30 | 164 | 71 | 174 | 82 | 78 | 80 | 468 | 70 | 1.76 |
| 83271010060 | Side A | 6.22 | 167 | 75 | 175 | 76 | 76 | 85 | 471 | 70 | 1.79 |
| | Side B | 6.20 | 160 | 67 | 172 | 83 | 79 | 89 | 478 | 70 | 1.76 |
| 83271010080 | Side A | 6.65 | 168 | 66 | 180 | 80 | 80 | 90 | 488 | 70 | 1.75 |
| | Side B | 6.54 | 166 | 73 | 177 | 77 | 73 | 84 | 464 | 70 | 1.75 |
| 83271010100 | Side A | 6.26 | 162 | 68 | 170 | 78 | 70 | 87 | 483 | 70 | 1.79 |
| | Side B | 6.37 | 161 | 74 | 176 | 84 | 74 | 86 | 457 | 70 | 1.75 |
| 83271010120 | Side A | 6.22 | 167 | 75 | 175 | 76 | 76 | 85 | 471 | 70 | 1.79 |
| | Side B | 6.28 | 169 | 69 | 178 | 79 | 71 | 89 | 489 | 70 | 1.76 |
| 83271010140 | Side A | 6.66 | 164 | 71 | 171 | 82 | 78 | 80 | 485 | 70 | 1.79 |
| | Side B | 6.70 | 166 | 73 | 177 | 77 | 73 | 84 | 494 | 70 | 1.76 |
| 83271010160 | Side A | 6.43 | 165 | 65 | 178 | 81 | 77 | 82 | 453 | 70 | 1.79 |
| | Side B | 6.35 | 169 | 69 | 174 | 79 | 71 | 89 | 476 | 70 | 1.79 |
| 83271010180 | Side A | 6.28 | 169 | 69 | 178 | 79 | 71 | 89 | 489 | 70 | 1.76 |
| | Side B | 6.43 | 165 | 65 | 178 | 81 | 77 | 82 | 453 | 70 | 1.79 |

*571 Industrial Parkway, Commerce, GA 30529 * Ph : 706-336-7000 * Fax : 706-336-7007 * Email : contact@skaps.com*

# APPENDIX E

**Geocomposite Conformance Test Reports**

**JUNE 2018** **18102853**

# GEOCOMPOSITE TEST RESULTS

**PROJECT NAME: FTN/CCSW-LEGACY LF- CELL 15-2N/AR**
**PROJECT NUMBER: 18102853**

ROLL DESIGNATION: **83271010003**

| | PEEL STRENGTH (ppi) TOP | PEEL STRENGTH (ppi) BOTTOM | TRANSMISSIVTY[1] ($m^2/s$) |
|---|---|---|---|
| 1. | 4.63 | 5.75 | 4.3E-04 |
| 2. | 2.63 | 3.00 | 4.3E-04 |
| 3. | 3.75 | 3.63 | |
| 4. | 4.50 | 4.63 | |
| 5. | 2.25 | 4.13 | |
| **AVG** | 3.6 | 4.2 | 4.3E-04 |

ROLL DESIGNATION: **83271010053**

| | PEEL STRENGTH (ppi) TOP | PEEL STRENGTH (ppi) BOTTOM | TRANSMISSIVTY[1] ($m^2/s$) |
|---|---|---|---|
| 1. | 3.63 | 5.00 | 3.6E-04 |
| 2. | 6.63 | 4.13 | 4.6E-04 |
| 3. | 5.75 | 4.25 | |
| 4. | 2.38 | 3.13 | |
| 5. | 1.63 | 3.88 | |
| **AVG** | 4.0 | 4.1 | 4.1E-04 |

**(1) Pressure- 10,000 psf, Gradient- 1.0, 1 hour seating time, and between two steel plates.**

**JUNE 2018** **18102853**

# GEOCOMPOSITE TEST RESULTS

**PROJECT NAME: FTN/CCSW-LEGACY LF- CELL 15-2N/AR**
**PROJECT NUMBER: 18102853**

ROLL DESIGNATION: **83271010091**

| | PEEL STRENGTH (ppi) TOP | PEEL STRENGTH (ppi) BOTTOM | TRANSMISSIVTY[1] ($m^2/s$) |
|---|---|---|---|
| 1. | 2.88 | 5.63 | 4.2E-04 |
| 2. | 5.00 | 4.50 | 5.0E-04 |
| 3. | 4.25 | 4.63 | |
| 4. | 2.25 | 2.50 | |
| 5. | 3.25 | 4.00 | |
| **AVG** | 3.5 | 4.3 | 4.6E-04 |

ROLL DESIGNATION: **83271010108**

| | PEEL STRENGTH (ppi) TOP | PEEL STRENGTH (ppi) BOTTOM | TRANSMISSIVTY[1] ($m^2/s$) |
|---|---|---|---|
| 1. | 1.88 | 4.50 | 4.7E-04 |
| 2. | 4.38 | 3.25 | 4.4E-04 |
| 3. | 3.25 | 3.25 | |
| 4. | 1.75 | 1.25 | |
| 5. | 3.25 | 3.00 | |
| **AVG** | 2.9 | 3.1 | 4.6E-04 |

**(1) Pressure- 10,000 psf, Gradient- 1.0, 1 hour seating time, and between two steel plates.**

**JUNE 2018** **18102853**

# GEOCOMPOSITE TEST RESULTS

**PROJECT NAME: FTN/CCSW-LEGACY LF- CELL 15-2N/AR**
**PROJECT NUMBER: 18102853**

ROLL DESIGNATION: **83271010144**

| | PEEL STRENGTH (ppi) TOP | PEEL STRENGTH (ppi) BOTTOM | TRANSMISSIVTY[1] ($m^2/s$) |
|---|---|---|---|
| 1. | 3.50 | 2.13 | 4.1E-04 |
| 2. | 3.38 | 2.63 | 4.9E-04 |
| 3. | 2.25 | 3.75 | |
| 4. | 2.25 | 3.50 | |
| 5. | 1.38 | 4.00 | |
| **AVG** | 2.6 | 3.2 | 4.5E-04 |

ROLL DESIGNATION: **83271010166**

| | PEEL STRENGTH (ppi) TOP | PEEL STRENGTH (ppi) BOTTOM | TRANSMISSIVTY[1] ($m^2/s$) |
|---|---|---|---|
| 1. | 3.50 | 4.50 | 4.4E-04 |
| 2. | 2.63 | 4.50 | 4.0E-04 |
| 3. | 3.00 | 2.88 | |
| 4. | 1.13 | 2.88 | |
| 5. | 3.13 | 4.88 | |
| **AVG** | 2.7 | 3.9 | 4.2E-04 |

**(1) Pressure- 10,000 psf, Gradient- 1.0, 1 hour seating time, and between two steel plates.**

# APPENDIX F

**Clay Liner Installer Qualifications**

# DUMEY CONTRACTING, INC.

6554 Highway 77 • P.O. Box 558 • Benton, Missouri 63736


June 5, 2018

FTN Associates, Ltd.
ATTENTION: Mr. Nick Schoggin
124 W. Sunbridge Drive, Suite 3
Fayetteville, AR 72703

Re: Clay Liner Installation
Craighead County Solid Waste Disposal Authority
Legacy Landfill – Cell 1 South / 2 North Construction Project
Jonesboro, AR

Dear Sir:

Within the past three years, Dumey Contracting, Inc. has completed three landfill projects that contained clay liner construction. The projects, along with the square footage of clay liner constructed, are listed below:

| **Project Description** | **Area (SF)** |
|---|---|
| 1) Associated Electric Coop Utility Waste Landfill – New Madrid, MO | 1,307,000 SF |
| 2) Mississippi County Cell 15 Landfill – Luxora, AR | 396,000 SF |
| 3) Waste Path Sanitary Landfill - Calvert City, KY | 320,000 SF |

If you have any questions, please contact me at the office at 573-545-3030.

Sincerely,

DUMEY CONTRACTING, INC.

Thomas J. Jansen, P.E.
Vice-President


Phone 573-545-3030 • Fax 573-545-3830

# APPENDIX G

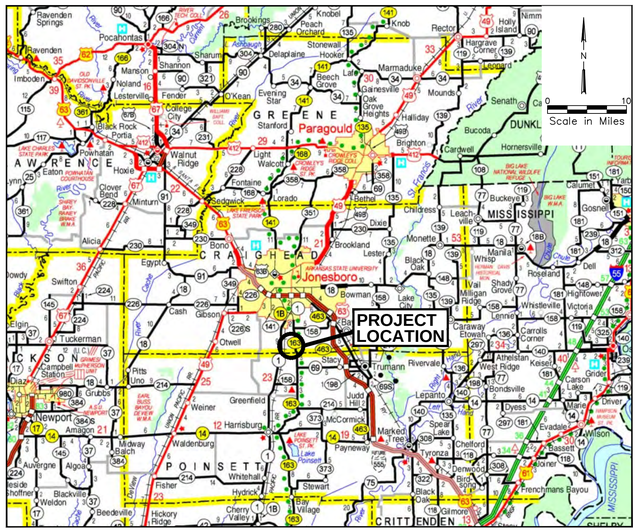
**Construction Plans**

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY

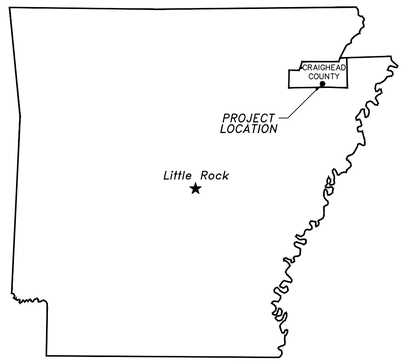
# LEGACY LANDFILL CELL 1 SOUTH / 2 NORTH CONSTRUCTION

**JONESBORO, ARKANSAS**

**MARCH 2018**




VICINITY MAP




| INDEX OF DRAWINGS | |
|---|---|
| SHEET No. | TITLE |
| 1 | GENERAL INFORMATION |
| 2 | SITE PLAN |
| 3 | SUBGRADE EXCAVATION PLAN |
| 4 | CLAY LINER PLAN |
| 5 | PROTECTIVE COVER LAYER PLAN |
| 6 | STORMWATER AND EROSION CONTROL PLAN |
| 7 | LEACHATE TRANSMISSION PIPELINE |
| 8 | GAS COLLECTION TRENCH |
| 9 | CELL NORTH–SOUTH CROSS SECTIONS |
| 10 | CELL EAST–WEST CROSS SECTION |
| 11 | CELL EAST–WEST CROSS SECTION |
| 12 | LINER DETAILS |
| 13 | GAS COLLECTION TRENCH DETAILS |
| 14 | LEACHATE COLLECTION SYSTEM DETAILS |
| 15 | LEACHATE COLLECTION SYSTEM DETAILS CONTINUED |
| 16 | LEACHATE TRANSMISSION SYSTEM DETAILS |
| 17 | STORMWATER CONTROL SYSTEM DETAILS |

ftn Associates Ltd.
water resources/environmental consultants

FTN Project No. 04469–1541–001

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 14268
NICHOLAS STOKES VAUGHN SCHUSTER
March 19, 2018

CERTIFICATE OF AUTHORIZATION
FTN Associates, Ltd.
No. 63
ARKANSAS ENGINEER

CALL BEFORE YOU DIG
1-800-482-8998
ARKANSAS ONE-CALL SYSTEM

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# ABBREVIATIONS & SYMBOLS

## ABBREVIATIONS

| | |
|---|---|
| D.F.T | DRY FILM THICKNESS |
| DIA | DIAMETER |
| DWG | DRAWING |
| E | EASTING |
| EL | ELEVATION |
| EXIST | EXISTING |
| FL | FLOW LINE |
| FT | FEET |
| FL IN | FLOW LINE IN |
| FL OUT | FLOW LINE OUT |
| HDPE | HIGH DENSITY POLYETHYLENE |
| MAX | MAXIMUM |
| MH | MANHOLE |
| MIN | MINIMUM |
| N | NORTHING |
| N.T.S. | NOT TO SCALE |
| R | RADIUS |
| TYP | TYPICAL |

## SYMBOLS

480 — EXISTING INDEX CONTOUR (5–FT)

EXISTING INTERMEDIATE CONTOUR (1–FT)

EXISTING DRAINAGE OR STREAM

EXISTING ROAD (UNPAVED)

EXISTING ROAD (PAVED)

EXISTING TREES

EXISTING TREE LINE

EXISTING UTILITY POLE

EXISTING BUILDING

EXISTING CULVERT

EXISTING FENCE

PROPERTY BOUNDARY

PROPOSED GRAVEL ROAD

PROPOSED DRAINAGE CHANNEL

H:V — FILL SLOPE INDICATOR

H:V — CUT SLOPE INDICATOR

PROPOSED CULVERT

BM #3 — SURVEY CONTROL POINT

E 6500 — SITE GRID TICK

300 — PROPOSED SUBGRADE (10–FT) CONTOUR

PROPOSED SUBGRADE (2–FT) CONTOUR

MW–4R — GROUNDWATER MONITORING WELL

PROPOSED WASTE CELL LIMITS

x 362.89 — SPOT ELEVATION

2% — SLOPE INDICATOR

1 — CONSTRUCTION CONTROL POINT

SILTY CLAY

PROTECTIVE COVER LAYER

COMPACTED CLAY LAYER

GRAVEL

CONCRETE

STORMWATER DIVERSION BERM

LCP — LEACHATE COLLECTION PIPE

LTP — LEACHATE TRANSMISSION PIPE

LIMITS OF GEOSYNTHETICS

GEOCOMPOSITE

GEOMEMBRANE

ROCK CHECK DAM

SILT FENCE

EXISTING ROAD (UNPAVED)

EXISTING ROAD (PAVED)

WASTE CELL BOUNDARY

LANDFILL PERMIT BOUNDARY

EXISTING WELL HEAD

EXISTING RAIL ROAD

EXISTING MANHOLE

EXISTING IRRIGATION VALVE

EXISTING GAS VENT

EXISTING GAS PROBE LOCATION

EXISTING GRAVITY FLOW LEACHATE PIPE

OHE — EXISTING OVERHEAD ELECTRIC

# GENERAL NOTES

1. SURVEY DATA IS BASED UPON ARKANSAS NORTH STATE PLANE COORDINATE SYSTEM. ELEVATIONS ARE BASED UPON THE NORTH AMERICAN VERTICAL DATUM OF 1988.

2. LANDFILL COORDINATE SYSTEM IS BASED UPON SITE COORDINATE SYSTEM, WHICH IS TIED INTO ARKANSAS STATE PLANE COORDINATE SYSTEM.

3. SURVEY CONTROL POINTS ARE SHOWN ON SHEET 2.

4. THE LEGACY LANDFILL IS AN ACTIVE FACILITY. CONTRACTOR SHALL TAKE PRECAUTIONS NOT TO INTERRUPT THE DAILY OPERATIONS OF THE LANDFILL. CONTRACTOR SHALL COORDINATE WITH OWNER FOR STAGING AREA.

5. CONTRACTOR SHALL OBTAIN ALL REQUIRED ENVIRONMENTAL PERMITS FOR THE WORK SHOWN IN THESE DRAWINGS.

6. EXISTING FACILITIES AND FEATURES ARE SHOWN LIGHT–LINED AND/OR SCREENED. NEW FACILITIES AND FEATURES ARE SHOWN SOLID AND HEAVY–LINED.

7. SLOPES AND GRADES SHOWN ARE IN UNITS OF FT/FT UNLESS OTHERWISE NOTED.

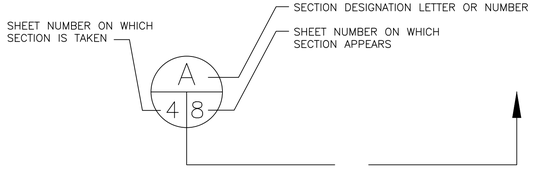
8. EROSION CONTROL FACILITIES REQUIRED BY THESE PLANS AND/OR THE FACILITY PERMIT ARE THE MINIMUM REQUIRED. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL FACILITIES AS NECESSARY.

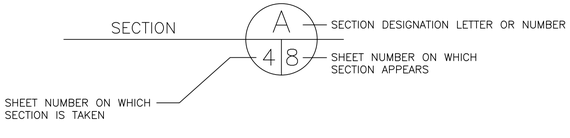
9 CONTRACTOR SHALL VERIFY ELEVATIONS PRIOR TO ANY EXCAVATION INCLUDING TOPSOIL STRIPPING.

9. ALL CONSTRUCTION OF LANDFILL LINER AND PROTECTIVE COVER LAYER SHALL BE CONDUCTED IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS.

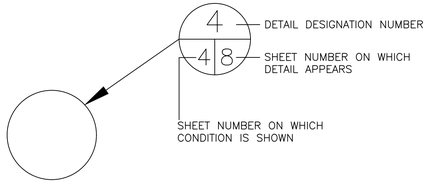
10. ALL EXISTING SUBSURFACE UTILITIES TO BE FIELD VERIFIED BY CONTRACTOR PRIOR EXCAVATION.

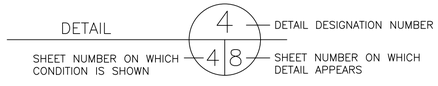
## SECTIONS




## DETAILS




CALL BEFORE YOU DIG 1–800–482–8998 ARKANSAS ONE–CALL SYSTEM

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ftn Associates Ltd. water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION — FTN Associates, Ltd. — No. 63 — ARKANSAS ENGINEER

STATE OF ARKANSAS — LICENSED PROFESSIONAL ENGINEER — NICHOLAS VAUGHN — No. 14288 — March 19, 2018

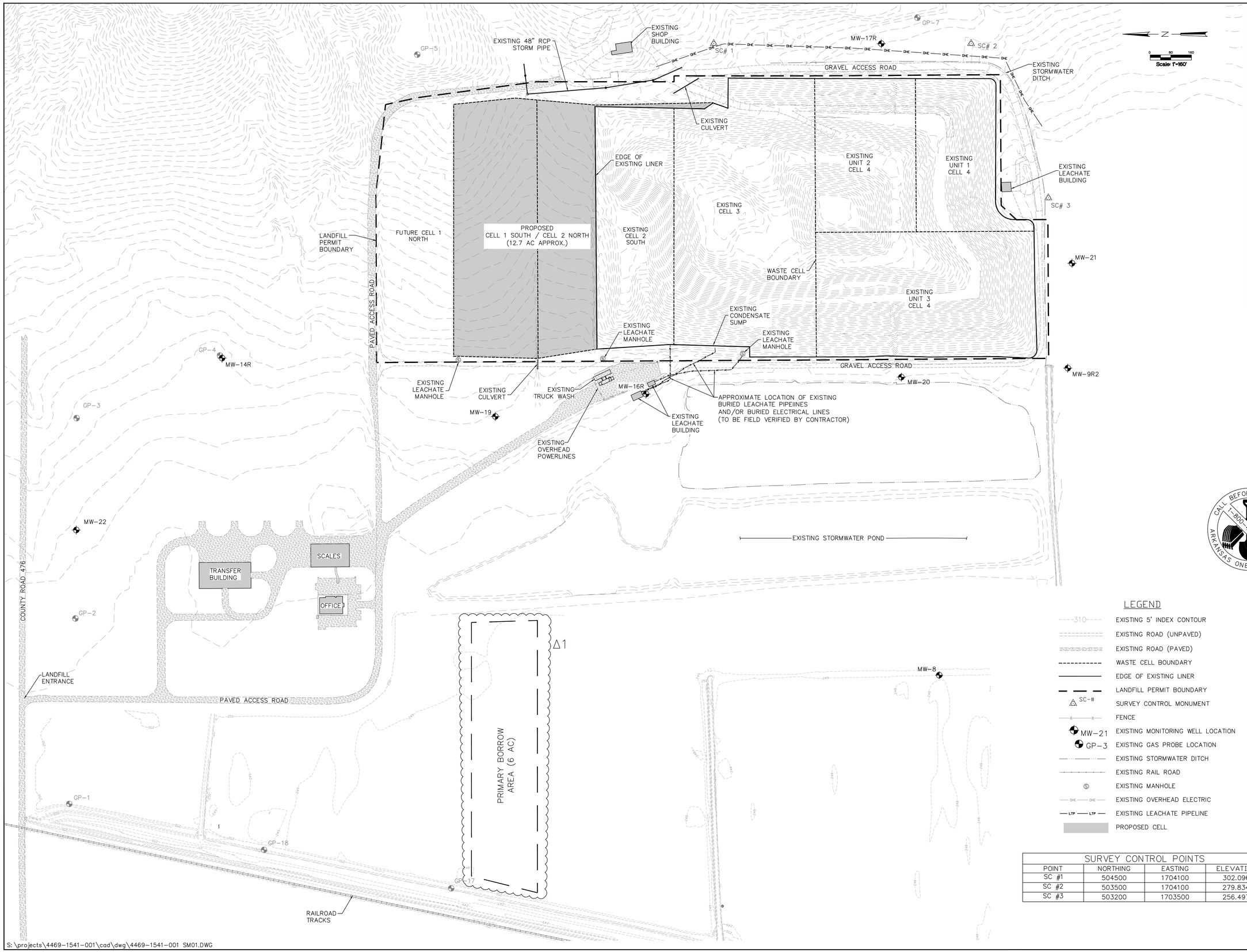
**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**

**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**

**JONESBORO, ARKANSAS**

**GENERAL INFORMATION**

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: IN01.DWG |
| APPROVED: NVB | PROJECT NO. 4469–1541–001 |
| SCALE: 1" = 100' | DATE: 03/19/18 |
| SHEET NO. 1 OF 17 | |




| REV | DATE | DESCRIPTION | BY | APVD |
|---|---|---|---|---|
| 1 | 06/17/16 | REVISE BORROW AREA LOCATION AND SIZE | JWM | NVS |

TTN ASSOCIATES, Ltd.
water resources / environmental consultants

CERTIFICATE OF AUTHORIZATION No. 63 — LICENSED PROFESSIONAL ENGINEER — NICHOLAS VAUGHN — ARKANSAS
STATE OF ARKANSAS — LICENSED PROFESSIONAL ENGINEER — NICHOLAS VAUGHN — 14468
April 5, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

### LEGEND

- 310 — EXISTING 5' INDEX CONTOUR
- EXISTING ROAD (UNPAVED)
- EXISTING ROAD (PAVED)
- WASTE CELL BOUNDARY
- EDGE OF EXISTING LINER
- LANDFILL PERMIT BOUNDARY
- SC-# — SURVEY CONTROL MONUMENT
- FENCE
- MW-21 — EXISTING MONITORING WELL LOCATION
- GP-3 — EXISTING GAS PROBE LOCATION
- EXISTING STORMWATER DITCH
- EXISTING RAIL ROAD
- EXISTING MANHOLE
- OHE — EXISTING OVERHEAD ELECTRIC
- LTP — EXISTING LEACHATE PIPELINE
- PROPOSED CELL

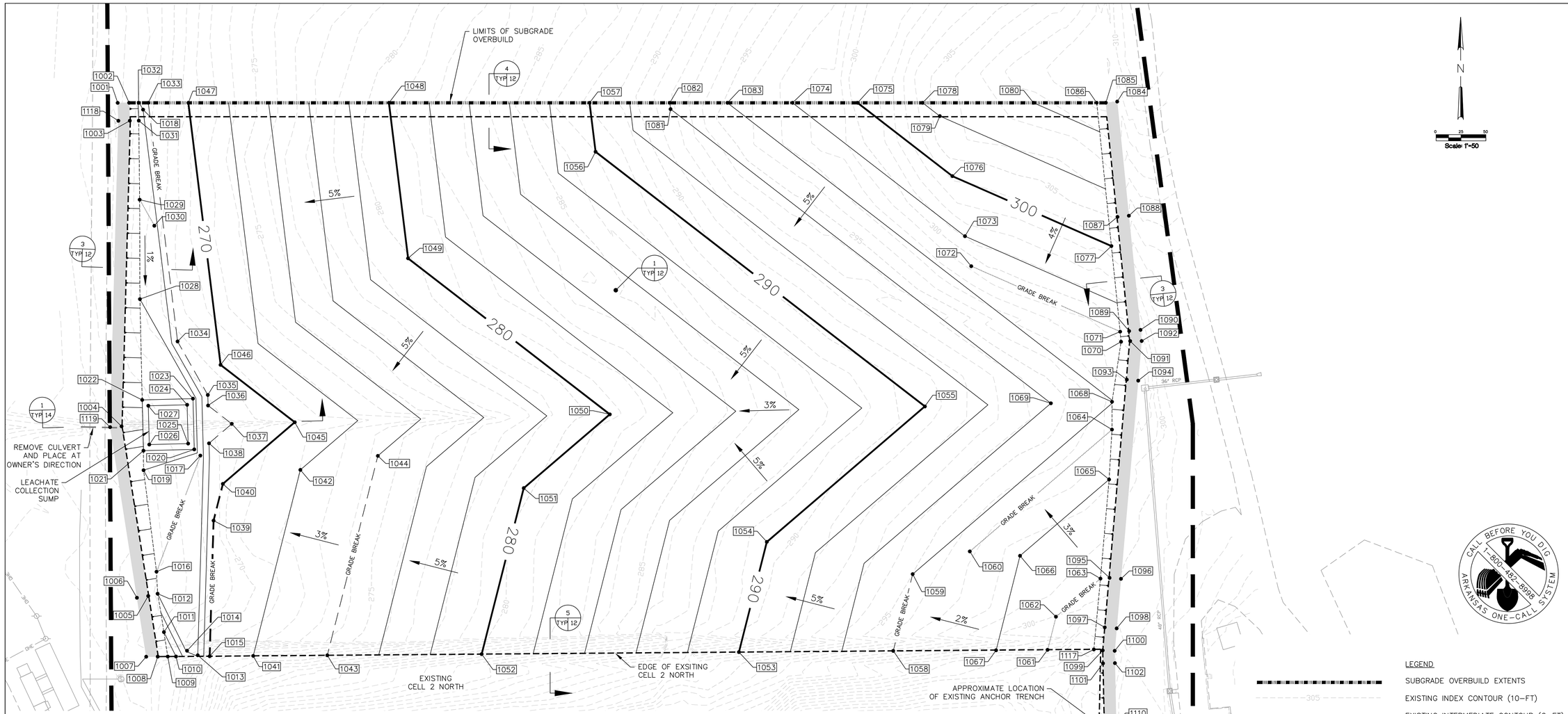
### SURVEY CONTROL POINTS

| POINT | NORTHING | EASTING | ELEVATION |
|---|---|---|---|
| SC #1 | 504500 | 1704100 | 302.096 |
| SC #2 | 503500 | 1704100 | 279.834 |
| SC #3 | 503200 | 1703500 | 256.497 |

## SITE PLAN

| DRAWN BY: | FILE NAME: |
|---|---|
| JWM | SM01DWG |
| APPROVED: NVS | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 160' | DATE: 04/05/18 |
| SHEET NO. 2 OF 17 | |

S:\projects\4469-1541-001\cad\dwg\4469-1541-001 SM01.DWG




| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | Elevation |
| 1001 | 505510.59 | 1702871.56 | 269.00 |
| 1002 | 505510.66 | 1702883.06 | 269.00 |
| 1003 | 505492.63 | 1702883.75 | 269.00 |
| 1004 | 505185.36 | 1702875.47 | 269.00 |
| 1005 | 505014.84 | 1702902.24 | 269.00 |
| 1006 | 505013.06 | 1702890.89 | 269.00 |
| 1007 | 504953.78 | 1702900.19 | 263.00 |
| 1008 | 504953.87 | 1702911.78 | 263.00 |
| 1009 | 504953.95 | 1702921.86 | 261.10 |
| 1010 | 504954.02 | 1702930.17 | 262.00 |
| 1011 | 504978.55 | 1702918.00 | 262.00 |
| 1012 | 505017.18 | 1702911.67 | 266.00 |
| 1013 | 504955.26 | 1702951.98 | 266.00 |
| 1014 | 504959.83 | 1702941.23 | 266.00 |
| 1015 | 504954.28 | 1702963.96 | 270.00 |
| 1016 | 505039.26 | 1702910.55 | 265.00 |
| 1017 | 505156.00 | 1702954.62 | 265.00 |
| 1018 | 505503.80 | 1702897.06 | 266.00 |
| 1019 | 505141.28 | 1702897.57 | 264.00 |
| 1020 | 505162.21 | 1702948.46 | 263.00 |
| 1021 | 505160.93 | 1702897.46 | 263.00 |
| 1022 | 505211.93 | 1702896.18 | 263.00 |
| 1023 | 505213.21 | 1702947.18 | 263.00 |
| 1024 | 505207.06 | 1702941.33 | 261.00 |
| 1025 | 505168.06 | 1702942.31 | 261.00 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | Elevation |
| 1026 | 505167.08 | 1702903.31 | 261.00 |
| 1027 | 505206.09 | 1702902.33 | 261.00 |
| 1028 | 505313.26 | 1702893.92 | 264.00 |
| 1029 | 505413.26 | 1702893.62 | 265.00 |
| 1030 | 505387.06 | 1702908.37 | 265.00 |
| 1031 | 505492.68 | 1702892.76 | 266.00 |
| 1032 | 505510.66 | 1702892.62 | 266.00 |
| 1033 | 505510.66 | 1702902.27 | 268.00 |
| 1034 | 505270.74 | 1702931.72 | 268.00 |
| 1035 | 505216.95 | 1702962.09 | 268.00 |
| 1036 | 505206.33 | 1702962.36 | 268.00 |
| 1037 | 505187.91 | 1702986.15 | 268.00 |
| 1038 | 505168.33 | 1702963.31 | 268.00 |
| 1039 | 505090.63 | 1702967.88 | 270.00 |
| 1040 | 505127.58 | 1702977.24 | 270.00 |
| 1041 | 504954.63 | 1703007.71 | 272.00 |
| 1042 | 505141.64 | 1703055.08 | 272.00 |
| 1043 | 504955.21 | 1703082.13 | 274.00 |
| 1044 | 505155.70 | 1703132.91 | 274.00 |
| 1045 | 505189.50 | 1703049.44 | 270.00 |
| 1046 | 505247.20 | 1702974.91 | 270.00 |
| 1047 | 505510.66 | 1702942.57 | 270.00 |
| 1048 | 505510.66 | 1703144.07 | 280.00 |
| 1049 | 505354.32 | 1703163.26 | 280.00 |
| 1050 | 505197.45 | 1703365.92 | 280.00 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | Elevation |
| 1051 | 505123.28 | 1703279.44 | 280.00 |
| 1052 | 504956.42 | 1703237.17 | 280.00 |
| 1053 | 504958.45 | 1703495.58 | 290.00 |
| 1054 | 505069.24 | 1703523.64 | 290.00 |
| 1055 | 505205.39 | 1703682.40 | 290.00 |
| 1056 | 505461.44 | 1703351.61 | 290.00 |
| 1057 | 505510.66 | 1703345.57 | 290.00 |
| 1058 | 504959.66 | 1703650.63 | 296.00 |
| 1059 | 505036.81 | 1703670.17 | 296.00 |
| 1060 | 505059.67 | 1703727.54 | 297.00 |
| 1061 | 504960.70 | 1703805.62 | 299.00 |
| 1062 | 504993.99 | 1703814.06 | 299.00 |
| 1063 | 505032.35 | 1703858.78 | 299.00 |
| 1064 | 505182.12 | 1703870.31 | 297.00 |
| 1065 | 505131.97 | 1703867.45 | 298.00 |
| 1066 | 505055.25 | 1703778.00 | 298.00 |
| 1067 | 504960.29 | 1703753.94 | 298.00 |
| 1068 | 505210.11 | 1703870.38 | 295.90 |
| 1069 | 505208.57 | 1703808.99 | 294.00 |
| 1070 | 505270.44 | 1703879.46 | 296.90 |
| 1071 | 505280.57 | 1703878.55 | 297.00 |
| 1072 | 505346.38 | 1703728.98 | 297.00 |
| 1073 | 505376.56 | 1703722.66 | 298.00 |
| 1074 | 505510.66 | 1703549.41 | 298.00 |
| 1075 | 505510.66 | 1703614.76 | 300.00 |

| Point Table | | | |
|---|---|---|---|
| Point # | Northing | Easting | Elevation |
| 1076 | 505436.92 | 1703710.03 | 300.00 |
| 1077 | 505366.64 | 1703869.75 | 300.00 |
| 1078 | 505510.66 | 1703680.11 | 302.00 |
| 1079 | 505497.28 | 1703697.40 | 302.00 |
| 1080 | 505510.66 | 1703791.53 | 304.00 |
| 1081 | 505504.29 | 1703426.95 | 294.00 |
| 1082 | 505510.66 | 1703426.17 | 294.00 |
| 1083 | 505510.66 | 1703484.06 | 296.00 |
| 1084 | 505511.88 | 1703875.59 | 308.00 |
| 1085 | 505510.72 | 1703864.16 | 308.00 |
| 1086 | 505510.66 | 1703854.98 | 305.00 |
| 1087 | 505395.95 | 1703875.88 | 304.00 |
| 1088 | 505397.12 | 1703887.31 | 304.00 |
| 1089 | 505281.19 | 1703887.61 | 300.00 |
| 1090 | 505282.36 | 1703899.04 | 300.00 |
| 1091 | 505271.10 | 1703888.64 | 299.60 |
| 1092 | 505271.19 | 1703900.18 | 299.60 |
| 1093 | 505232.33 | 1703885.27 | 300.00 |
| 1094 | 505231.34 | 1703896.71 | 300.00 |
| 1095 | 505033.09 | 1703867.93 | 302.00 |
| 1096 | 505032.09 | 1703879.38 | 302.00 |
| 1097 | 504983.32 | 1703863.09 | 302.50 |
| 1098 | 504982.28 | 1703875.04 | 302.50 |
| 1099 | 504960.12 | 1703861.07 | 302.50 |
| 1100 | 504959.72 | 1703873.08 | 302.50 |

LEGEND

- SUBGRADE OVERBUILD EXTENTS
- 305 — EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BRAKE AT PROPOSED SUBGRADE (10 FT) CONTOUR
- GRADE BRAKE AT PROPOSED SUBGRADE (2 FT) CONTOUR
- 300 — PROPOSED SUBGRADE (10 FT) CONTOUR
- PROPOSED SUBGRADE (2 FT) CONTOUR
- 1001 — CONSTRUCTION CONTROL POINT
- TOP OF PERIMETER BERM SUBGRADE
- DHE — DHE — EXISTING OVERHEAD ELECTRICAL LINE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING GRAVITY FLOW LEACHATE PIPE

NOTE:

REMOVE ALL SPRINKLER RELATED EQUIPMENT FROM PROJECT AREA.

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ENGINEER
ARKANSAS

STATE OF ARKANSAS
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No. 14288
NICHOLAS J. VAUGHN
March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## SUBGRADE EXCAVATION PLAN

| | |
|---|---|
| DRAWN BY: gwm | FILE NAME: 4469-034EP01.DWG |
| APPROVED: nms | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 50' | DATE: 03/19/18 |
| SHEET NO. 3 OF 17 | |

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EDGE OF CELL 1 SOUTH

LIMITS OF CLAY LINER OVERBUILD

4 TYP 12

GRADE BREAK

270

280

290

300

5%

1%

4%

3%

2%

3 TYP 12

1 TYP 12

1 TYP 14

LEACHATE COLLECTION SUMP

5 TYP 12

EXISTING CELL 2 NORTH

EDGE OF EXISTING CELL 2 SOUTH

36" RCP

48" RCP

1 TYP 13

EXISTING CELL 2 SOUTH

PERIMETER BERM EXPANSION

APPROXIMATE LOCATION OF EXISTING ANCHOR TRENCH

GRAVEL ACCESS ROAD

N

0 25 50

Scale: 1"=50'

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

LEGEND

- CLAY LINER OVERBUILD EXTENTS
- 305 EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BREAK GRADE BRAKE AT PROPOSED CLAY LINER (10 FT) CONTOUR
- GRADE BREAK GRADE BRAKE AT PROPOSED CLAY LINER (2 FT) CONTOUR
- 300 PROPOSED CLAY LINER (10 FT) CONTOUR
- PROPOSED CLAY LINER (2 FT) CONTOUR
- TOP OF PERIMETER BERM
- OHE OHE EXISTING OVERHEAD ELECTRICAL LINE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING GRAVITY FLOW LEACHATE PIPE

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STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER NICHOLAS VAUGHN No. 14288

March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## CLAY LINER PLAN

| | |
|---|---|
| DRAWN BY: SWM | FILE NAME: 4469-034EP01.DWG |
| APPROVED: NBS | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 50' | DATE: 03/19/18 |
| SHEET NO. 4 OF 17 | |

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EDGE OF CELL 1 SOUTH

LIMITS OF PROTECTIVE COVER OVERBUILD

EXPANSION BERM

4 TYP 12

GRADE BREAK

5%

1%

3 TYP 12

270

280

290

300

1 TYP 12

4%

3%

2%

2 TYP 12

LEACHATE COLLECTION TRENCH

LCP

3 TYP 14

LEACHATE COLLECTION SUMP

5 TYP 12

36" RCP

CLEANOUT HEADWALL 2 / 5 / 15

LIMITS OF PROTECTIVE COVER

TOP OF PERIMETER BERM

48" RCP

1 TYP 13

EXISTING CELL 2 NORTH

EDGE OF EXISTING CELL 2 SOUTH

EXISTING CELL 2 SOUTH

PERIMETER BERM EXPANSION

APPROXIMATE LOCATION OF EXISTING ANCHOR TRENCH

GRAVEL ACCESS ROAD

N

0 25 50

Scale: 1"=50'

LEGEND

- OVERBUILD EXTENTS
- EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- TOP OF PERIMETER BERM
- EXISTING OVERHEAD ELECTRICAL LINE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING GRAVITY FLOW LEACHATE PIPE

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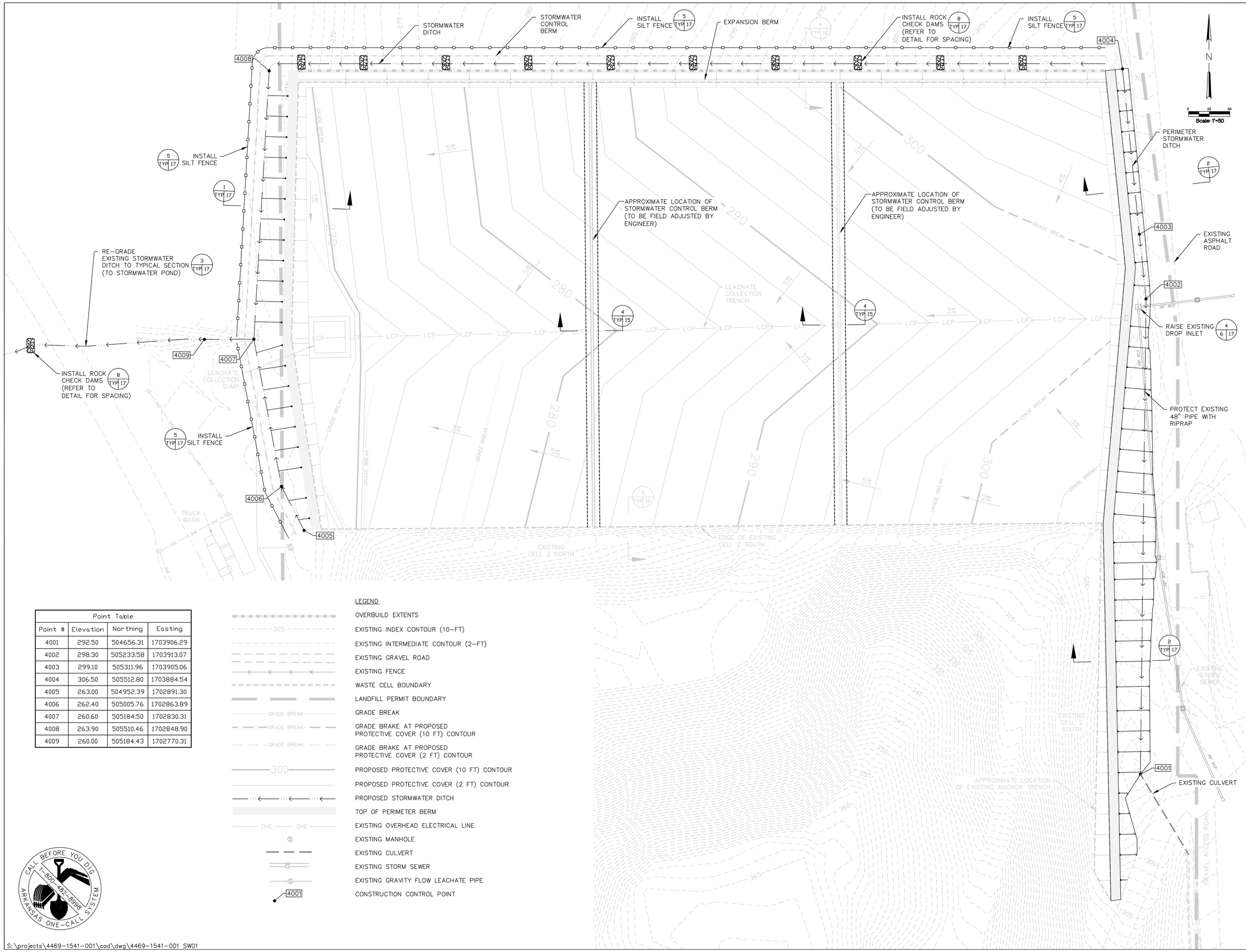
March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## PROTECTIVE COVER LAYER PLAN

| | |
|---|---|
| DRAWN BY: gwm | FILE NAME: PC01.DWG |
| APPROVED: nbs | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 50' | DATE: 03/19/18 |
| SHEET NO. 5 OF 17 | |

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| Point Table | | | |
|---|---|---|---|
| Point # | Elevation | Northing | Easting |
| 4001 | 292.50 | 504656.31 | 1703906.29 |
| 4002 | 298.30 | 505233.58 | 1703913.07 |
| 4003 | 299.10 | 505311.96 | 1703905.06 |
| 4004 | 306.50 | 505512.80 | 1703884.54 |
| 4005 | 263.00 | 504952.39 | 1702891.30 |
| 4006 | 262.40 | 505005.76 | 1702863.89 |
| 4007 | 260.60 | 505184.50 | 1702830.31 |
| 4008 | 263.90 | 505510.46 | 1702848.90 |
| 4009 | 260.00 | 505184.43 | 1702770.31 |

LEGEND

- OVERBUILD EXTENTS
- EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- EXISTING FENCE
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED STORMWATER DITCH
- TOP OF PERIMETER BERM
- EXISTING OVERHEAD ELECTRICAL LINE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING GRAVITY FLOW LEACHATE PIPE
- CONSTRUCTION CONTROL POINT

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

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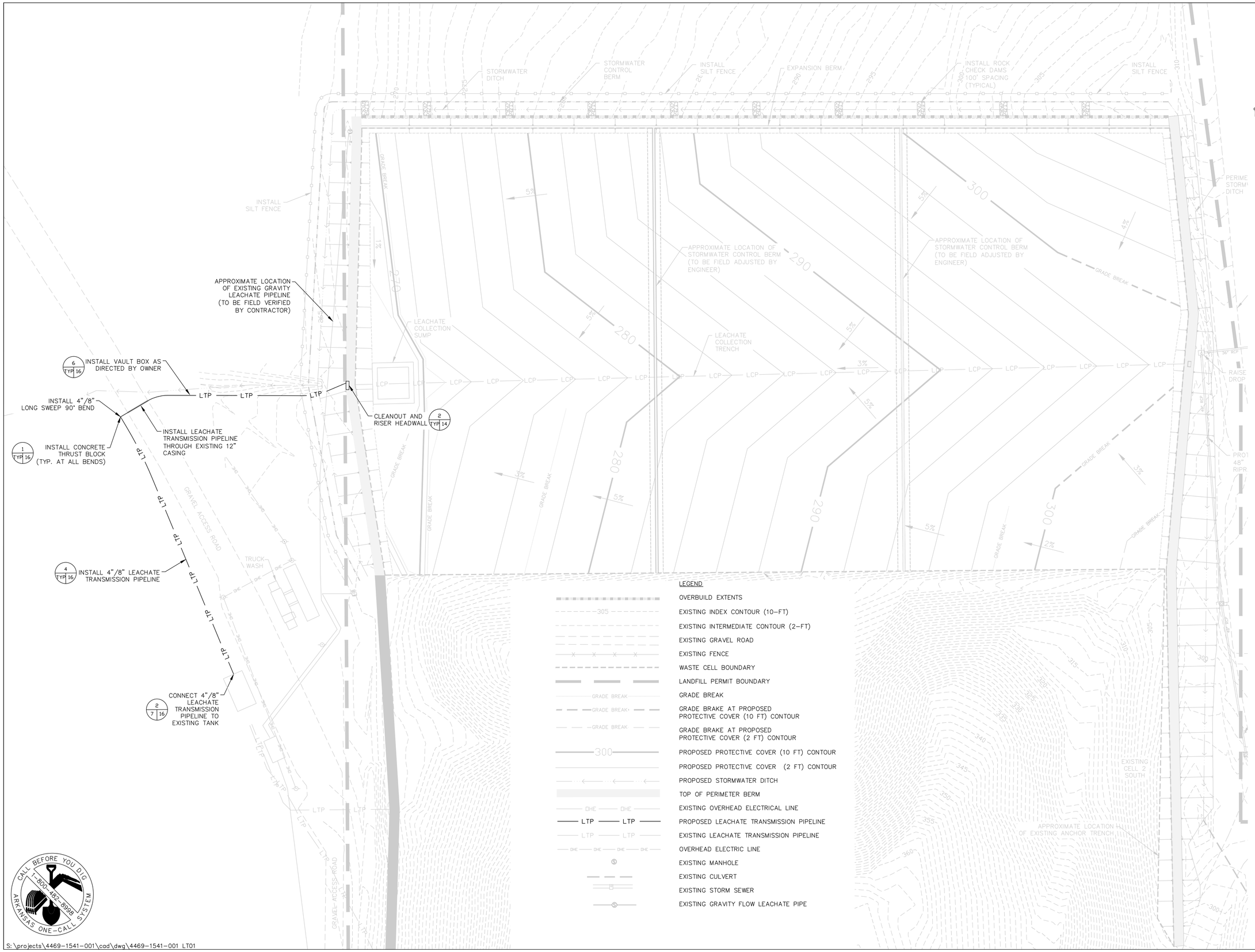
CERTIFICATE OF AUTHORIZATION FTN Associates, Ltd. No. 63 ENGINEER ARKANSAS

STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER No. 14288 NICHOLAS S. VAUGHN March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## STORMWATER AND EROSION CONTROL PLAN

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: 4469-034SW01.DWG |
| APPROVED: NSS | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 50' | DATE: 03/19/18 |
| SHEET NO. 6 OF 17 | |




LEGEND

- OVERBUILD EXTENTS
- EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- EXISTING FENCE
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED STORMWATER DITCH
- TOP OF PERIMETER BERM
- EXISTING OVERHEAD ELECTRICAL LINE
- PROPOSED LEACHATE TRANSMISSION PIPELINE
- EXISTING LEACHATE TRANSMISSION PIPELINE
- OVERHEAD ELECTRIC LINE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING GRAVITY FLOW LEACHATE PIPE

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

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STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER No. 14288 NICHOLAS S. VAUGHN March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## LEACHATE TRANSMISSION PIPELINE PLAN

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: LT01.DWG |
| APPROVED: NSS | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 50' | DATE: 03/19/18 |
| SHEET NO. 7 OF 17 | |




| Point Table for Gas Collection Trench | | |
|---|---|---|
| Point # | Northing | Easting |
| 6001 | 505483.54 | 1702871.01 |
| 6002 | 505343.59 | 1702867.24 |
| 6003 | 505203.64 | 1702863.46 |
| 6004 | 505165.69 | 1702865.91 |
| 6005 | 505064.43 | 1702881.81 |
| 6006 | 504963.17 | 1702897.71 |
| 6007 | 504926.23 | 1702900.91 |
| 6008 | 504806.52 | 1702908.39 |
| 6009 | 504686.80 | 1702915.86 |
| 6010 | 504657.46 | 1702916.61 |
| 6011 | 504527.53 | 1702912.85 |
| 6012 | 504397.60 | 1702909.08 |
| 6013 | 505495.03 | 1703878.31 |
| 6014 | 505385.60 | 1703889.50 |
| 6015 | 505276.17 | 1703900.68 |
| 6016 | 505265.48 | 1703900.69 |
| 6017 | 505180.80 | 1703893.32 |
| 6018 | 505096.12 | 1703885.95 |
| 6019 | 505086.16 | 1703885.08 |
| 6020 | 504989.02 | 1703876.63 |
| 6021 | 504891.65 | 1703875.47 |
| 6022 | 504881.65 | 1703875.68 |
| 6023 | 504759.18 | 1703878.18 |
| 6024 | 504636.70 | 1703880.68 |
| 6025 | 504959.69 | 1703874.08 |

LEGEND

- OVERBUILD EXTENTS
- EXISTING INDEX CONTOUR (10-FT)
- EXISTING INTERMEDIATE CONTOUR (2-FT)
- EXISTING GRAVEL ROAD
- EXISTING FENCE
- WASTE CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- GRADE BREAK
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- GRADE BRAKE AT PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (10 FT) CONTOUR
- PROPOSED PROTECTIVE COVER (2 FT) CONTOUR
- PROPOSED STORMWATER DITCH
- TOP OF PERIMETER BERM
- EXISTING OVERHEAD ELECTRICAL LINE
- GAS COLLECTION TRENCH
- EXISTING CONDENSATE SUMP
- EXISTING GAS COLLECTION PIPE
- EXISTING MANHOLE
- EXISTING CULVERT
- EXISTING STORM SEWER
- EXISTING VALVE BOX
- EXISTING GRAVITY FLOW LEACHATE PIPE
- CONSTRUCTION CONTROL POINT

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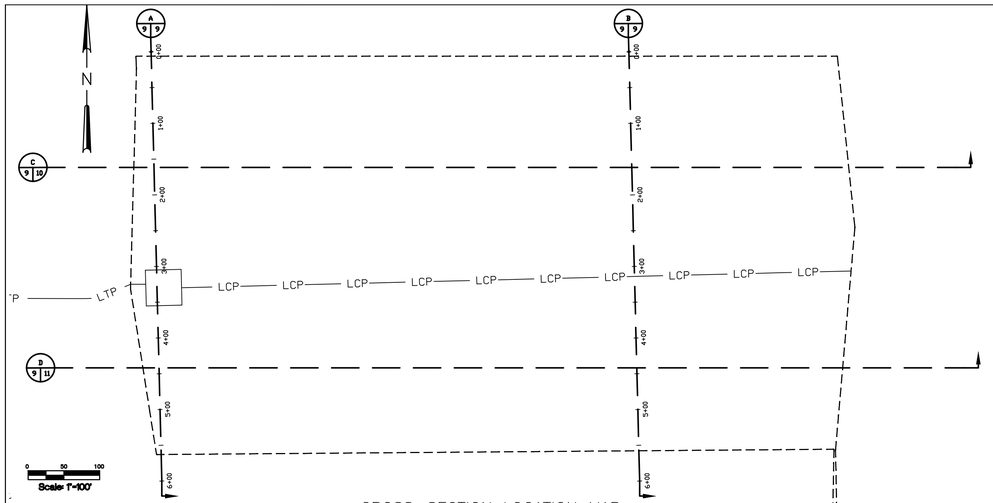
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ARKANSAS ENGINEER

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 14288
VAUGHN
March 19, 2018

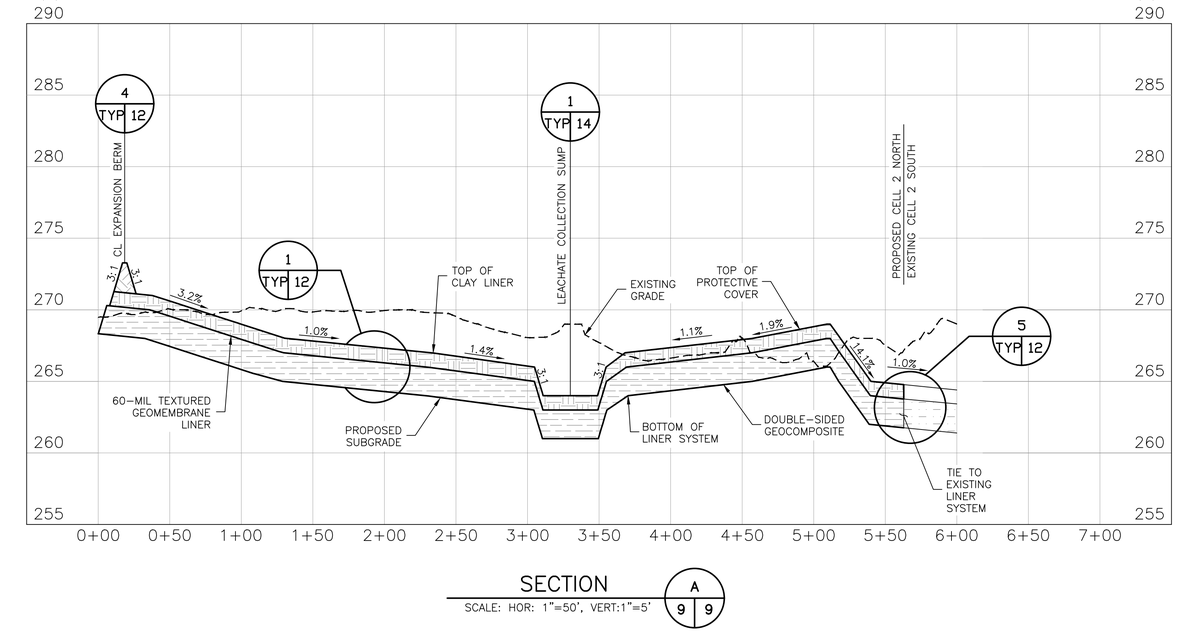
# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## GAS COLLECTION TRENCH

| | |
|---|---|
| DRAWN BY: JWM | FILE NAME: GC01.DWG |
| APPROVED: MWS | PROJECT NO. 4469-1541-001 |
| SCALE: 1" = 50' | DATE: 03/19/18 |
| SHEET NO. 8 OF 17 | |




CROSS-SECTION LOCATION MAP



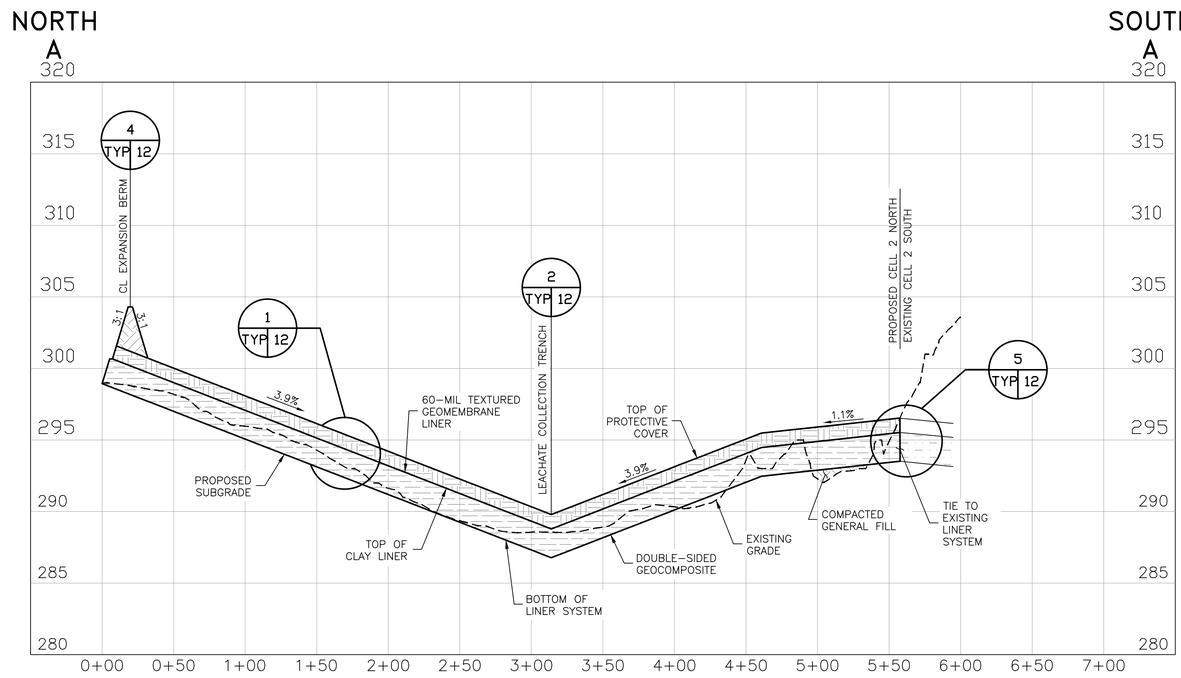

SECTION
SCALE: HOR: 1"=50', VERT:1"=5'
A
9 9

## LEGEND

- EXISTING GROUND
- PROPOSED BOTTOM LINER SYSTEM
- LCP — LCP — LCP — LEACHATE COLLECTION PIPE
- LTP — LTP — DUAL-CONTAINED LEACHATE TRANSMISSION PIPELINE
- COMPACTED CLAY LINER
- COMPACTED PROTECTIVE COVER
- COMPACTED GENERAL FILL

NOTES:

1. AREAS REQUIRING FILL TO MEET SUBGRADE ELEVATIONS WILL BE CONSTRUCTED WITH COMPACTED GENERAL FILL SOILS. REFER TO SHEET 3 FOR SUBGRADE PLAN.
2. REFER TO SHEET 4 FOR INFORMATION ON BOTTOM LINER SYSTEM.
3. REFER TO SHEET 3 FOR INFORMATION ON SUBGRADE ELEVATIONS AND GRADE.




SECTION
SCALE: HOR: 1"=50', VERT:1"=5'
B
9 9

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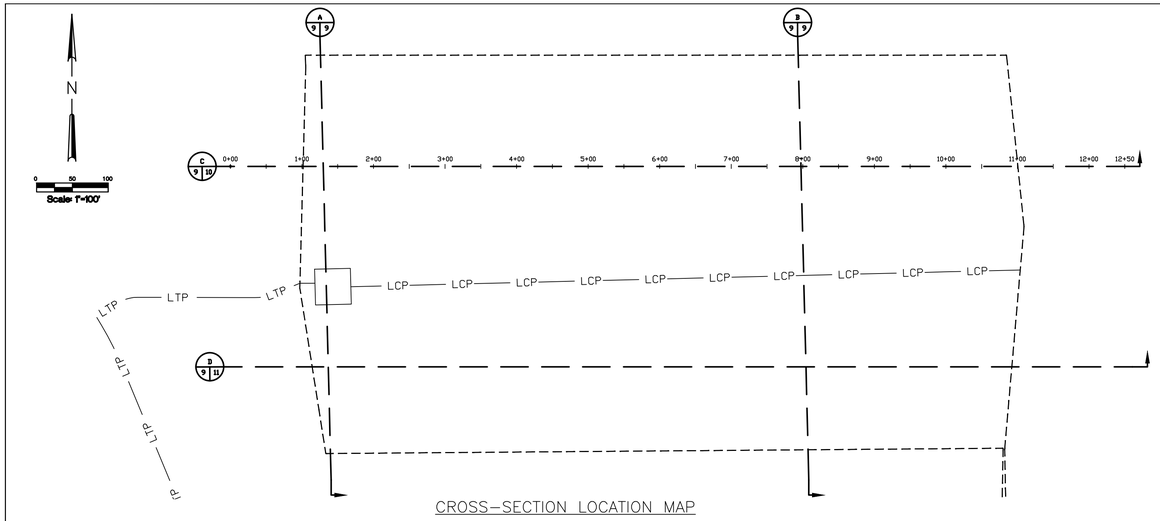
STATE OF ARKANSAS
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NICHOLAS VAUGHN
No. 14288
March 19, 2018

**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**NORTH - SOUTH CROSS SECTIONS**

| | |
|---|---|
| DRAWN BY: jwm | FILE NAME: CX01.DWG |
| APPROVED: nsvs | PROJECT NO. 04469-1541-001 |
| SCALE: AS SHOWN | DATE: 03/19/18 |
| SHEET NO. 9 OF 17 | |

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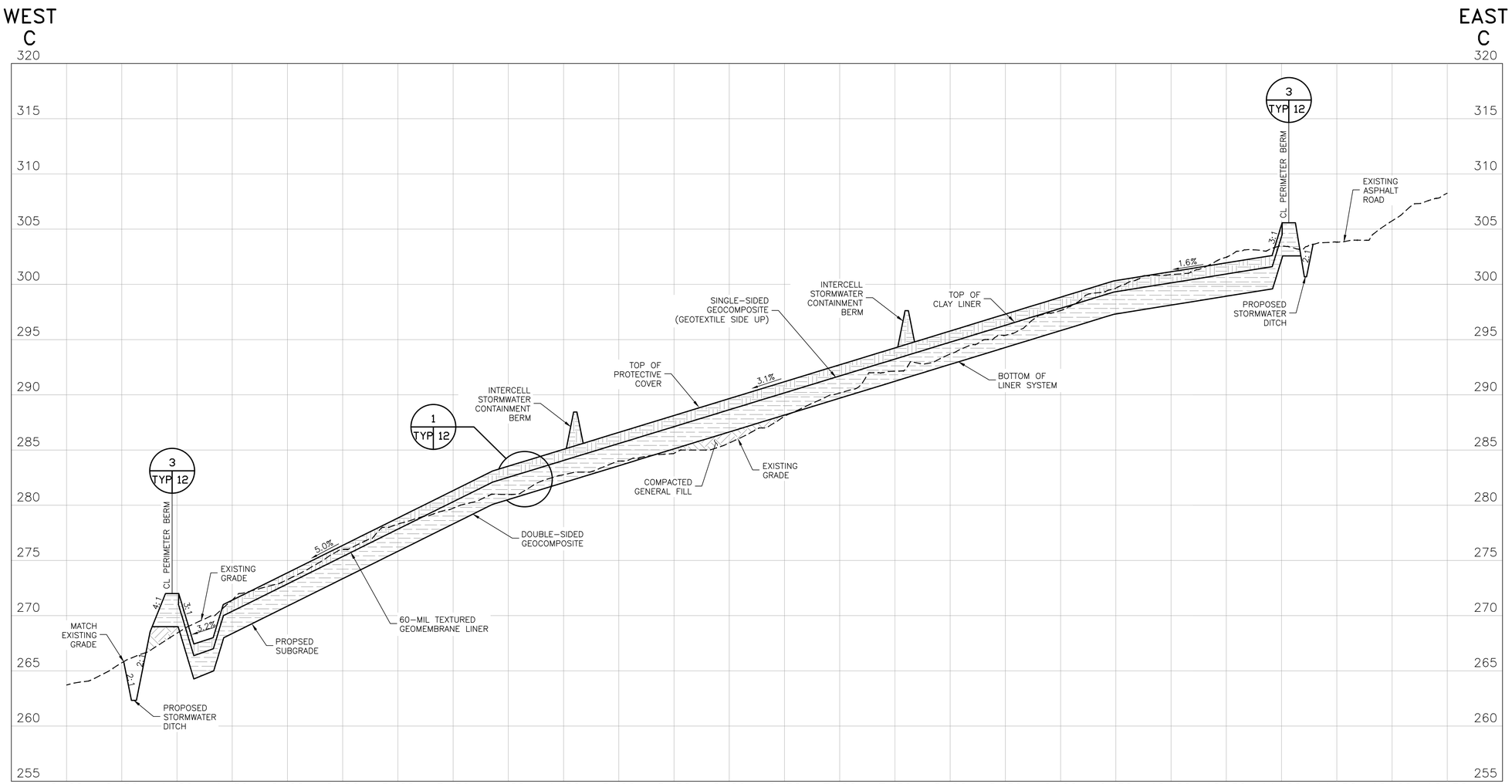

CROSS–SECTION LOCATION MAP

## LEGEND

- EXISTING GROUND
- PROPOSED BOTTOM LINER SYSTEM
- LCP — LCP — LCP — LEACHATE COLLECTION PIPE
- LTP — LTP — DUAL–CONTAINED LEACHATE TRANSMISSION PIPELINE
- COMPACTED CLAY LINER
- COMPACTED PROTECTIVE COVER
- COMPACTED GENERAL FILL

NOTES:

1. AREAS REQUIRING FILL TO MEET SUBGRADE ELEVATIONS WILL BE CONSTRUCTED WITH COMPACTED GENERAL FILL SOILS. REFER TO SHEET 3 FOR SUBGRADE PLAN.
2. REFER TO SHEET 4 FOR INFORMATION ON BOTTOM LINER SYSTEM.
3. REFER TO SHEET 3 FOR INFORMATION ON SUBGRADE ELEVATIONS AND GRADE.




SECTION C 9 | 10

SCALE: HOR: 1"=50', VERT:1"=5'

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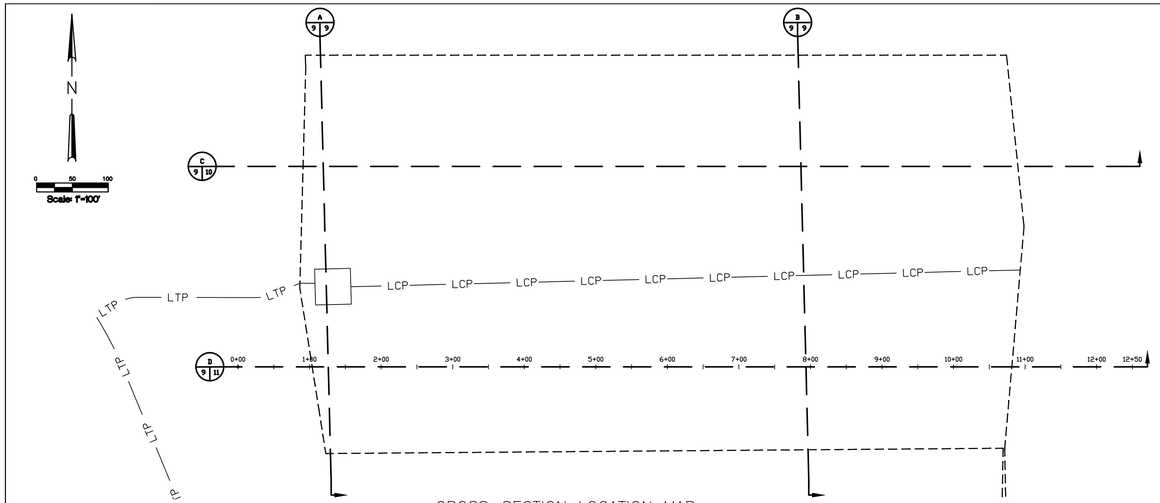
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No. 14288
March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## EAST - WEST CROSS SECTION

CALL BEFORE YOU DIG 1–800–482–8998 ARKANSAS ONE–CALL SYSTEM

| | |
|---|---|
| DRAWN BY: jwm | FILE NAME: CX02.DWG |
| APPROVED: nmv | PROJECT NO. 04469–1541–001 |
| SCALE: AS SHOWN | DATE: 03/19/18 |
| SHEET NO. 10 OF 17 | |



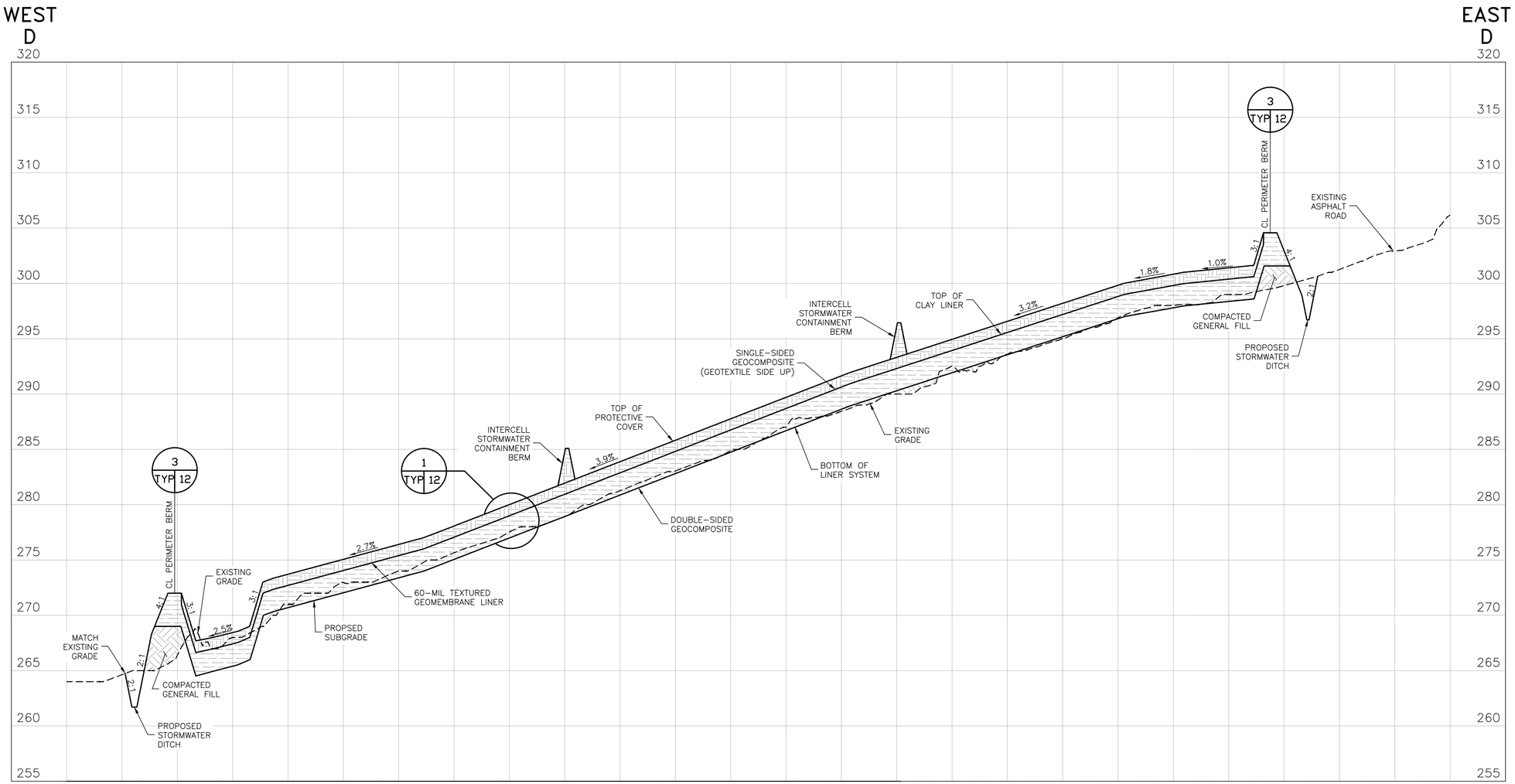

CROSS–SECTION LOCATION MAP

## LEGEND

- EXISTING GROUND
- PROPOSED BOTTOM LINER SYSTEM
- LCP — LCP — LCP — LEACHATE COLLECTION PIPE
- LTP — LTP — DUAL–CONTAINED LEACHATE TRANSMISSION PIPELINE
- COMPACTED CLAY LINER
- COMPACTED PROTECTIVE COVER
- COMPACTED GENERAL FILL

NOTES:

1. AREAS REQUIRING FILL TO MEET SUBGRADE ELEVATIONS WILL BE CONSTRUCTED WITH COMPACTED GENERAL FILL SOILS. REFER TO SHEET 3 FOR SUBGRADE PLAN.
2. REFER TO SHEET 4 FOR INFORMATION ON BOTTOM LINER SYSTEM.
3. REFER TO SHEET 3 FOR INFORMATION ON SUBGRADE ELEVATIONS AND GRADE.




SECTION D 9 11

SCALE: HOR: 1"=50', VERT:1"=5'

S:\projects\04469–1541–001\cad\dwg\04469–1541–001 CX03.DWG

FTN Associates, Ltd. water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION FTN Associates, Ltd. No. 63 ENGINEER ARKANSAS

STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER NICHOLAS S. VAUGHN No. 14288

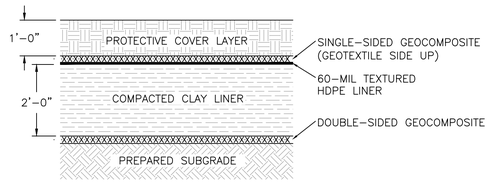
March 19, 2018

# CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY
## CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION
## JONESBORO, ARKANSAS

## EAST - WEST CROSS SECTION

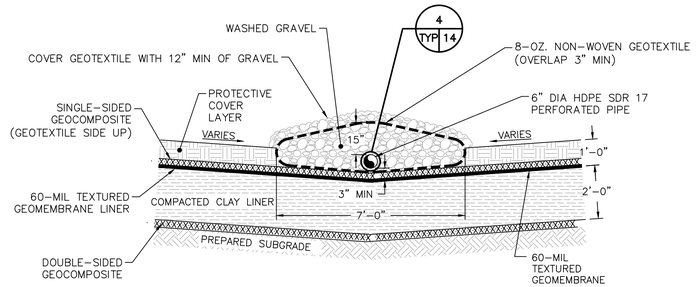
CALL BEFORE YOU DIG 1–800–482–8998 ARKANSAS ONE–CALL SYSTEM

| DRAWN BY: | FILE NAME: |
|---|---|
| JWM | CX03.DWG |
| APPROVED: | PROJECT NO. |
| NSS | 04469–1541–001 |
| SCALE: AS SHOWN | DATE: 03/19/18 |
| SHEET NO. | 11 OF 17 |



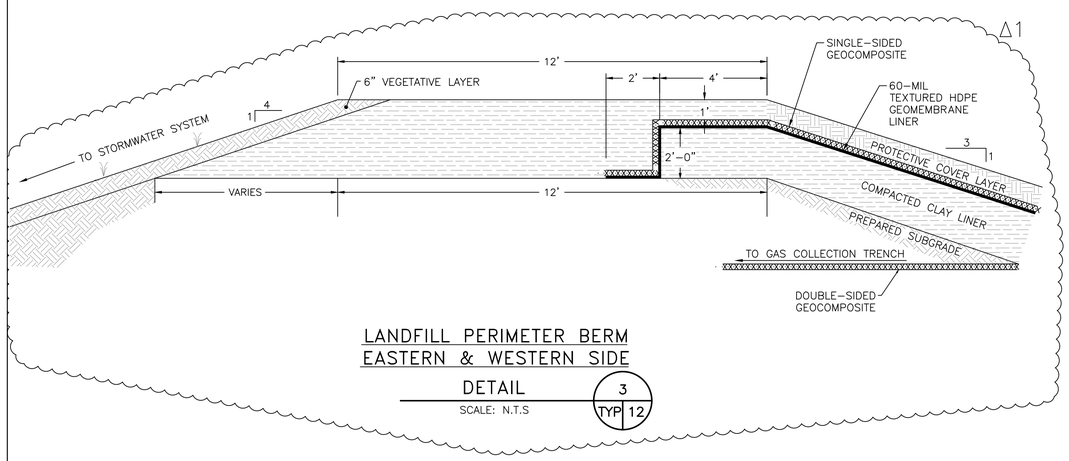

## COMPOSITE LINER BOTTOM OF CELL

DETAIL 1 TYP 12
SCALE: 1/2"=1'–0"



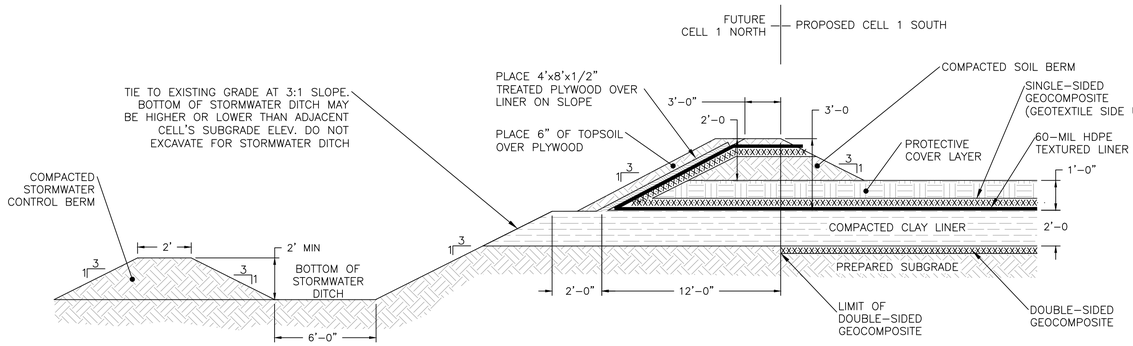

## LEACHATE COLLECTION PIPE TRENCH

DETAIL 2 TYP 12
SCALE: N.T.S.



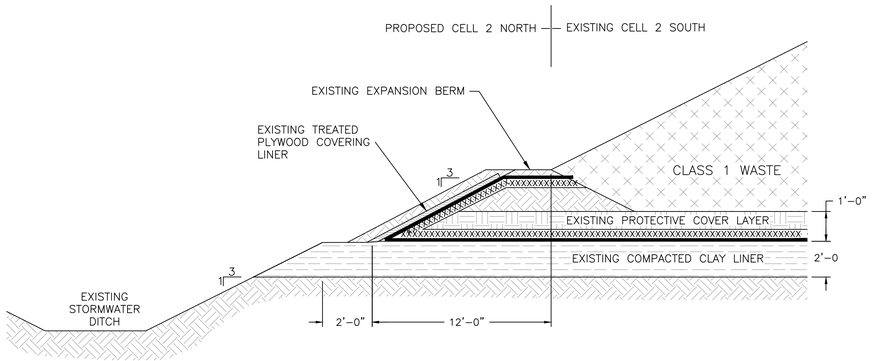

## LANDFILL PERIMETER BERM EASTERN & WESTERN SIDE

DETAIL 3 TYP 12
SCALE: N.T.S

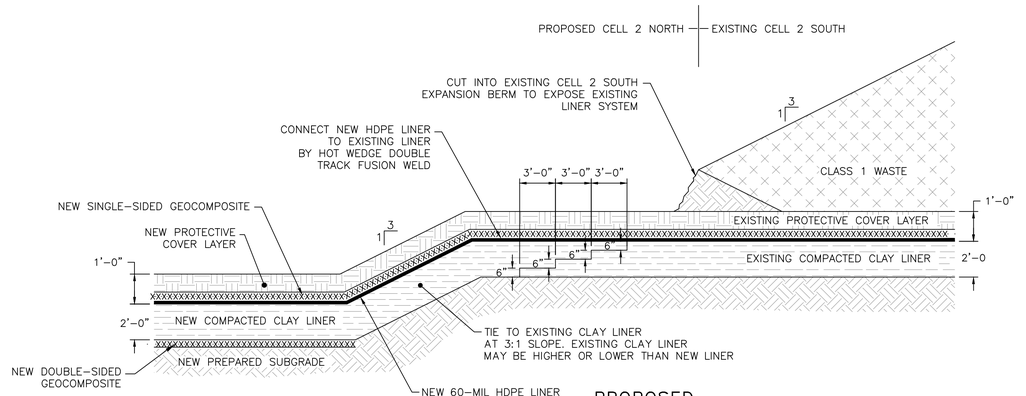



## TYPICAL EXPANSION BERM (NORTHERN BERM)

DETAIL 4 TYP 12
SCALE: N.T.S.




EXISTING




PROPOSED

## CLAY LINER TIE–IN TO CELL 2 SOUTH

DETAIL 5 TYP 12
SCALE: N.T.S.

| REV | DATE | DESCRIPTION | BY | APVD |
|---|---|---|---|---|
| Δ1 | 04/19/18 | SINGLE–SIDED GEOCOMPOSITE REVISION | JWM | NVS |

ftn Associates, Ltd. water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION ENGINEER ftn Associates, Ltd. No. 63 ARKANSAS

STATE OF ARKANSAS NICHOLAS V. SAUGHS 14468 LICENSED PROFESSIONAL ENGINEER

April 19, 2018

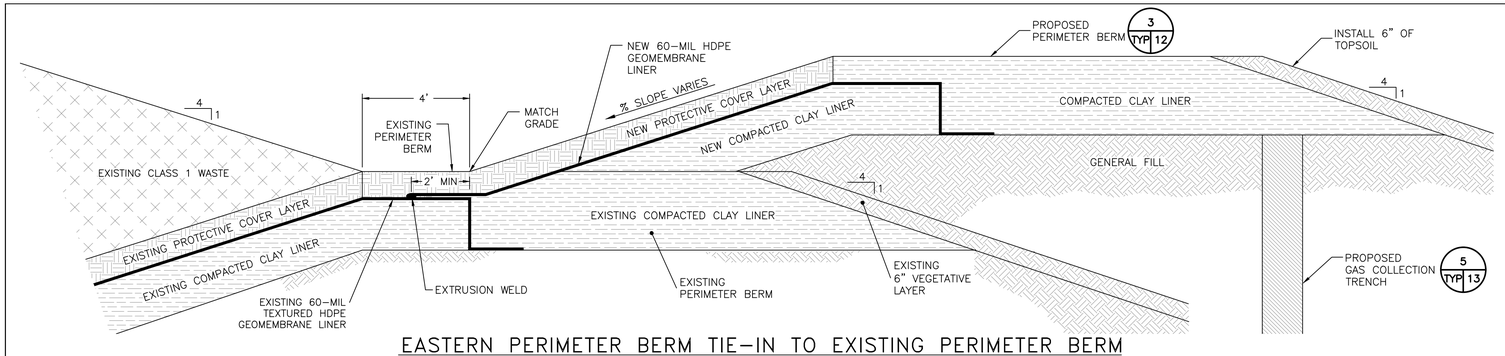
**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**LINER DETAILS**

| DRAWN BY: | FILE NAME: |
|---|---|
| jwm | DD01.DWG |
| APPROVED: | PROJECT NO. |
| nvs | 04469–1541–001 |
| SCALE: AS SHOWN | DATE: 04/19/18 |
| SHEET NO. | 12 OF 17 |

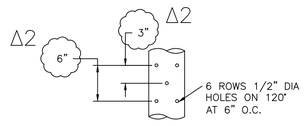
CALL BEFORE YOU DIG 1–800–482–8998 ARKANSAS ONE–CALL SYSTEM

S:\projects\04469–1541–001\cad\dwg\04469–1541–001 DD01.DWG




EASTERN PERIMETER BERM TIE-IN TO EXISTING PERIMETER BERM

DETAIL 1 TYP 13
SCALE: N.T.S.



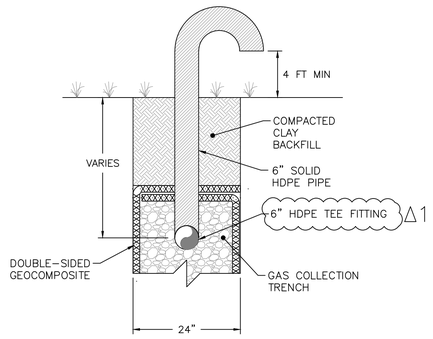

6" HDPE PERFORATED PIPE

PERFORATED GAS COLLECTION PIPE

DETAIL 2 TYP 13
SCALE: 1"=1'-0"

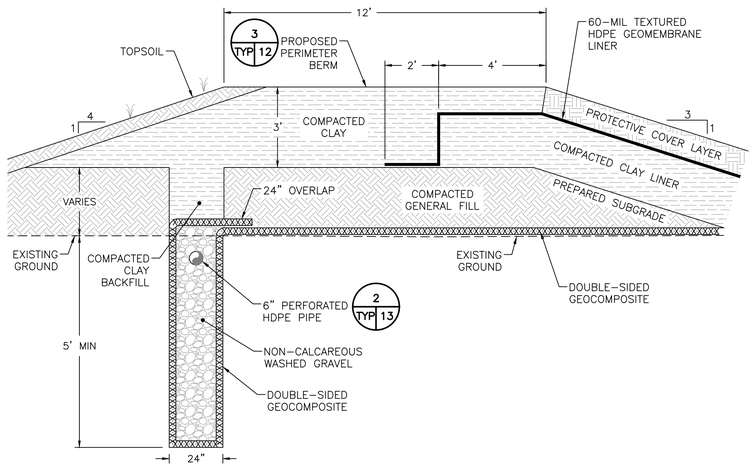
NOTES:

1. PIPE SHALL BE PAINTED WITH WITH ONE COAT (3.0 MIL D.F.T.) 'SHERWIN WILLIAMS' LATEX PRIMER (B51W45) AND TWO COATS (1.5 MIL D.F.T. EACH) 'SHERWIN WILLIAMS' INDUSTRIAL ENAMEL, COLOR SHALL BE SAFETY YELLOW (B54Y37).



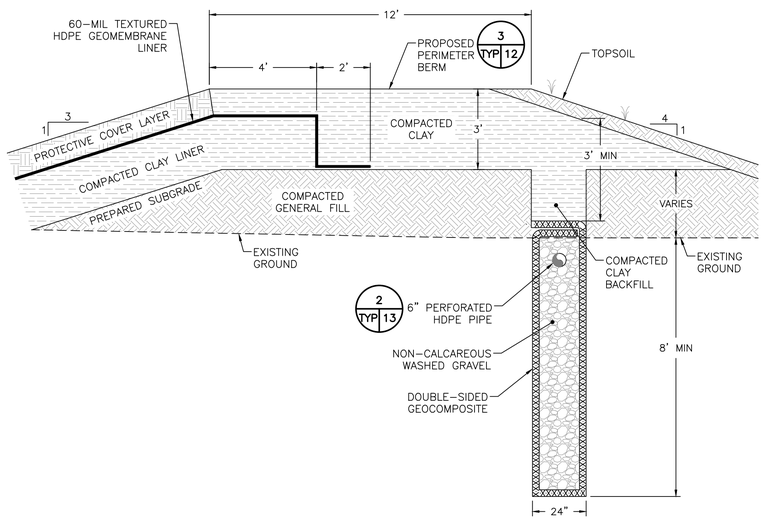

TYPICAL GAS VENT DETAIL

DETAIL 3 TYP 13
SCALE: N.T.S.



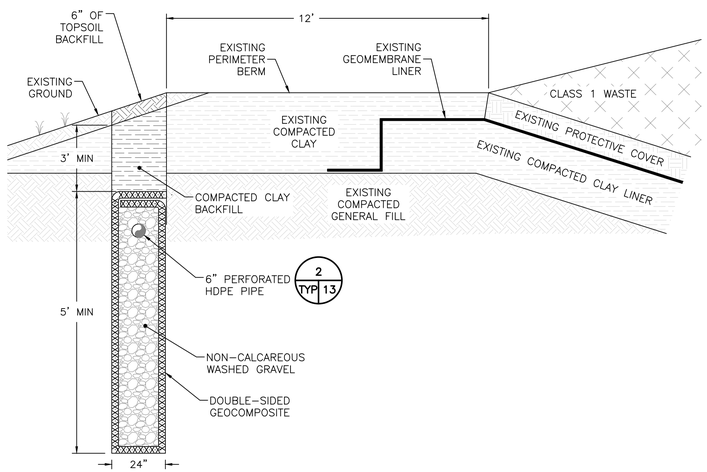

GAS COLLECTION TRENCH UNDER PROPOSED PERIMETER BERM

DETAIL 4 8 13
SCALE: N.T.S.




EASTERN GAS COLLECTION TRENCH UNDER PROPOSED PERIMETER BERM EXPANSION

DETAIL 5 TYP 13
SCALE: N.T.S.




WESTERN GAS COLLECTION TRENCH UNDER EXISTING PERIMETER BERM

DETAIL 6 8 13
SCALE: N.T.S.

| REV | DATE | DESCRIPTION | BY | APVD |
|---|---|---|---|---|
| | | | JWM | NVS |
| Δ1 | 04/06/18 | GAS VENT DETAIL REVISION | JWM | NVS |
| Δ2 | 04/10/18 | PERFORATION SPACING REVISION | JWM | NVS |

SCOTT ENGINEERING ASSOCIATES, Ltd.
water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION
ENGINEER
ETN Associates, Ltd.
No. 63
ARKANSAS

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 14808
NICHOLAS V. SCOTT
April 10, 2018

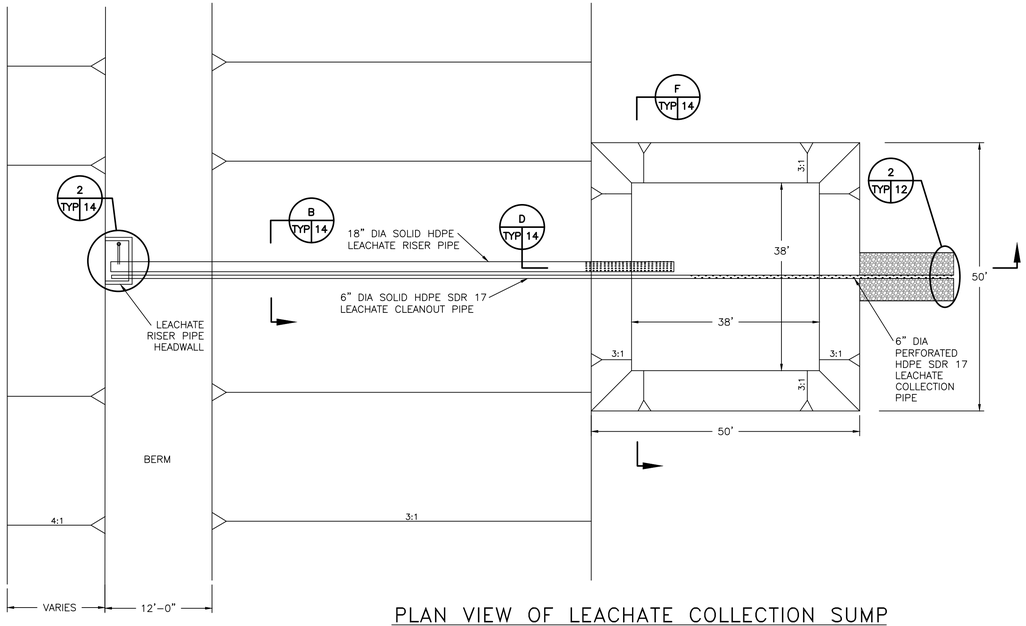
**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**GAS COLLECTION TRENCH DETAILS**

CALL BEFORE YOU DIG 1-800-482-3998 ARKANSAS ONE-CALL SYSTEM

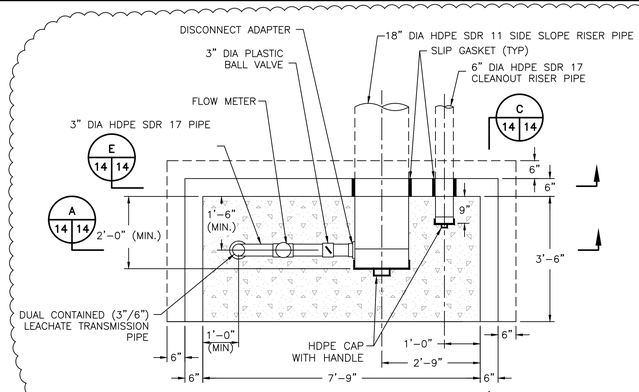
| DRAWN BY: | FILE NAME: |
|---|---|
| jwm | DD02.DWG |
| APPROVED: nvs | PROJECT NO. 04469-1541-001 |
| SCALE: AS SHOWN | DATE: 04/10/18 |
| SHEET NO. 13 OF 17 | |

S:\projects\04469-1541-001\cad\dwg\04469-1541-001 DD02.DWG



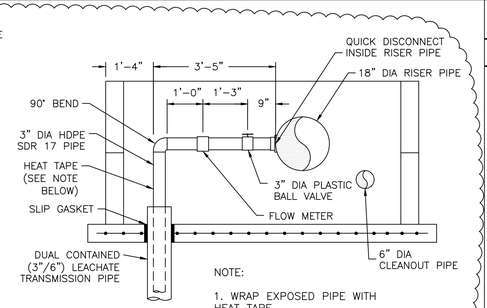

## PLAN VIEW OF LEACHATE COLLECTION SUMP AND WEST RISER PIPE

DETAIL I TYP 14
SCALE: NTS



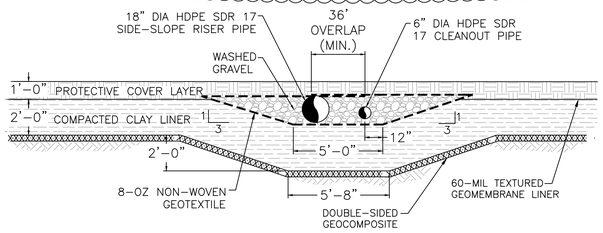

## WEST RISER PIPE HEADWALL

DETAIL 2 TYP 14
SCALE: 1/2"=1'-0"



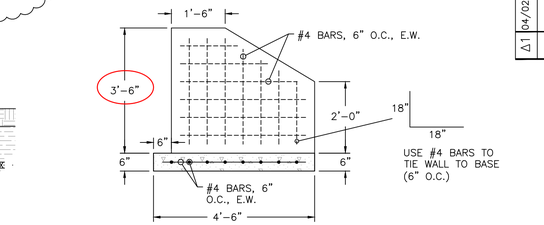

## LEACHATE DISCHARGE PIPING

SECTION A 14 14
SCALE: 1/2"=1'-0"



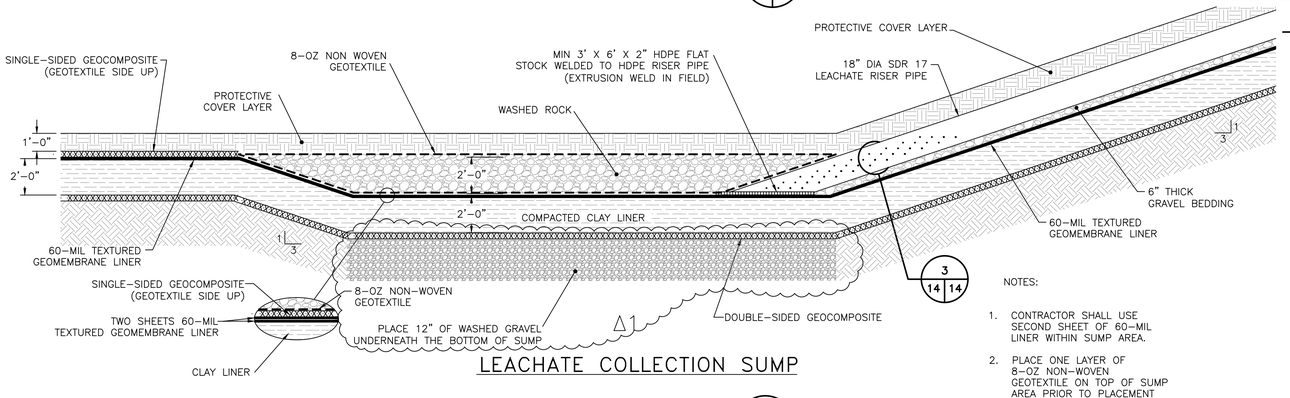

## WEST SUMP RISER TRENCH

SECTION B TYP 14
SCALE: 1/4"=1'-0"




## WEST PIPE HEADWALL – WING WALL SECTION

SECTION C 14 14
SCALE: 1/2"=1'-0"

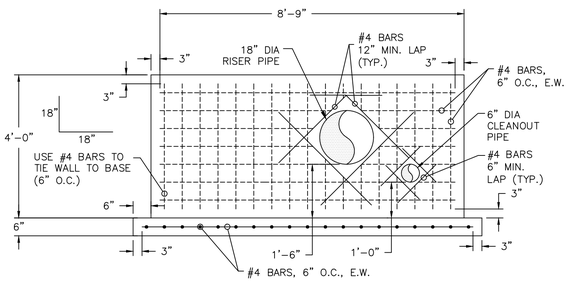



## LEACHATE COLLECTION SUMP

SECTION D TYP 14
SCALE: 1/4"=1'-0"

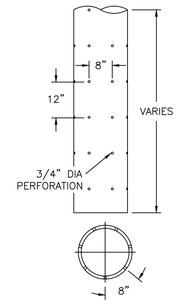
NOTES:

1. CONTRACTOR SHALL USE SECOND SHEET OF 60-MIL LINER WITHIN SUMP AREA.
2. PLACE ONE LAYER OF 8-OZ NON-WOVEN GEOTEXTILE ON TOP OF SUMP AREA PRIOR TO PLACEMENT OF PROTECTIVE COVER.



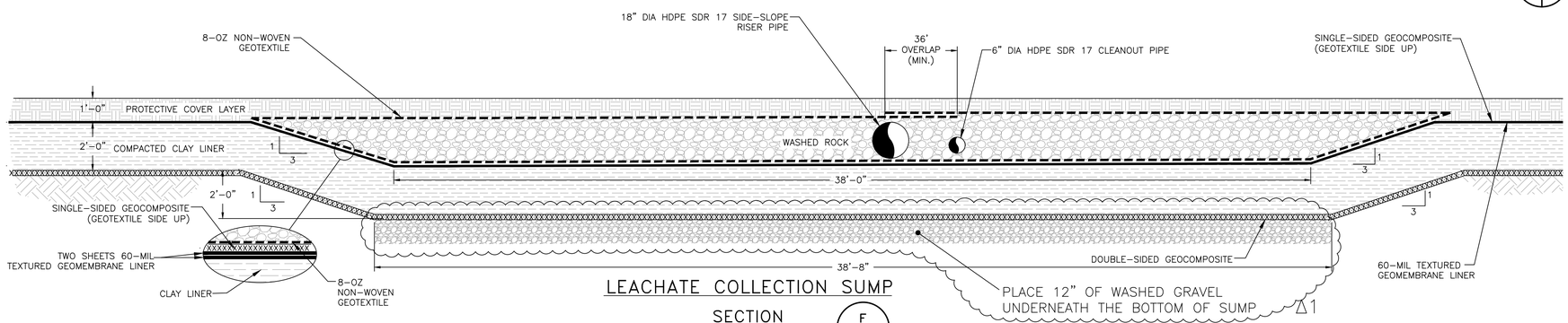

## WEST RISER PIPE HEADWALL – BACK WALL SECTION

SECTION E 14 14
SCALE: 1/2"=1'-0"



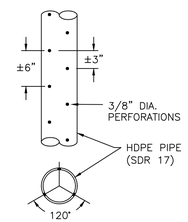

## RISER PIPE PERFORATIONS

DETAIL 3 14 14
SCALE: N.T.S.




## LEACHATE COLLECTION SUMP

SECTION F TYP 14
SCALE: 3/8"=1'-0"




## LEACHATE COLLECTION PIPE

DETAIL 4 TYP 14
SCALE: N.T.S.

NOTES:

1. HORIZONTAL BARS SHOWN SECTIONS A, C, & E SHALL BE CONTINUOUS AT ACROSS ALL FACES.
2. REFER TO PROJECT SPECIFICATIONS FOR CONCRETE CONSTRUCTION REQUIREMENTS.
3. REFER TO PROJECT SPECIFICATIONS FOR INFORMATION ON CONCRETE AND REINFORCEMENT BAR MATERIAL REQUIREMENTS.

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

| REV | DATE | DESCRIPTION | BY | APVD |
|---|---|---|---|---|
| Δ1 | 04/02/18 | MODIFIED LTP SIZE AND SUMP SUBGRADE | JWM | NVS |

tn ASSOCIATES, Ltd. water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION TN ASSOCIATES, Ltd. No. 63 LICENSED ENGINEER ARKANSAS

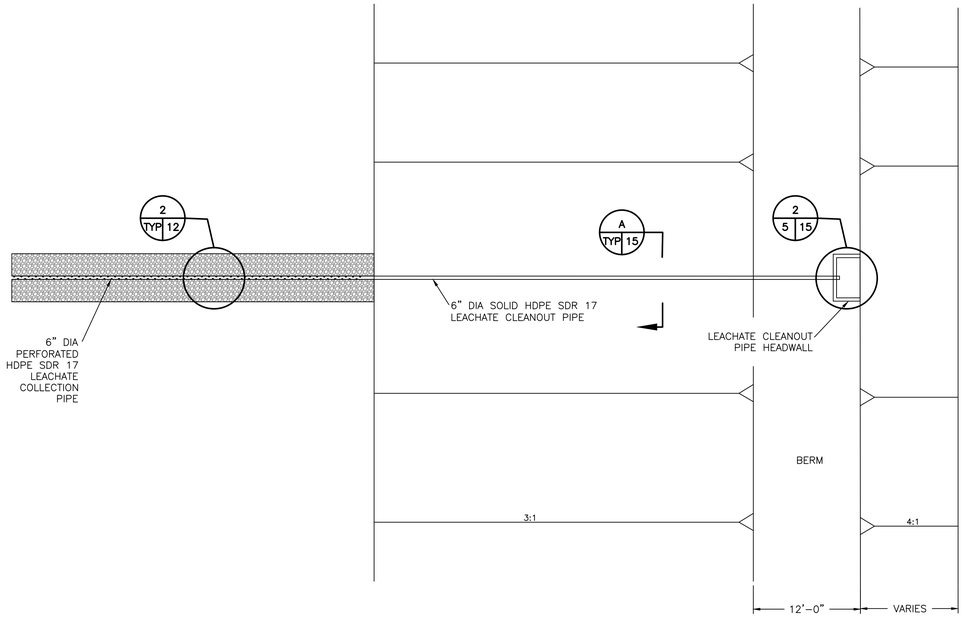
STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER NICHOLAS A. VAUGHN 14468 April 5, 2018

**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**LEACHATE COLLECTION SYSTEM DETAILS**

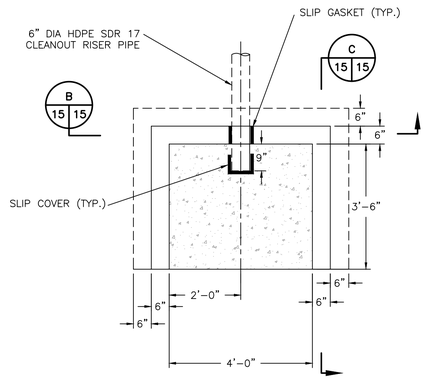
| DRAWN BY: | FILE NAME: |
|---|---|
| JWM | DD03.DWG |
| APPROVED: | PROJECT NO. |
| NVS | 04469-1541-001 |
| SCALE: AS SHOWN | DATE: 04/05/18 |
| SHEET NO. | 14 OF 17 |

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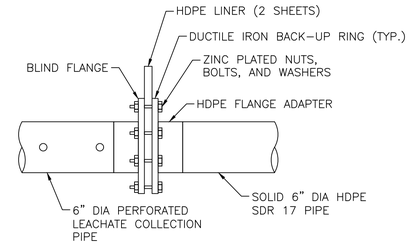

PLAN VIEW OF LEACHATE COLLECTION PIPE CLEANOUT

DETAIL 1 TYP 15
SCALE: NTS



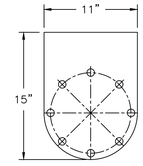

EAST LEACHATE CLEANOUT PIPE HEADWALL

DETAIL 2 5 15
SCALE: 1/2"=1'-0"

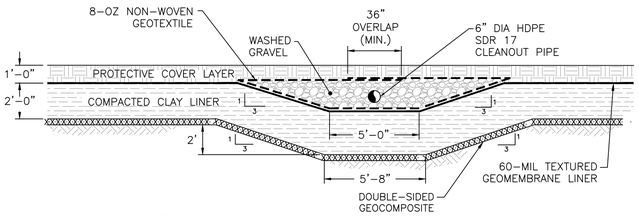



MJ BLIND FLANGE CONNECTION

DETAIL 3 15 15
SCALE: N.T.S.




HDPE BLIND FLANGE




EAST LEACHATE CLEANOUT RISER TRENCH

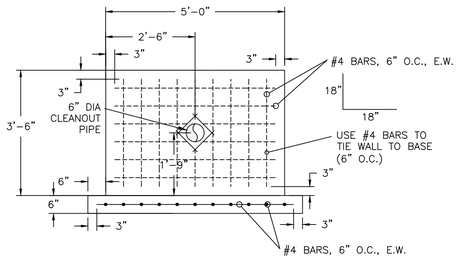
SECTION A TYP 15
SCALE: 1/4"=1'-0"

NOTES:

1. HORIZONTAL BARS SHOWN SECTIONS B AND C SHALL BE CONTINUOUS AT ACROSS ALL FACES.

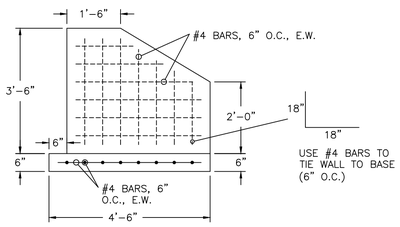
2.REFER TO PROJECT SPECIFICATIONS FOR CONCRETE CONSTRUCTION REQUIREMENTS.

3. REFER TO PROJECT SPECIFICATIONS FOR INFORMATION ON CONCRETE AND REINFORCEMENT BAR MATERIAL REQUIREMENTS.



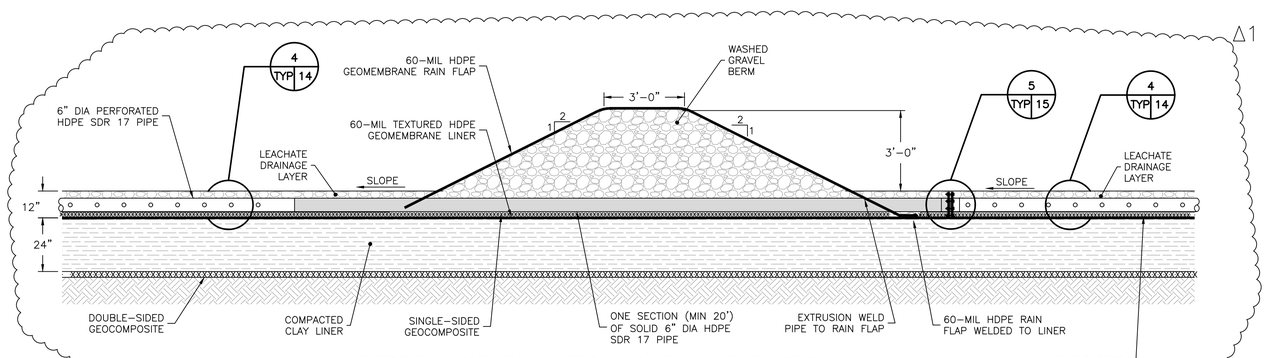

EAST RISER PIPE HEADWALL – BACK WALL SECTION

SECTION B 15 15
SCALE: 1/2"=1'-0"



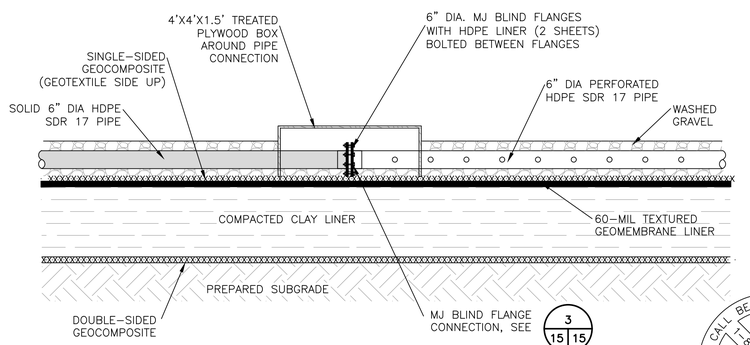

EAST RISER HEADWALL – WING WALL SECTION

SECTION C 15 15
SCALE: 1/2"=1'-0"




INTERCELL STORMWATER CONTAINMENT BERM

DETAIL 4 TYP 15
SCALE: 3/8"=1'-0"




LEACHATE PIPE CONNECTION

DETAIL 5 15 15
SCALE: 1/2"=1'-0"

| REV | DATE | DESCRIPTION | BY | APVD |
|---|---|---|---|---|
| Δ1 | 04/19/18 | SINGLE-SIDED GEOCOMPOSITE REVISION | JWM | NVS |

ftn Associates, Ltd.
water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION
ENGINEER
ftn Associates, Ltd
No. 63
ARKANSAS

STATE OF ARKANSAS
NICHOLAS V. SCHUG
LICENSED PROFESSIONAL ENGINEER
No. 14268
April 19, 2018

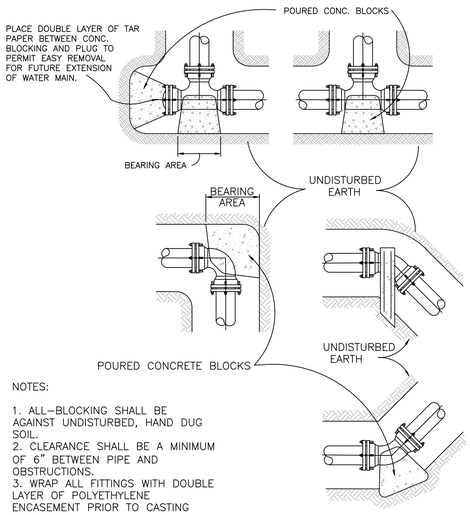
**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**LEACHATE TRANSMISSION SYSTEM DETAILS**

| DRAWN BY: | FILE NAME: |
|---|---|
| JWM | DD04.DWG |
| APPROVED: NVS | PROJECT NO. 04469-1541-001 |
| SCALE: AS SHOWN | DATE: 04/19/18 |
| SHEET NO. | 15 OF 17 |

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

S:\projects\04469-1541-001\cad\dwg\04469-1541-001 DD04.DWG




NOTES:

1. ALL–BLOCKING SHALL BE AGAINST UNDISTURBED, HAND DUG SOIL.
2. CLEARANCE SHALL BE A MINIMUM OF 6" BETWEEN PIPE AND OBSTRUCTIONS.
3. WRAP ALL FITTINGS WITH DOUBLE LAYER OF POLYETHYLENE ENCASEMENT PRIOR TO CASTING CONCRETE.

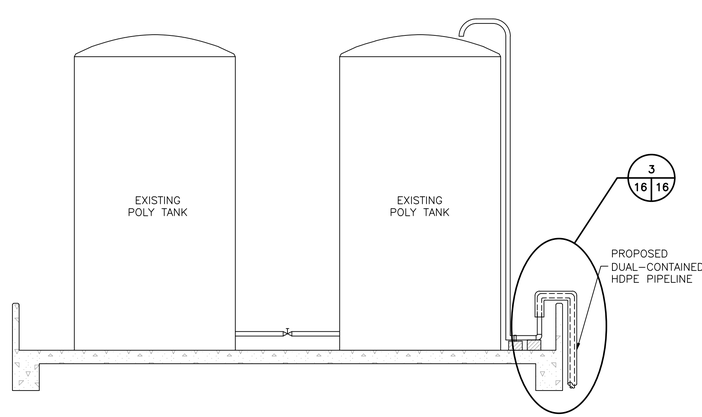
| BEARING AREA OF BLOCK IN SQ. FT. | | | | | |
|---|---|---|---|---|---|
| FITTING SIZES | TEE & END | 90°BEND | 45°BEND | 22 1/2°BEND | 11 1/4°BEND |
| 4" & 6" | 3.6 | 5.4 | 2.5 | 1.5 | 0.8 |
| 8" | 6.8 | 8.9 | 4.8 | 2.5 | 1.3 |

NOTE TO DESIGNER: AREAS BASED ON PIPE BURST PRESSURE OF 250 PSI.

| SOIL BEARING PRESSURE | MULTIPLIER |
|---|---|
| 1000 | 2.0 |
| 1500 | 1.33 |
| 2000 | 1.0 |
| 3000 | 0.67 |

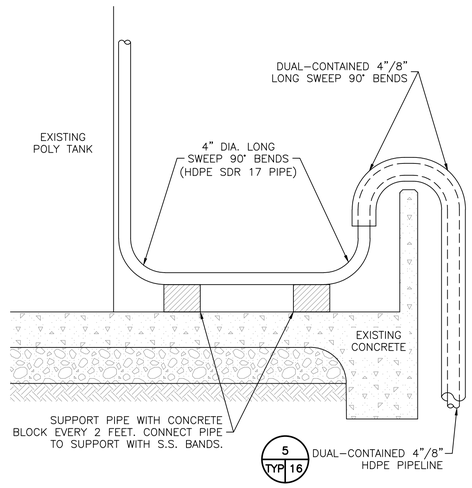
## THRUST BLOCK

DETAIL 1 TYP 16
SCALE: NTS



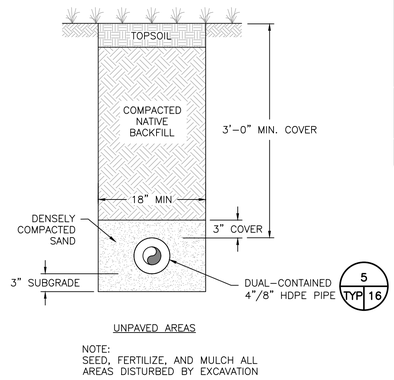

## LEACHATE TRANSMISSION PIPELINE CONNECTION TO EXISTING TANK

DETAIL 2 7 16
SCALE: N.T.S.




## TANK CONNECTION

DETAIL 3 16 16
SCALE: N.T.S.

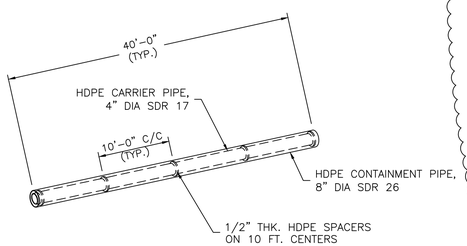



UNPAVED AREAS

NOTE:
SEED, FERTILIZE, AND MULCH ALL AREAS DISTURBED BY EXCAVATION

## HDPE DUAL–CONTAINED PIPELINE BEDDING

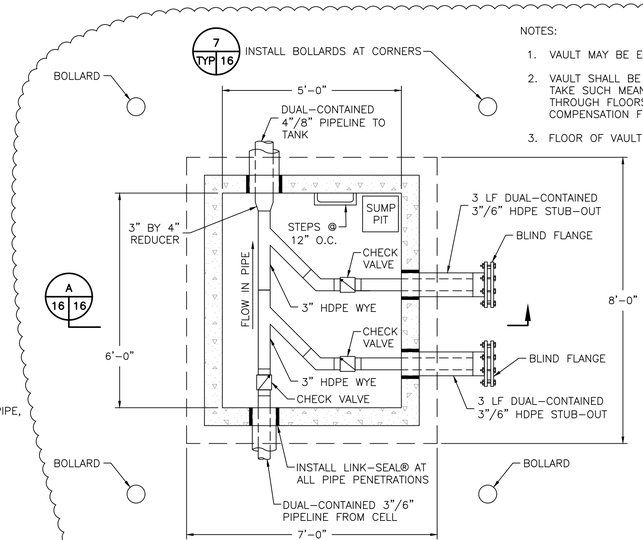
DETAIL 4 TYP 16
SCALE: 1"=1'–0"




## HDPE DUAL CONTAINMENT PIPE

DETAIL 5 TYP 16
SCALE: N.T.S.

A1

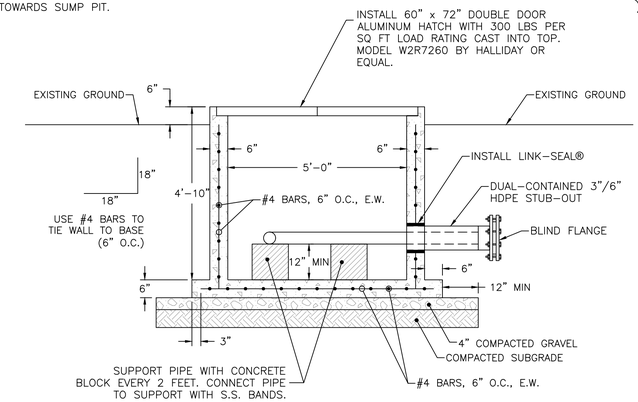



NOTES:

1. VAULT MAY BE EITHER CAST–IN–PLACE OR PRE–CAST CONCRETE.
2. VAULT SHALL BE WATER TIGHT. CONTRACTOR WILL BE REQUIRED TO TAKE SUCH MEANS NECESSARY TO CORRECT ANY AND ALL LEAKAGE THROUGH FLOORS OR WALL OF STRUCTURE WITHOUT ADDITIONAL COMPENSATION FROM OWNER.
3. FLOOR OF VAULT SHALL DRAIN TOWARDS SUMP PIT.

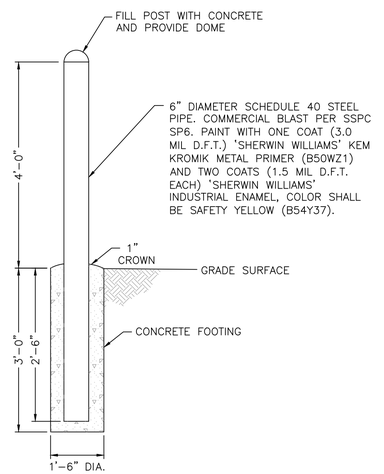
## VALVE VAULT

DETAIL 6 TYP 16
SCALE: N.T.S.




## VALVE VAULT – SIDE SECTION

SECTION A 16 16
SCALE: N.T.S.




## 6" PIPE BOLLARD

DETAIL 7 16 16
SCALE: N.T.S.

| REV | DATE | DESCRIPTION | BY | APVD |
|---|---|---|---|---|
| Δ1 | 03/19/18 | MODIFIED LTP SIZE | JWM | NVS |

CALL BEFORE YOU DIG
1–800–482–8998
ARKANSAS ONE–CALL SYSTEM

ETN Associates, Ltd.
water resources | environmental consultants

CERTIFICATE OF AUTHORIZATION
ETN Associates, Ltd.
No. 63
ARKANSAS

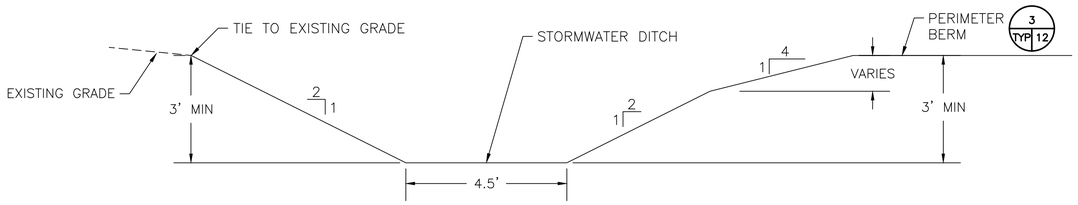
STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
NICHOLAS A. VAUGHN
9/17/2018
April 5, 2018

**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**LEACHATE TRANSMISSION SYSTEM DETAILS**

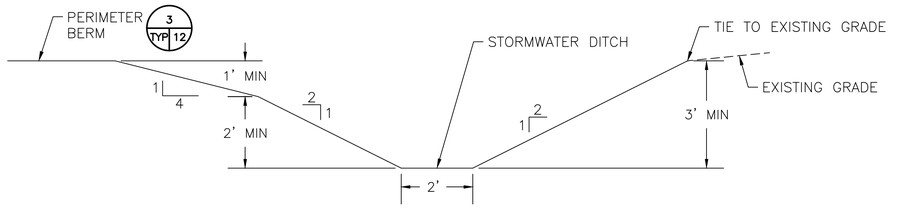
| DRAWN BY: | FILE NAME: |
|---|---|
| JWM | DD05.DWG |
| APPROVED: NVS | PROJECT NO. 04469–1541–001 |
| SCALE: AS SHOWN | DATE: 04/05/18 |
| SHEET NO. 16 OF 17 | |

S:\projects\04469–1541–001\cad\dwg\04469–1541–001 DD05.DWG



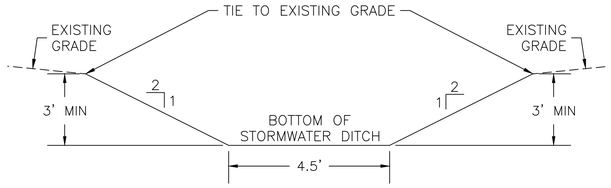

WESTERN PERIMETER STORMWATER DITCH

DETAIL 1 TYP 17
SCALE: N.T.S.



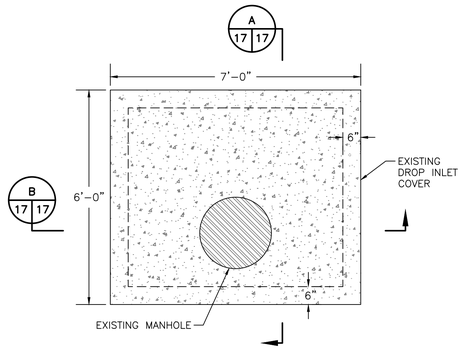

EASTERN PERIMETER STORMWATER DITCH

DETAIL 2 TYP 17
SCALE: N.T.S.



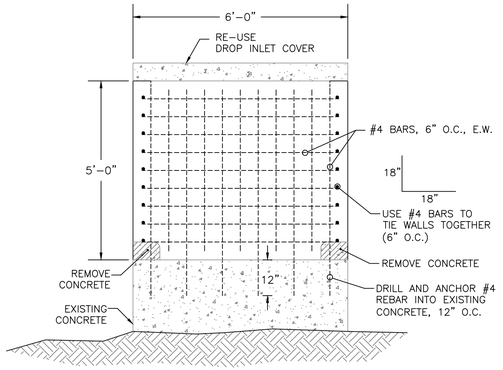

TYPICAL STORMWATER DITCH

DETAIL 3 TYP 17
SCALE: N.T.S.



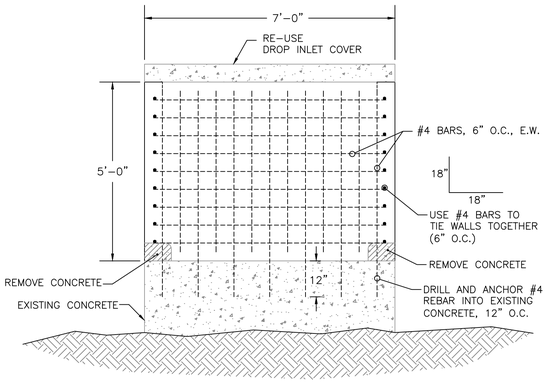

STORMWATER DROP INLET EXTENSION

DETAIL 4 TYP 17
SCALE: 1/2"=1'-0"



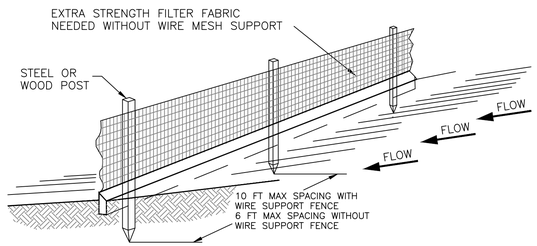

STORMWATER DROP INLET EXTENSION
EAST WEST SECTION

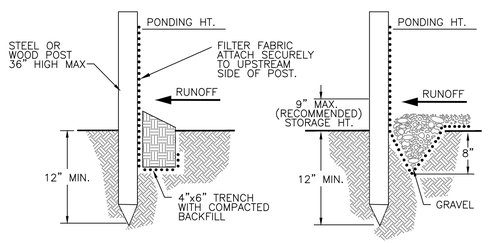
SECTION A 17 17
SCALE: 1/2"=1'-0"




STORMWATER DROP INLET EXTENSION
NORTH SOUTH SECTION

SECTION B 17 17
SCALE: 1/2"=1'-0"




STANDARD DETAIL
TRENCH WITH NATIVE BACKFILL



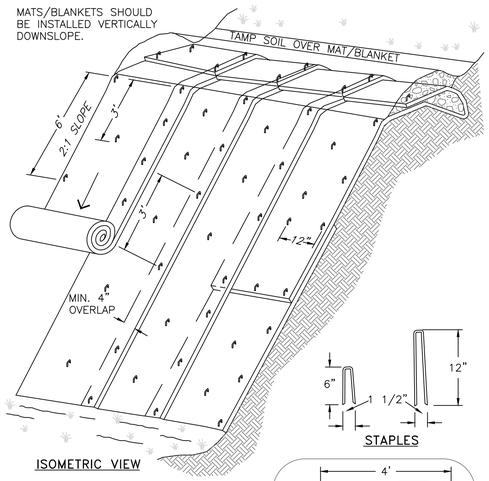

ALTERNATE DETAIL
TRENCH WITH GRAVEL

NOTE:

1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

SILT FENCE

DETAIL 5 TYP 17
SCALE: N.T.S.




TYPICAL SLOPE
SOIL STABILIZATION

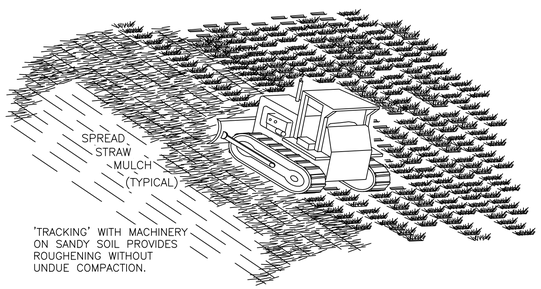
NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/ BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

NOT TO SCALE

EROSION CONTROL BLANKETS

DETAIL 6 TYP 17
SCALE: N.T.S.

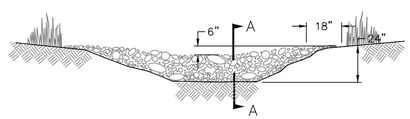



NOTES:

1. ROUGHEN SLOPE WITH BULLDOZER
2. BROADCAST SEED AND FERTILIZER.
3. SPREAD STRAW MULCH 3" THICK. (OTHER MULCHING MATERIALS ARE ACCEPTABLE, REFER TO OPERATIONS NARRATIVE).
4. PUNCH STRAW MULCH INTO SLOPE BY RUNNING BULLDOZER UP AND AND DOWN SLOPE.

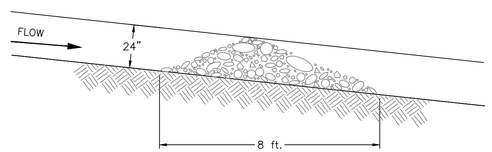
STRAW ANCHORING

DETAIL 7 TYP 17
SCALE: N.T.S.



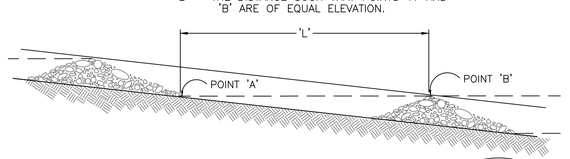

VIEW LOOKING UP STREAM

NOTE: KEY STONE INTO THE DITCH BANKS AND EXTEND IT BEYOND THE ABUTMENTS A MINIMUM OF 18" TO PREVENT OVERFLOW AROUND DAM.




SECTION A-A

'L' = THE DISTANCE SUCH THAT POINTS 'A' AND 'B' ARE OF EQUAL ELEVATION.




SPACING BETWEEN CHECK DAMS

ROCK CHECK DAM

DETAIL 8 TYP 17
SCALE: N.T.S.

CALL BEFORE YOU DIG 1-800-482-8998 ARKANSAS ONE-CALL SYSTEM

FTN Associates, Ltd. water resources environmental consultants

CERTIFICATE OF AUTHORIZATION ENGINEER No. 63 FTN Associates, Ltd ARKANSAS

STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER JOHN D. VAUGHN No. 14288 March 19, 2018

**CRAIGHEAD COUNTY SOLID WASTE DISPOSAL AUTHORITY**
**CELL 1 SOUTH / CELL 2 NORTH CONSTRUCTION**
**JONESBORO, ARKANSAS**

**STORMWATER CONTROL SYSTEM DETAILS**

| DRAWN BY: | FILE NAME: |
|---|---|
| JWM | DD06.DWG |
| APPROVED: JWM | PROJECT NO. 04469-1541-001 |
| SCALE: AS SHOWN | DATE: 03/19/18 |
| SHEET NO. 17 OF 17 | |

S:\projects\04469-1541-001\cad\dwg04469-1541-001 DD06.DWG

# APPENDIX H

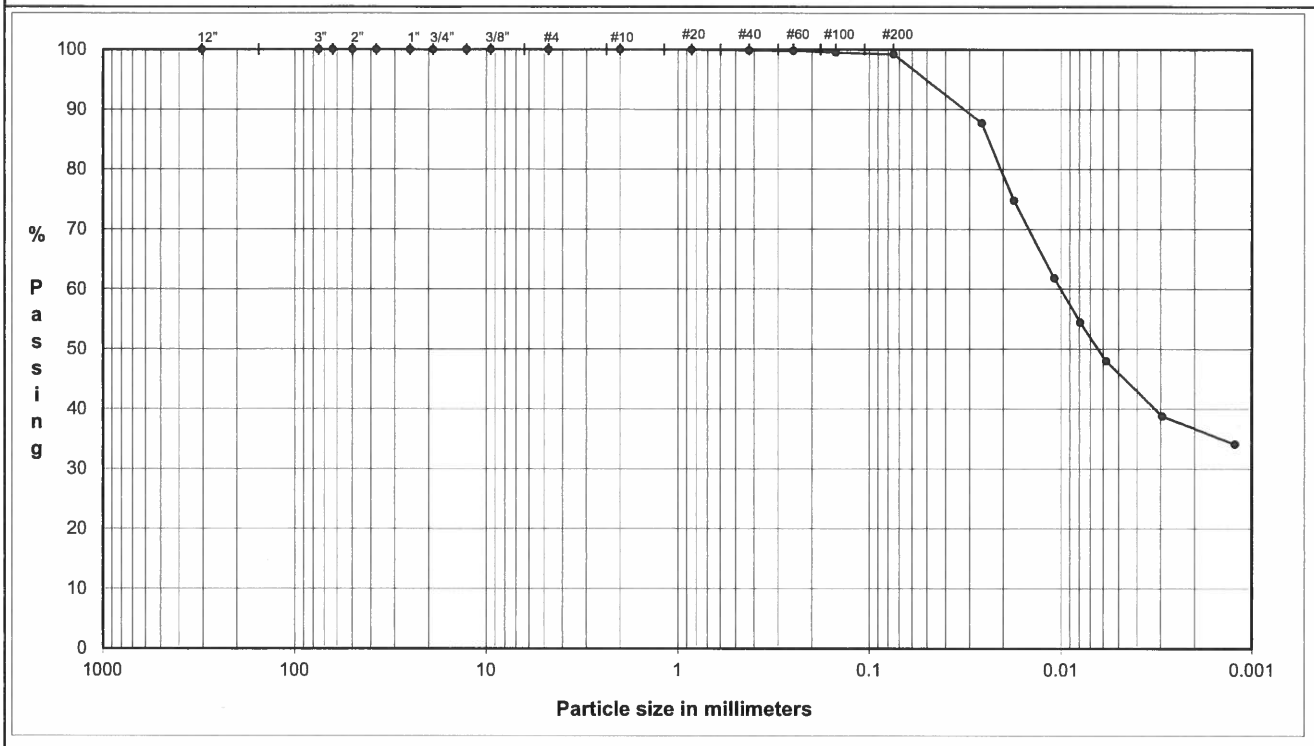
**Clay Liner Material Pre-Construction Reports**

JULY 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **PC-1B** - Depth: -
TYPE: **Bulk**



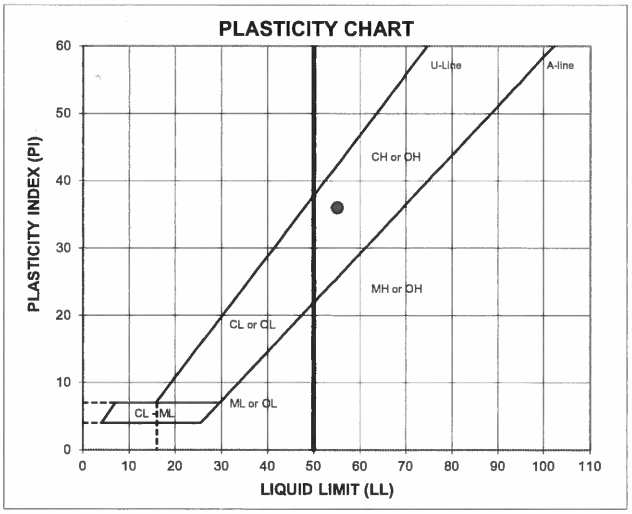

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | **100.0** | | |
| 3.0" | 75.0 | **100.0** | Cobbles | **0.0** |
| 2.5" | 63.5 | **100.0** | | |
| 2.0" | 50.0 | **100.0** | | |
| 1.5" | 37.5 | **100.0** | | |
| 1.0" | 25.0 | **100.0** | | |
| 0.75" | 19.0 | **100.0** | Coarse Gravel | **0.0** |
| 0.50" | 12.7 | **100.0** | | |
| 0.375" | 9.5 | **100.0** | | |
| #4 | 4.8 | **100.0** | Fine Gravel | **0.0** |
| #10 | 2.00 | **100.0** | Coarse Sand | **0.0** |
| #20 | 0.85 | **100.0** | | |
| #40 | 0.43 | **99.8** | Medium Sand | **0.2** |
| #60 | 0.25 | **99.8** | | |
| #100 | 0.15 | **99.5** | | |
| #200 | 0.075 | **99.2** | Fine Sand | **0.7** |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.026 | **87.7** | | |
| 0.018 | **74.8** | | |
| 0.011 | **61.8** | Fines | |
| 0.0079 | **54.5** | Silt or Clay | **99.2** |
| 0.0058 | **48.0** | | |
| 0.0029 | **38.8** | | |
| 0.0012 | **34.2** | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| **21.4** | **55** | **19** | **36** | **0.06** |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** CLAY, trace sand; light brownish gray.

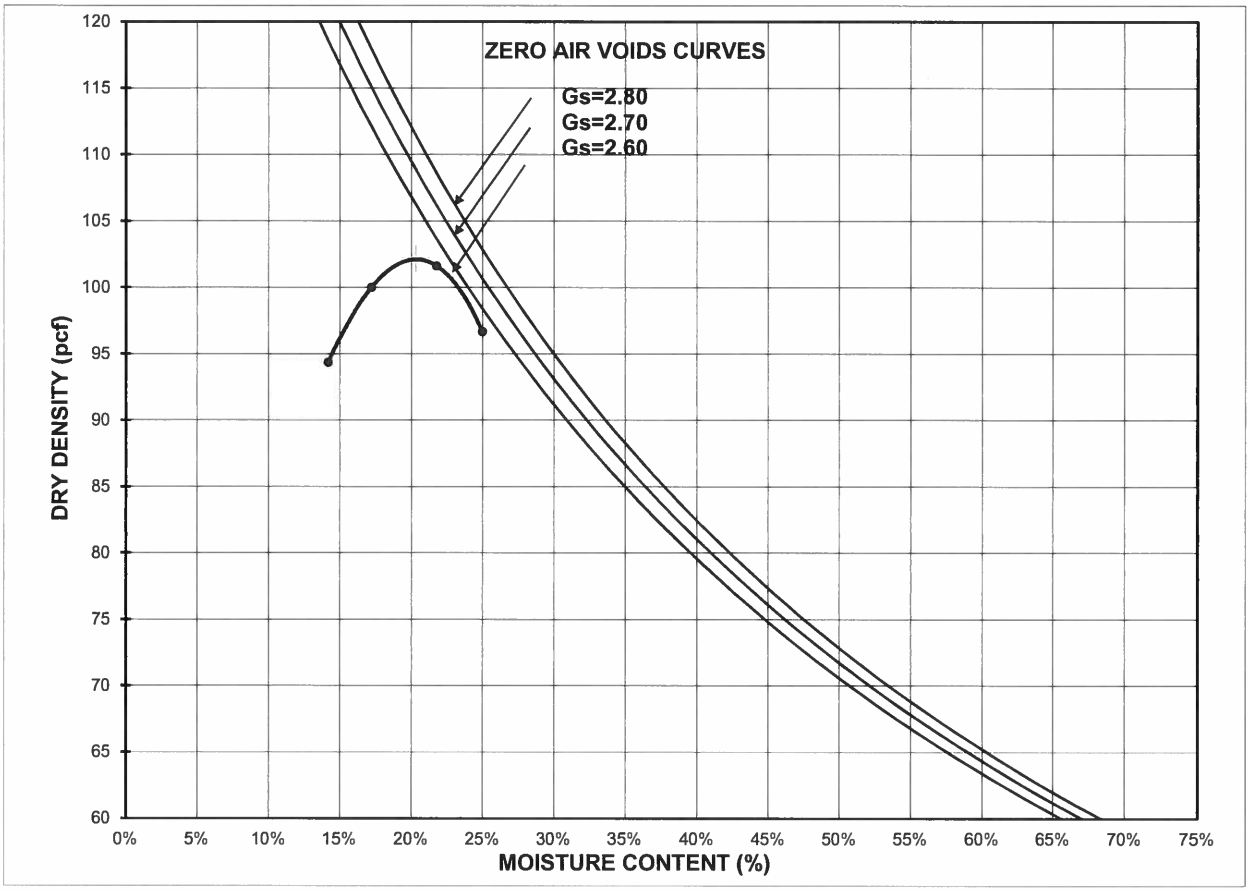
**USCS:** CH

| | |
|---|---|
| **TECH** | TB |
| **DATE** | 7/11/18 |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
PROJECT NUMBER: **18102853**
SAMPLE ID: **PC-1B** - DEPTH: - SAMPLE TYPE: **Bulk**




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 94.3 | 14.2% |
| 2 | 100.0 | 17.2% |
| 3 | 101.6 | 21.8% |
| 4 | 96.7 | 25.0% |

| | |
|---|---|
| Maximum Dry Density (pcf) | **102.2** |
| Optimum Moisture (%) | **20.3** |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | **21.4%** |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** CLAY, trace sand; light brownish gray.

**USCS** CH

**CHECK**
**REVIEW**
**APPROVE**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 15 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | PC-1B - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.2% of the Maximum Dry Density and OPTM + 3.3% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.998 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 |
| Volume, cm³ | 300.35 | Top Pres. | 80.0 |
| Mass, g | 578.54 | Tot. B.P. | 80.0 |
| Moisture Content, % | 23.61 | Head, max. | 140.68 |
| Dry Density, pcf | 97.24 | Head, min. | 140.68 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 18.46 |
| Volume Solids, cm³ | 173.35 | Min. Grad. | 18.46 |
| Volume Voids, cm³ | 127.00 | | |
| Void Ratio | 0.73 | | |
| Saturation, % | 87.0% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.000 |
| Diameter, inches | 2.793 |
| Area, cm² | 39.53 |
| Volume, cm³ | 301.20 |
| Mass, g | 590.45 |
| Moisture Content, % | 26.15 |
| Dry Density, pcf | 96.97 |
| Volume Solids, cm³ | 173.35 |
| Volume Voids, cm³ | 127.85 |
| Void Ratio | 0.74 |
| Saturation, % | 95.7% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 578.54 | 703.87 |
| Wt Soil & Tare, f | g | 468.05 | 581.48 |
| Wt Tare | g | 0.00 | 113.48 |
| Wt Moisture Lost | g | 110.49 | 122.39 |
| Wt Dry Soil | g | 468.05 | 468.00 |
| Water Content | % | 23.61% | 26.15% |

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CH

DESCRIPTION: CLAY, trace sand; light brownish gray.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 07/30/18 | 43311 | 9 | 0 | 20.4 | 0 | 0 | 0 | 0 | 2.00 | 140.68 | 18.46 | 1.6E-08 |
| 07/30/18 | 43311 | 9 | 5 | 20.4 | 5 | 5 | 300 | 300 | 2.00 | 140.68 | 18.46 | 1.6E-08 |
| 07/30/18 | 43311 | 9 | 10 | 20.4 | 5 | 10 | 300 | 600 | 2.00 | 140.68 | 18.46 | 1.6E-08 |
| 07/30/18 | 43311 | 9 | 15 | 20.4 | 5 | 15 | 300 | 900 | 2.00 | 140.68 | 18.46 | 1.6E-08 * |
| 07/30/18 | 43311 | 9 | 20 | 20.4 | 5 | 20 | 300 | 1200 | 2.00 | 140.68 | 18.46 | 1.6E-08 * |
| 07/30/18 | 43311 | 9 | 25 | 20.4 | 5 | 25 | 300 | 1500 | 2.00 | 140.68 | 18.46 | 1.6E-08 * |
| 07/30/18 | 43311 | 9 | 30 | 20.4 | 5 | 30 | 300 | 1800 | 2.00 | 140.68 | 18.46 | 1.6E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

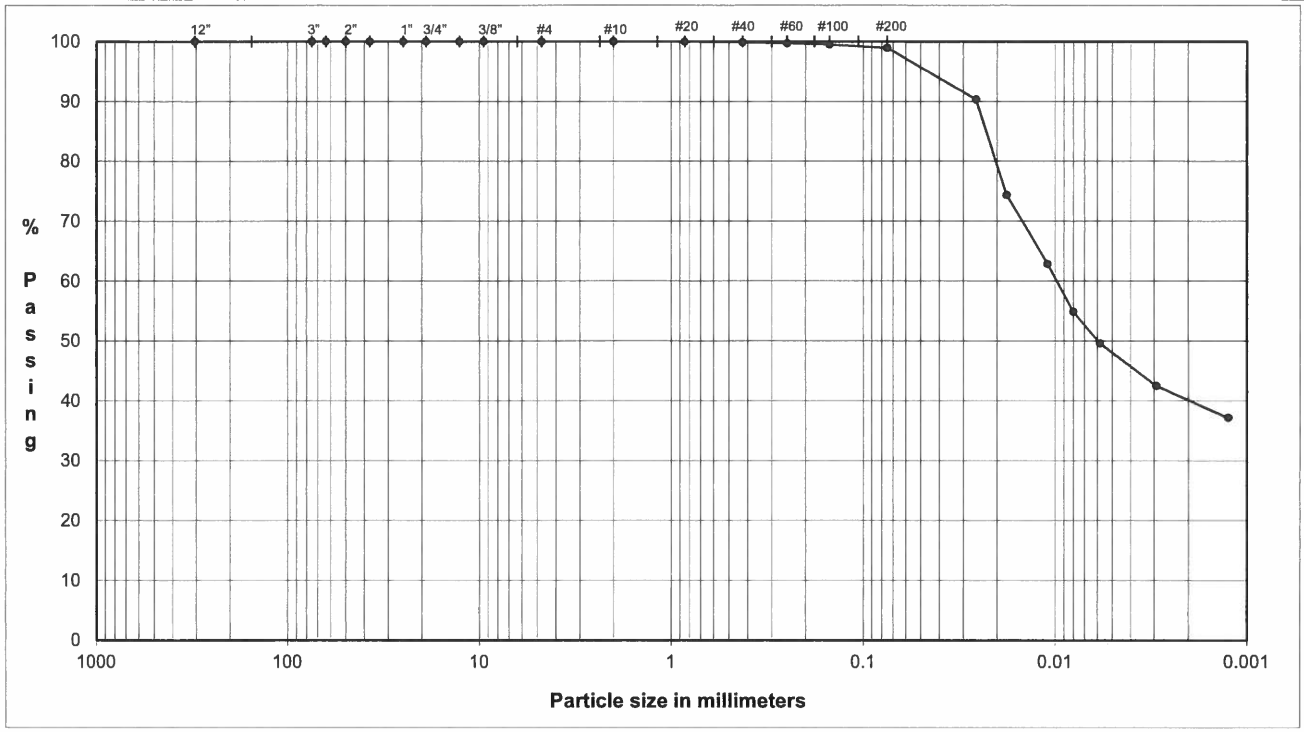
PERMEABILITY REPORTED AS ** 1.6E-08 cm/sec **

| | |
|---|---|
| DATE | 7/30/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **PC-2** - Depth: **2.0'**
TYPE: **Bulk**



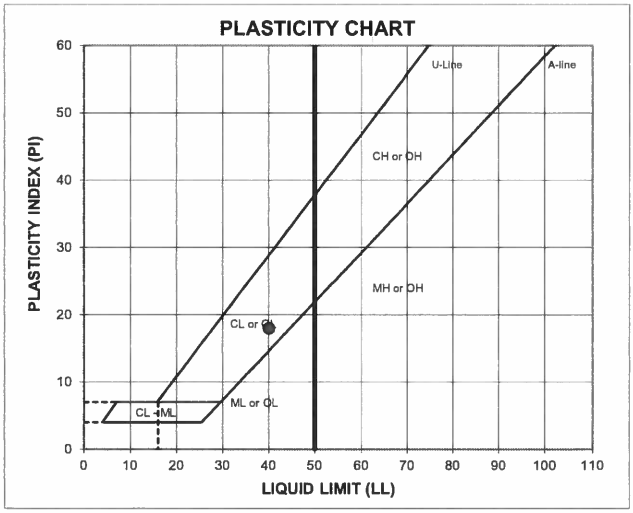

| COBBLES | Coarse GRAVEL | Fine GRAVEL | Coarse SAND | Medium SAND | Fine SAND | Silt or Clay FINES |
|---|---|---|---|---|---|---|

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | **100.0** | | |
| 3.0" | 75.0 | **100.0** | Cobbles | **0.0** |
| 2.5" | 63.5 | **100.0** | | |
| 2.0" | 50.0 | **100.0** | | |
| 1.5" | 37.5 | **100.0** | | |
| 1.0" | 25.0 | **100.0** | | |
| 0.75" | 19.0 | **100.0** | Coarse Gravel | **0.0** |
| 0.50" | 12.7 | **100.0** | | |
| 0.375" | 9.5 | **100.0** | | |
| #4 | 4.8 | **100.0** | Fine Gravel | **0.0** |
| #10 | 2.00 | **100.0** | Coarse Sand | **0.0** |
| #20 | 0.85 | **100.0** | | |
| #40 | 0.43 | **99.9** | Medium Sand | **0.1** |
| #60 | 0.25 | **99.7** | | |
| #100 | 0.15 | **99.5** | | |
| #200 | 0.075 | **98.9** | Fine Sand | **1.0** |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.026 | **90.3** | | |
| 0.018 | **74.4** | | |
| 0.011 | **62.9** | Fines | |
| 0.0080 | **54.9** | Silt or Clay | **98.9** |
| 0.0058 | **49.6** | | |
| 0.0029 | **42.5** | | |
| 0.0012 | **37.2** | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| **17.3** | **40** | **22** | **18** | **-0.26** |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to coarse medium; light gray.

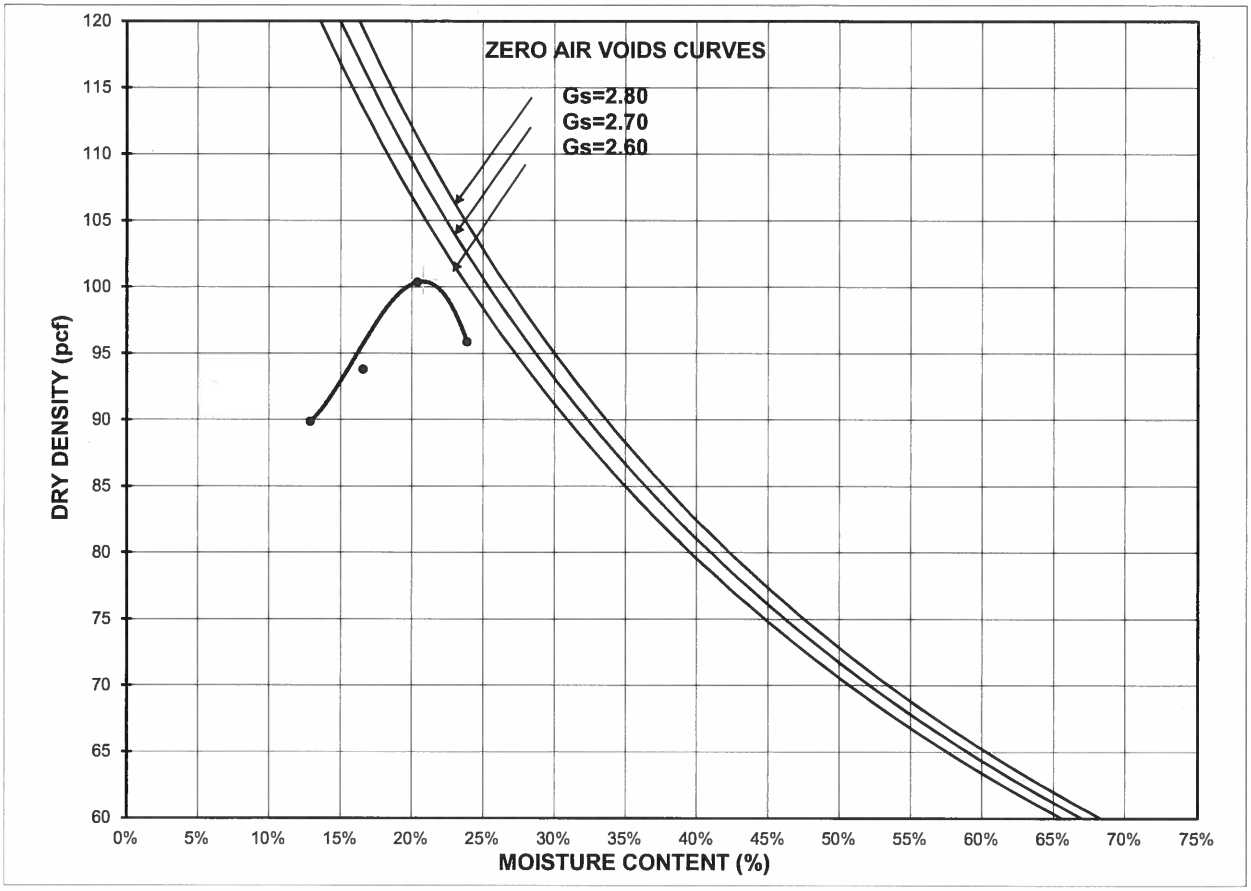
**USCS:** CL

| | |
|---|---|
| **TECH** | FT/HH |
| **DATE** | 5/24/18 |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
PROJECT NUMBER: **18102853**
SAMPLE ID: **PC-2** - DEPTH: **2.0'** SAMPLE TYPE: **Bulk**




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 89.8 | 12.9% |
| 2 | 93.8 | 16.6% |
| 3 | 100.3 | 20.4% |
| 4 | 95.9 | 23.9% |
| | | |
| | | |

| | |
|---|---|
| Maximum Dry Density (pcf) | **100.5** |
| Optimum Moisture (%) | **20.8** |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | **17.3%** |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to coarse medium; light gray.

**USCS** CL

**CHECK**
**REVIEW**
**APPROVE**

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| **PROJECT TITLE** | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | **Board #** | 3 | **COMMENTS** The sample was remolded to 95.1% of the Maximum Dry Density and OPTM + 3.5% (using ASTM D 698). |
| **PROJECT NUMBER** | 18102853 | | **Flow Pump** | 2 | |
| **SAMPLE ID** | PC-2 | 2.0' | **Flow Pump Speed** | 10 | |
| **SAMPLE TYPE** | Bulk | | **Technician** | FT | |

| **Sample Data, Initial** | | | | **Sample Data, Final** | |
|---|---|---|---|---|---|
| **Height, inches** | 3.000 | **B-Value, f** | 0.98 | **Height, inches** | 2.999 |
| **Diameter, inches** | 2.790 | **Cell Pres.** | 90.0 | **Diameter, inches** | 2.793 |
| **Area, cm²** | 39.44 | **Bot. Pres.** | 80.0 | **Area, cm²** | 39.53 |
| **Volume, cm³** | 300.55 | **Top Pres.** | 80.0 | **Volume, cm³** | 301.10 |
| **Mass, g** | 572.31 | **Tot. B.P.** | 80.0 | **Mass, g** | 579.49 |
| **Moisture Content, %** | 24.28 | **Head, max.** | 168.82 | **Moisture Content, %** | 25.84 |
| **Dry Density, pcf** | 95.60 | **Head, min.** | 168.82 | **Dry Density, pcf** | 95.43 |
| **Spec. Gravity (assumed)** | 2.700 | **Max. Grad.** | 22.16 | **Volume Solids, cm³** | 170.55 |
| **Volume Solids, cm³** | 170.55 | **Min. Grad.** | 22.16 | **Volume Voids, cm³** | 130.55 |
| **Volume Voids, cm³** | 130.00 | | | **Void Ratio** | 0.77 |
| **Void Ratio** | 0.76 | | | **Saturation, %** | 91.2% |
| **Saturation, %** | 86.0% | | | | |

**Flow Pump Rate** 2.25E-05 cm³/sec **USCS** CL

| **WATER CONTENTS** | | **Sample Initial** | **Sample Final** |
|---|---|---|---|
| **Wt Soil & Tare, i** | g | 572.31 | 657.52 |
| **Wt Soil & Tare, f** | g | 460.49 | 538.54 |
| **Wt Tare** | g | 0.00 | 78.15 |
| **Wt Moisture Lost** | g | 111.82 | 118.98 |
| **Wt Dry Soil** | g | 460.49 | 460.39 |
| **Water Content** | % | 24.28% | 25.84% |

**DESCRIPTION**
SILTY CLAY, trace fine to coarse medium; light gray.

| **TIME FUNCTIONS, SECONDS** | | | | | | | | **dP** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DATE** | **DAY** | **HOUR** | **MIN** | **TEMP (°C)** | **dt (min)** | **dt,acc (min)** | **dt (sec)** | **dt,acc (sec)** | **Reading (psi)** | **Head (cm)** | **Gradient** | **Permeability (cm/sec)** |
| 05/31/18 | 43251 | 9 | 0 | 19.3 | 0 | 0 | 0 | 0 | 2.40 | 168.82 | 22.16 | 2.6E-08 |
| 05/31/18 | 43251 | 9 | 5 | 19.3 | 5 | 5 | 300 | 300 | 2.40 | 168.82 | 22.16 | 2.6E-08 |
| 05/31/18 | 43251 | 9 | 10 | 19.3 | 5 | 10 | 300 | 600 | 2.40 | 168.82 | 22.16 | 2.6E-08 |
| 05/31/18 | 43251 | 9 | 15 | 19.3 | 5 | 15 | 300 | 900 | 2.40 | 168.82 | 22.16 | 2.6E-08 * |
| 05/31/18 | 43251 | 9 | 20 | 19.3 | 5 | 20 | 300 | 1200 | 2.40 | 168.82 | 22.16 | 2.6E-08 * |
| 05/31/18 | 43251 | 9 | 25 | 19.3 | 5 | 25 | 300 | 1500 | 2.40 | 168.82 | 22.16 | 2.6E-08 * |
| 05/31/18 | 43251 | 9 | 30 | 19.3 | 5 | 30 | 300 | 1800 | 2.40 | 168.82 | 22.16 | 2.6E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

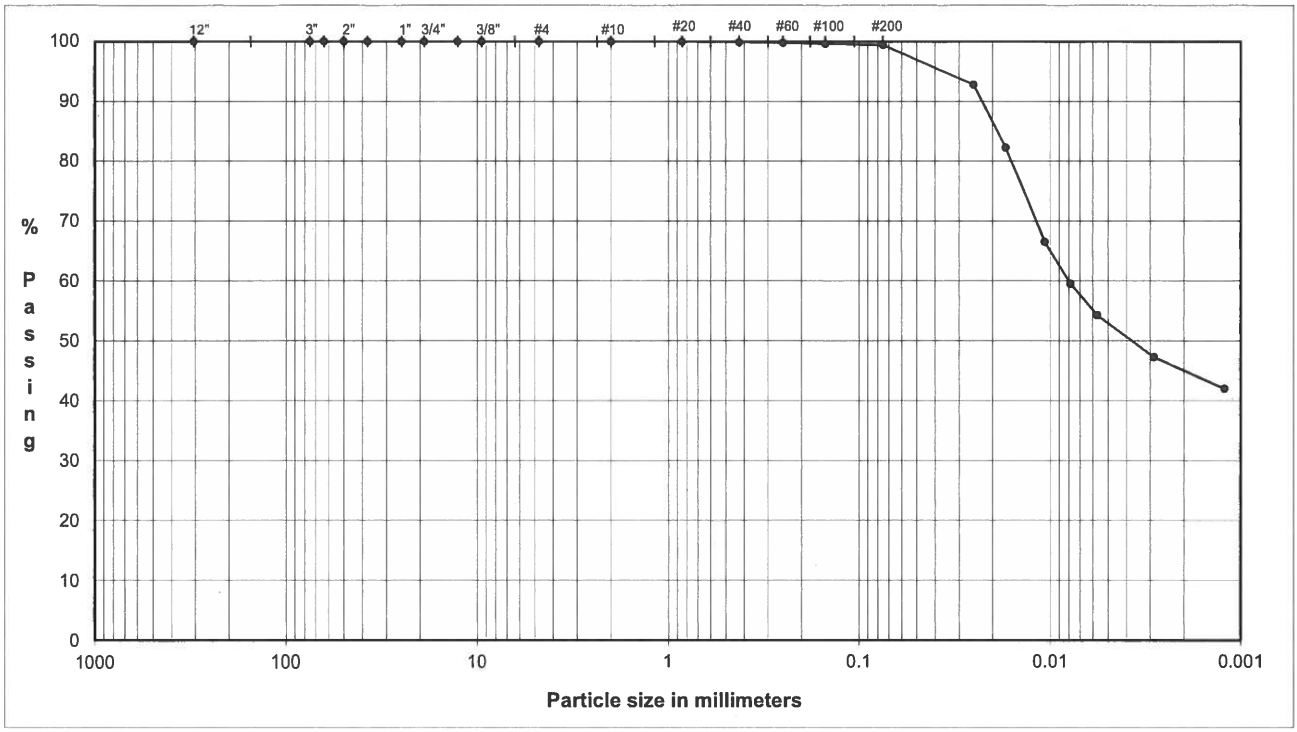
**PERMEABILITY REPORTED AS ** 2.6E-08 cm/sec ****

| | |
|---|---|
| **DATE** | 5/31/18 |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **PC-3** - Depth: **2.0'**
TYPE: **Bulk**



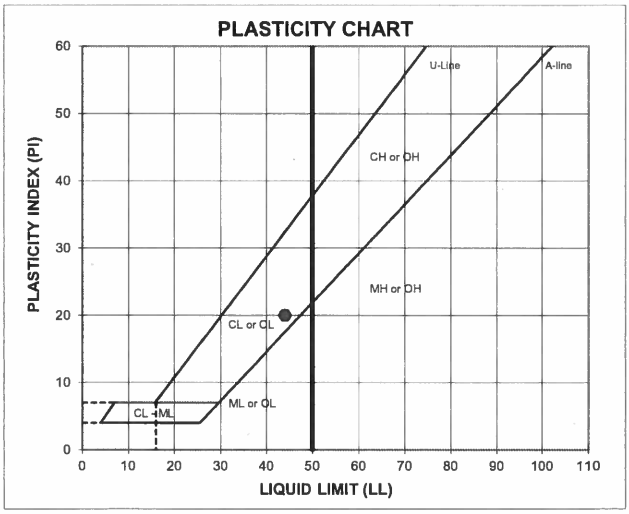

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | **100.0** | | |
| 3.0" | 75.0 | **100.0** | Cobbles | **0.0** |
| 2.5" | 63.5 | **100.0** | | |
| 2.0" | 50.0 | **100.0** | | |
| 1.5" | 37.5 | **100.0** | | |
| 1.0" | 25.0 | **100.0** | | |
| 0.75" | 19.0 | **100.0** | Coarse Gravel | **0.0** |
| 0.50" | 12.7 | **100.0** | | |
| 0.375" | 9.5 | **100.0** | | |
| #4 | 4.8 | **100.0** | Fine Gravel | **0.0** |
| #10 | 2.00 | **100.0** | Coarse Sand | **0.0** |
| #20 | 0.85 | **99.9** | | |
| #40 | 0.43 | **99.9** | Medium Sand | **0.1** |
| #60 | 0.25 | **99.8** | | |
| #100 | 0.15 | **99.6** | | |
| #200 | 0.075 | **99.4** | Fine Sand | **0.5** |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.025 | **92.8** | | |
| 0.017 | **82.3** | | |
| 0.011 | **66.5** | Fines | |
| 0.0078 | **59.5** | Silt or Clay | **99.4** |
| 0.0057 | **54.3** | | |
| 0.0029 | **47.3** | | |
| 0.0012 | **42.0** | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| **24.9** | **44** | **24** | **20** | **0.04** |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to medium sand; light olive brown.

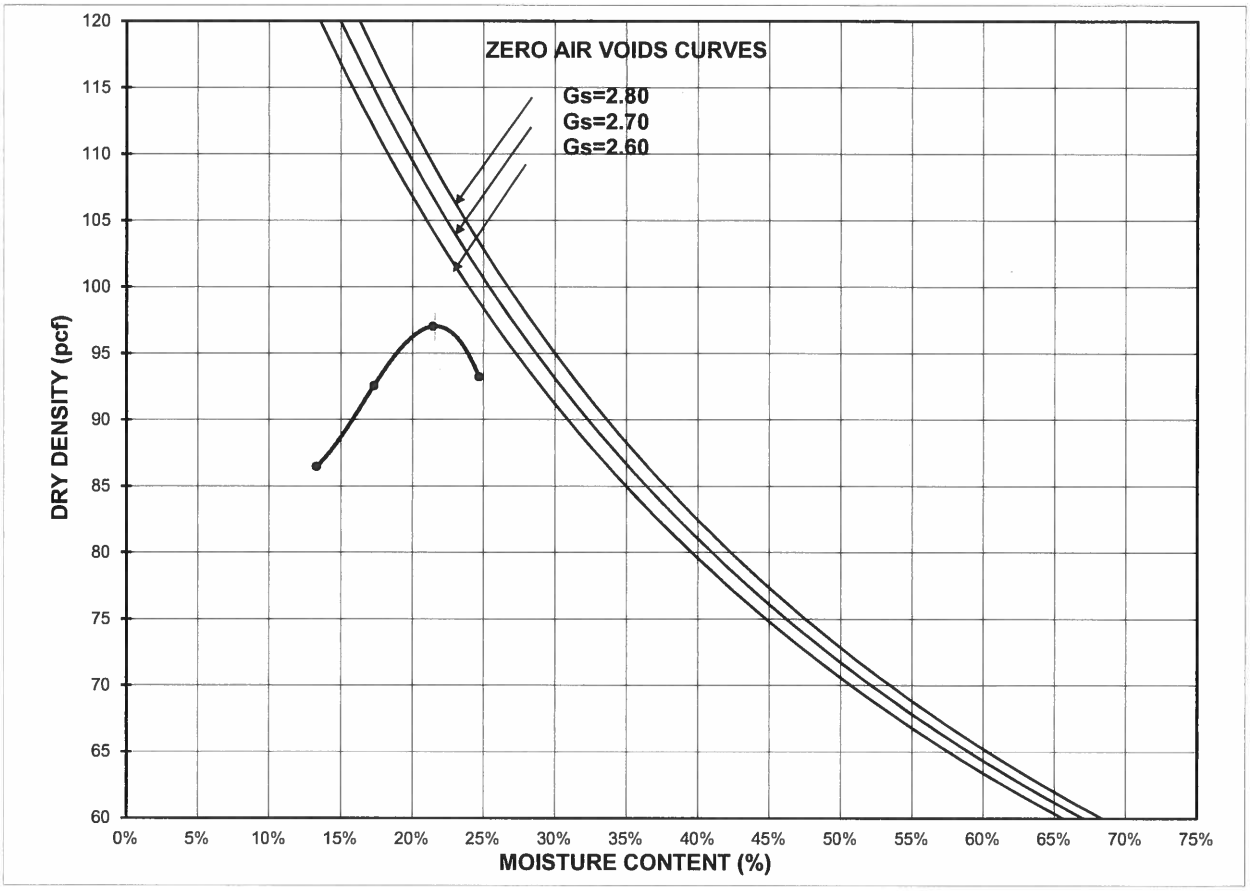
**USCS:** CL

| | |
|---|---|
| **TECH** | FT/HH |
| **DATE** | 5/24/18 |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: PC-3 - DEPTH: 2.0' SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 86.4 | 13.3% |
| 2 | 92.6 | 17.3% |
| 3 | 97.0 | 21.4% |
| 4 | 93.2 | 24.7% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 97.0 |
| Optimum Moisture (%) | 21.6 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 24.9% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to medium sand; light olive brown.

**USCS** CL

**CHECK**
**REVIEW**
**APPROVE**

# FLEXIBLE WALL TRIAXIAL PERMEABILITY
## ASTM D 5084
## METHOD C, FALLING HEAD W/INCREASING TAIL WATER PRESSURE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PROJECT TITLE** | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | **Using Pipettes Only** | YES | **COMMENTS** | The sample was remolded to 97.3% of the Maximum Dry Density and OPTM + 3.5% (using ASTM D 698). |
| **PROJECT NUMBER** | 18102853 | | **Using Pipettes & Burettes** | NO | | |
| **SAMPLE ID** | PC-3 A | 2.0' | **BOARD#** 3 | **TECH** FT | | |
| **SAMPLE TYPE** | Bulk | | **CELL #** 3 | **DATE** 6/1/18 | | |

**Sample Data, Initial**

| | |
|---|---|
| Height, inches | 3.000 |
| Diameter, inches | 2.790 |
| Area, cm^2 | 39.44 |
| Volume, cm^3 | 300.55 |
| Mass, g | 568.40 |
| Moisture Content, % | 25.1 |
| Dry Density, pcf | 94.3 |
| Spec. Gravity (assumed) | 2.700 |
| Volume Solids, cm^3 | 168.22 |
| Volume Voids, cm^3 | 132.33 |
| Void Ratio | 0.79 |
| Saturation | 86.3% |

| | | |
|---|---|---|
| B-Value,f | 0.96 | |
| Cell Pres. | 90.0 | psi |
| Bot. Pres. | 82.0 | psi |
| Top Pres. | 80.0 | psi |
| Head, cm | 140.68 | |
| Max. Grad. | 21.66 | |
| Min. Grad. | 21.07 | |
| Max. E.S. | 10.00 | |
| Min. E.S. | 8.00 | |

**Sample Data, Final**

| | |
|---|---|
| Height, inches | 3.001 |
| Diameter, inches | 2.788 |
| Area, cm^2 | 39.39 |
| Volume, cm^3 | 300.22 |
| Mass, g | 582.43 |
| Moisture Content % | 28.24 |
| Dry Density, pcf | 94.40 |
| Saturation | 97.1% |
| Inflow Volume per (cc) | 1.00 |
| Outflow Volume per (cc) | 1.00 |

| **Water Contents** | **Initial** | **Final** |
|---|---|---|
| Wt soil&tare, i | 568.40 | 660.38 |
| Wt soil&tare, f | 454.19 | 532.18 |
| Wt Tare | 0.00 | 78.14 |
| Wt Moisture Lost | 114.21 | 128.20 |
| Wt Dry Soil | 454.19 | 454.04 |
| Water Content | 25.15% | 28.24% |

**DESCRIPTION** SILTY CLAY, trace fine to medium sand; light olive brown.

**USCS** CL

PERMEANT: Deaired Tap Water

| TIME FUNCTION | | | READINGS | | | TIME IN MINUTES & SECONDS | | | | | | VOLUME | | PERMEABILITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HOUR | MIN | Inflow (cc) | Outflow (cc) | Temp. | dt (min) | dt (sec) | dt, acc (sec) | Head (cm) | (H1/H2) (inc.) | Gradient | Inflow (cc) | Outflow (cc) | @ 20 Degrees C (cm/sec) |
| 06/01/18 | 10 | 37 | 0.0 | 25.0 | 20.5 | 0.0 | 0.0 | 0 | 165.10 | | 21.66 | 0.00 | 0.00 | 0.0 |
| 06/02/18 | 7 | 42 | 0.6 | 24.1 | 19.4 | 1265.0 | 75900 | 75900 | 163.63 | 1.01 | 21.47 | 0.60 | 0.90 | 1.2E-08 * |
| 06/03/18 | 14 | 48 | 1.6 | 23.3 | 18.9 | 1866.0 | 111960 | 187860 | 161.88 | 1.01 | 21.24 | 1.00 | 0.80 | 9.6E-09 * |
| 06/04/18 | 7 | 18 | 2.0 | 22.8 | 19.1 | 990.0 | 59400 | 247260 | 161.00 | 1.01 | 21.12 | 0.40 | 0.50 | 9.1E-09 * |
| 06/04/18 | 14 | 16 | 2.2 | 22.6 | 20.2 | 418.0 | 25080 | 272340 | 160.61 | 1.00 | 21.07 | 0.20 | 0.20 | 9.3E-09 * |

| | |
|---|---|
| **Inflow Rate** | 0.000008 |
| **Outflow Rate** | 0.000009 |
| **Outflow/Inflow Ratio** | 1.09 |

***PERMEABILITY REPORTED AS** **9.9E-09** **cm/sec**

| | |
|---|---|
| **DATE** | 6/1/18 |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

# APPENDIX I

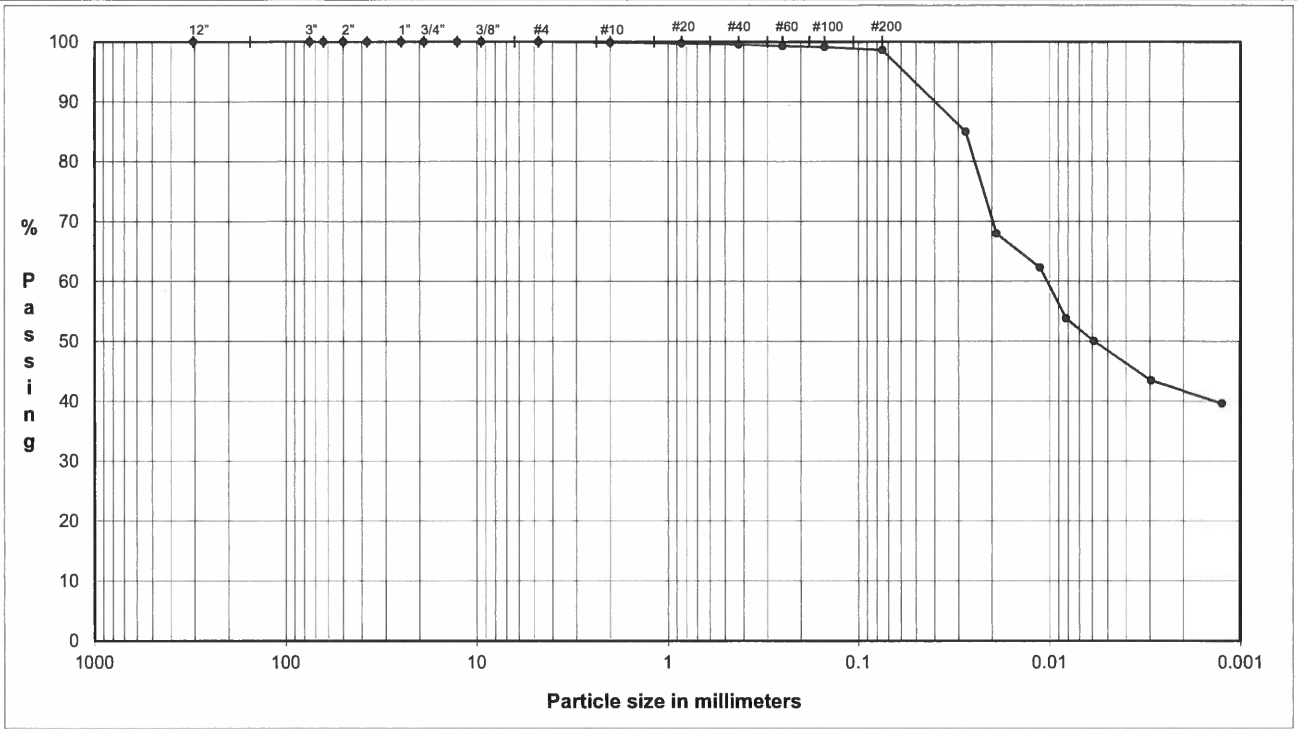
**Clay Liner Material Construction Reports**

MAY 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF-CELL 1S-2N/AR**
SAMPLE ID: **C-1** - Depth: **4.0'**
TYPE: **Bulk**




| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

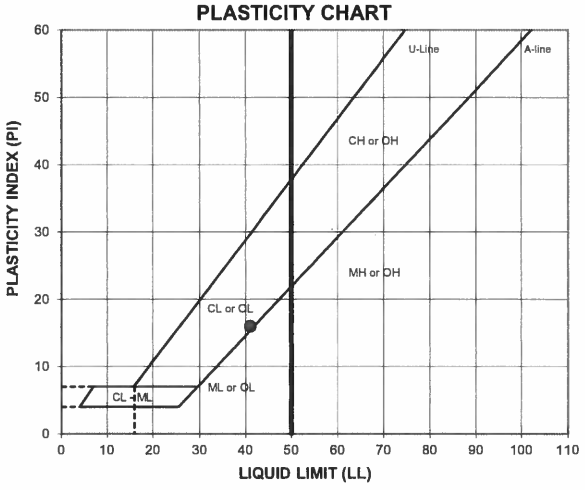
U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | **100.0** | | |
| 3.0" | 75.0 | **100.0** | Cobbles | **0.0** |
| 2.5" | 63.5 | **100.0** | | |
| 2.0" | 50.0 | **100.0** | | |
| 1.5" | 37.5 | **100.0** | | |
| 1.0" | 25.0 | **100.0** | | |
| 0.75" | 19.0 | **100.0** | Coarse Gravel | **0.0** |
| 0.50" | 12.7 | **100.0** | | |
| 0.375" | 9.5 | **100.0** | | |
| #4 | 4.8 | **100.0** | Fine Gravel | **0.0** |
| #10 | 2.00 | **99.8** | Coarse Sand | **0.2** |
| #20 | 0.85 | **99.7** | | |
| #40 | 0.43 | **99.5** | Medium Sand | **0.3** |
| #60 | 0.25 | **99.3** | | |
| #100 | 0.15 | **99.2** | | |
| #200 | 0.075 | **98.6** | Fine Sand | **1.0** |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.027 | **85.0** | | |
| 0.019 | **68.0** | | |
| 0.011 | **62.3** | Fines | |
| 0.0082 | **53.8** | Silt or Clay | **98.6** |
| 0.0059 | **50.0** | | |
| 0.0030 | **43.4** | | |
| 0.0012 | **39.6** | | |

**PLASTICITY CHART**




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| **23.5** | **41** | **25** | **16** | **-0.12** |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to coarse sand; grayish brown.

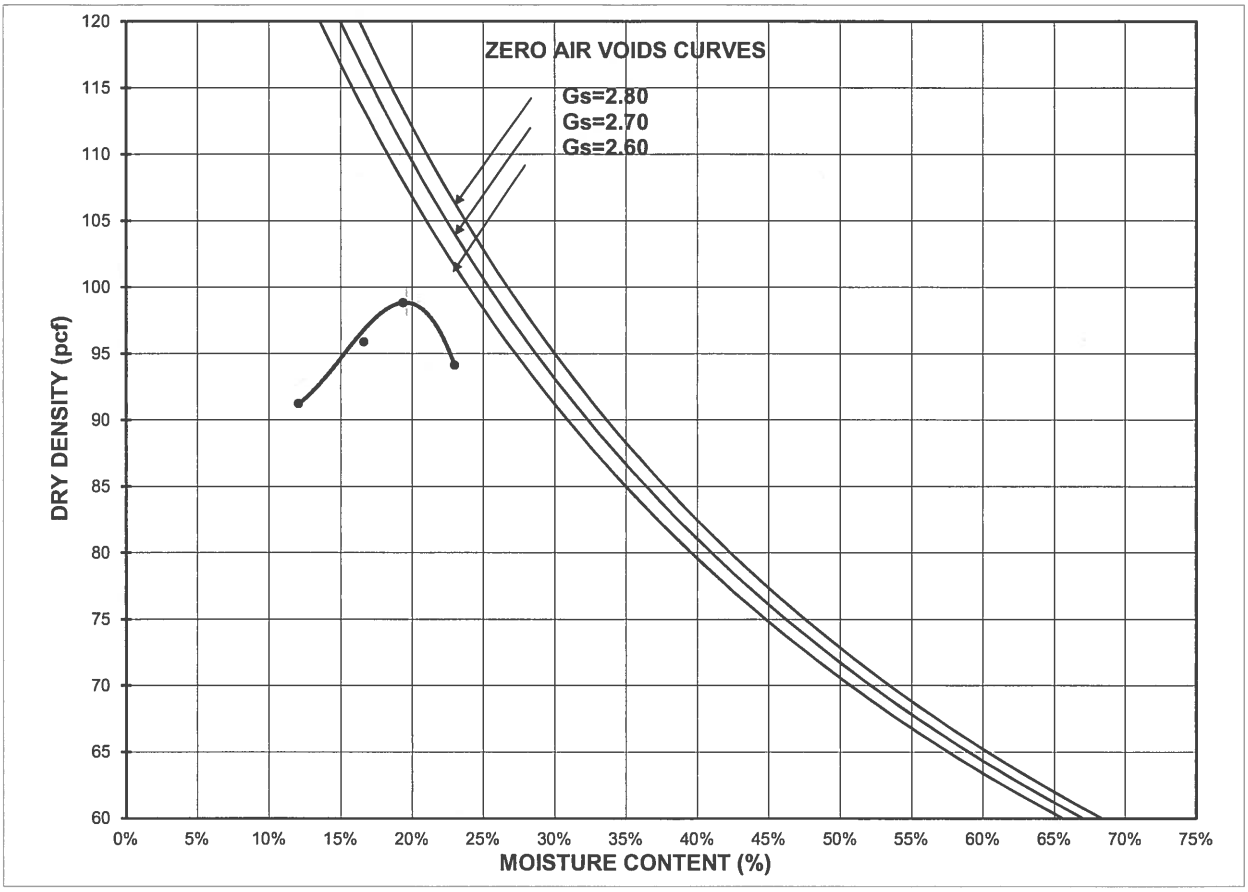
**USCS:** CL

| | |
|---|---|
| TECH | FT/HH |
| DATE | 5/24/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF-CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-1 - DEPTH: 4.0' SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 91.2 | 12.1% |
| 2 | 95.9 | 16.6% |
| 3 | 98.8 | 19.4% |
| 4 | 94.1 | 23.0% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 98.9 |
| Optimum Moisture (%) | 19.6 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 23.5% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to coarse sand; grayish brown.

**USCS** CL

**CHECK** **REVIEW** **APPROVE**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF-CELL 1S-2N/AR | | Board # | 5 | COMMENTS: The sample was remolded to 95.0% of the Maximum Dry Density and OPTM + 4.0% (using ASTM D 698). |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | C-1 | 4.0' | Flow Pump Speed | 10 | |
| SAMPLE TYPE | Bulk | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.001 | B-Value, f | 0.96 | Height, inches | 3.003 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.798 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 39.67 |
| Volume, cm³ | 300.65 | Top Pres. | 80.0 | Volume, cm³ | 302.58 |
| Mass, g | 558.89 | Tot. B.P. | 80.0 | Mass, g | 579.74 |
| Moisture Content, % | 23.55 | Head, max. | 147.71 | Moisture Content, % | 28.16 |
| Dry Density, pcf | 93.88 | Head, min. | 147.71 | Dry Density, pcf | 93.28 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 19.37 | Volume Solids, cm³ | 167.53 |
| Volume Solids, cm³ | 167.53 | Min. Grad. | 19.37 | Volume Voids, cm³ | 135.05 |
| Volume Voids, cm³ | 133.12 | | | Void Ratio | 0.81 |
| Void Ratio | 0.79 | | | Saturation, % | 94.3% |
| Saturation, % | 80.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 558.89 | 662.94 |
| Wt Soil & Tare, f | g | 452.34 | 535.61 |
| Wt Tare | g | 0.00 | 83.51 |
| Wt Moisture Lost | g | 106.55 | 127.33 |
| Wt Dry Soil | g | 452.34 | 452.10 |
| Water Content | % | 23.55% | 28.16% |

DESCRIPTION: SILTY CLAY, trace fine to coarse sand; grayish brown.

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 05/30/18 | 43250 | 10 | 30 | 19.4 | 0 | 0 | 0 | 0 | 2.10 | 147.71 | 19.37 | 3.0E-08 |
| 05/30/18 | 43250 | 10 | 35 | 19.4 | 5 | 5 | 300 | 300 | 2.10 | 147.71 | 19.37 | 3.0E-08 |
| 05/30/18 | 43250 | 10 | 40 | 19.4 | 5 | 10 | 300 | 600 | 2.10 | 147.71 | 19.37 | 3.0E-08 |
| 05/30/18 | 43250 | 10 | 45 | 19.4 | 5 | 15 | 300 | 900 | 2.10 | 147.71 | 19.37 | 3.0E-08 * |
| 05/30/18 | 43250 | 10 | 50 | 19.4 | 5 | 20 | 300 | 1200 | 2.10 | 147.71 | 19.37 | 3.0E-08 * |
| 05/30/18 | 43250 | 10 | 55 | 19.4 | 5 | 25 | 300 | 1500 | 2.10 | 147.71 | 19.37 | 3.0E-08 * |
| 05/30/18 | 43250 | 11 | 0 | 19.4 | 5 | 30 | 300 | 1800 | 2.10 | 147.71 | 19.37 | 3.0E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.0E-08 cm/sec **

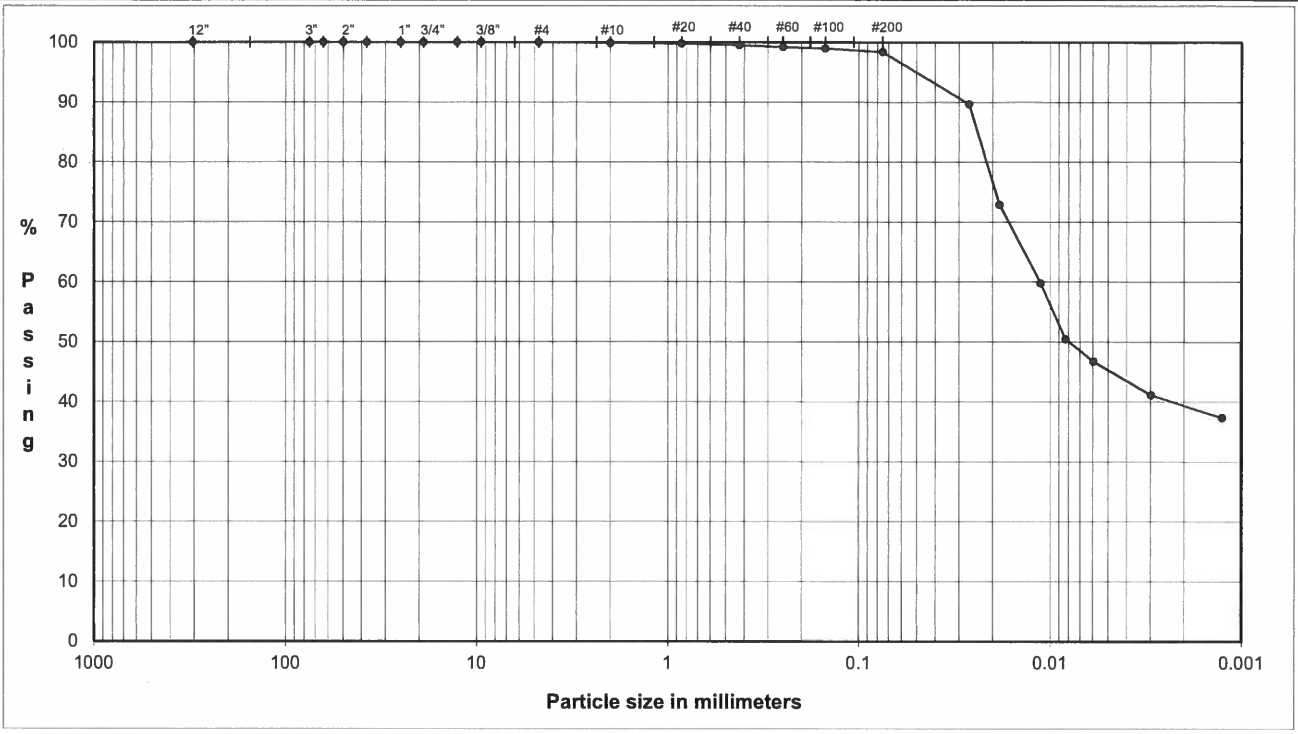
| | |
|---|---|
| DATE | 5/30/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

MAY 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-2** - Depth: **4.0'**
TYPE: **Bulk**



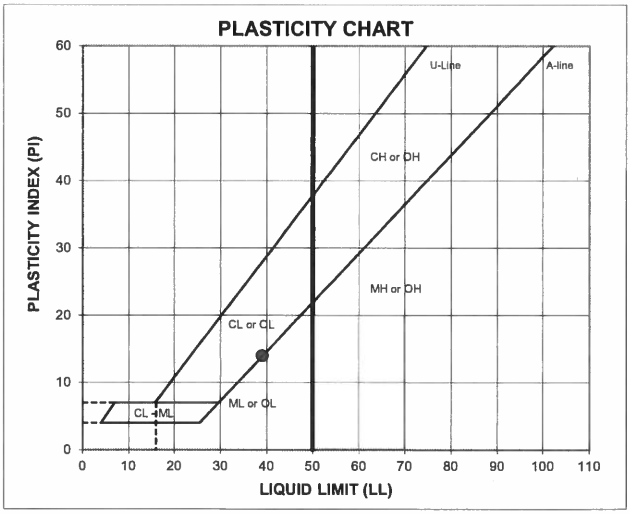

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | **100.0** | | |
| 3.0" | 75.0 | **100.0** | Cobbles | **0.0** |
| 2.5" | 63.5 | **100.0** | | |
| 2.0" | 50.0 | **100.0** | | |
| 1.5" | 37.5 | **100.0** | | |
| 1.0" | 25.0 | **100.0** | | |
| 0.75" | 19.0 | **100.0** | Coarse Gravel | **0.0** |
| 0.50" | 12.7 | **100.0** | | |
| 0.375" | 9.5 | **100.0** | | |
| #4 | 4.8 | **100.0** | Fine Gravel | **0.0** |
| #10 | 2.00 | **99.9** | Coarse Sand | **0.1** |
| #20 | 0.85 | **99.8** | | |
| #40 | 0.43 | **99.5** | Medium Sand | **0.4** |
| #60 | 0.25 | **99.2** | | |
| #100 | 0.15 | **99.0** | | |
| #200 | 0.075 | **98.4** | Fine Sand | **1.1** |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.027 | **89.7** | | |
| 0.018 | **72.8** | | |
| 0.011 | **59.8** | Fines | |
| 0.0083 | **50.4** | Silt or Clay | **98.4** |
| 0.0059 | **46.7** | | |
| 0.0030 | **41.1** | | |
| 0.0013 | **37.4** | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| **19.1** | **39** | **25** | **14** | **-0.47** |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to coarse sand; grayish brown.

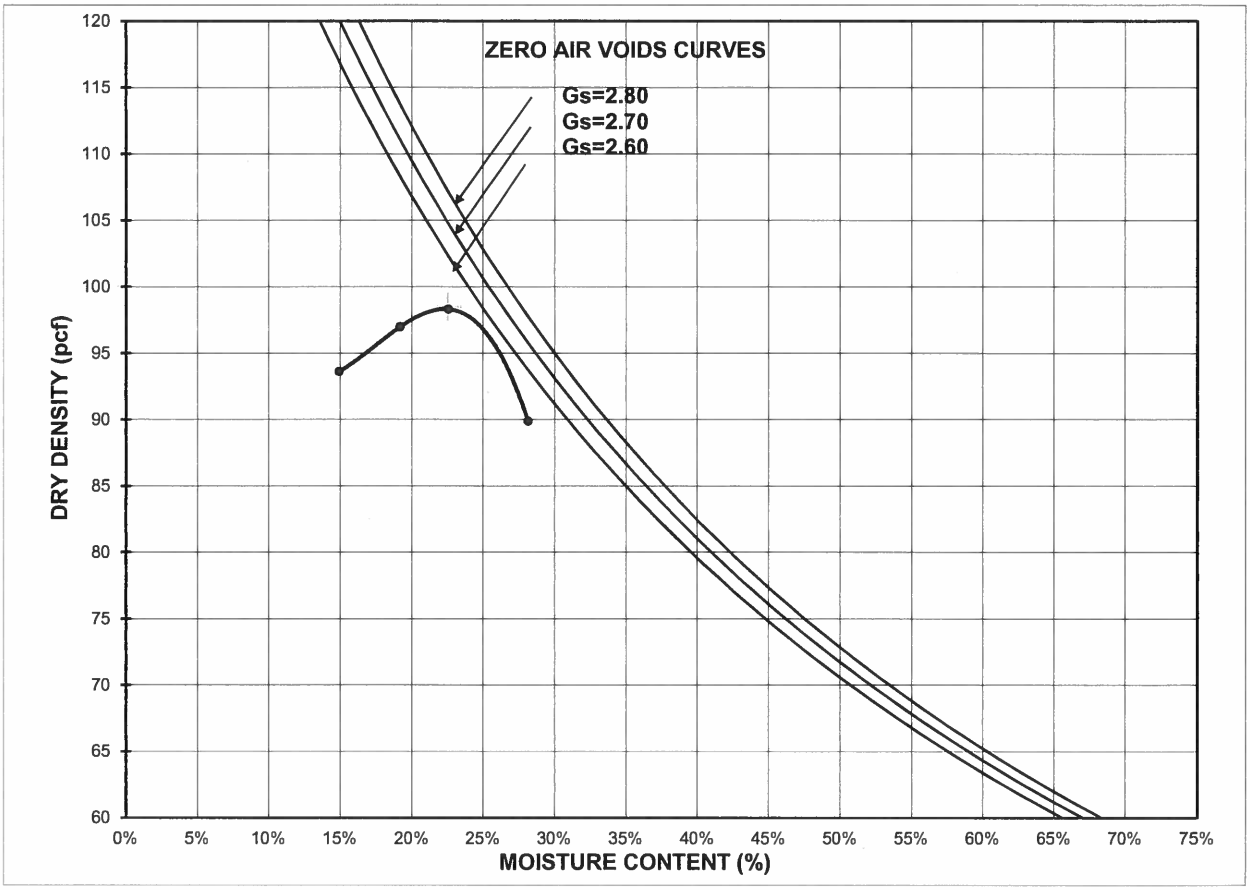
**USCS:** CL

| | |
|---|---|
| TECH | FT/HH |
| DATE | 5/24/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-2 - DEPTH: 4.0' SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 93.6 | 14.9% |
| 2 | 97.0 | 19.2% |
| 3 | 98.3 | 22.6% |
| 4 | 89.9 | 28.1% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 98.5 |
| Optimum Moisture (%) | 22.5 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 19.1% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to coarse sand; grayish brown.

**USCS** CL

**CHECK**
**REVIEW** MWM
**APPROVE**

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 4 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-2 4.0' | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 94.3% of the Maximum Dry Density and OPTM + 3.8% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.999 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 |
| Volume, cm³ | 300.45 | Top Pres. | 80.0 |
| Mass, g | 564.67 | Tot. B.P. | 80.0 |
| Moisture Content, % | 26.34 | Head, max. | 168.82 |
| Dry Density, pcf | 92.83 | Head, min. | 168.82 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 22.15 |
| Volume Solids, cm³ | 165.54 | Min. Grad. | 22.15 |
| Volume Voids, cm³ | 134.91 | | |
| Void Ratio | 0.81 | | |
| Saturation, % | 87.2% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.000 |
| Diameter, inches | 2.783 |
| Area, cm² | 39.24 |
| Volume, cm³ | 299.05 |
| Mass, g | 570.53 |
| Moisture Content, % | 27.65 |
| Dry Density, pcf | 93.26 |
| Volume Solids, cm³ | 165.54 |
| Volume Voids, cm³ | 133.51 |
| Void Ratio | 0.81 |
| Saturation, % | 92.6% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 564.67 | 652.97 |
| Wt Soil & Tare, f | g | 446.96 | 529.42 |
| Wt Tare | g | 0.00 | 82.53 |
| Wt Moisture Lost | g | 117.71 | 123.55 |
| Wt Dry Soil | g | 446.96 | 446.89 |
| Water Content | % | 26.34% | 27.65% |

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

DESCRIPTION: SILTY CLAY, trace fine to coarse sand; grayish brown.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 05/31/18 | 43251 | 11 | 0 | 20.3 | 0 | 0 | 0 | 0 | 2.40 | 168.82 | 22.15 | 1.3E-08 |
| 05/31/18 | 43251 | 11 | 5 | 20.3 | 5 | 5 | 300 | 300 | 2.40 | 168.82 | 22.15 | 1.3E-08 |
| 05/31/18 | 43251 | 11 | 10 | 20.3 | 5 | 10 | 300 | 600 | 2.40 | 168.82 | 22.15 | 1.3E-08 |
| 05/31/18 | 43251 | 11 | 15 | 20.3 | 5 | 15 | 300 | 900 | 2.40 | 168.82 | 22.15 | 1.3E-08 * |
| 05/31/18 | 43251 | 11 | 20 | 20.3 | 5 | 20 | 300 | 1200 | 2.40 | 168.82 | 22.15 | 1.3E-08 * |
| 05/31/18 | 43251 | 11 | 25 | 20.3 | 5 | 25 | 300 | 1500 | 2.40 | 168.82 | 22.15 | 1.3E-08 * |
| 05/31/18 | 43251 | 11 | 30 | 20.3 | 5 | 30 | 300 | 1800 | 2.40 | 168.82 | 22.15 | 1.3E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

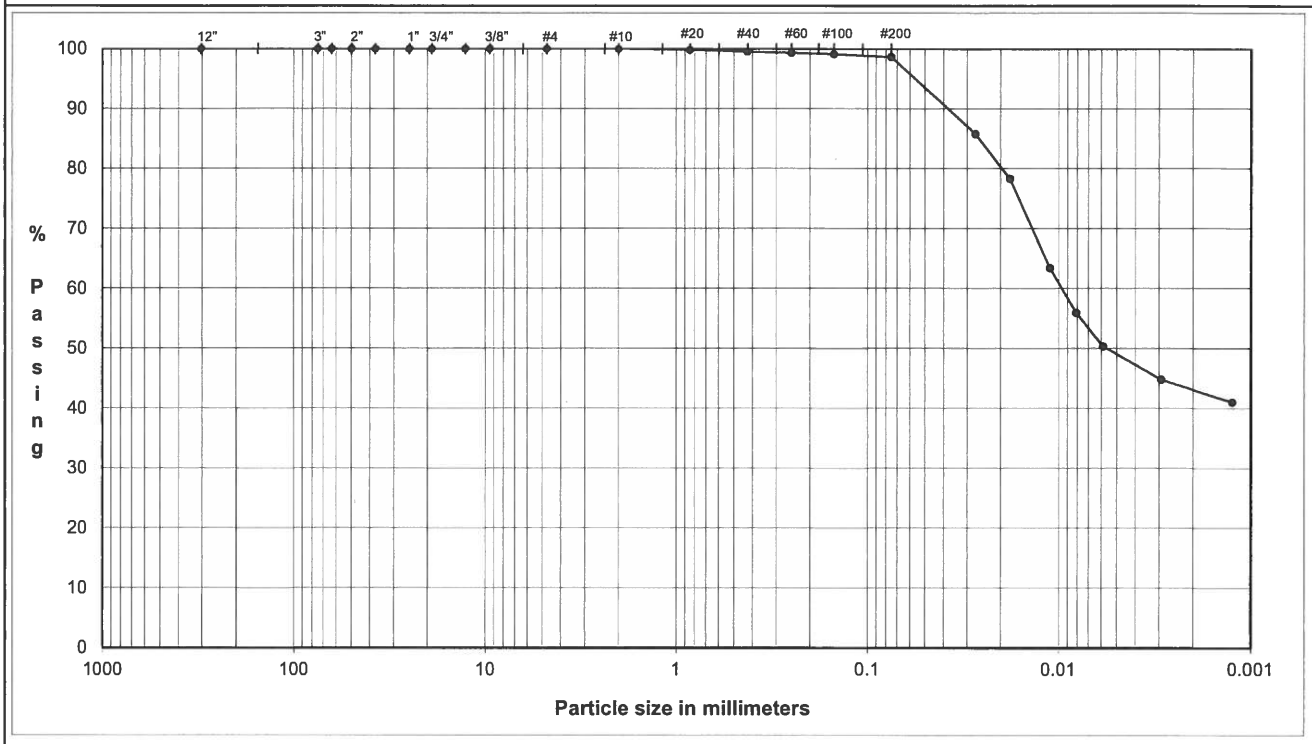
PERMEABILITY REPORTED AS ** 1.3E-08 cm/sec **

| | |
|---|---|
| DATE | 5/31/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-3** - Depth: **4.0'**
TYPE: **Bulk**



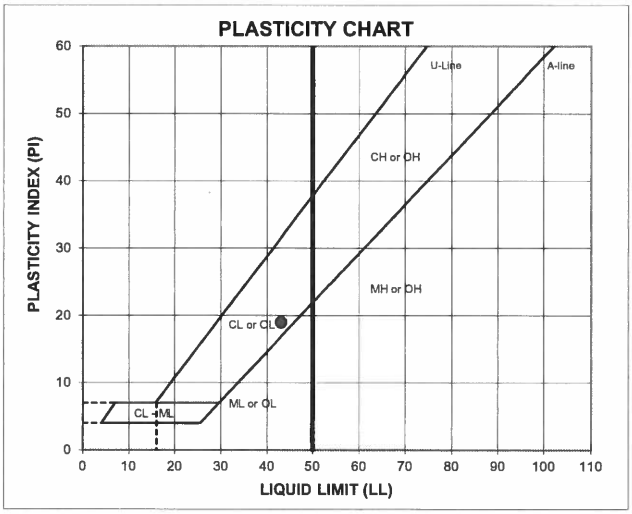

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 99.8 | | |
| #40 | 0.43 | 99.5 | Medium Sand | 0.5 |
| #60 | 0.25 | 99.3 | | |
| #100 | 0.15 | 99.1 | | |
| #200 | 0.075 | 98.6 | Fine Sand | 0.9 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.027 | 85.7 | | |
| 0.018 | 78.3 | | |
| 0.011 | 63.4 | Fines | |
| 0.0081 | 55.9 | Silt or Clay | 98.6 |
| 0.0059 | 50.3 | | |
| 0.0029 | 44.7 | | |
| 0.0012 | 41.0 | | |




**ATTERBERG LIMITS**
Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 23.4 | 43 | 24 | 19 | -0.02 |

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to medium sand; light brownish gray.

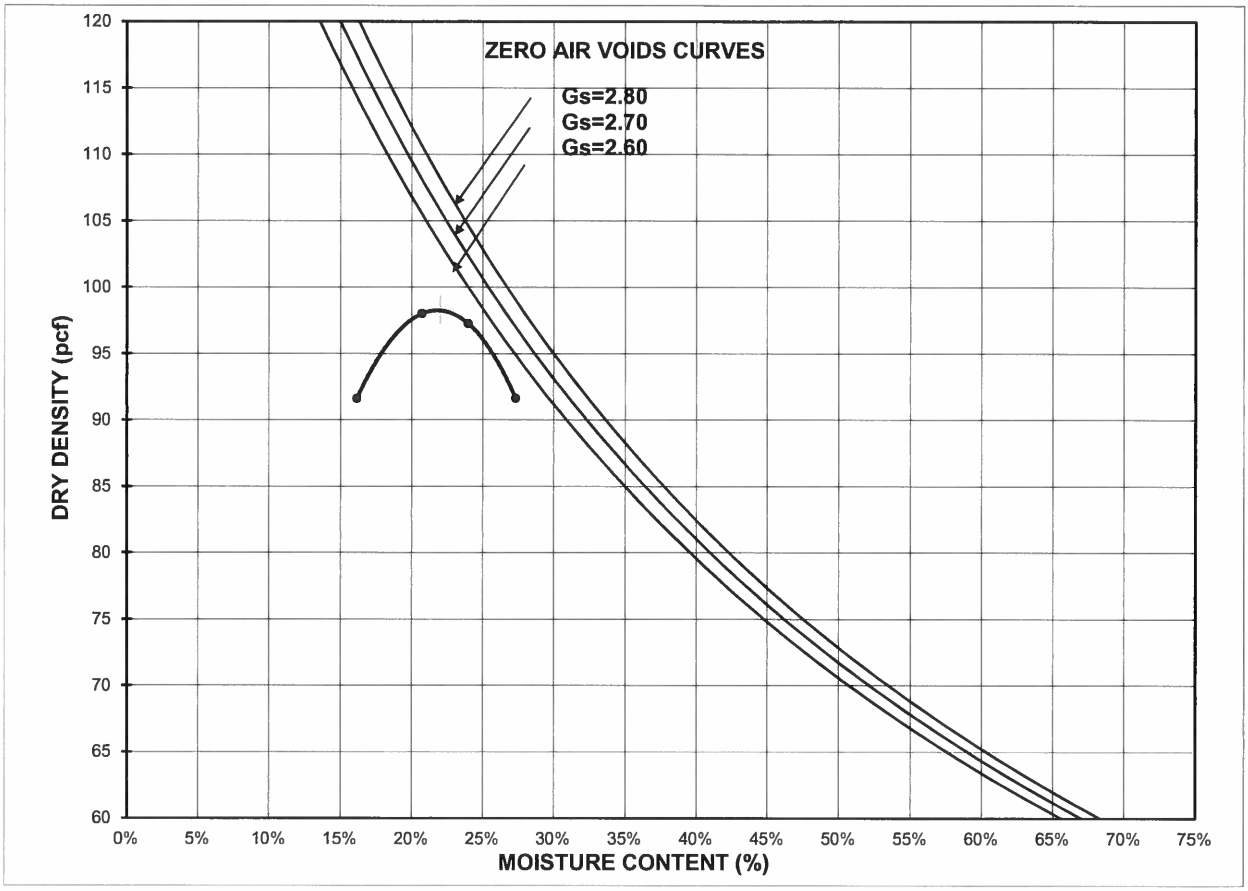
**USCS:** CL

| | |
|---|---|
| TECH | FT/HH |
| DATE | 5/24/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-3 - DEPTH: 4.0' SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 91.6 | 16.2% |
| 2 | 98.0 | 20.7% |
| 3 | 97.2 | 24.0% |
| 4 | 91.6 | 27.3% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 98.3 |
| Optimum Moisture (%) | 22.0 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 23.4% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to medium sand; light brownish gray.

**USCS** CL

**CHECK**
**REVIEW** JWM
**APPROVE**

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 5 | COMMENTS: The sample was remolded to 95.1% of the Maximum Dry Density and OPTM + 3.2% (using ASTM D 698). |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | C-3 | 4.0' | Flow Pump Speed | 10 | |
| SAMPLE TYPE | Bulk | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.000 | B-Value, f | 0.97 | Height, inches | 2.999 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.789 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 39.41 |
| Volume, cm³ | 300.55 | Top Pres. | 80.0 | Volume, cm³ | 300.24 |
| Mass, g | 562.94 | Tot. B.P. | 80.0 | Mass, g | 577.58 |
| Moisture Content, % | 25.16 | Head, max. | 116.06 | Moisture Content, % | 28.42 |
| Dry Density, pcf | 93.38 | Head, min. | 116.06 | Dry Density, pcf | 93.48 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 15.24 | Volume Solids, cm³ | 166.58 |
| Volume Solids, cm³ | 166.58 | Min. Grad. | 15.24 | Volume Voids, cm³ | 133.66 |
| Volume Voids, cm³ | 133.97 | | | Void Ratio | 0.80 |
| Void Ratio | 0.80 | | | Saturation, % | 95.6% |
| Saturation, % | 84.5% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 562.94 | 659.72 |
| Wt Soil & Tare, f | g | 449.76 | 531.94 |
| Wt Tare | g | 0.00 | 82.31 |
| Wt Moisture Lost | g | 113.18 | 127.78 |
| Wt Dry Soil | g | 449.76 | 449.63 |
| Water Content | % | 25.16% | 28.42% |

DESCRIPTION: SILTY CLAY, trace fine to medium sand; light brownish gray.

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 05/31/18 | 43251 | 10 | 0 | 20.7 | 0 | 0 | 0 | 0 | 1.65 | 116.06 | 15.24 | 3.7E-08 |
| 05/31/18 | 43251 | 10 | 5 | 20.7 | 5 | 5 | 300 | 300 | 1.65 | 116.06 | 15.24 | 3.7E-08 |
| 05/31/18 | 43251 | 10 | 10 | 20.7 | 5 | 10 | 300 | 600 | 1.65 | 116.06 | 15.24 | 3.7E-08 |
| 05/31/18 | 43251 | 10 | 15 | 20.7 | 5 | 15 | 300 | 900 | 1.65 | 116.06 | 15.24 | 3.7E-08 * |
| 05/31/18 | 43251 | 10 | 20 | 20.7 | 5 | 20 | 300 | 1200 | 1.65 | 116.06 | 15.24 | 3.7E-08 * |
| 05/31/18 | 43251 | 10 | 25 | 20.7 | 5 | 25 | 300 | 1500 | 1.65 | 116.06 | 15.24 | 3.7E-08 * |
| 05/31/18 | 43251 | 10 | 30 | 20.7 | 5 | 30 | 300 | 1800 | 1.65 | 116.06 | 15.24 | 3.7E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.7E-08 cm/sec **

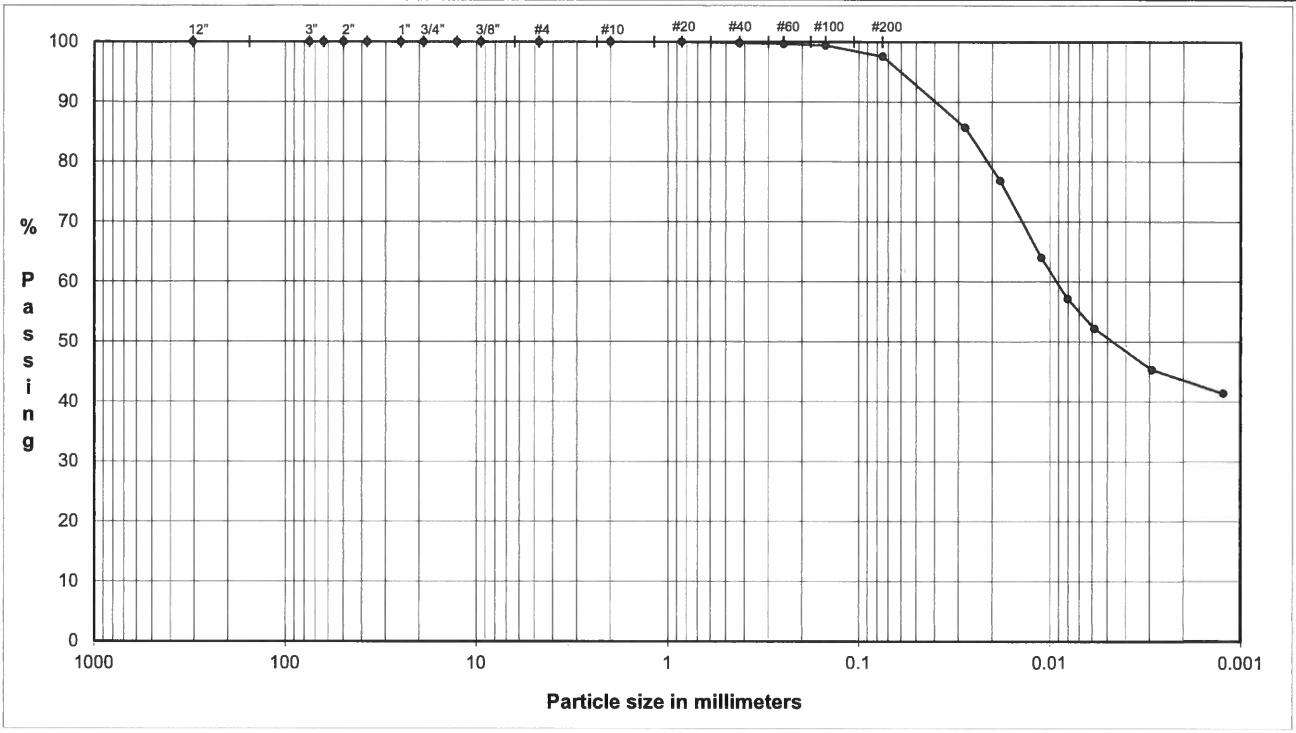
| | |
|---|---|
| DATE | 5/31/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

OCTOBER 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-4** - Depth: -
TYPE: **Bulk**



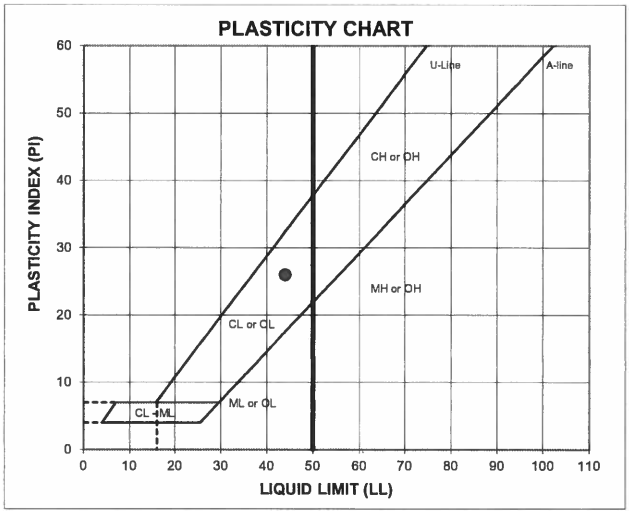

| COBBLES | Coarse GRAVEL | Fine GRAVEL | Coarse SAND | Medium SAND | Fine SAND | Silt or Clay FINES |
|---|---|---|---|---|---|---|

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 100.0 | | |
| #40 | 0.43 | 99.8 | Medium Sand | 0.2 |
| #60 | 0.25 | 99.6 | | |
| #100 | 0.15 | 99.4 | | |
| #200 | 0.075 | 97.6 | Fine Sand | 2.2 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.028 | 85.7 | | |
| 0.018 | 76.8 | | |
| 0.011 | 64.0 | Fines | |
| 0.0081 | 57.1 | Silt or Clay | 97.6 |
| 0.0058 | 52.2 | | |
| 0.0029 | 45.3 | | |
| 0.0012 | 41.4 | | |




**ATTERBERG LIMITS**
Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 22.5 | 44 | 18 | 26 | 0.17 |

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to medium sand; grayish brown.

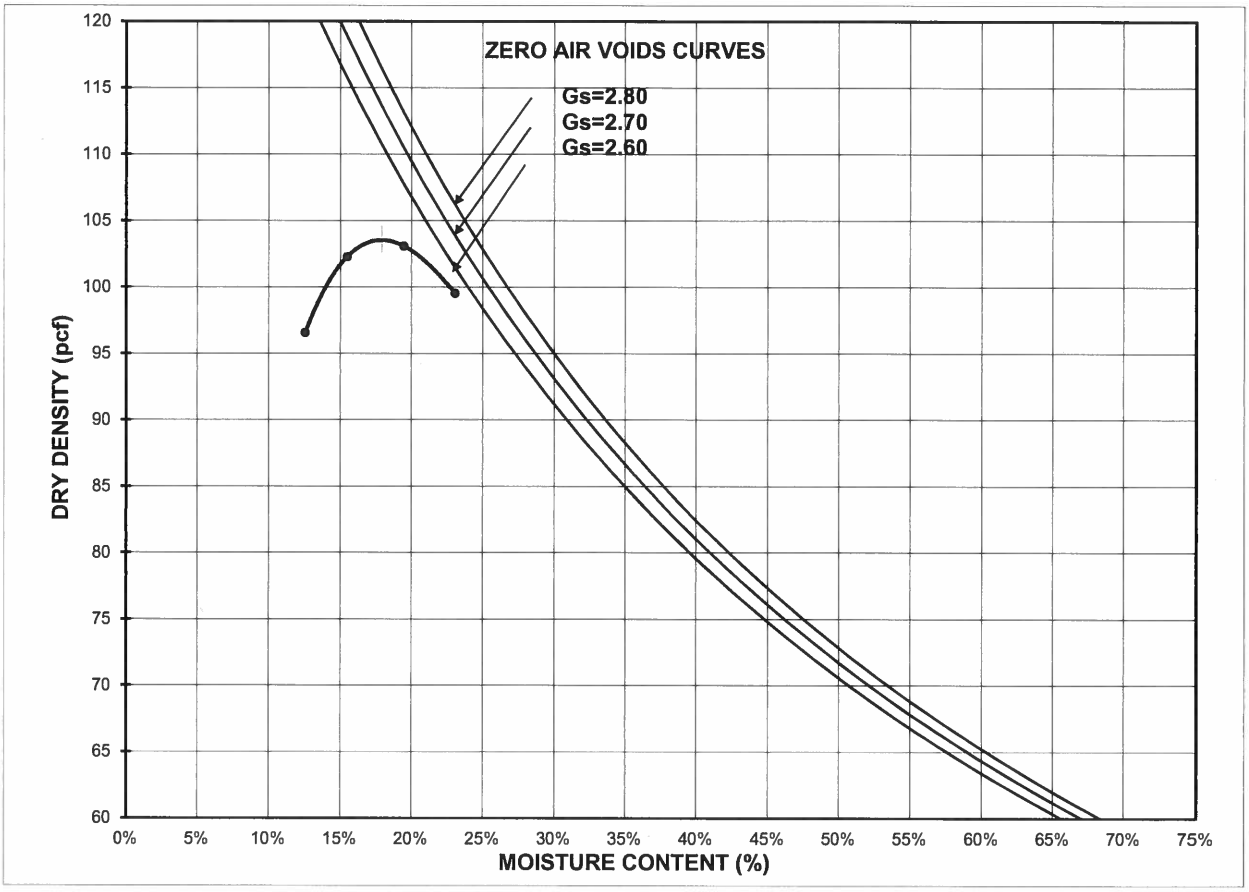
**USCS:** CL

| | |
|---|---|
| TECH | BA/TJ |
| DATE | 10/3/18 |
| CHECK | DA |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-4 - DEPTH: - SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 96.6 | 12.5% |
| 2 | 102.3 | 15.5% |
| 3 | 103.1 | 19.5% |
| 4 | 99.5 | 23.1% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 103.6 |
| Optimum Moisture (%) | 17.9 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 22.5% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to medium sand; grayish brown.

**USCS** CL

**CHECK** DB
**REVIEW** TWR
**APPROVE**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 8 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-4 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.3% of the Maximum Dry Density and OPTM + 4.0% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.997 | B-Value, f | 1.00 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 |
| Volume, cm³ | 300.25 | Top Pres. | 80.0 |
| Mass, g | 579.04 | Tot. B.P. | 80.0 |
| Moisture Content, % | 21.88 | Head, max. | 160.38 |
| Dry Density, pcf | 98.74 | Head, min. | 160.38 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 21.06 |
| Volume Solids, cm³ | 175.96 | Min. Grad. | 21.06 |
| Volume Voids, cm³ | 124.29 | | |
| Void Ratio | 0.71 | | |
| Saturation, % | 83.6% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.998 |
| Diameter, inches | 2.770 |
| Area, cm² | 38.88 |
| Volume, cm³ | 296.06 |
| Mass, g | 591.12 |
| Moisture Content, % | 24.42 |
| Dry Density, pcf | 100.14 |
| Volume Solids, cm³ | 175.96 |
| Volume Voids, cm³ | 120.10 |
| Void Ratio | 0.68 |
| Saturation, % | 96.6% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 579.04 | 598.79 |
| Wt Soil & Tare, f | g | 475.10 | 482.96 |
| Wt Tare | g | 0.00 | 8.64 |
| Wt Moisture Lost | g | 103.94 | 115.83 |
| Wt Dry Soil | g | 475.10 | 474.32 |
| Water Content | % | 21.88% | 24.42% |

DESCRIPTION: SILTY CLAY, trace fine to medium sand; grayish brown.

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/12/18 | 43385 | 14 | 0 | 21.5 | 0 | 0 | 0 | 0 | 2.28 | 160.38 | 21.06 | 1.4E-08 |
| 10/12/18 | 43385 | 14 | 5 | 21.5 | 5 | 5 | 300 | 300 | 2.28 | 160.38 | 21.06 | 1.4E-08 |
| 10/12/18 | 43385 | 14 | 10 | 21.5 | 5 | 10 | 300 | 600 | 2.28 | 160.38 | 21.06 | 1.4E-08 |
| 10/12/18 | 43385 | 14 | 15 | 21.5 | 5 | 15 | 300 | 900 | 2.28 | 160.38 | 21.06 | 1.4E-08 * |
| 10/12/18 | 43385 | 14 | 20 | 21.5 | 5 | 20 | 300 | 1200 | 2.28 | 160.38 | 21.06 | 1.4E-08 * |
| 10/12/18 | 43385 | 14 | 25 | 21.5 | 5 | 25 | 300 | 1500 | 2.28 | 160.38 | 21.06 | 1.4E-08 * |
| 10/12/18 | 43385 | 14 | 30 | 21.5 | 5 | 30 | 300 | 1800 | 2.28 | 160.38 | 21.06 | 1.4E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.4E-08 cm/sec **

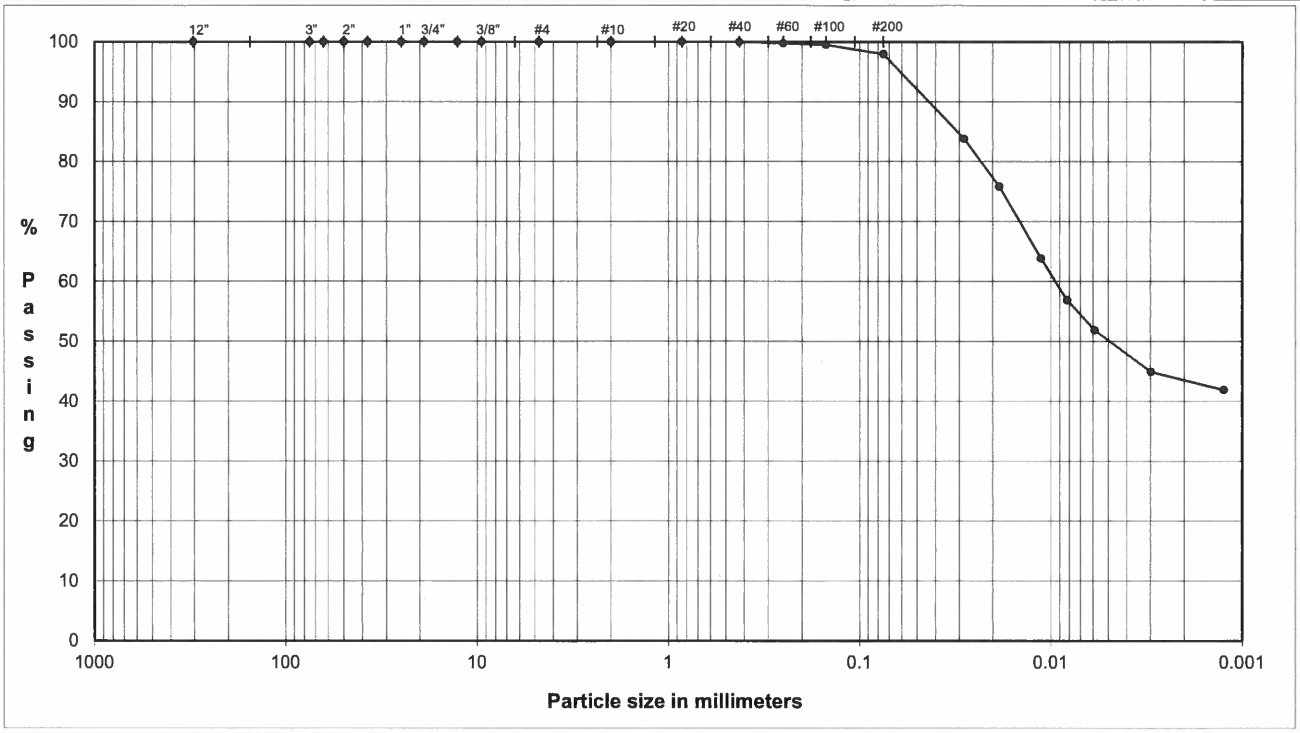
| | |
|---|---|
| DATE | 10/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

OCTOBER 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-5** - Depth: -
TYPE: **Bulk**



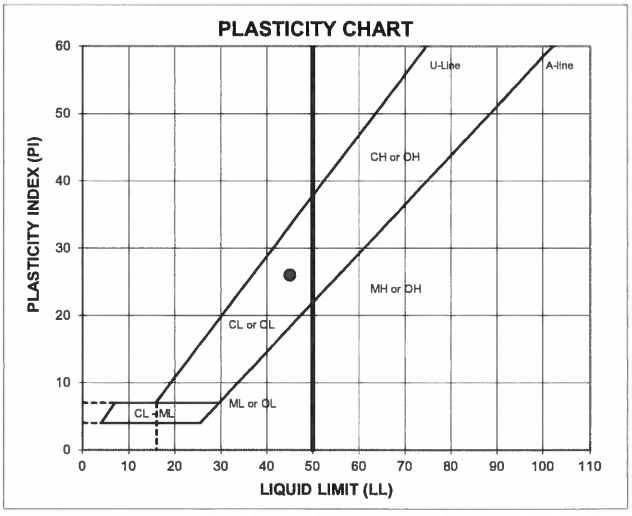

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 100.0 | | |
| #40 | 0.43 | 99.9 | Medium Sand | 0.1 |
| #60 | 0.25 | 99.7 | | |
| #100 | 0.15 | 99.5 | | |
| #200 | 0.075 | 97.9 | Fine Sand | 2.0 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.028 | 83.8 | | |
| 0.019 | 75.8 | | |
| 0.011 | 63.8 | Fines | |
| 0.0082 | 56.9 | Silt or Clay | 97.9 |
| 0.0059 | 51.9 | | |
| 0.0030 | 44.9 | | |
| 0.0012 | 41.9 | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 23.2 | 45 | 19 | 26 | 0.18 |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, ftrace fine to medium sand; grayish brown.

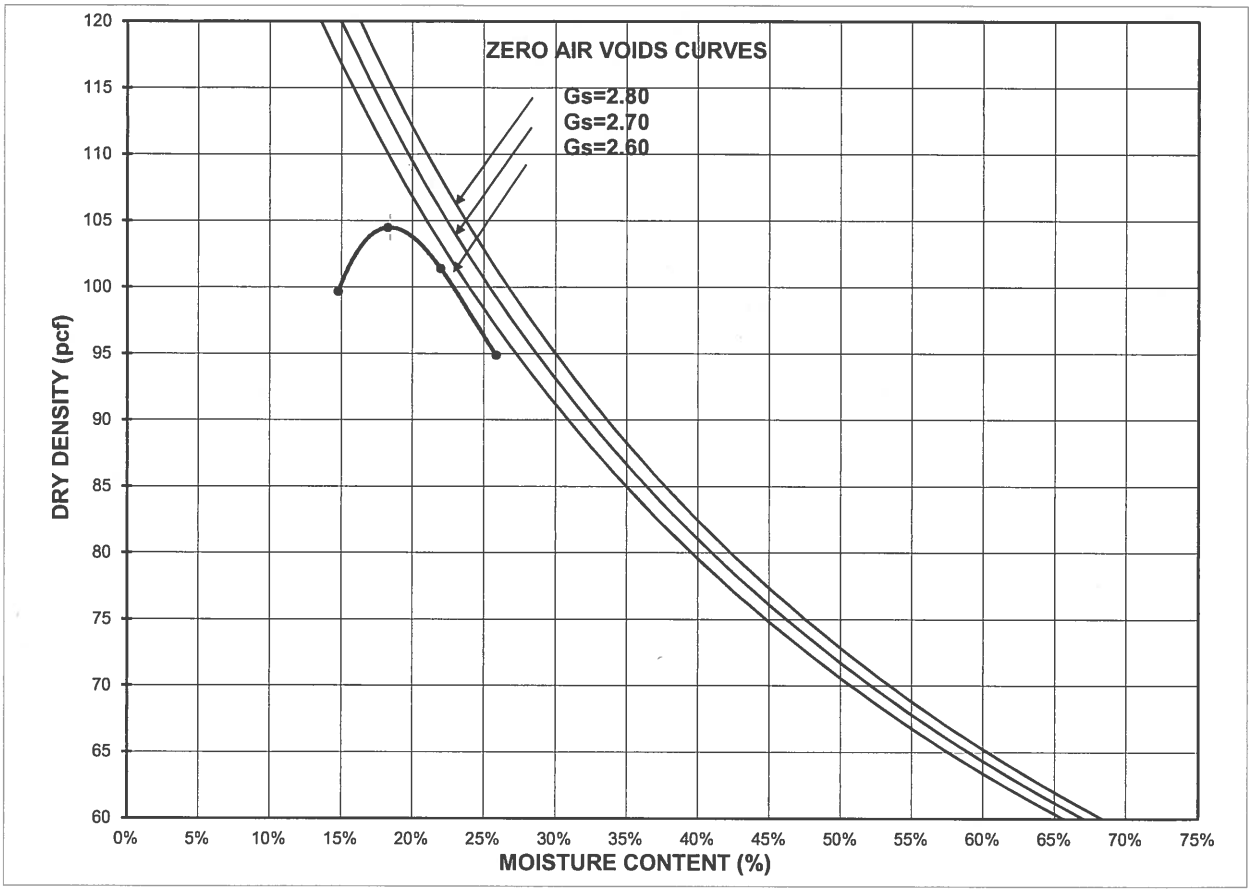
**USCS:** CL

| | |
|---|---|
| TECH | BA/TJ |
| DATE | 10/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-5 - DEPTH: - SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 99.6 | 14.8% |
| 2 | 104.5 | 18.3% |
| 3 | 101.4 | 22.0% |
| 4 | 94.9 | 25.9% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 104.5 |
| Optimum Moisture (%) | 18.4 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 23.2% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, ftrace fine to medium sand; grayish brown.

**USCS** CL

**CHECK** DA
**REVIEW** JWL
**APPROVE**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 9 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-5 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.9% of the Maximum Dry Density and OPTM + 4.2% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.002 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 |
| Volume, cm³ | 300.75 | Top Pres. | 80.0 |
| Mass, g | 591.88 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.61 | Head, max. | 160.38 |
| Dry Density, pcf | 100.16 | Head, min. | 160.38 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 20.84 |
| Volume Solids, cm³ | 178.79 | Min. Grad. | 20.84 |
| Volume Voids, cm³ | 121.96 | | |
| Void Ratio | 0.68 | | |
| Saturation, % | 89.5% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.030 |
| Diameter, inches | 2.787 |
| Area, cm² | 39.36 |
| Volume, cm³ | 302.91 |
| Mass, g | 598.84 |
| Moisture Content, % | 24.05 |
| Dry Density, pcf | 99.44 |
| Volume Solids, cm³ | 178.79 |
| Volume Voids, cm³ | 124.12 |
| Void Ratio | 0.69 |
| Saturation, % | 93.5% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 591.88 | 607.17 |
| Wt Soil & Tare, f | g | 482.73 | 491.13 |
| Wt Tare | g | 0.00 | 8.69 |
| Wt Moisture Lost | g | 109.15 | 116.04 |
| Wt Dry Soil | g | 482.73 | 482.44 |
| Water Content | % | 22.61% | 24.05% |

DESCRIPTION: SILTY CLAY, ftrace fine to medium sand; grayish brown.

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/12/18 | 43385 | 12 | 0 | 21.5 | 0 | 0 | 0 | 0 | 2.28 | 160.38 | 20.84 | 1.4E-08 |
| 10/12/18 | 43385 | 12 | 5 | 21.5 | 5 | 5 | 300 | 300 | 2.28 | 160.38 | 20.84 | 1.4E-08 |
| 10/12/18 | 43385 | 12 | 10 | 21.5 | 5 | 10 | 300 | 600 | 2.28 | 160.38 | 20.84 | 1.4E-08 |
| 10/12/18 | 43385 | 12 | 15 | 21.5 | 5 | 15 | 300 | 900 | 2.28 | 160.38 | 20.84 | 1.4E-08 * |
| 10/12/18 | 43385 | 12 | 20 | 21.5 | 5 | 20 | 300 | 1200 | 2.28 | 160.38 | 20.84 | 1.4E-08 * |
| 10/12/18 | 43385 | 12 | 25 | 21.5 | 5 | 25 | 300 | 1500 | 2.28 | 160.38 | 20.84 | 1.4E-08 * |
| 10/12/18 | 43385 | 12 | 30 | 21.5 | 5 | 30 | 300 | 1800 | 2.28 | 160.38 | 20.84 | 1.4E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.4E-08 cm/sec **

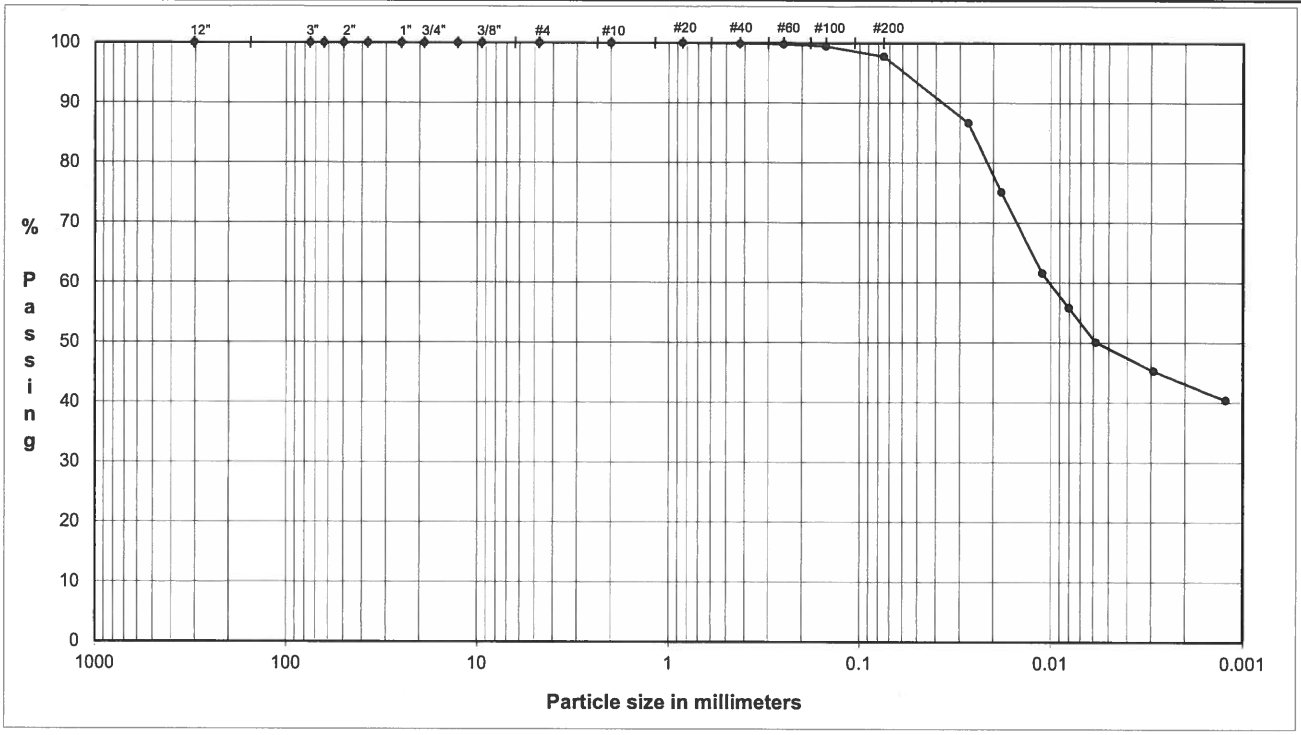
| | |
|---|---|
| DATE | 10/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

OCTOBER 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
SAMPLE ID: C-6 - Depth: -
TYPE: Bulk



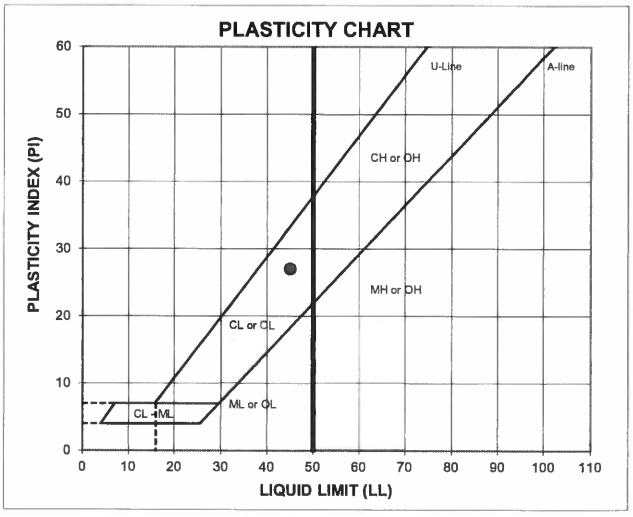

| COBBLES | GRAVEL | | | SAND | | | FINES |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay | |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 100.0 | | |
| #40 | 0.43 | 99.9 | Medium Sand | 0.1 |
| #60 | 0.25 | 99.8 | | |
| #100 | 0.15 | 99.5 | | |
| #200 | 0.075 | 97.7 | Fine Sand | 2.1 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.027 | 86.6 | | |
| 0.018 | 75.1 | | |
| 0.011 | 61.6 | Fines | |
| 0.0081 | 55.8 | Silt or Clay | 97.7 |
| 0.0058 | 50.1 | | |
| 0.0029 | 45.2 | | |
| 0.0012 | 40.4 | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 22.6 | 45 | 18 | 27 | 0.17 |

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to medium sand; grayish brown.

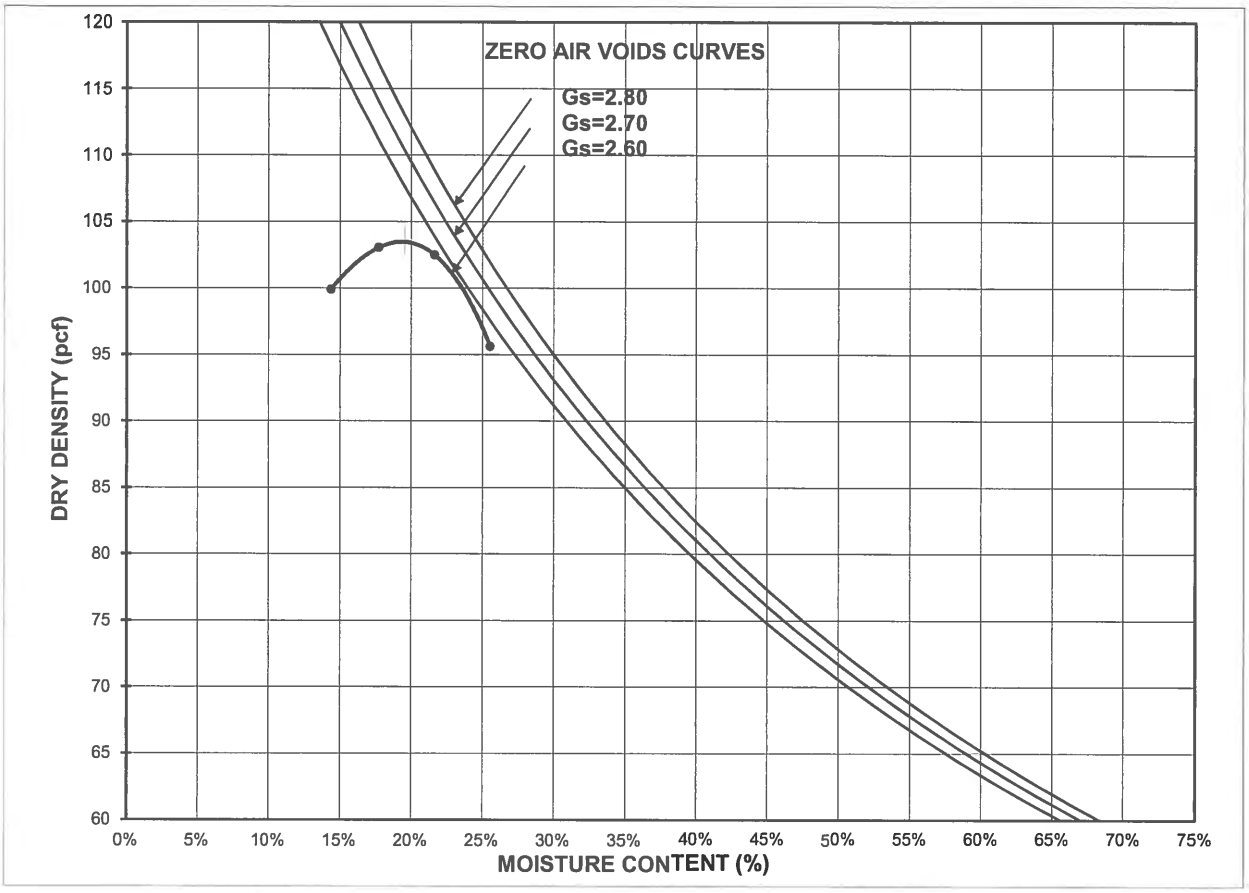
**USCS:** CL

| | |
|---|---|
| TECH | BA/TJ |
| DATE | 10/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-6 - DEPTH: - SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 99.9 | 14.4% |
| 2 | 103.0 | 17.7% |
| 3 | 102.5 | 21.6% |
| 4 | 95.6 | 25.5% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 103.6 |
| Optimum Moisture (%) | 19.5 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 22.6% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to medium sand; grayish brown.

**USCS** CL

**CHECK** DB
**REVIEW** TWH
**APPROVE**

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 7 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-6 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.2% of the Maximum Dry Density and OPTM + 4.4% (using ASTM D 698).

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.001 | B-Value, f | 0.99 | Height, inches | 3.014 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.765 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 38.74 |
| Volume, cm³ | 300.65 | Top Pres. | 80.0 | Volume, cm³ | 296.57 |
| Mass, g | 588.49 | Tot. B.P. | 80.0 | Mass, g | 594.69 |
| Moisture Content, % | 23.91 | Head, max. | 163.19 | Moisture Content, % | 25.21 |
| Dry Density, pcf | 98.57 | Head, min. | 163.19 | Dry Density, pcf | 99.93 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 21.32 | Volume Solids, cm³ | 175.90 |
| Volume Solids, cm³ | 175.90 | Min. Grad. | 21.32 | Volume Voids, cm³ | 120.66 |
| Volume Voids, cm³ | 124.75 | | | Void Ratio | 0.69 |
| Void Ratio | 0.71 | | | Saturation, % | 99.2% |
| Saturation, % | 91.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 588.49 | 602.36 |
| Wt Soil & Tare, f | g | 474.94 | 482.74 |
| Wt Tare | g | 0.00 | 8.31 |
| Wt Moisture Lost | g | 113.55 | 119.62 |
| Wt Dry Soil | g | 474.94 | 474.43 |
| Water Content | % | 23.91% | 25.21% |

DESCRIPTION: SILTY CLAY, trace fine to medium sand; grayish brown.

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/12/18 | 43385 | 10 | 30 | 21.5 | 0 | 0 | 0 | 0 | 2.32 | 163.19 | 21.32 | 1.4E-08 |
| 10/12/18 | 43385 | 10 | 35 | 21.5 | 5 | 5 | 300 | 300 | 2.32 | 163.19 | 21.32 | 1.4E-08 |
| 10/12/18 | 43385 | 10 | 40 | 21.5 | 5 | 10 | 300 | 600 | 2.32 | 163.19 | 21.32 | 1.4E-08 |
| 10/12/18 | 43385 | 10 | 45 | 21.5 | 5 | 15 | 300 | 900 | 2.32 | 163.19 | 21.32 | 1.4E-08 * |
| 10/12/18 | 43385 | 10 | 50 | 21.5 | 5 | 20 | 300 | 1200 | 2.32 | 163.19 | 21.32 | 1.4E-08 * |
| 10/12/18 | 43385 | 10 | 55 | 21.5 | 5 | 25 | 300 | 1500 | 2.32 | 163.19 | 21.32 | 1.4E-08 * |
| 10/12/18 | 43385 | 11 | 0 | 21.5 | 5 | 30 | 300 | 1800 | 2.32 | 163.19 | 21.32 | 1.4E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.4E-08 cm/sec **

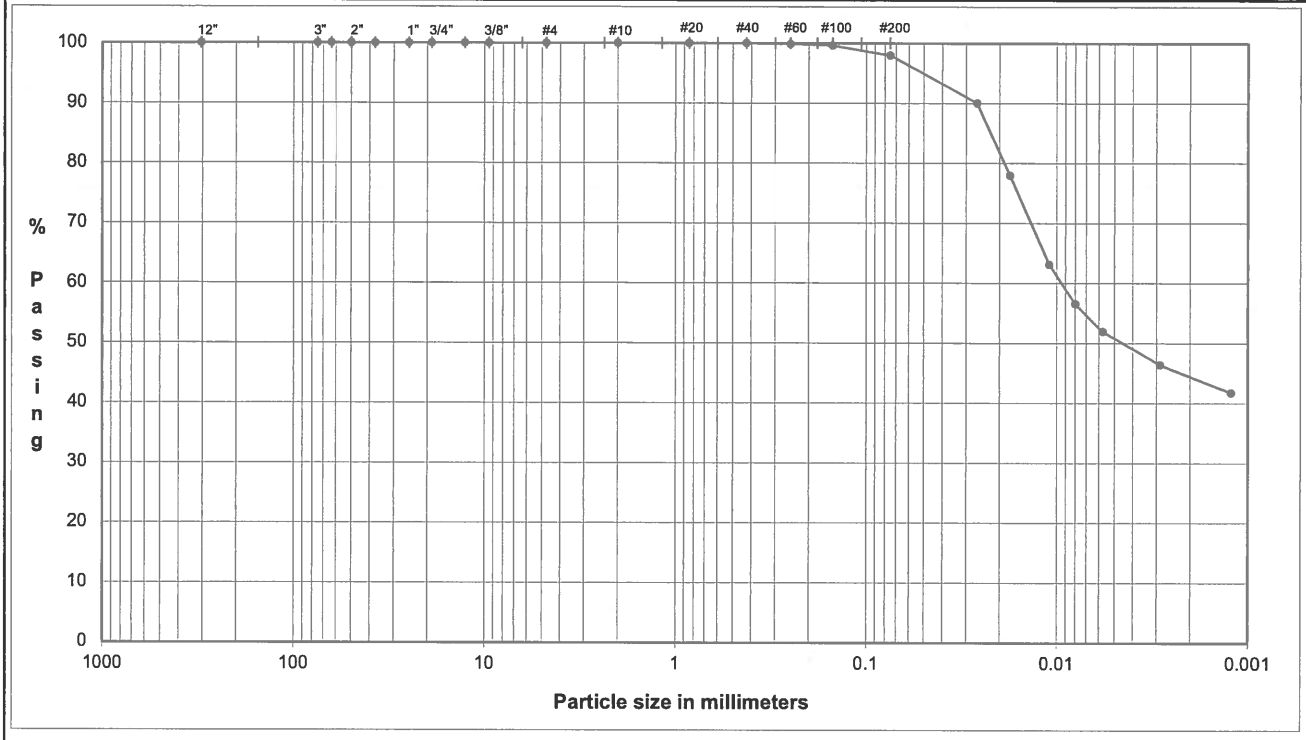
| | |
|---|---|
| DATE | 10/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

OCTOBER 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-7** - Depth: -
TYPE: **Bulk**



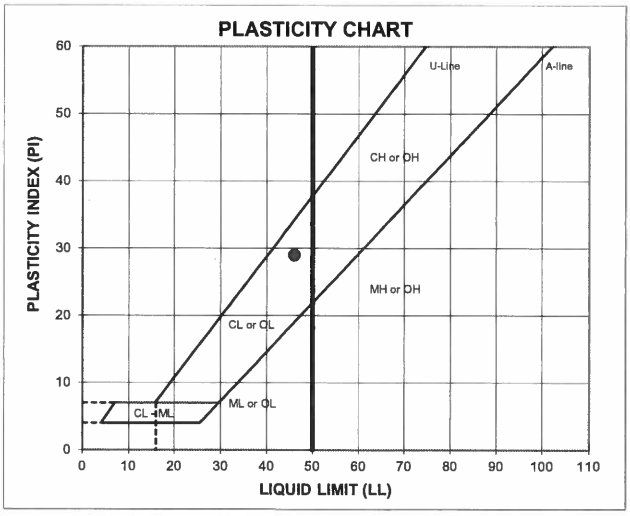

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 100.0 | | |
| #40 | 0.43 | 100.0 | Medium Sand | 0.0 |
| #60 | 0.25 | 99.9 | | |
| #100 | 0.15 | 99.6 | | |
| #200 | 0.075 | 97.9 | Fine Sand | 2.1 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.026 | 90.0 | | |
| 0.018 | 78.0 | | |
| 0.011 | 63.1 | Fines | |
| 0.0080 | 56.6 | Silt or Clay | 97.9 |
| 0.0057 | 52.0 | | |
| 0.0029 | 46.4 | | |
| 0.0012 | 41.8 | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 22.8 | 46 | 17 | 29 | 0.18 |

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine sand; grayish brown.

**USCS:** CL

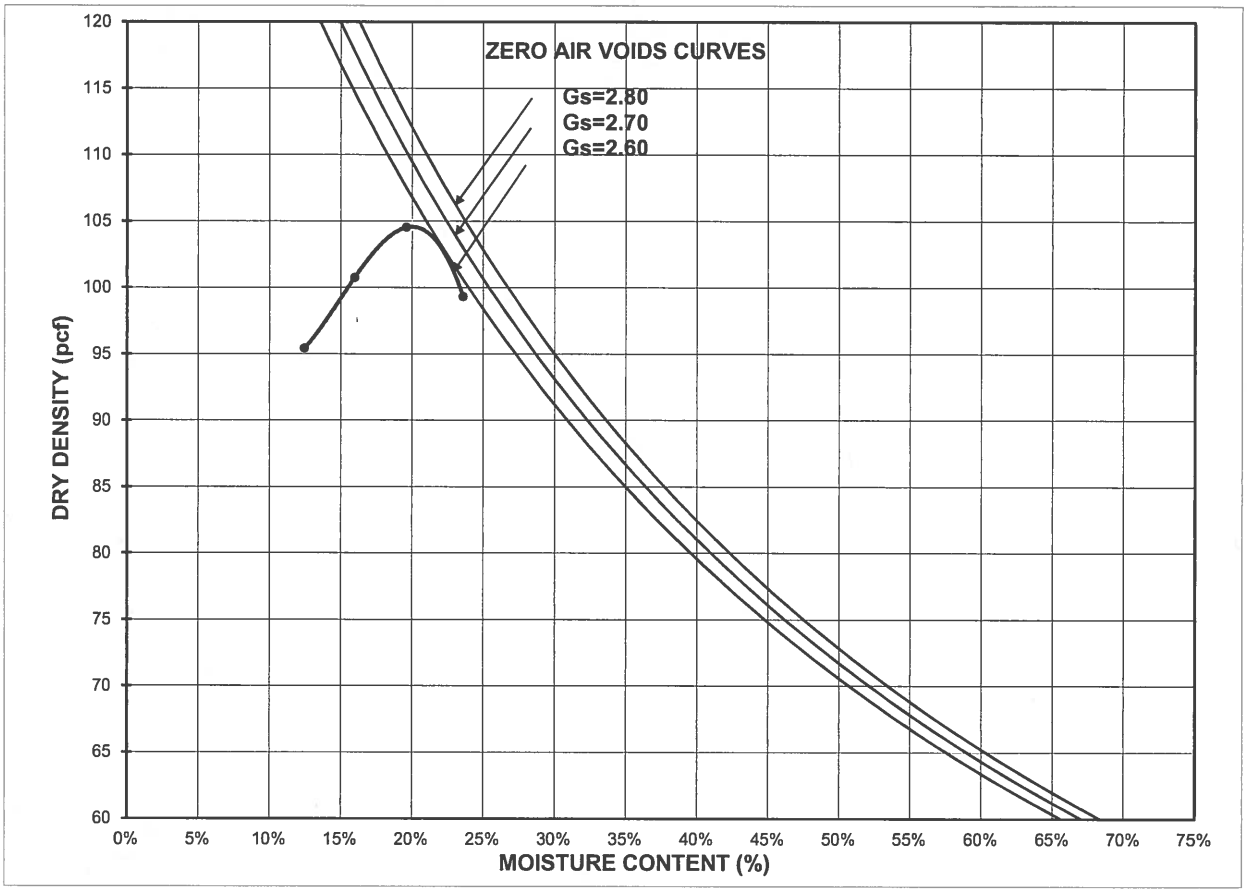
| | |
|---|---|
| TECH | BA/TJ |
| DATE | 10/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

OCTOBER 2018 18102853

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-7 - DEPTH: - SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 95.4 | 12.4% |
| 2 | 100.7 | 16.0% |
| 3 | 104.5 | 19.6% |
| 4 | 99.3 | 23.6% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 104.5 |
| Optimum Moisture (%) | 20.0 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 22.8% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine sand; grayish brown.

**USCS** CL

**CHECK** DA
**REVIEW** [signature]
**APPROVE**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 5 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-7 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.2% of the Maximum Dry Density and OPTM + 3.9% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.004 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 |
| Volume, cm³ | 300.95 | Top Pres. | 80.0 |
| Mass, g | 593.82 | Tot. B.P. | 80.0 |
| Moisture Content, % | 23.87 | Head, max. | 147.01 |
| Dry Density, pcf | 99.40 | Head, min. | 147.01 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 19.27 |
| Volume Solids, cm³ | 177.55 | Min. Grad. | 19.27 |
| Volume Voids, cm³ | 123.40 | | |
| Void Ratio | 0.70 | | |
| Saturation, % | 92.7% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.003 |
| Diameter, inches | 2.788 |
| Area, cm² | 39.39 |
| Volume, cm³ | 300.42 |
| Mass, g | 600.57 |
| Moisture Content, % | 25.28 |
| Dry Density, pcf | 99.57 |
| Volume Solids, cm³ | 177.55 |
| Volume Voids, cm³ | 122.87 |
| Void Ratio | 0.69 |
| Saturation, % | 98.6% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 593.82 | 607.85 |
| Wt Soil & Tare, f | g | 479.39 | 486.87 |
| Wt Tare | g | 0.00 | 8.25 |
| Wt Moisture Lost | g | 114.43 | 120.98 |
| Wt Dry Soil | g | 479.39 | 478.62 |
| Water Content | % | 23.87% | 25.28% |

DESCRIPTION: SILTY CLAY, trace fine sand; grayish brown.

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/12/18 | 43385 | 10 | 0 | 21.8 | 0 | 0 | 0 | 0 | 2.09 | 147.01 | 19.27 | 1.5E-08 |
| 10/12/18 | 43385 | 10 | 5 | 21.8 | 5 | 5 | 300 | 300 | 2.09 | 147.01 | 19.27 | 1.5E-08 |
| 10/12/18 | 43385 | 10 | 10 | 21.8 | 5 | 10 | 300 | 600 | 2.09 | 147.01 | 19.27 | 1.5E-08 |
| 10/12/18 | 43385 | 10 | 15 | 21.8 | 5 | 15 | 300 | 900 | 2.09 | 147.01 | 19.27 | 1.5E-08 * |
| 10/12/18 | 43385 | 10 | 20 | 21.8 | 5 | 20 | 300 | 1200 | 2.09 | 147.01 | 19.27 | 1.5E-08 * |
| 10/12/18 | 43385 | 10 | 25 | 21.8 | 5 | 25 | 300 | 1500 | 2.09 | 147.01 | 19.27 | 1.5E-08 * |
| 10/12/18 | 43385 | 10 | 30 | 21.8 | 5 | 30 | 300 | 1800 | 2.09 | 147.01 | 19.27 | 1.5E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

| | |
|---|---|
| DATE | 10/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

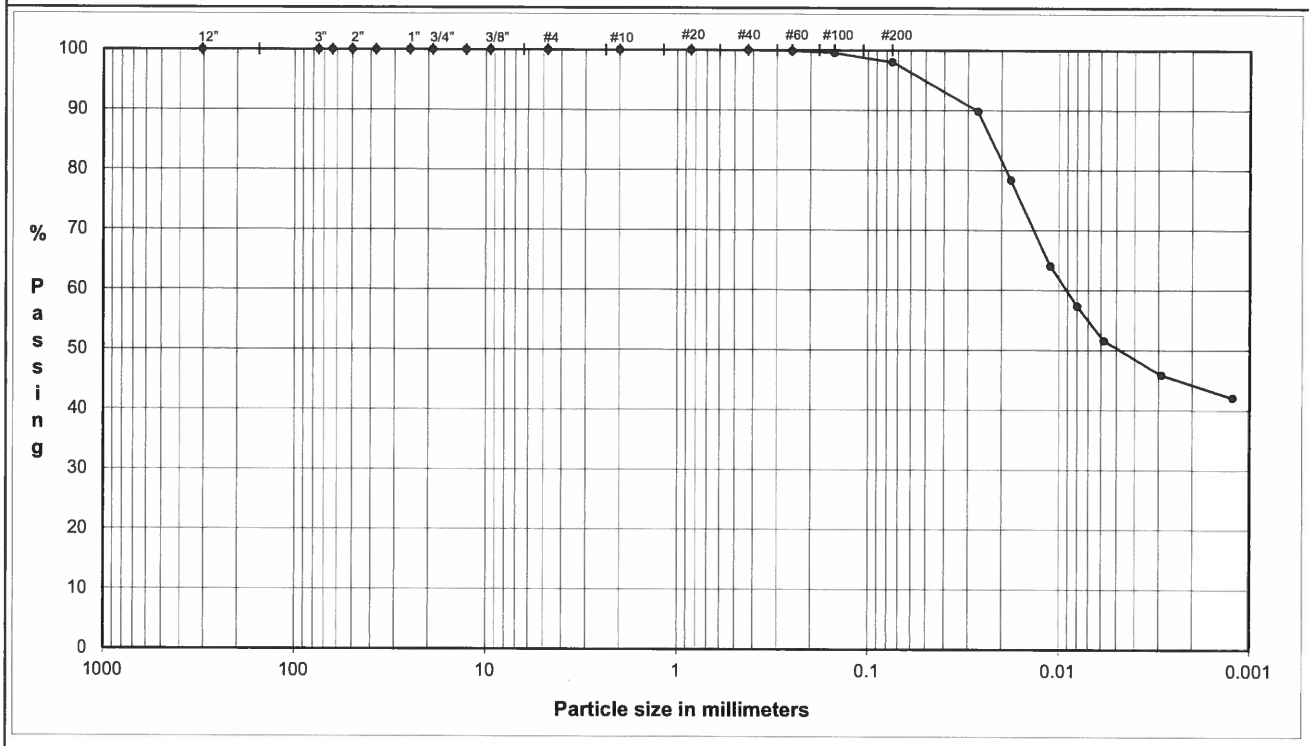
OCTOBER 2018

18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-8** - Depth: -
TYPE: **Bulk**



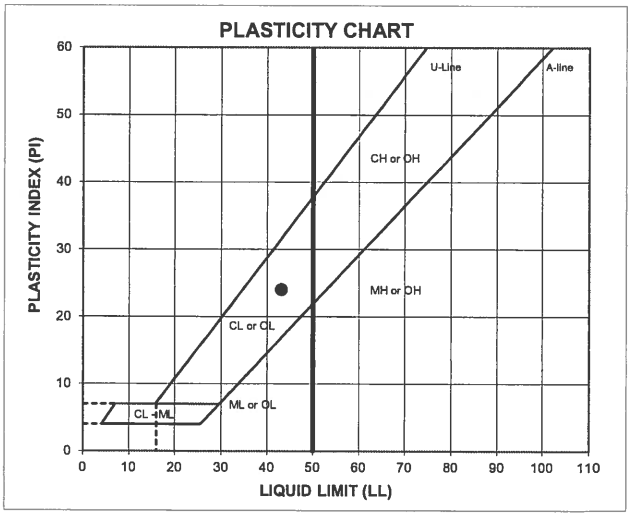

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 100.0 | | |
| #40 | 0.43 | 100.0 | Medium Sand | 0.0 |
| #60 | 0.25 | 99.8 | | |
| #100 | 0.15 | 99.6 | | |
| #200 | 0.075 | 98.0 | Fine Sand | 2.0 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.027 | 89.8 | | |
| 0.018 | 78.4 | | |
| 0.011 | 64.0 | Fines | |
| 0.0080 | 57.3 | Silt or Clay | 98.0 |
| 0.0058 | 51.6 | | |
| 0.0029 | 45.9 | | |
| 0.0012 | 42.0 | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 23.2 | 43 | 19 | 24 | 0.19 |

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine sand; grayish brown.

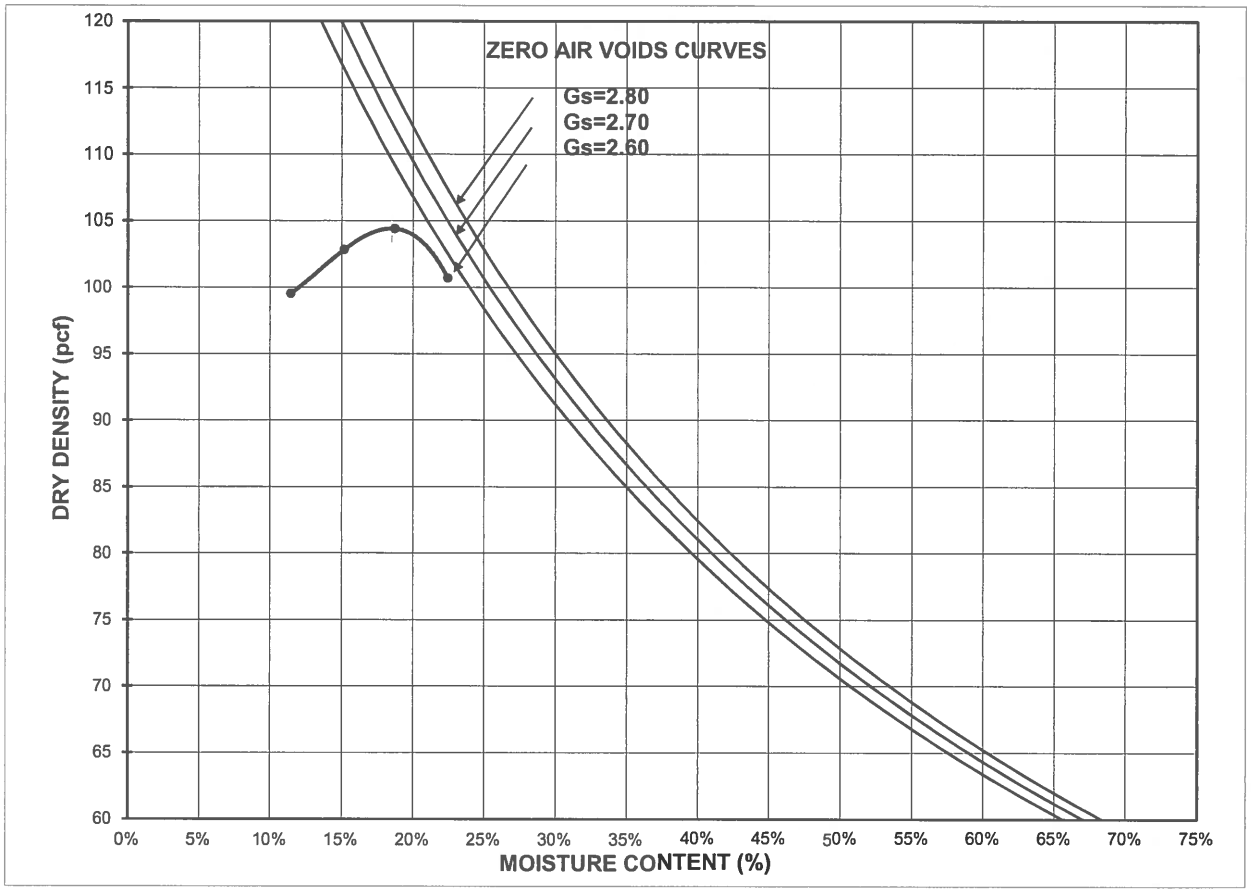
**USCS:** CL

| | |
|---|---|
| TECH | BA/TJ |
| DATE | 10/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
PROJECT NUMBER: **18102853**
SAMPLE ID: **C-8** - DEPTH: - SAMPLE TYPE: **Bulk**




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 99.5 | 11.4% |
| 2 | 102.8 | 15.2% |
| 3 | 104.4 | 18.7% |
| 4 | 100.7 | 22.4% |

| | |
|---|---|
| Maximum Dry Density (pcf) | **104.4** |
| Optimum Moisture (%) | **18.5** |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | **23.2%** |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine sand; grayish brown.

**USCS** CL

**CHECK** DA
**REVIEW** MWL
**APPROVE**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 7 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-8 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.1% of the Maximum Dry Density and OPTM + 4.4% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.001 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, $cm^2$ | 39.44 | Bot. Pres. | 80.0 |
| Volume, $cm^3$ | 300.65 | Top Pres. | 80.0 |
| Mass, g | 587.85 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.92 | Head, max. | 150.53 |
| Dry Density, pcf | 99.25 | Head, min. | 150.53 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 19.75 |
| Volume Solids, $cm^3$ | 177.12 | Min. Grad. | 19.75 |
| Volume Voids, $cm^3$ | 123.53 | | |
| Void Ratio | 0.70 | | |
| Saturation, % | 88.7% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.000 |
| Diameter, inches | 2.786 |
| Area, $cm^2$ | 39.33 |
| Volume, $cm^3$ | 299.69 |
| Mass, g | 591.84 |
| Moisture Content, % | 23.76 |
| Dry Density, pcf | 99.57 |
| Volume Solids, $cm^3$ | 177.12 |
| Volume Voids, $cm^3$ | 122.57 |
| Void Ratio | 0.69 |
| Saturation, % | 92.7% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 587.85 | 674.88 |
| Wt Soil & Tare, f | g | 478.22 | 561.27 |
| Wt Tare | g | 0.00 | 83.09 |
| Wt Moisture Lost | g | 109.63 | 113.61 |
| Wt Dry Soil | g | 478.22 | 478.18 |
| Water Content | % | 22.92% | 23.76% |

DESCRIPTION: SILTY CLAY, trace fine sand; grayish brown.

Flow Pump Rate: 1.18E-05 $cm^3$/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/16/18 | 43389 | 10 | 0 | 19.3 | 0 | 0 | 0 | 0 | 2.14 | 150.53 | 19.75 | 1.5E-08 |
| 10/16/18 | 43389 | 10 | 5 | 19.3 | 5 | 5 | 300 | 300 | 2.14 | 150.53 | 19.75 | 1.5E-08 |
| 10/16/18 | 43389 | 10 | 10 | 19.3 | 5 | 10 | 300 | 600 | 2.14 | 150.53 | 19.75 | 1.5E-08 |
| 10/16/18 | 43389 | 10 | 15 | 19.3 | 5 | 15 | 300 | 900 | 2.14 | 150.53 | 19.75 | 1.5E-08 * |
| 10/16/18 | 43389 | 10 | 20 | 19.3 | 5 | 20 | 300 | 1200 | 2.14 | 150.53 | 19.75 | 1.5E-08 * |
| 10/16/18 | 43389 | 10 | 25 | 19.3 | 5 | 25 | 300 | 1500 | 2.14 | 150.53 | 19.75 | 1.5E-08 * |
| 10/16/18 | 43389 | 10 | 30 | 19.3 | 5 | 30 | 300 | 1800 | 2.14 | 150.53 | 19.75 | 1.5E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

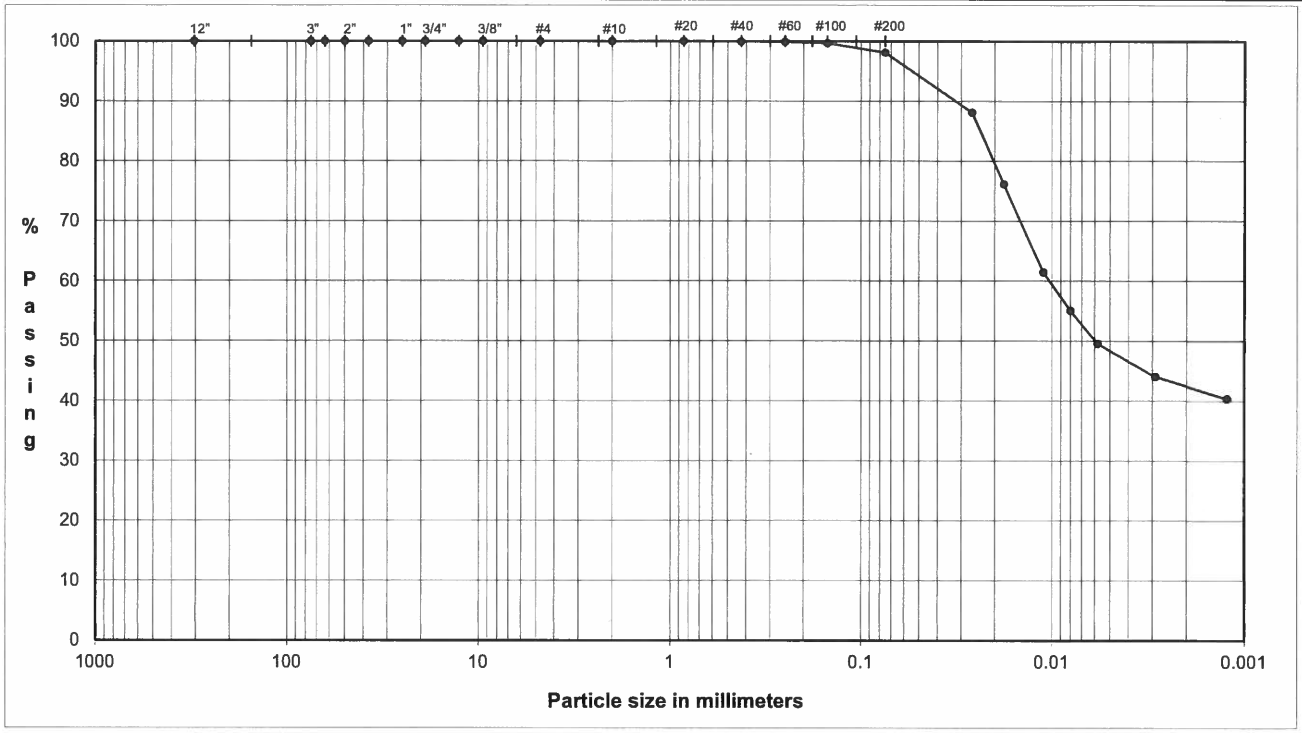
| | |
|---|---|
| DATE | 10/16/18 |
| CHECK | DA |
| REVIEW | MWG |
| APPROVE | |

OCTOBER 2018 18102853

# PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

**ASTM D421, D422, D4318**

PROJECT NAME: **FTN/CCSW-LEGACY LF - CELL 1S-2N/AR**
SAMPLE ID: **C-9** - Depth: -
TYPE: **Bulk**



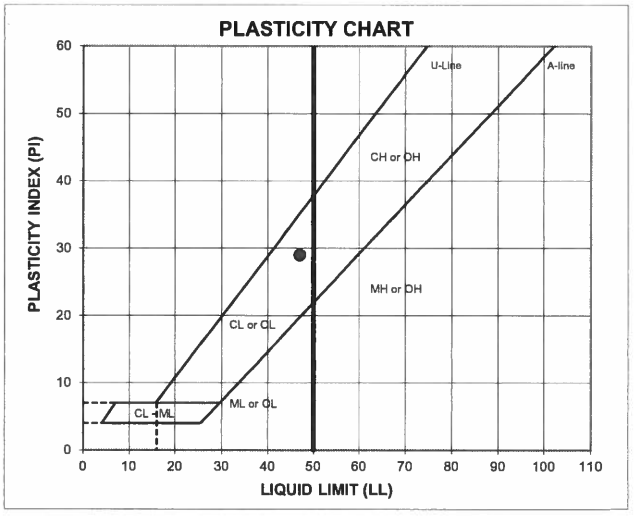

| COBBLES | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt or Clay |

U.S. Standard Sieves Sizes and Numbers

| | Particle Size (mm) | % Passing | Particle Size Classification | Percentage |
|---|---|---|---|---|
| 12.0" | 304.8 | 100.0 | | |
| 3.0" | 75.0 | 100.0 | Cobbles | 0.0 |
| 2.5" | 63.5 | 100.0 | | |
| 2.0" | 50.0 | 100.0 | | |
| 1.5" | 37.5 | 100.0 | | |
| 1.0" | 25.0 | 100.0 | | |
| 0.75" | 19.0 | 100.0 | Coarse Gravel | 0.0 |
| 0.50" | 12.7 | 100.0 | | |
| 0.375" | 9.5 | 100.0 | | |
| #4 | 4.8 | 100.0 | Fine Gravel | 0.0 |
| #10 | 2.00 | 100.0 | Coarse Sand | 0.0 |
| #20 | 0.85 | 100.0 | | |
| #40 | 0.43 | 99.9 | Medium Sand | 0.1 |
| #60 | 0.25 | 99.9 | | |
| #100 | 0.15 | 99.6 | | |
| #200 | 0.075 | 98.1 | Fine Sand | 1.9 |

Hydrometer Analysis

| (mm) | %Finer | | |
|---|---|---|---|
| 0.026 | 88.1 | | |
| 0.018 | 76.1 | | |
| 0.011 | 61.5 | Fines | |
| 0.0080 | 55.0 | Silt or Clay | 98.1 |
| 0.0058 | 49.5 | | |
| 0.0029 | 44.0 | | |
| 0.0012 | 40.4 | | |




**ATTERBERG LIMITS**

Method -B (Dry preparation)

| $M_c$ | LL | PL | PI | LI |
|---|---|---|---|---|
| 22.9 | 47 | 18 | 29 | 0.18 |

LL (oven-dried) / 0.75 = ORGANIC (OL/OH)

**DESCRIPTION:** SILTY CLAY, trace fine to medium sand; grayish brown.

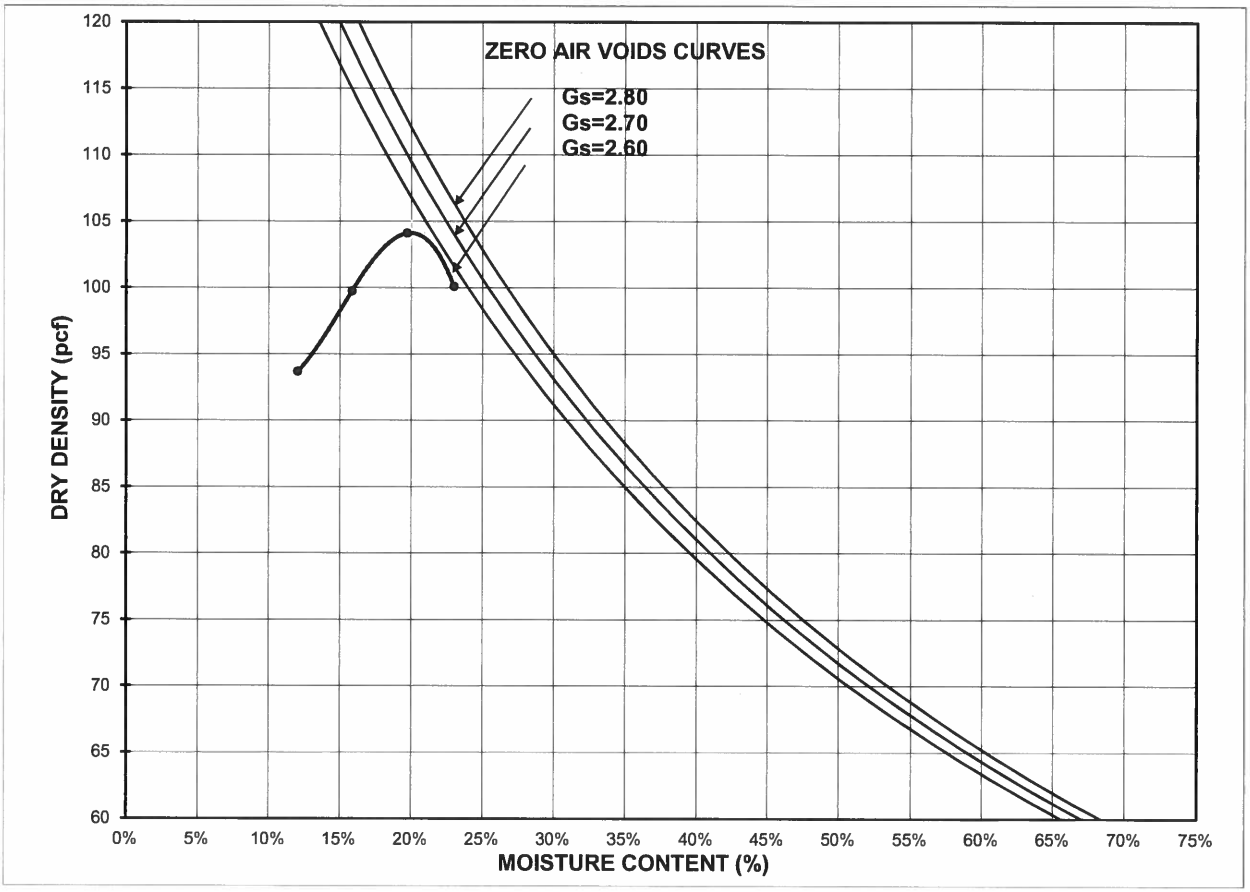
**USCS:** CL

| | |
|---|---|
| TECH | BA/TJ |
| DATE | 10/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# MOISTURE / DRY DENSITY CURVE
## ASTM D 698 Method A

| Mechanical | Standard | Dry Method |
|---|---|---|

PROJECT NAME: FTN/CCSW-LEGACY LF - CELL 1S-2N/AR
PROJECT NUMBER: 18102853
SAMPLE ID: C-9 - DEPTH: - SAMPLE TYPE: Bulk




| COMPACTION POINTS | | |
|---|---|---|
| Specimen Number | Dry Density (pcf) | Moisture Content (%) |
| 1 | 93.7 | 12.0% |
| 2 | 99.7 | 15.9% |
| 3 | 104.1 | 19.7% |
| 4 | 100.1 | 23.0% |

| | |
|---|---|
| Maximum Dry Density (pcf) | 104.1 |
| Optimum Moisture (%) | 20.0 |
| Corrected Maximum Dry Density (pcf) | |
| Corrected Optimum Moisture (%) | |
| As-Received Moisture Content | 22.9% |
| % Retained on # 4 sieve | |
| % Retained on 3/8" sieve | |
| % Retained on 3/4" sieve | |

**DESCRIPTION** SILTY CLAY, trace fine to medium sand; grayish brown.

**USCS** CL

**CHECK** DA
**REVIEW** [illegible]
**APPROVE**

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 15 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | C-9 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | FT |

COMMENTS: The sample was remolded to 95.1% of the Maximum Dry Density and OPTM + 3.2% (using ASTM D 698).

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.999 | B-Value, f | 1.00 | Height, inches | 2.996 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.769 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 38.85 |
| Volume, cm³ | 300.45 | Top Pres. | 80.0 | Volume, cm³ | 295.65 |
| Mass, g | 592.50 | Tot. B.P. | 80.0 | Mass, g | 597.72 |
| Moisture Content, % | 23.81 | Head, max. | 119.58 | Moisture Content, % | 24.90 |
| Dry Density, pcf | 99.39 | Head, min. | 119.58 | Dry Density, pcf | 101.00 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 15.71 | Volume Solids, cm³ | 177.24 |
| Volume Solids, cm³ | 177.24 | Min. Grad. | 15.71 | Volume Voids, cm³ | 118.41 |
| Volume Voids, cm³ | 123.21 | | | Void Ratio | 0.67 |
| Void Ratio | 0.70 | | | Saturation, % | 100.0% |
| Saturation, % | 92.5% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 592.50 | 605.35 |
| Wt Soil & Tare, f | g | 478.56 | 486.36 |
| Wt Tare | g | 0.00 | 8.50 |
| Wt Moisture Lost | g | 113.94 | 118.99 |
| Wt Dry Soil | g | 478.56 | 477.86 |
| Water Content | % | 23.81% | 24.90% |

DESCRIPTION: SILTY CLAY, trace fine to medium sand; grayish brown.

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/12/18 | 43385 | 13 | 0 | 21.5 | 0 | 0 | 0 | 0 | 1.70 | 119.58 | 15.71 | 1.9E-08 |
| 10/12/18 | 43385 | 13 | 5 | 21.5 | 5 | 5 | 300 | 300 | 1.70 | 119.58 | 15.71 | 1.9E-08 |
| 10/12/18 | 43385 | 13 | 10 | 21.5 | 5 | 10 | 300 | 600 | 1.70 | 119.58 | 15.71 | 1.9E-08 |
| 10/12/18 | 43385 | 13 | 15 | 21.5 | 5 | 15 | 300 | 900 | 1.70 | 119.58 | 15.71 | 1.9E-08 * |
| 10/12/18 | 43385 | 13 | 20 | 21.5 | 5 | 20 | 300 | 1200 | 1.70 | 119.58 | 15.71 | 1.9E-08 * |
| 10/12/18 | 43385 | 13 | 25 | 21.5 | 5 | 25 | 300 | 1500 | 1.70 | 119.58 | 15.71 | 1.9E-08 * |
| 10/12/18 | 43385 | 13 | 30 | 21.5 | 5 | 30 | 300 | 1800 | 1.70 | 119.58 | 15.71 | 1.9E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.9E-08 cm/sec **

| | |
|---|---|
| DATE | 10/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# APPENDIX J

**Clay Liner Field Test Reports**

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-BR-1 | 7/31/18 | See Drawing | 7 | 8" | 103.0 | 103.6 | 99.4% | 95% | 20.2 | 17.9 | > Opt. | P | | | RPG |
| D-BR-2 | 7/31/18 | See Drawing | 2 | 8" | 100.1 | 100.5 | 99.6% | 95% | 23.6 | 20.8 | > Opt. | P | P-1-4A & P-2-4A | $1.5x10^{-8}$ & $1.0x10^{-8}$ | RPG |
| D-BR-3 | 7/31/18 | See Drawing | 7 | 8" | 102.1 | 103.6 | 98.6% | 95% | 19.6 | 17.9 | > Opt. | P | | | RPG |
| D-BR-4 | 7/27/18 | See Drawing | 2 | 8" | 99.6 | 100.5 | 99.1% | 95% | 25.8 | 20.8 | > Opt. | P | | | RPG |
| D-BR-5 | 7/27/18 | See Drawing | 1 | 8" | 101.0 | 102.2 | 98.8% | 95% | 23.2 | 20.3 | > Opt. | P | P-1-3A & P-2-3A | $3.9x10^{-8}$ & $3.9x10^{-8}$ | RPG |
| D-BR-6 | 7/27/18 | See Drawing | 4 | 8" | 98.4 | 98.9 | 99.5% | 95% | 26.0 | 19.6 | > Opt. | P | | | RPG |
| D-BR-7 | 7/27/18 | See Drawing | 2 | 8" | 99.7 | 100.5 | 99.2% | 95% | 24.4 | 20.8 | > Opt. | P | | | RPG |
| D-BR-8 | 7/27/18 | See Drawing | 7 | 8" | 102.6 | 103.6 | 99.0% | 95% | 24.5 | 17.9 | > Opt. | P | | | RPG |
| D-BR-9 | 7/27/18 | See Drawing | 7 | 8" | 103.5 | 103.6 | 99.9% | 95% | 22.9 | 17.9 | > Opt. | P | | | RPG |
| D-BR-10 | 7/31/18 | See Drawing | 7 | 8" | 102.3 | 103.6 | 98.7% | 95% | 21.8 | 17.9 | > Opt. | P | | | RPG |
| D-BR-11 | 7/31/18 | See Drawing | 7 | 8" | 102.8 | 103.6 | 99.2% | 95% | 20.3 | 17.9 | > Opt. | P | | | RPG |
| D-BR-12 | 7/31/18 | See Drawing | 7 | 8" | 102.6 | 103.6 | 99.0% | 95% | 20.0 | 17.9 | > Opt. | P | | | RPG |
| D-BR-13 | 7/31/18 | See Drawing | 7 | 8" | 100.9 | 103.6 | 97.4% | 95% | 19.8 | 17.9 | > Opt. | P | | | RPG |
| D-BR-14 | 7/31/18 | See Drawing | 8 | 8" | 103.9 | 104.5 | 99.4% | 95% | 20.4 | 18.4 | > Opt. | P | | | RPG |
| D-BR-15 | 7/31/18 | See Drawing | 8 | 8" | 104.1 | 104.5 | 99.6% | 95% | 19.9 | 18.4 | > Opt. | P | | | RPG |
| D-BR-16 | 7/27/18 | See Drawing | 4 | 8" | 98.8 | 98.9 | 99.9% | 95% | 23.9 | 19.6 | > Opt. | P | P-1-1A & P-2-1A | $3.8x10^{-8}$ & $4.9x10^{-8}$ | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-BR-17 | 7/27/18 | See Drawing | 4 | 8" | 95.2 | 98.9 | 96.3% | 95% | 23.5 | 19.6 | > Opt. | P | | | RPG |
| D-BR-18 | 7/27/18 | See Drawing | 10 | 8" | 104.7 | 104.5 | 100.2% | 95% | 22.6 | 20.0 | > Opt. | P | | | RPG |
| D-BR-19 | 7/27/18 | See Drawing | 8 | 8" | 104.4 | 104.5 | 99.9% | 95% | 22.5 | 18.4 | > Opt. | P | P-1-2A & P-2-2A | $3.3x10^{-8}$ & $2.5x10^{-8}$ | RPG |
| D-BR-20 | 7/27/18 | See Drawing | 8 | 8" | 103.5 | 104.5 | 99.0% | 95% | 22.8 | 18.4 | > Opt. | P | | | RPG |
| D-BR-21 | 7/27/18 | See Drawing | 2 | 8" | 99.9 | 100.5 | 99.4% | 95% | 22.8 | 20.8 | > Opt. | P | | | RPG |
| D-BR-22 | 7/27/18 | See Drawing | 8 | 8" | 102.3 | 104.5 | 97.9% | 95% | 23.8 | 18.4 | > Opt. | P | | | RPG |
| D-BR-23 | 7/31/18 | See Drawing | 9 | 8" | 102.9 | 103.6 | 99.3% | 95% | 22.6 | 19.5 | > Opt. | P | P-1-5A & P-2-5A | $1.6x10^{-8}$ & $3.3x10^{-8}$ | RPG |
| D-BR-24 | 7/31/18 | See Drawing | 8 | 8" | 103.8 | 104.5 | 99.3% | 95% | 19.6 | 18.4 | > Opt. | P | | | RPG |
| D-BR-25 | 7/31/18 | See Drawing | 1 | 8" | 101.0 | 102.2 | 98.8% | 95% | 23.7 | 20.3 | > Opt. | P | | | RPG |
| D-BR-26 | 7/31/18 | See Drawing | 7 | 8" | 102.6 | 103.6 | 99.0% | 95% | 23.9 | 17.9 | > Opt. | P | | | RPG |
| D-BR-27 | 7/31/18 | See Drawing | 4 | 8" | 97.6 | 98.9 | 98.7% | 95% | 21.2 | 19.6 | > Opt. | P | | | RPG |
| D-BR-28 | 7/31/18 | See Drawing | 6 | 8" | 97.8 | 98.3 | 99.5% | 95% | 22.2 | 22.0 | > Opt. | P | P-1-6A & P-2-6A | $3.6x10^{-8}$ & $2.6x10^{-8}$ | RPG |
| D-BR-29 | 7/31/18 | See Drawing | 1 | 8" | 100.7 | 102.2 | 98.5% | 95% | 23.6 | 20.3 | > Opt. | P | | | RPG |
| D-BR-30 | 7/31/18 | See Drawing | 4 | 8" | 96.2 | 98.9 | 97.3% | 95% | 20.6 | 19.6 | > Opt. | P | | | RPG |
| D-BR-31 | 7/31/18 | See Drawing | 10 | 8" | 104.4 | 104.5 | 99.9% | 95% | 21.8 | 20.0 | > Opt. | P | P-1-7A & P-2-7A | $2.9x10^{-8}$ & $4.7x10^{-8}$ | RPG |
| D-BR-32 | 7/31/18 | See Drawing | 8 | 8" | 105.3 | 104.5 | 100.8% | 95% | 20.0 | 18.4 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-BR-33 | 7/31/18 | See Drawing | 7 | 8" | 102.0 | 103.6 | 98.5% | 95% | 22.5 | 17.9 | > Opt. | P | | | RPG |
| D-BR-34 | 7/31/18 | See Drawing | 8 | 8" | 104.6 | 104.5 | 100.1% | 95% | 20.0 | 18.4 | > Opt. | P | | | RPG |
| D-BR-35 | 7/31/18 | See Drawing | 11 | 8" | 103.8 | 104.4 | 99.4% | 95% | 20.7 | 18.5 | > Opt. | P | | | RPG |
| D-BR-36 | 7/31/18 | See Drawing | 12 | 8" | 103.1 | 104.1 | 99.0% | 95% | 23.8 | 20.0 | > Opt. | P | P-1-8A & P-2-8A | $1.5x10^{-8}$ & $6.1x10^{-8}$ | RPG |
| D-BR-37 | 8/2/18 | See Drawing | 10 | 8" | 109.7 | 104.5 | 105.0% | 95% | 20.2 | 20.0 | > Opt. | P | | | RPG |
| D-BR-38 | 8/2/18 | See Drawing | 8 | 8" | 107.3 | 104.5 | 102.7% | 95% | 20.5 | 18.4 | > Opt. | P | | | RPG |
| D-BR-39 | 8/2/18 | See Drawing | 12 | 8" | 103.6 | 104.1 | 99.5% | 95% | 22.0 | 20.0 | > Opt. | P | P-1-9A & P-2-9A | $2.9x10^{-8}$ & $2.9x10^{-8}$ | RPG |
| D-BR-40 | 8/2/18 | See Drawing | 8 | 8" | 105.6 | 104.5 | 101.1% | 95% | 20.9 | 18.4 | > Opt. | P | | | RPG |
| D-BR-41 | 8/2/18 | See Drawing | 8 | 8" | 110.8 | 104.5 | 106.0% | 95% | 19.8 | 18.4 | > Opt. | P | | | RPG |
| D-BR-42 | 8/2/18 | See Drawing | 8 | 8" | 106.9 | 104.5 | 102.3% | 95% | 19.6 | 18.4 | > Opt. | P | | | RPG |
| D-BR-43 | 8/2/18 | See Drawing | 8 | 8" | 107.9 | 104.5 | 103.3% | 95% | 20.0 | 18.4 | > Opt. | P | | | RPG |
| D-BR-44 | 8/2/18 | See Drawing | 10 | 8" | 109.9 | 104.5 | 105.2% | 95% | 21.3 | 20.0 | > Opt. | P | P-1-10A & P-2-10A | $3.7x10^{-8}$ & $4.1x10^{-8}$ | RPG |
| D-BR-45 | 8/2/18 | See Drawing | 10 | 8" | 107.1 | 104.5 | 102.5% | 95% | 20.4 | 20.0 | > Opt. | P | | | RPG |
| D-BR-46 | 8/2/18 | See Drawing | 8 | 8" | 107.6 | 104.5 | 103.0% | 95% | 19.6 | 18.4 | > Opt. | P | | | RPG |
| D-BR-47 | 8/2/18 | See Drawing | 8 | 8" | 110.1 | 104.5 | 105.4% | 95% | 19.6 | 18.4 | > Opt. | P | | | RPG |
| D-BR-48 | 8/2/18 | See Drawing | 11 | 8" | 103.9 | 104.4 | 99.5% | 95% | 19.9 | 18.5 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-BR-49 | 8/2/18 | See Drawing | 8 | 8" | 111.8 | 104.5 | 107.0% | 95% | 19.8 | 18.4 | > Opt. | P | | | RPG |
| D-BR-50 | 8/2/18 | See Drawing | 8 | 8" | 105.7 | 104.5 | 101.1% | 95% | 20.3 | 18.4 | > Opt. | P | P-1-11A & P-2-11A | $7.0x10^{-8}$ & $3.5x10^{-8}$ | RPG |
| D-BR-51 | 8/2/18 | See Drawing | 9 | 8" | 101.3 | 103.6 | 97.8% | 95% | 19.6 | 19.5 | > Opt. | P | | | RPG |
| D-BR-52 | 8/2/18 | See Drawing | 8 | 8" | 107.9 | 104.5 | 103.3% | 95% | 20.1 | 18.4 | > Opt. | P | P-1-12A & P-2-12A | $2.0x10^{-8}$ & $3.1x10^{-8}$ | RPG |
| D-BR-53 | 8/2/18 | See Drawing | 8 | 8" | 109.3 | 104.5 | 104.6% | 95% | 19.9 | 18.4 | > Opt. | P | | | RPG |
| D-BR-54 | 8/2/18 | See Drawing | 10 | 8" | 104.4 | 104.5 | 99.9% | 95% | 20.9 | 20.0 | > Opt. | P | P-1-13A & P-2-13A | $1.0x10^{-7}$ & $2.4x10^{-8}$ | RPG |
| D-BR-55 | 8/2/18 | See Drawing | 10 | 8" | 105.8 | 104.5 | 101.2% | 95% | 20.2 | 20.0 | > Opt. | P | | | RPG |
| D-BR-56 | 8/2/18 | See Drawing | 8 | 8" | 103.4 | 104.5 | 98.9% | 95% | 22.7 | 18.4 | > Opt. | P | P-1-14A & P-2-14A | $2.5x10^{-8}$ & $2.8x10^{-8}$ | RPG |
| D-3-1 | 8/2/18 | See Drawing | 8 | 6" | 109.7 | 104.5 | 105.0% | 95% | 20.4 | 18.4 | > Opt. | P | | | RPG |
| D-3-2 | 8/3/18 | See Drawing | 1 | 6" | 101.8 | 102.2 | 99.6% | 95% | 22.1 | 20.3 | > Opt. | P | P-3-1A | $4.2 \times 10^{-8}$ | RPG |
| D-3-3 | 8/3/18 | See Drawing | 12 | 6" | 103.2 | 104.1 | 99.1% | 95% | 20.3 | 20.0 | > Opt. | P | | | RPG |
| D-3-4 | 8/3/18 | See Drawing | 11 | 6" | 104.1 | 104.4 | 99.7% | 95% | 19.8 | 18.5 | > Opt. | P | | | RPG |
| D-3-5 | 8/3/18 | See Drawing | 11 | 6" | 102.3 | 104.4 | 98.0% | 95% | 20.4 | 18.5 | > Opt. | F | P-3-2A | $2.7 \times 10^{-8}$ | RPG |
| D-3-6 | 8/3/18 | See Drawing | 11 | 6" | 102.9 | 104.4 | 98.6% | 95% | 23.0 | 18.5 | > Opt. | P | | | RPG |
| D-3-7 | 8/3/18 | See Drawing | 11 | 6" | 103.9 | 104.4 | 99.5% | 95% | 20.3 | 18.5 | > Opt. | P | | | RPG |
| D-3-8 | 8/3/18 | See Drawing | 11 | 6" | 104.3 | 104.4 | 99.9% | 95% | 20.2 | 18.5 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-3-9 | 8/3/18 | See Drawing | 11 | 6" | 102.6 | 104.4 | 98.3% | 95% | 19.6 | 18.5 | > Opt. | P | | | RPG |
| D-3-10 | 8/3/18 | See Drawing | 11 | 6" | 102.9 | 104.4 | 98.6% | 95% | 21.8 | 18.5 | > Opt. | P | | | RPG |
| D-3-11 | 8/3/18 | See Drawing | 11 | 6" | 101.2 | 104.4 | 96.9% | 95% | 19.8 | 18.5 | > Opt. | P | | | RPG |
| D-3-12 | 8/3/18 | See Drawing | 11 | 6" | 104.3 | 104.4 | 99.9% | 95% | 20.6 | 18.5 | > Opt. | P | | | RPG |
| D-3-13 | 8/3/18 | See Drawing | 2 | 6" | 99.2 | 100.5 | 98.7% | 95% | 21.8 | 20.8 | > Opt. | P | P-3-3A | $2.0 \times 10^{-8}$ | RPG |
| D-3-14 | 8/3/18 | See Drawing | 8 | 6" | 105.8 | 104.5 | 101.2% | 95% | 19.7 | 18.4 | > Opt. | P | | | RPG |
| D-3-15 | 8/3/18 | See Drawing | 8 | 6" | 102.9 | 104.5 | 98.5% | 95% | 20.8 | 18.4 | > Opt. | P | | | RPG |
| D-3-16 | 8/3/18 | See Drawing | 8 | 6" | 104.6 | 104.5 | 100.1% | 95% | 20.3 | 18.4 | > Opt. | P | P-3-4A | $3.5 \times 10^{-8}$ | RPG |
| D-3-17 | 8/3/18 | See Drawing | 7 | 6" | 103.5 | 103.6 | 99.9% | 95% | 22.8 | 17.9 | > Opt. | P | | | RPG |
| D-3-18 | 8/3/18 | See Drawing | 7 | 6" | 99.2 | 103.6 | 95.8% | 95% | 23.9 | 17.9 | > Opt. | P | | | RPG |
| D-3-19 | 8/3/18 | See Drawing | 10 | 6" | 103.6 | 104.5 | 99.1% | 95% | 20.1 | 20.0 | > Opt. | P | P-3-5A | $2.4 \times 10^{-8}$ | RPG |
| D-3-20 | 8/3/18 | See Drawing | 11 | 6" | 103.7 | 104.4 | 99.3% | 95% | 20.0 | 18.5 | > Opt. | P | | | RPG |
| D-3-21 | 8/3/18 | See Drawing | 10 | 6" | 105.4 | 104.5 | 100.9% | 95% | 21.6 | 20.0 | > Opt. | P | | | RPG |
| D-3-22 | 8/3/18 | See Drawing | 1 | 6" | 101.8 | 102.2 | 99.6% | 95% | 21.3 | 20.3 | > Opt. | P | | | RPG |
| D-3-23 | 8/3/18 | See Drawing | 8 | 6" | 104.2 | 104.5 | 99.7% | 95% | 21.6 | 18.4 | > Opt. | P | | | RPG |
| D-3-24 | 8/3/18 | See Drawing | 8 | 6" | 106.0 | 104.5 | 101.4% | 95% | 19.8 | 18.4 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-3-25 | 8/3/18 | See Drawing | 10 | 6" | 104.7 | 104.5 | 100.2% | 95% | 20.8 | 20.0 | > Opt. | P | | | RPG |
| D-3-26 | 8/3/18 | See Drawing | 7 | 6" | 102.9 | 103.6 | 99.3% | 95% | 21.2 | 17.9 | > Opt. | P | P-3-6A | $2.9 \times 10^{-8}$ | RPG |
| D-3-27 | 8/3/18 | See Drawing | 8 | 6" | 105.3 | 104.5 | 100.8% | 95% | 19.6 | 18.4 | > Opt. | P | | | RPG |
| D-3-28 | 8/3/18 | See Drawing | 8 | 6" | 105.4 | 104.5 | 100.9% | 95% | 20.7 | 18.4 | > Opt. | P | P-3-7A | $3.4 \times 10^{-8}$ | RPG |
| D-3-29 | 8/3/18 | See Drawing | 7 | 6" | 103.0 | 103.6 | 99.4% | 95% | 22.6 | 17.9 | > Opt. | P | | | RPG |
| D-3-30 | 8/3/18 | See Drawing | 12 | 6" | 103.8 | 104.1 | 99.7% | 95% | 22.8 | 20.0 | > Opt. | P | | | RPG |
| D-3-31 | 8/7/18 | See Drawing | 7 | 6" | 100.8 | 103.6 | 97.3% | 95% | 21.7 | 17.9 | > Opt. | P | | | RPG |
| D-3-32 | 8/7/18 | See Drawing | 10 | 6" | 105.0 | 104.5 | 100.5% | 95% | 20.9 | 20.0 | > Opt. | P | | | RPG |
| D-3-33 | 8/7/18 | See Drawing | 5 | 6" | 97.0 | 98.5 | 98.5% | 95% | 25.3 | 22.5 | > Opt. | P | | | RPG |
| D-3-34 | 8/7/18 | See Drawing | 5 | 6" | 94.3 | 98.5 | 95.7% | 95% | 25.0 | 22.5 | > Opt. | P | P-3-9A | $5.2 \times 10^{-8}$ | RPG |
| D-3-35 | 8/7/18 | See Drawing | 7 | 6" | 102.7 | 103.6 | 99.1% | 95% | 19.6 | 17.9 | > Opt. | P | | | RPG |
| D-3-36 | 8/7/18 | See Drawing | 12 | 6" | 103.7 | 104.1 | 99.6% | 95% | 20.8 | 20.0 | > Opt. | P | P-3-8A | $3.2 \times 10^{-8}$ | RPG |
| D-3-37 | 8/7/18 | See Drawing | 10 | 6" | 104.9 | 104.5 | 100.4% | 95% | 20.7 | 20.0 | > Opt. | P | | | RPG |
| D-3-38 | 8/7/18 | See Drawing | 7 | 6" | 102.3 | 103.6 | 98.7% | 95% | 19.3 | 17.9 | > Opt. | P | | | RPG |
| D-3-39 | 8/7/18 | See Drawing | 6 | 6" | 94.7 | 98.3 | 96.3% | 95% | 26.0 | 22.0 | > Opt. | P | P-3-10A | $8.2 \times 10^{-8}$ | RPG |
| D-3-40 | 8/7/18 | See Drawing | 7 | 6" | 103.0 | 103.6 | 99.4% | 95% | 21.2 | 17.9 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-3-41 | 8/7/18 | See Drawing | 7 | 6" | 99.2 | 103.6 | 95.8% | 95% | 20.5 | 17.9 | > Opt. | P | | | RPG |
| D-3-42 | 8/7/18 | See Drawing | 10 | 6" | 105.3 | 104.5 | 100.8% | 95% | 20.1 | 20.0 | > Opt. | P | | | RPG |
| D-3-43 | 8/7/18 | See Drawing | 2 | 6" | 99.9 | 100.5 | 99.4% | 95% | 21.5 | 20.8 | > Opt. | P | | | RPG |
| D-3-44 | 8/7/18 | See Drawing | 10 | 6" | 105.7 | 104.5 | 101.1% | 95% | 20.9 | 20.0 | > Opt. | P | | | RPG |
| D-3-45 | 8/7/18 | See Drawing | 12 | 6" | 103.8 | 104.1 | 99.7% | 95% | 20.3 | 20.0 | > Opt. | P | | | RPG |
| D-3-46 | 8/7/18 | See Drawing | 8 | 6" | 104.4 | 104.5 | 99.9% | 95% | 19.7 | 18.4 | > Opt. | P | | | RPG |
| D-3-47 | 8/7/18 | See Drawing | 1 | 6" | 100.6 | 102.2 | 98.4% | 95% | 23.1 | 20.3 | > Opt. | P | P-3-14A | $2.7 \times 10^{-8}$ | RPG |
| D-3-48 | 8/7/18 | See Drawing | 7 | 6" | 102.2 | 103.6 | 98.6% | 95% | 21.4 | 17.9 | > Opt. | P | | | RPG |
| D-3-49 | 8/7/18 | See Drawing | 7 | 6" | 103.3 | 103.6 | 99.7% | 95% | 20.5 | 17.9 | > Opt. | P | P-3-12A | $3.2 \times 10^{-8}$ | RPG |
| D-3-50 | 8/7/18 | See Drawing | 7 | 6" | 103.0 | 103.6 | 99.4% | 95% | 20.0 | 17.9 | > Opt. | P | | | RPG |
| D-3-51 | 8/7/18 | See Drawing | 1 | 6" | 101.2 | 102.2 | 99.0% | 95% | 22.6 | 20.3 | > Opt. | P | P-3-11A | $3.8 \times 10^{-8}$ | RPG |
| D-3-52 | 8/7/18 | See Drawing | 11 | 6" | 103.6 | 104.4 | 99.2% | 95% | 19.6 | 18.5 | > Opt. | P | | | RPG |
| D-3-53 | 8/7/18 | See Drawing | 1 | 6" | 100.6 | 102.2 | 98.4% | 95% | 22.0 | 20.3 | > Opt. | P | | | RPG |
| D-3-54 | 8/7/18 | See Drawing | 1 | 6" | 100.5 | 102.2 | 98.3% | 95% | 24.1 | 20.3 | > Opt. | P | | | RPG |
| D-3-55 | 8/7/18 | See Drawing | 1 | 6" | 101.1 | 102.2 | 98.9% | 95% | 22.2 | 20.3 | > Opt. | P | P-3-13A | $2.7 \times 10^{-8}$ | RPG |
| D-3-56 | 8/7/18 | See Drawing | 7 | 6" | 100.9 | 103.6 | 97.4% | 95% | 19.7 | 17.9 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-4-1 | 8/9/18 | See Drawing | 8 | 6" | 106.3 | 104.5 | 101.7% | 95% | 19.6 | 18.4 | > Opt. | P | | | RPG |
| D-4-2 | 8/9/18 | See Drawing | 4 | 6" | 95.8 | 98.9 | 96.9% | 95% | 20.9 | 19.6 | > Opt. | P | P-4-1A | $4.1 \times 10^{-8}$ | RPG |
| D-4-3 | 8/9/18 | See Drawing | 9 | 6" | 102.8 | 103.6 | 99.2% | 95% | 20.7 | 19.5 | > Opt. | P | | | RPG |
| D-4-4 | 8/9/18 | See Drawing | 3 | 6" | 94.5 | 97.0 | 97.4% | 95% | 21.8 | 21.6 | > Opt. | P | | | RPG |
| D-4-5 | 8/9/18 | See Drawing | 8 | 6" | 104.5 | 104.5 | 100.0% | 95% | 22.3 | 18.4 | > Opt. | P | P-4-2A | $2.1 \times 10^{-8}$ | RPG |
| D-4-6 | 8/9/18 | See Drawing | 8 | 6" | 105.4 | 104.5 | 100.9% | 95% | 20.5 | 18.4 | > Opt. | P | | | RPG |
| D-4-7 | 8/9/18 | See Drawing | 2 | 6" | 99.9 | 100.5 | 99.4% | 95% | 22.7 | 20.8 | > Opt. | P | | | RPG |
| D-4-8 | 8/9/18 | See Drawing | 5 | 6" | 96.5 | 98.5 | 98.0% | 95% | 26.0 | 22.5 | > Opt. | P | P-4-3A | $3.0 \times 10^{-8}$ | RPG |
| D-4-9 | 8/9/18 | See Drawing | 8 | 6" | 104.7 | 104.5 | 100.2% | 95% | 20.5 | 18.4 | > Opt. | P | | | RPG |
| D-4-10 | 8/9/18 | See Drawing | 9 | 6" | 103.1 | 103.6 | 99.5% | 95% | 19.6 | 19.5 | > Opt. | P | | | RPG |
| D-4-11 | 8/9/18 | See Drawing | 12 | 6" | 103.8 | 104.1 | 99.7% | 95% | 20.1 | 20.0 | > Opt. | P | | | RPG |
| D-4-12 | 8/9/18 | See Drawing | 8 | 6" | 104.6 | 104.5 | 100.1% | 95% | 20.1 | 18.4 | > Opt. | P | | | RPG |
| D-4-13 | 8/9/18 | See Drawing | 11 | 6" | 103.8 | 104.4 | 99.4% | 95% | 20.3 | 18.5 | > Opt. | P | | | RPG |
| D-4-14 | 8/9/18 | See Drawing | 4 | 6" | 98.3 | 98.9 | 99.4% | 95% | 22.3 | 19.6 | > Opt. | P | | | RPG |
| D-4-15 | 8/9/18 | See Drawing | 11 | 6" | 102.7 | 104.4 | 98.4% | 95% | 19.8 | 18.5 | > Opt. | P | | | RPG |
| D-4-16 | 8/9/18 | See Drawing | 11 | 6" | 104.0 | 104.4 | 99.6% | 95% | 20.0 | 18.5 | > Opt. | P | P-4-4A | $1.4 \times 10^{-8}$ | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-4-17 | 8/9/18 | See Drawing | 2 | 6" | 99.6 | 100.5 | 99.1% | 95% | 23.5 | 20.8 | > Opt. | P | | | RPG |
| D-4-18 | 8/9/18 | See Drawing | 7 | 6" | 102.9 | 103.6 | 99.3% | 95% | 22.4 | 17.9 | > Opt. | P | | | RPG |
| D-4-19 | 8/9/18 | See Drawing | 1 | 6" | 100.7 | 102.2 | 98.5% | 95% | 22.5 | 20.3 | > Opt. | P | | | RPG |
| D-4-20 | 8/9/18 | See Drawing | 1 | 6" | 101.1 | 102.2 | 98.9% | 95% | 20.4 | 20.3 | > Opt. | P | | | RPG |
| D-4-21 | 8/9/18 | See Drawing | 7 | 6" | 103.2 | 103.6 | 99.6% | 95% | 21.6 | 17.9 | > Opt. | P | P-4-5A | $4.9 \times 10^{-8}$ | RPG |
| D-4-22 | 8/9/18 | See Drawing | 5 | 6" | 97.6 | 98.5 | 99.1% | 95% | 23.8 | 22.5 | > Opt. | P | P-4-6A | $2.4 \times 10^{-8}$ | RPG |
| D-4-23 | 8/9/18 | See Drawing | 8 | 6" | 104.5 | 104.5 | 100.0% | 95% | 21.6 | 18.4 | > Opt. | P | | | RPG |
| D-4-24 | 8/9/18 | See Drawing | 8 | 6" | 105.2 | 104.5 | 100.7% | 95% | 20.0 | 18.4 | > Opt. | P | P-4-7A | $2.5 \times 10^{-8}$ | RPG |
| D-4-25 | 8/11/18 | See Drawing | 8 | 6" | 105.3 | 104.5 | 100.8% | 95% | 20.2 | 18.4 | > Opt. | P | | | RPG |
| D-4-26 | 8/11/18 | See Drawing | 7 | 6" | 102.3 | 103.6 | 98.7% | 95% | 23.3 | 17.9 | > Opt. | P | | | RPG |
| D-4-27 | 8/11/18 | See Drawing | 7 | 6" | 103.1 | 103.6 | 99.5% | 95% | 21.3 | 17.9 | > Opt. | P | | | RPG |
| D-4-28 | 8/11/18 | See Drawing | 1 | 6" | 102.1 | 102.2 | 99.9% | 95% | 20.8 | 20.3 | > Opt. | P | | | RPG |
| D-4-29 | 8/11/18 | See Drawing | 7 | 6" | 103.4 | 103.6 | 99.8% | 95% | 23.7 | 17.9 | > Opt. | P | P-4-8A | $8.6 \times 10^{-8}$ | RPG |
| D-4-30 | 8/11/18 | See Drawing | 7 | 6" | 103.5 | 103.6 | 99.9% | 95% | 20.1 | 17.9 | > Opt. | P | | | RPG |
| D-4-31 | 8/11/18 | See Drawing | 7 | 6" | 102.4 | 103.6 | 98.8% | 95% | 20.7 | 17.9 | > Opt. | P | | | RPG |
| D-4-32 | 8/11/18 | See Drawing | 7 | 6" | 102.2 | 103.6 | 98.6% | 95% | 21.9 | 17.9 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-4-33 | 8/11/18 | See Drawing | 7 | 6" | 103.0 | 103.6 | 99.4% | 95% | 21.5 | 17.9 | > Opt. | P | P-4-9A | $4.7 \times 10^{-8}$ | RPG |
| D-4-34 | 8/11/18 | See Drawing | 6 | 6" | 96.4 | 98.3 | 98.1% | 95% | 23.7 | 22.0 | > Opt. | P | | | RPG |
| D-4-35 | 8/11/18 | See Drawing | 7 | 6" | 102.5 | 103.6 | 98.9% | 95% | 20.7 | 17.9 | > Opt. | P | | | RPG |
| D-4-36 | 8/11/18 | See Drawing | 2 | 6" | 100.4 | 100.5 | 99.9% | 95% | 22.6 | 20.8 | > Opt. | P | P-4-10A | $2.8 \times 10^{-8}$ | RPG |
| D-4-37 | 8/11/18 | See Drawing | 9 | 6" | 101.8 | 103.6 | 98.3% | 95% | 21.0 | 19.5 | > Opt. | P | | | RPG |
| D-4-38 | 8/11/18 | See Drawing | 9 | 6" | 99.2 | 103.6 | 95.8% | 95% | 19.7 | 19.5 | > Opt. | P | | | RPG |
| D-4-39 | 8/11/18 | See Drawing | 6 | 6" | 96.7 | 98.3 | 98.4% | 95% | 25.1 | 22.0 | > Opt. | P | | | RPG |
| D-4-40 | 8/11/18 | See Drawing | 8 | 6" | 105.8 | 104.5 | 101.2% | 95% | 20.6 | 18.4 | > Opt. | P | | | RPG |
| D-4-41 | 8/11/18 | See Drawing | 6 | 6" | 93.6 | 98.3 | 95.2% | 95% | 25.3 | 22.0 | > Opt. | P | P-4-11A | $4.4 \times 10^{-8}$ | RPG |
| D-4-42 | 8/11/18 | See Drawing | 9 | 6" | 101.3 | 103.6 | 97.8% | 95% | 21.4 | 19.5 | > Opt. | P | | | RPG |
| D-4-43 | 8/11/18 | See Drawing | 11 | 6" | 104.0 | 104.4 | 99.6% | 95% | 19.8 | 18.5 | > Opt. | P | | | RPG |
| D-4-44 | 8/11/18 | See Drawing | 1 | 6" | 101.0 | 102.2 | 98.8% | 95% | 24.0 | 20.3 | > Opt. | P | P-4-12A | $4.2 \times 10^{-8}$ | RPG |
| D-4-45 | 8/11/18 | See Drawing | 7 | 6" | 102.4 | 103.6 | 98.8% | 95% | 19.7 | 17.9 | > Opt. | P | | | RPG |
| D-4-46 | 8/11/18 | See Drawing | 7 | 6" | 103.1 | 103.6 | 99.5% | 95% | 19.6 | 17.9 | > Opt. | P | | | RPG |
| D-4-47 | 8/11/18 | See Drawing | 8 | 6" | 104.6 | 104.5 | 100.1% | 95% | 19.9 | 18.4 | > Opt. | F | | | RPG |
| D-4-48 | 8/11/18 | See Drawing | 7 | 6" | 103.0 | 103.6 | 99.4% | 95% | 20.7 | 17.9 | > Opt. | P | | | RPG |

# NUCLEAR DENSITY AND MOISTURE TEST SUMMARY

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North**

Project Location: **Craighead County, Arkansas**

FTN Project Number: **R04469-1869-001**

Description of Area Tested and General Remarks: **Clay Liner**

| Proctor Number | | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| PC-1 | 1 | 102.2 | 20.3 |
| PC-2 | 2 | 100.5 | 20.8 |
| PC-3 | 3 | 97.0 | 21.6 |
| C-1 | 4 | 98.9 | 19.6 |
| C-2 | 5 | 98.5 | 22.5 |
| C-3 | 6 | 98.3 | 22.0 |
| C-4 | 7 | 103.6 | 17.9 |
| C-5 | 8 | 104.5 | 18.4 |
| C-6 | 9 | 103.6 | 19.5 |
| C-7 | 10 | 104.5 | 20.0 |
| C-8 | 11 | 104.4 | 18.5 |
| C-9 | 12 | 104.1 | 20.0 |

| Test Number | Date Tested | Test Location | Proctor Number | Depth Tested | Dry Density (pcf) | | Compaction (%) | | Water Content (%) | | | Pass or Fail | Perm Sample ID | Permeability (cm/s) | FTN QC Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field | Max. | Field | Req'd | Field | OMC | Min. Req'd | | | | |
| D-4-49 | 8/11/18 | See Drawing | 7 | 6" | 103.4 | 103.6 | 99.8% | 95% | 19.7 | 17.9 | > Opt. | P | | | RPG |
| D-4-50 | 8/13/18 | See Drawing | 11 | 6" | 104.1 | 104.4 | 99.7% | 95% | 19.7 | 18.5 | > Opt. | P | | | RPG |
| D-4-51 | 8/13/18 | See Drawing | 2 | 6" | 100.3 | 100.5 | 99.8% | 95% | 22.4 | 20.8 | > Opt. | P | P-4-13A | $5.7 \times 10^{-8}$ | RPG |
| D-4-52 | 8/13/18 | See Drawing | 7 | 6" | 102.8 | 103.6 | 99.2% | 95% | 22.6 | 17.9 | > Opt. | P | | | RPG |
| D-4-53 | 8/13/18 | See Drawing | 1 | 6" | 100.6 | 102.2 | 98.4% | 95% | 20.8 | 20.3 | > Opt. | P | | | RPG |
| D-4-54 | 8/13/18 | See Drawing | 2 | 6" | 99.2 | 100.5 | 98.7% | 95% | 24.3 | 20.8 | > Opt. | P | P-4-14A | $5.1 \times 10^{-8}$ | RPG |
| D-4-55 | 8/13/18 | See Drawing | 10 | 6" | 104.5 | 104.5 | 100.0% | 95% | 21.2 | 20.0 | > Opt. | P | | | RPG |
| D-4-56 | 8/13/18 | See Drawing | 10 | 6" | 102.2 | 104.5 | 97.8% | 95% | 20.5 | 20.0 | > Opt. | P | | | RPG |

# APPENDIX K

**Clay Liner Performance Test Reports**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 2 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-1A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.092 | B-Value, f | 0.98 | Height, inches | 3.100 |
| Diameter, inches | 2.858 | Cell Pres. | 90.0 | Diameter, inches | 2.858 |
| Area, cm² | 41.39 | Bot. Pres. | 80.0 | Area, cm² | 41.39 |
| Volume, cm³ | 325.05 | Top Pres. | 80.0 | Volume, cm³ | 325.89 |
| Mass, g | 616.44 | Tot. B.P. | 80.0 | Mass, g | 639.93 |
| Moisture Content, % | 20.9 | Head, max. | 109.03 | Moisture Content, % | 25.56 |
| Dry Density, pcf | 97.8 | Head, min. | 109.03 | Dry Density, pcf | 97.59 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 13.85 | Volume Solids, cm³ | 188.77 |
| Volume Solids, cm³ | 188.77 | Min. Grad. | 13.85 | Volume Voids, cm³ | 137.13 |
| Volume Voids, cm³ | 136.29 | | | Void Ratio | 0.73 |
| Void Ratio | 0.72 | | | Saturation, % | 95.0% |
| Saturation, % | 78.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 616.44 | 747.43 |
| Wt Soil & Tare, f | g | 509.67 | 617.20 |
| Wt Tare | g | 0.00 | 107.65 |
| Wt Moisture Lost | g | 106.77 | 130.23 |
| Wt Dry Soil | g | 509.67 | 509.55 |
| Water Content | % | 20.95% | 25.56% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/02/18 | 43314 | 13 | 0 | 21.4 | 0 | 0 | 0 | 0 | 1.55 | 109.03 | 13.85 | 3.8E-08 |
| 08/02/18 | 43314 | 13 | 5 | 21.4 | 5 | 5 | 300 | 300 | 1.55 | 109.03 | 13.85 | 3.8E-08 |
| 08/02/18 | 43314 | 13 | 10 | 21.4 | 5 | 10 | 300 | 600 | 1.55 | 109.03 | 13.85 | 3.8E-08 |
| 08/02/18 | 43314 | 13 | 15 | 21.4 | 5 | 15 | 300 | 900 | 1.55 | 109.03 | 13.85 | 3.8E-08 * |
| 08/02/18 | 43314 | 13 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 1.55 | 109.03 | 13.85 | 3.8E-08 * |
| 08/02/18 | 43314 | 13 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 1.55 | 109.03 | 13.85 | 3.8E-08 * |
| 08/02/18 | 43314 | 13 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 1.55 | 109.03 | 13.85 | 3.8E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.8E-08 cm/sec **

| | |
|---|---|
| DATE | 8/2/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-2A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.129 | B-Value, f | 1.00 | Height, inches | 3.129 |
| Diameter, inches | 2.858 | Cell Pres. | 90.0 | Diameter, inches | 2.859 |
| Area, cm$^2$ | 41.39 | Bot. Pres. | 80.0 | Area, cm$^2$ | 41.42 |
| Volume, cm$^3$ | 328.94 | Top Pres. | 80.0 | Volume, cm$^3$ | 329.17 |
| Mass, g | 645.72 | Tot. B.P. | 80.0 | Mass, g | 651.48 |
| Moisture Content, % | 25.7 | Head, max. | 125.91 | Moisture Content, % | 26.84 |
| Dry Density, pcf | 97.4 | Head, min. | 125.91 | Dry Density, pcf | 97.37 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 15.84 | Volume Solids, cm$^3$ | 190.23 |
| Volume Solids, cm$^3$ | 190.23 | Min. Grad. | 15.84 | Volume Voids, cm$^3$ | 138.94 |
| Volume Voids, cm$^3$ | 138.71 | | | Void Ratio | 0.73 |
| Void Ratio | 0.73 | | | Saturation, % | 99.2% |
| Saturation, % | 95.2% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 645.72 | 764.87 |
| Wt Soil & Tare, f | g | 513.62 | 627.06 |
| Wt Tare | g | 0.00 | 113.61 |
| Wt Moisture Lost | g | 132.10 | 137.81 |
| Wt Dry Soil | g | 513.62 | 513.45 |
| Water Content | % | 25.72% | 26.84% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm$^3$/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/02/18 | 43314 | 8 | 0 | 21.4 | 0 | 0 | 0 | 0 | 1.79 | 125.91 | 15.84 | 3.3E-08 |
| 08/02/18 | 43314 | 8 | 5 | 21.4 | 5 | 5 | 300 | 300 | 1.79 | 125.91 | 15.84 | 3.3E-08 |
| 08/02/18 | 43314 | 8 | 10 | 21.4 | 5 | 10 | 300 | 600 | 1.79 | 125.91 | 15.84 | 3.3E-08 |
| 08/02/18 | 43314 | 8 | 15 | 21.4 | 5 | 15 | 300 | 900 | 1.79 | 125.91 | 15.84 | 3.3E-08 * |
| 08/02/18 | 43314 | 8 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 1.79 | 125.91 | 15.84 | 3.3E-08 * |
| 08/02/18 | 43314 | 8 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 1.79 | 125.91 | 15.84 | 3.3E-08 * |
| 08/02/18 | 43314 | 8 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 1.79 | 125.91 | 15.84 | 3.3E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.3E-08 cm/sec **

| | |
|---|---|
| DATE | 8/2/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

FLEXIBLE WALL PERMEABILITY

ASTM D 5084

METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 12 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-3A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.131 | B-Value, f | 1.00 | Height, inches | 3.131 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.861 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 41.48 |
| Volume, cm³ | 330.08 | Top Pres. | 80.0 | Volume, cm³ | 329.84 |
| Mass, g | 634.68 | Tot. B.P. | 80.0 | Mass, g | 641.50 |
| Moisture Content, % | 24.1 | Head, max. | 107.62 | Moisture Content, % | 25.45 |
| Dry Density, pcf | 96.7 | Head, min. | 107.62 | Dry Density, pcf | 96.74 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 13.53 | Volume Solids, cm³ | 189.39 |
| Volume Solids, cm³ | 189.39 | Min. Grad. | 13.53 | Volume Voids, cm³ | 140.45 |
| Volume Voids, cm³ | 140.69 | | | Void Ratio | 0.74 |
| Void Ratio | 0.74 | | | Saturation, % | 92.7% |
| Saturation, % | 87.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 634.68 | 755.31 |
| Wt Soil & Tare, f | g | 511.35 | 625.18 |
| Wt Tare | g | 0.00 | 113.89 |
| Wt Moisture Lost | g | 123.33 | 130.13 |
| Wt Dry Soil | g | 511.35 | 511.29 |
| Water Content | % | 24.12% | 25.45% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/02/18 | 43314 | 9 | 0 | 21.4 | 0 | 0 | 0 | 0 | 1.53 | 107.62 | 13.53 | 3.9E-08 | |
| 08/02/18 | 43314 | 9 | 5 | 21.4 | 5 | 5 | 300 | 300 | 1.53 | 107.62 | 13.53 | 3.9E-08 | |
| 08/02/18 | 43314 | 9 | 10 | 21.4 | 5 | 10 | 300 | 600 | 1.53 | 107.62 | 13.53 | 3.9E-08 | |
| 08/02/18 | 43314 | 9 | 15 | 21.4 | 5 | 15 | 300 | 900 | 1.53 | 107.62 | 13.53 | 3.9E-08 | * |
| 08/02/18 | 43314 | 9 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 1.53 | 107.62 | 13.53 | 3.9E-08 | * |
| 08/02/18 | 43314 | 9 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 1.53 | 107.62 | 13.53 | 3.9E-08 | * |
| 08/02/18 | 43314 | 9 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 1.53 | 107.62 | 13.53 | 3.9E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/2/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-4A | - | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.112 | B-Value, f | 1.00 | Height, inches | 3.113 |
| Diameter, inches | 2.778 | Cell Pres. | 90.0 | Diameter, inches | 2.831 |
| Area, cm² | 39.10 | Bot. Pres. | 80.0 | Area, cm² | 40.61 |
| Volume, cm³ | 309.10 | Top Pres. | 80.0 | Volume, cm³ | 321.11 |
| Mass, g | 612.61 | Tot. B.P. | 80.0 | Mass, g | 621.42 |
| Moisture Content, % | 24.2 | Head, max. | 146.31 | Moisture Content, % | 25.97 |
| Dry Density, pcf | 99.6 | Head, min. | 146.31 | Dry Density, pcf | 95.86 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 18.50 | Volume Solids, cm³ | 182.71 |
| Volume Solids, cm³ | 182.71 | Min. Grad. | 18.50 | Volume Voids, cm³ | 138.40 |
| Volume Voids, cm³ | 126.39 | | | Void Ratio | 0.76 |
| Void Ratio | 0.69 | | | Saturation, % | 92.6% |
| Saturation, % | 94.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 612.61 | 840.47 |
| Wt Soil & Tare, f | g | 493.31 | 712.44 |
| Wt Tare | g | 0.00 | 219.44 |
| Wt Moisture Lost | g | 119.30 | 128.03 |
| Wt Dry Soil | g | 493.31 | 493.00 |
| Water Content | % | 24.18% | 25.97% |

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/03/18 | 43315 | 12 | 0 | 22.0 | 0 | 0 | 0 | 0 | 2.08 | 146.31 | 18.50 | 1.5E-08 | |
| 08/03/18 | 43315 | 12 | 5 | 22.0 | 5 | 5 | 300 | 300 | 2.08 | 146.31 | 18.50 | 1.5E-08 | |
| 08/03/18 | 43315 | 12 | 10 | 22.0 | 5 | 10 | 300 | 600 | 2.08 | 146.31 | 18.50 | 1.5E-08 | |
| 08/03/18 | 43315 | 12 | 15 | 22.0 | 5 | 15 | 300 | 900 | 2.08 | 146.31 | 18.50 | 1.5E-08 | * |
| 08/03/18 | 43315 | 12 | 20 | 22.0 | 5 | 20 | 300 | 1200 | 2.08 | 146.31 | 18.50 | 1.5E-08 | * |
| 08/03/18 | 43315 | 12 | 25 | 22.0 | 5 | 25 | 300 | 1500 | 2.08 | 146.31 | 18.50 | 1.5E-08 | * |
| 08/03/18 | 43315 | 12 | 30 | 22.0 | 5 | 30 | 300 | 1800 | 2.08 | 146.31 | 18.50 | 1.5E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 7 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-5A | - | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.118 | B-Value, f | 0.99 | Height, inches | 3.114 |
| Diameter, inches | 2.873 | Cell Pres. | 90.0 | Diameter, inches | 2.859 |
| Area, cm² | 41.82 | Bot. Pres. | 80.0 | Area, cm² | 41.42 |
| Volume, cm³ | 331.24 | Top Pres. | 80.0 | Volume, cm³ | 327.60 |
| Mass, g | 656.82 | Tot. B.P. | 80.0 | Mass, g | 665.25 |
| Moisture Content, % | 22.3 | Head, max. | 132.24 | Moisture Content, % | 23.88 |
| Dry Density, pcf | 101.2 | Head, min. | 132.24 | Dry Density, pcf | 102.29 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 16.72 | Volume Solids, cm³ | 198.90 |
| Volume Solids, cm³ | 198.90 | Min. Grad. | 16.72 | Volume Voids, cm³ | 128.70 |
| Volume Voids, cm³ | 132.34 | | | Void Ratio | 0.65 |
| Void Ratio | 0.67 | | | Saturation, % | 99.6% |
| Saturation, % | 90.5% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 656.82 | 881.85 |
| Wt Soil & Tare, f | g | 537.02 | 753.67 |
| Wt Tare | g | 0.00 | 216.86 |
| Wt Moisture Lost | g | 119.80 | 128.18 |
| Wt Dry Soil | g | 537.02 | 536.81 |
| Water Content | % | 22.31% | 23.88% |

DESCRIPTION: -

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/03/18 | 43315 | 10 | 30 | 22.0 | 0 | 0 | 0 | 0 | 1.88 | 132.24 | 16.72 | 1.6E-08 | |
| 08/03/18 | 43315 | 10 | 35 | 22.0 | 5 | 5 | 300 | 300 | 1.88 | 132.24 | 16.72 | 1.6E-08 | |
| 08/03/18 | 43315 | 10 | 40 | 22.0 | 5 | 10 | 300 | 600 | 1.88 | 132.24 | 16.72 | 1.6E-08 | |
| 08/03/18 | 43315 | 10 | 45 | 22.0 | 5 | 15 | 300 | 900 | 1.88 | 132.24 | 16.72 | 1.6E-08 | * |
| 08/03/18 | 43315 | 10 | 50 | 22.0 | 5 | 20 | 300 | 1200 | 1.88 | 132.24 | 16.72 | 1.6E-08 | * |
| 08/03/18 | 43315 | 10 | 55 | 22.0 | 5 | 25 | 300 | 1500 | 1.88 | 132.24 | 16.72 | 1.6E-08 | * |
| 08/03/18 | 43315 | 11 | 0 | 22.0 | 5 | 30 | 300 | 1800 | 1.88 | 132.24 | 16.72 | 1.6E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.6E-08 cm/sec **

| | |
|---|---|
| DATE | 8/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-6A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.119 | B-Value, f | 1.00 | Height, inches | 3.109 |
| Diameter, inches | 2.853 | Cell Pres. | 90.0 | Diameter, inches | 2.866 |
| Area, cm² | 41.24 | Bot. Pres. | 80.0 | Area, cm² | 41.62 |
| Volume, cm³ | 326.75 | Top Pres. | 80.0 | Volume, cm³ | 328.67 |
| Mass, g | 651.11 | Tot. B.P. | 80.0 | Mass, g | 657.47 |
| Moisture Content, % | 23.4 | Head, max. | 113.25 | Moisture Content, % | 24.62 |
| Dry Density, pcf | 100.8 | Head, min. | 113.25 | Dry Density, pcf | 100.16 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 14.34 | Volume Solids, cm³ | 195.39 |
| Volume Solids, cm³ | 195.39 | Min. Grad. | 14.34 | Volume Voids, cm³ | 133.28 |
| Volume Voids, cm³ | 131.35 | | | Void Ratio | 0.68 |
| Void Ratio | 0.67 | | | Saturation, % | 97.5% |
| Saturation, % | 94.1% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 651.11 | 747.74 |
| Wt Soil & Tare, f | g | 527.56 | 617.87 |
| Wt Tare | g | 0.00 | 90.46 |
| Wt Moisture Lost | g | 123.55 | 129.87 |
| Wt Dry Soil | g | 527.56 | 527.41 |
| Water Content | % | 23.42% | 24.62% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/03/18 | 43315 | 13 | 0 | 22.0 | 0 | 0 | 0 | 0 | 1.61 | 113.25 | 14.34 | 3.6E-08 |
| 08/03/18 | 43315 | 13 | 5 | 22.0 | 5 | 5 | 300 | 300 | 1.61 | 113.25 | 14.34 | 3.6E-08 |
| 08/03/18 | 43315 | 13 | 10 | 22.0 | 5 | 10 | 300 | 600 | 1.61 | 113.25 | 14.34 | 3.6E-08 |
| 08/03/18 | 43315 | 13 | 15 | 22.0 | 5 | 15 | 300 | 900 | 1.61 | 113.25 | 14.34 | 3.6E-08 * |
| 08/03/18 | 43315 | 13 | 20 | 22.0 | 5 | 20 | 300 | 1200 | 1.61 | 113.25 | 14.34 | 3.6E-08 * |
| 08/03/18 | 43315 | 13 | 25 | 22.0 | 5 | 25 | 300 | 1500 | 1.61 | 113.25 | 14.34 | 3.6E-08 * |
| 08/03/18 | 43315 | 13 | 30 | 22.0 | 5 | 30 | 300 | 1800 | 1.61 | 113.25 | 14.34 | 3.6E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.6E-08 cm/sec **

| | |
|---|---|
| DATE | 8/3/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-7A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | DA | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.116 | B-Value, f | 1.00 | Height, inches | 3.126 |
| Diameter, inches | 2.847 | Cell Pres. | 90.0 | Diameter, inches | 2.850 |
| Area, cm² | 41.07 | Bot. Pres. | 80.0 | Area, cm² | 41.16 |
| Volume, $cm^3$ | 325.06 | Top Pres. | 80.0 | Volume, $cm^3$ | 326.79 |
| Mass, g | 640.45 | Tot. B.P. | 80.0 | Mass, g | 656.91 |
| Moisture Content, % | 20.6 | Head, max. | 148.42 | Moisture Content, % | 23.74 |
| Dry Density, pcf | 101.9 | Head, min. | 148.42 | Dry Density, pcf | 101.37 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 18.69 | Volume Solids, $cm^3$ | 196.62 |
| Volume Solids, $cm^3$ | 196.62 | Min. Grad. | 18.69 | Volume Voids, $cm^3$ | 130.17 |
| Volume Voids, $cm^3$ | 128.44 | | | Void Ratio | 0.66 |
| Void Ratio | 0.65 | | | Saturation, % | 96.8% |
| Saturation, % | 85.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 640.45 | 664.97 |
| Wt Soil & Tare, f | g | 530.87 | 539.00 |
| Wt Tare | g | 0.00 | 8.40 |
| Wt Moisture Lost | g | 109.58 | 125.97 |
| Wt Dry Soil | g | 530.87 | 530.60 |
| Water Content | % | 20.64% | 23.74% |

Flow Pump Rate: 2.25E-05 $cm^3$/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/05/18 | 43317 | 15 | 0 | 20.2 | 0 | 0 | 0 | 0 | 2.11 | 148.42 | 18.69 | 2.9E-08 |
| 08/05/18 | 43317 | 15 | 5 | 20.2 | 5 | 5 | 300 | 300 | 2.11 | 148.42 | 18.69 | 2.9E-08 |
| 08/05/18 | 43317 | 15 | 10 | 20.2 | 5 | 10 | 300 | 600 | 2.11 | 148.42 | 18.69 | 2.9E-08 |
| 08/05/18 | 43317 | 15 | 15 | 20.2 | 5 | 15 | 300 | 900 | 2.11 | 148.42 | 18.69 | 2.9E-08 * |
| 08/05/18 | 43317 | 15 | 20 | 20.2 | 5 | 20 | 300 | 1200 | 2.11 | 148.42 | 18.69 | 2.9E-08 * |
| 08/05/18 | 43317 | 15 | 25 | 20.2 | 5 | 25 | 300 | 1500 | 2.11 | 148.42 | 18.69 | 2.9E-08 * |
| 08/05/18 | 43317 | 15 | 30 | 20.2 | 5 | 30 | 300 | 1800 | 2.11 | 148.42 | 18.69 | 2.9E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/5/18 |
| CHECK | |
| REVIEW | TWM |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 12 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-8A | - | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | DA | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.116 | B-Value, f | 1.00 | Height, inches | 3.122 |
| Diameter, inches | 2.856 | Cell Pres. | 90.0 | Diameter, inches | 2.861 |
| Area, cm² | 41.33 | Bot. Pres. | 80.0 | Area, cm² | 41.48 |
| Volume, cm³ | 327.12 | Top Pres. | 80.0 | Volume, cm³ | 328.90 |
| Mass, g | 668.42 | Tot. B.P. | 80.0 | Mass, g | 673.91 |
| Moisture Content, % | 20.8 | Head, max. | 145.60 | Moisture Content, % | 21.84 |
| Dry Density, pcf | 105.5 | Head, min. | 145.60 | Dry Density, pcf | 104.94 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 18.36 | Volume Solids, cm³ | 204.85 |
| Volume Solids, cm³ | 204.85 | Min. Grad. | 18.36 | Volume Voids, cm³ | 124.04 |
| Volume Voids, cm³ | 122.26 | | | Void Ratio | 0.61 |
| Void Ratio | 0.60 | | | Saturation, % | 97.4% |
| Saturation, % | 94.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 668.42 | 682.21 |
| Wt Soil & Tare, f | g | 553.11 | 561.44 |
| Wt Tare | g | 0.00 | 8.49 |
| Wt Moisture Lost | g | 115.31 | 120.77 |
| Wt Dry Soil | g | 553.11 | 552.95 |
| Water Content | % | 20.85% | 21.84% |

DESCRIPTION: -

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/05/18 | 43317 | 14 | 10 | 20.2 | 0 | 0 | 0 | 0 | 2.07 | 145.60 | 18.36 | 1.5E-08 | |
| 08/05/18 | 43317 | 14 | 15 | 20.2 | 5 | 5 | 300 | 300 | 2.07 | 145.60 | 18.36 | 1.5E-08 | |
| 08/05/18 | 43317 | 14 | 20 | 20.2 | 5 | 10 | 300 | 600 | 2.07 | 145.60 | 18.36 | 1.5E-08 | |
| 08/05/18 | 43317 | 14 | 25 | 20.2 | 5 | 15 | 300 | 900 | 2.07 | 145.60 | 18.36 | 1.5E-08 | * |
| 08/05/18 | 43317 | 14 | 30 | 20.2 | 5 | 20 | 300 | 1200 | 2.07 | 145.60 | 18.36 | 1.5E-08 | * |
| 08/05/18 | 43317 | 14 | 35 | 20.2 | 5 | 25 | 300 | 1500 | 2.07 | 145.60 | 18.36 | 1.5E-08 | * |
| 08/05/18 | 43317 | 14 | 40 | 20.2 | 5 | 30 | 300 | 1800 | 2.07 | 145.60 | 18.36 | 1.5E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/5/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 2 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-9A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.122 | B-Value, f | 0.99 | Height, inches | 3.123 |
| Diameter, inches | 2.874 | Cell Pres. | 90.0 | Diameter, inches | 2.856 |
| Area, cm² | 41.85 | Bot. Pres. | 80.0 | Area, cm² | 41.33 |
| Volume, cm³ | 331.89 | Top Pres. | 80.0 | Volume, cm³ | 327.85 |
| Mass, g | 664.28 | Tot. B.P. | 80.0 | Mass, g | 674.36 |
| Moisture Content, % | 22.6 | Head, max. | 145.60 | Moisture Content, % | 24.46 |
| Dry Density, pcf | 101.9 | Head, min. | 145.60 | Dry Density, pcf | 103.13 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 18.36 | Volume Solids, cm³ | 197.03 |
| Volume Solids, cm³ | 197.03 | Min. Grad. | 18.36 | Volume Voids, cm³ | 130.82 |
| Volume Voids, cm³ | 134.86 | | | Void Ratio | 0.66 |
| Void Ratio | 0.68 | | | Saturation, % | 100.0% |
| Saturation, % | 90.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 664.28 | 682.52 |
| Wt Soil & Tare, f | g | 541.84 | 550.05 |
| Wt Tare | g | 0.00 | 8.43 |
| Wt Moisture Lost | g | 122.44 | 132.47 |
| Wt Dry Soil | g | 541.84 | 541.62 |
| Water Content | % | 22.60% | 24.46% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/07/18 | 43319 | 8 | 45 | 20.3 | 0 | 0 | 0 | 0 | 2.07 | 145.60 | 18.36 | 2.9E-08 |
| 08/07/18 | 43319 | 8 | 50 | 20.3 | 5 | 5 | 300 | 300 | 2.07 | 145.60 | 18.36 | 2.9E-08 |
| 08/07/18 | 43319 | 8 | 55 | 20.3 | 5 | 10 | 300 | 600 | 2.07 | 145.60 | 18.36 | 2.9E-08 |
| 08/07/18 | 43319 | 9 | 0 | 20.3 | 5 | 15 | 300 | 900 | 2.07 | 145.60 | 18.36 | 2.9E-08 * |
| 08/07/18 | 43319 | 9 | 5 | 20.3 | 5 | 20 | 300 | 1200 | 2.07 | 145.60 | 18.36 | 2.9E-08 * |
| 08/07/18 | 43319 | 9 | 10 | 20.3 | 5 | 25 | 300 | 1500 | 2.07 | 145.60 | 18.36 | 2.9E-08 * |
| 08/07/18 | 43319 | 9 | 15 | 20.3 | 5 | 30 | 300 | 1800 | 2.07 | 145.60 | 18.36 | 2.9E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/7/18 |
| CHECK | |
| REVIEW | PWM |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 5 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-10A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.120 | B-Value, f | 0.99 | Height, inches | 3.128 |
| Diameter, inches | 2.866 | Cell Pres. | 90.0 | Diameter, inches | 2.859 |
| Area, cm² | 41.62 | Bot. Pres. | 80.0 | Area, cm² | 41.42 |
| Volume, cm³ | 329.84 | Top Pres. | 80.0 | Volume, cm³ | 329.07 |
| Mass, g | 672.66 | Tot. B.P. | 80.0 | Mass, g | 678.67 |
| Moisture Content, % | 20.9 | Head, max. | 113.95 | Moisture Content, % | 21.96 |
| Dry Density, pcf | 105.3 | Head, min. | 113.95 | Dry Density, pcf | 105.52 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 14.34 | Volume Solids, cm³ | 206.11 |
| Volume Solids, cm³ | 206.11 | Min. Grad. | 14.34 | Volume Voids, cm³ | 122.96 |
| Volume Voids, cm³ | 123.73 | | | Void Ratio | 0.60 |
| Void Ratio | 0.60 | | | Saturation, % | 99.4% |
| Saturation, % | 93.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 672.66 | 686.95 |
| Wt Soil & Tare, f | g | 556.49 | 564.80 |
| Wt Tare | g | 0.00 | 8.46 |
| Wt Moisture Lost | g | 116.17 | 122.15 |
| Wt Dry Soil | g | 556.49 | 556.34 |
| Water Content | % | 20.88% | 21.96% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/07/18 | 43319 | 9 | 45 | 20.5 | 0 | 0 | 0 | 0 | 1.62 | 113.95 | 14.34 | 3.7E-08 |
| 08/07/18 | 43319 | 9 | 50 | 20.5 | 5 | 5 | 300 | 300 | 1.62 | 113.95 | 14.34 | 3.7E-08 |
| 08/07/18 | 43319 | 9 | 55 | 20.5 | 5 | 10 | 300 | 600 | 1.62 | 113.95 | 14.34 | 3.7E-08 |
| 08/07/18 | 43319 | 10 | 0 | 20.5 | 5 | 15 | 300 | 900 | 1.62 | 113.95 | 14.34 | 3.7E-08 * |
| 08/07/18 | 43319 | 10 | 5 | 20.5 | 5 | 20 | 300 | 1200 | 1.62 | 113.95 | 14.34 | 3.7E-08 * |
| 08/07/18 | 43319 | 10 | 10 | 20.5 | 5 | 25 | 300 | 1500 | 1.62 | 113.95 | 14.34 | 3.7E-08 * |
| 08/07/18 | 43319 | 10 | 15 | 20.5 | 5 | 30 | 300 | 1800 | 1.62 | 113.95 | 14.34 | 3.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/7/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 4 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-11A | - | Flow Pump Speed | 9 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.122 | B-Value, f | 1.00 | Height, inches | 3.123 |
| Diameter, inches | 2.865 | Cell Pres. | 90.0 | Diameter, inches | 2.863 |
| Area, cm² | 41.59 | Bot. Pres. | 80.0 | Area, cm² | 41.53 |
| Volume, cm³ | 329.82 | Top Pres. | 80.0 | Volume, cm³ | 329.46 |
| Mass, g | 663.57 | Tot. B.P. | 80.0 | Mass, g | 671.91 |
| Moisture Content, % | 21.5 | Head, max. | 116.06 | Moisture Content, % | 23.04 |
| Dry Density, pcf | 103.3 | Head, min. | 116.06 | Dry Density, pcf | 103.43 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 14.63 | Volume Solids, cm³ | 202.25 |
| Volume Solids, cm³ | 202.25 | Min. Grad. | 14.63 | Volume Voids, cm³ | 127.21 |
| Volume Voids, cm³ | 127.56 | | | Void Ratio | 0.63 |
| Void Ratio | 0.63 | | | Saturation, % | 98.9% |
| Saturation, % | 92.1% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 663.57 | 680.29 |
| Wt Soil & Tare, f | g | 546.08 | 554.48 |
| Wt Tare | g | 0.00 | 8.47 |
| Wt Moisture Lost | g | 117.49 | 125.81 |
| Wt Dry Soil | g | 546.08 | 546.01 |
| Water Content | % | 21.51% | 23.04% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/07/18 | 43319 | 8 | 0 | 20.2 | 0 | 0 | 0 | 0 | 1.65 | 116.06 | 14.63 | 7.0E-08 |
| 08/07/18 | 43319 | 8 | 5 | 20.2 | 5 | 5 | 300 | 300 | 1.65 | 116.06 | 14.63 | 7.0E-08 |
| 08/07/18 | 43319 | 8 | 10 | 20.2 | 5 | 10 | 300 | 600 | 1.65 | 116.06 | 14.63 | 7.0E-08 |
| 08/07/18 | 43319 | 8 | 15 | 20.2 | 5 | 15 | 300 | 900 | 1.65 | 116.06 | 14.63 | 7.0E-08 * |
| 08/07/18 | 43319 | 8 | 20 | 20.2 | 5 | 20 | 300 | 1200 | 1.65 | 116.06 | 14.63 | 7.0E-08 * |
| 08/07/18 | 43319 | 8 | 25 | 20.2 | 5 | 25 | 300 | 1500 | 1.65 | 116.06 | 14.63 | 7.0E-08 * |
| 08/07/18 | 43319 | 8 | 30 | 20.2 | 5 | 30 | 300 | 1800 | 1.65 | 116.06 | 14.63 | 7.0E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 7.0E-08 cm/sec **

| | |
|---|---|
| DATE | 8/7/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-12A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.426 | B-Value, f | 0.99 | Height, inches | 2.445 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.844 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 40.98 |
| Volume, cm³ | 255.75 | Top Pres. | 80.0 | Volume, cm³ | 254.52 |
| Mass, g | 519.32 | Tot. B.P. | 80.0 | Mass, g | 528.51 |
| Moisture Content, % | 20.8 | Head, max. | 158.97 | Moisture Content, % | 22.90 |
| Dry Density, pcf | 104.9 | Head, min. | 158.97 | Dry Density, pcf | 105.43 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 25.60 | Volume Solids, cm³ | 156.37 |
| Volume Solids, cm³ | 156.37 | Min. Grad. | 25.60 | Volume Voids, cm³ | 98.15 |
| Volume Voids, cm³ | 99.38 | | | Void Ratio | 0.63 |
| Void Ratio | 0.64 | | | Saturation, % | 100.0% |
| Saturation, % | 89.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 519.32 | 536.88 |
| Wt Soil & Tare, f | g | 430.03 | 438.43 |
| Wt Tare | g | 0.00 | 8.53 |
| Wt Moisture Lost | g | 89.29 | 98.45 |
| Wt Dry Soil | g | 430.03 | 429.90 |
| Water Content | % | 20.76% | 22.90% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/08/18 | 43320 | 12 | 10 | 21.9 | 0 | 0 | 0 | 0 | 2.26 | 158.97 | 25.60 | 2.0E-08 |
| 08/08/18 | 43320 | 12 | 15 | 21.9 | 5 | 5 | 300 | 300 | 2.26 | 158.97 | 25.60 | 2.0E-08 |
| 08/08/18 | 43320 | 12 | 20 | 21.9 | 5 | 10 | 300 | 600 | 2.26 | 158.97 | 25.60 | 2.0E-08 |
| 08/08/18 | 43320 | 12 | 25 | 21.9 | 5 | 15 | 300 | 900 | 2.26 | 158.97 | 25.60 | 2.0E-08 * |
| 08/08/18 | 43320 | 12 | 30 | 21.9 | 5 | 20 | 300 | 1200 | 2.26 | 158.97 | 25.60 | 2.0E-08 * |
| 08/08/18 | 43320 | 12 | 35 | 21.9 | 5 | 25 | 300 | 1500 | 2.26 | 158.97 | 25.60 | 2.0E-08 * |
| 08/08/18 | 43320 | 12 | 40 | 21.9 | 5 | 30 | 300 | 1800 | 2.26 | 158.97 | 25.60 | 2.0E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.0E-08 cm/sec **

| | |
|---|---|
| DATE | 8/8/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 5 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-13A | - | Flow Pump Speed | 8 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.022 | B-Value, f | 1.00 | Height, inches | 2.020 |
| Diameter, inches | 2.870 | Cell Pres. | 90.0 | Diameter, inches | 2.869 |
| Area, cm² | 41.74 | Bot. Pres. | 80.0 | Area, cm² | 41.71 |
| Volume, cm³ | 214.36 | Top Pres. | 80.0 | Volume, cm³ | 213.99 |
| Mass, g | 416.45 | Tot. B.P. | 80.0 | Mass, g | 436.92 |
| Moisture Content, % | 17.9 | Head, max. | 129.43 | Moisture Content, % | 23.73 |
| Dry Density, pcf | 102.8 | Head, min. | 129.43 | Dry Density, pcf | 102.97 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 25.23 | Volume Solids, cm³ | 128.41 |
| Volume Solids, cm³ | 128.41 | Min. Grad. | 25.23 | Volume Voids, cm³ | 85.59 |
| Volume Voids, cm³ | 85.95 | | | Void Ratio | 0.67 |
| Void Ratio | 0.67 | | | Saturation, % | 97.9% |
| Saturation, % | 73.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 416.45 | 445.48 |
| Wt Soil & Tare, f | g | 353.12 | 361.70 |
| Wt Tare | g | 0.00 | 8.69 |
| Wt Moisture Lost | g | 63.33 | 83.78 |
| Wt Dry Soil | g | 353.12 | 353.01 |
| Water Content | % | 17.94% | 23.73% |

Flow Pump Rate: 1.12E-04 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/08/18 | 43320 | 9 | 30 | 21.9 | 0 | 0 | 0 | 0 | 1.84 | 129.43 | 25.23 | 1.0E-07 |
| 08/08/18 | 43320 | 9 | 35 | 21.9 | 5 | 5 | 300 | 300 | 1.84 | 129.43 | 25.23 | 1.0E-07 |
| 08/08/18 | 43320 | 9 | 40 | 21.9 | 5 | 10 | 300 | 600 | 1.84 | 129.43 | 25.23 | 1.0E-07 |
| 08/08/18 | 43320 | 9 | 45 | 21.9 | 5 | 15 | 300 | 900 | 1.84 | 129.43 | 25.23 | 1.0E-07 * |
| 08/08/18 | 43320 | 9 | 50 | 21.9 | 5 | 20 | 300 | 1200 | 1.84 | 129.43 | 25.23 | 1.0E-07 * |
| 08/08/18 | 43320 | 9 | 55 | 21.9 | 5 | 25 | 300 | 1500 | 1.84 | 129.43 | 25.23 | 1.0E-07 * |
| 08/08/18 | 43320 | 10 | 0 | 21.9 | 5 | 30 | 300 | 1800 | 1.84 | 129.43 | 25.23 | 1.0E-07 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.0E-07 cm/sec **

| | |
|---|---|
| DATE | 8/8/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P1-14A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.120 | B-Value, f | 1.00 | Height, inches | 3.121 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.861 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 41.48 |
| Volume, cm³ | 328.92 | Top Pres. | 80.0 | Volume, cm³ | 328.79 |
| Mass, g | 660.65 | Tot. B.P. | 80.0 | Mass, g | 665.49 |
| Moisture Content, % | 21.2 | Head, max. | 166.71 | Moisture Content, % | 22.07 |
| Dry Density, pcf | 103.4 | Head, min. | 166.71 | Dry Density, pcf | 103.46 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 21.03 | Volume Solids, cm³ | 201.91 |
| Volume Solids, cm³ | 201.91 | Min. Grad. | 21.03 | Volume Voids, cm³ | 126.88 |
| Volume Voids, cm³ | 127.01 | | | Void Ratio | 0.63 |
| Void Ratio | 0.63 | | | Saturation, % | 94.8% |
| Saturation, % | 90.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 660.65 | 673.84 |
| Wt Soil & Tare, f | g | 545.16 | 553.53 |
| Wt Tare | g | 0.00 | 8.48 |
| Wt Moisture Lost | g | 115.49 | 120.31 |
| Wt Dry Soil | g | 545.16 | 545.05 |
| Water Content | % | 21.19% | 22.07% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/07/18 | 43319 | 13 | 45 | 21.2 | 0 | 0 | 0 | 0 | 2.37 | 166.71 | 21.03 | 2.5E-08 |
| 08/07/18 | 43319 | 13 | 50 | 21.2 | 5 | 5 | 300 | 300 | 2.37 | 166.71 | 21.03 | 2.5E-08 |
| 08/07/18 | 43319 | 13 | 55 | 21.2 | 5 | 10 | 300 | 600 | 2.37 | 166.71 | 21.03 | 2.5E-08 |
| 08/07/18 | 43319 | 14 | 0 | 21.2 | 5 | 15 | 300 | 900 | 2.37 | 166.71 | 21.03 | 2.5E-08 * |
| 08/07/18 | 43319 | 14 | 5 | 21.2 | 5 | 20 | 300 | 1200 | 2.37 | 166.71 | 21.03 | 2.5E-08 * |
| 08/07/18 | 43319 | 14 | 10 | 21.2 | 5 | 25 | 300 | 1500 | 2.37 | 166.71 | 21.03 | 2.5E-08 * |
| 08/07/18 | 43319 | 14 | 15 | 21.2 | 5 | 30 | 300 | 1800 | 2.37 | 166.71 | 21.03 | 2.5E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/7/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-1A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.142 | B-Value, f | 1.00 | Height, inches | 3.141 |
| Diameter, inches | 2.860 | Cell Pres. | 90.0 | Diameter, inches | 2.875 |
| Area, cm² | 41.45 | Bot. Pres. | 80.0 | Area, cm² | 41.88 |
| Volume, cm³ | 330.77 | Top Pres. | 80.0 | Volume, cm³ | 334.14 |
| Mass, g | 668.44 | Tot. B.P. | 80.0 | Mass, g | 685.58 |
| Moisture Content, % | 19.9 | Head, max. | 84.41 | Moisture Content, % | 22.96 |
| Dry Density, pcf | 105.2 | Head, min. | 84.41 | Dry Density, pcf | 104.12 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 10.58 | Volume Solids, cm³ | 206.51 |
| Volume Solids, cm³ | 206.51 | Min. Grad. | 10.58 | Volume Voids, cm³ | 127.64 |
| Volume Voids, cm³ | 124.26 | | | Void Ratio | 0.62 |
| Void Ratio | 0.60 | | | Saturation, % | 100.3% |
| Saturation, % | 89.2% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 668.44 | 775.30 |
| Wt Soil & Tare, f | g | 557.58 | 647.44 |
| Wt Tare | g | 0.00 | 90.49 |
| Wt Moisture Lost | g | 110.86 | 127.86 |
| Wt Dry Soil | g | 557.58 | 556.95 |
| Water Content | % | 19.88% | 22.96% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/02/18 | 43314 | 12 | 0 | 21.4 | 0 | 0 | 0 | 0 | 1.20 | 84.41 | 10.58 | 4.9E-08 | |
| 08/02/18 | 43314 | 12 | 5 | 21.4 | 5 | 5 | 300 | 300 | 1.20 | 84.41 | 10.58 | 4.9E-08 | |
| 08/02/18 | 43314 | 12 | 10 | 21.4 | 5 | 10 | 300 | 600 | 1.20 | 84.41 | 10.58 | 4.9E-08 | |
| 08/02/18 | 43314 | 12 | 15 | 21.4 | 5 | 15 | 300 | 900 | 1.20 | 84.41 | 10.58 | 4.9E-08 | * |
| 08/02/18 | 43314 | 12 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 1.20 | 84.41 | 10.58 | 4.9E-08 | * |
| 08/02/18 | 43314 | 12 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 1.20 | 84.41 | 10.58 | 4.9E-08 | * |
| 08/02/18 | 43314 | 12 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 1.20 | 84.41 | 10.58 | 4.9E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/2/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-2A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.113 | B-Value, f | 1.00 | Height, inches | 3.111 |
| Diameter, inches | 2.863 | Cell Pres. | 90.0 | Diameter, inches | 2.852 |
| Area, cm² | 41.53 | Bot. Pres. | 80.0 | Area, cm² | 41.22 |
| Volume, cm³ | 328.41 | Top Pres. | 80.0 | Volume, cm³ | 325.68 |
| Mass, g | 655.39 | Tot. B.P. | 80.0 | Mass, g | 657.09 |
| Moisture Content, % | 23.4 | Head, max. | 167.41 | Moisture Content, % | 23.75 |
| Dry Density, pcf | 100.9 | Head, min. | 167.41 | Dry Density, pcf | 101.73 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 21.19 | Volume Solids, cm³ | 196.66 |
| Volume Solids, cm³ | 196.66 | Min. Grad. | 21.19 | Volume Voids, cm³ | 129.02 |
| Volume Voids, cm³ | 131.75 | | | Void Ratio | 0.66 |
| Void Ratio | 0.67 | | | Saturation, % | 97.7% |
| Saturation, % | 94.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 655.39 | 873.98 |
| Wt Soil & Tare, f | g | 530.97 | 747.87 |
| Wt Tare | g | 0.00 | 216.93 |
| Wt Moisture Lost | g | 124.42 | 126.11 |
| Wt Dry Soil | g | 530.97 | 530.94 |
| Water Content | % | 23.43% | 23.75% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/02/18 | 43314 | 10 | 30 | 21.4 | 0 | 0 | 0 | 0 | 2.38 | 167.41 | 21.19 | 2.5E-08 | |
| 08/02/18 | 43314 | 10 | 35 | 21.4 | 5 | 5 | 300 | 300 | 2.38 | 167.41 | 21.19 | 2.5E-08 | |
| 08/02/18 | 43314 | 10 | 40 | 21.4 | 5 | 10 | 300 | 600 | 2.38 | 167.41 | 21.19 | 2.5E-08 | |
| 08/02/18 | 43314 | 10 | 45 | 21.4 | 5 | 15 | 300 | 900 | 2.38 | 167.41 | 21.19 | 2.5E-08 | * |
| 08/02/18 | 43314 | 10 | 50 | 21.4 | 5 | 20 | 300 | 1200 | 2.38 | 167.41 | 21.19 | 2.5E-08 | * |
| 08/02/18 | 43314 | 10 | 55 | 21.4 | 5 | 25 | 300 | 1500 | 2.38 | 167.41 | 21.19 | 2.5E-08 | * |
| 08/02/18 | 43314 | 11 | 0 | 21.4 | 5 | 30 | 300 | 1800 | 2.38 | 167.41 | 21.19 | 2.5E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/2/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

FLEXIBLE WALL PERMEABILITY

ASTM D 5084

METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 8 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-3A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.128 | B-Value, f | 1.00 | Height, inches | 3.123 |
| Diameter, inches | 2.855 | Cell Pres. | 90.0 | Diameter, inches | 2.852 |
| Area, cm² | 41.30 | Bot. Pres. | 80.0 | Area, cm² | 41.22 |
| Volume, cm³ | 328.15 | Top Pres. | 80.0 | Volume, cm³ | 326.94 |
| Mass, g | 609.38 | Tot. B.P. | 80.0 | Mass, g | 627.91 |
| Moisture Content, % | 23.9 | Head, max. | 108.32 | Moisture Content, % | 27.62 |
| Dry Density, pcf | 93.6 | Head, min. | 108.32 | Dry Density, pcf | 93.91 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 13.66 | Volume Solids, cm³ | 182.23 |
| Volume Solids, cm³ | 182.23 | Min. Grad. | 13.66 | Volume Voids, cm³ | 144.70 |
| Volume Voids, cm³ | 145.92 | | | Void Ratio | 0.79 |
| Void Ratio | 0.80 | | | Saturation, % | 93.9% |
| Saturation, % | 80.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 609.38 | 813.70 |
| Wt Soil & Tare, f | g | 492.03 | 677.85 |
| Wt Tare | g | 0.00 | 185.94 |
| Wt Moisture Lost | g | 117.35 | 135.85 |
| Wt Dry Soil | g | 492.03 | 491.91 |
| Water Content | % | 23.85% | 27.62% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/02/18 | 43314 | 11 | 0 | 21.4 | 0 | 0 | 0 | 0 | 1.54 | 108.32 | 13.66 | 3.9E-08 |
| 08/02/18 | 43314 | 11 | 5 | 21.4 | 5 | 5 | 300 | 300 | 1.54 | 108.32 | 13.66 | 3.9E-08 |
| 08/02/18 | 43314 | 11 | 10 | 21.4 | 5 | 10 | 300 | 600 | 1.54 | 108.32 | 13.66 | 3.9E-08 |
| 08/02/18 | 43314 | 11 | 15 | 21.4 | 5 | 15 | 300 | 900 | 1.54 | 108.32 | 13.66 | 3.9E-08 * |
| 08/02/18 | 43314 | 11 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 1.54 | 108.32 | 13.66 | 3.9E-08 * |
| 08/02/18 | 43314 | 11 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 1.54 | 108.32 | 13.66 | 3.9E-08 * |
| 08/02/18 | 43314 | 11 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 1.54 | 108.32 | 13.66 | 3.9E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/2/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 8 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-4A | - | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | DA | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.001 | B-Value, f | 1.00 | Height, inches | 1.977 |
| Diameter, inches | 2.853 | Cell Pres. | 90.0 | Diameter, inches | 2.838 |
| Area, cm² | 41.24 | Bot. Pres. | 80.0 | Area, cm² | 40.81 |
| Volume, cm³ | 209.62 | Top Pres. | 80.0 | Volume, cm³ | 204.94 |
| Mass, g | 405.05 | Tot. B.P. | 80.0 | Mass, g | 410.46 |
| Moisture Content, % | 23.7 | Head, max. | 141.38 | Moisture Content, % | 25.39 |
| Dry Density, pcf | 97.4 | Head, min. | 141.38 | Dry Density, pcf | 99.67 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 28.16 | Volume Solids, cm³ | 121.24 |
| Volume Solids, cm³ | 121.24 | Min. Grad. | 28.16 | Volume Voids, cm³ | 83.70 |
| Volume Voids, cm³ | 88.39 | | | Void Ratio | 0.69 |
| Void Ratio | 0.73 | | | Saturation, % | 99.3% |
| Saturation, % | 87.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 405.05 | 418.53 |
| Wt Soil & Tare, f | g | 327.34 | 335.51 |
| Wt Tare | g | 0.00 | 8.57 |
| Wt Moisture Lost | g | 77.71 | 83.02 |
| Wt Dry Soil | g | 327.34 | 326.94 |
| Water Content | % | 23.74% | 25.39% |

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/05/18 | 43317 | 13 | 20 | 20.1 | 0 | 0 | 0 | 0 | 2.01 | 141.38 | 28.16 | 1.0E-08 | |
| 08/05/18 | 43317 | 13 | 25 | 20.1 | 5 | 5 | 300 | 300 | 2.01 | 141.38 | 28.16 | 1.0E-08 | |
| 08/05/18 | 43317 | 13 | 30 | 20.1 | 5 | 10 | 300 | 600 | 2.01 | 141.38 | 28.16 | 1.0E-08 | |
| 08/05/18 | 43317 | 13 | 35 | 20.1 | 5 | 15 | 300 | 900 | 2.01 | 141.38 | 28.16 | 1.0E-08 | * |
| 08/05/18 | 43317 | 13 | 40 | 20.1 | 5 | 20 | 300 | 1200 | 2.01 | 141.38 | 28.16 | 1.0E-08 | * |
| 08/05/18 | 43317 | 13 | 45 | 20.1 | 5 | 25 | 300 | 1500 | 2.01 | 141.38 | 28.16 | 1.0E-08 | * |
| 08/05/18 | 43317 | 13 | 50 | 20.1 | 5 | 30 | 300 | 1800 | 2.01 | 141.38 | 28.16 | 1.0E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.0E-08 cm/sec **

| | |
|---|---|
| DATE | 8/5/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-5A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.111 | B-Value, f | 0.99 | Height, inches | 3.113 |
| Diameter, inches | 2.830 | Cell Pres. | 90.0 | Diameter, inches | 2.851 |
| Area, cm² | 40.58 | Bot. Pres. | 80.0 | Area, cm² | 41.19 |
| Volume, cm³ | 320.67 | Top Pres. | 80.0 | Volume, cm³ | 325.66 |
| Mass, g | 655.99 | Tot. B.P. | 80.0 | Mass, g | 661.84 |
| Moisture Content, % | 22.0 | Head, max. | 130.13 | Moisture Content, % | 23.12 |
| Dry Density, pcf | 104.6 | Head, min. | 130.13 | Dry Density, pcf | 103.00 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 16.46 | Volume Solids, cm³ | 199.09 |
| Volume Solids, cm³ | 199.09 | Min. Grad. | 16.46 | Volume Voids, cm³ | 126.57 |
| Volume Voids, cm³ | 121.58 | | | Void Ratio | 0.64 |
| Void Ratio | 0.61 | | | Saturation, % | 98.2% |
| Saturation, % | 97.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 655.99 | 669.98 |
| Wt Soil & Tare, f | g | 537.54 | 545.74 |
| Wt Tare | g | 0.00 | 8.44 |
| Wt Moisture Lost | g | 118.45 | 124.24 |
| Wt Dry Soil | g | 537.54 | 537.30 |
| Water Content | % | 22.03% | 23.12% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/06/18 | 43318 | 9 | 0 | 20.1 | 0 | 0 | 0 | 0 | 1.85 | 130.13 | 16.46 | 3.3E-08 |
| 08/06/18 | 43318 | 9 | 5 | 20.1 | 5 | 5 | 300 | 300 | 1.85 | 130.13 | 16.46 | 3.3E-08 |
| 08/06/18 | 43318 | 9 | 10 | 20.1 | 5 | 10 | 300 | 600 | 1.85 | 130.13 | 16.46 | 3.3E-08 |
| 08/06/18 | 43318 | 9 | 15 | 20.1 | 5 | 15 | 300 | 900 | 1.85 | 130.13 | 16.46 | 3.3E-08 * |
| 08/06/18 | 43318 | 9 | 20 | 20.1 | 5 | 20 | 300 | 1200 | 1.85 | 130.13 | 16.46 | 3.3E-08 * |
| 08/06/18 | 43318 | 9 | 25 | 20.1 | 5 | 25 | 300 | 1500 | 1.85 | 130.13 | 16.46 | 3.3E-08 * |
| 08/06/18 | 43318 | 9 | 30 | 20.1 | 5 | 30 | 300 | 1800 | 1.85 | 130.13 | 16.46 | 3.3E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.3E-08 cm/sec **

| | |
|---|---|
| DATE | 8/6/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 3 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P2-6A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | PWM |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 1.673 | B-Value, f | 0.98 |
| Diameter, inches | 2.851 | Cell Pres. | 90.0 |
| Area, cm² | 41.19 | Bot. Pres. | 80.0 |
| Volume, cm³ | 175.02 | Top Pres. | 80.0 |
| Mass, g | 348.46 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.7 | Head, max. | 89.33 |
| Dry Density, pcf | 101.2 | Head, min. | 89.33 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 21.11 |
| Volume Solids, cm³ | 103.25 | Min. Grad. | 21.11 |
| Volume Voids, cm³ | 71.77 | | |
| Void Ratio | 0.70 | | |
| Saturation, % | 89.9% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 1.666 |
| Diameter, inches | 2.852 |
| Area, cm² | 41.22 |
| Volume, cm³ | 174.41 |
| Mass, g | 354.03 |
| Moisture Content, % | 24.68 |
| Dry Density, pcf | 101.59 |
| Volume Solids, cm³ | 103.25 |
| Volume Voids, cm³ | 71.16 |
| Void Ratio | 0.69 |
| Saturation, % | 98.5% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 348.46 | 430.59 |
| Wt Soil & Tare, f | g | 283.94 | 360.56 |
| Wt Tare | g | 0.00 | 76.85 |
| Wt Moisture Lost | g | 64.52 | 70.03 |
| Wt Dry Soil | g | 283.94 | 283.71 |
| Water Content | % | 22.72% | 24.68% |

DESCRIPTION
-

Flow Pump Rate 2.25E-05 cm³/sec

USCS -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/06/18 | 43318 | 8 | 15 | 20.0 | 0 | 0 | 0 | 0 | 1.27 | 89.33 | 21.11 | 2.6E-08 |
| 08/06/18 | 43318 | 8 | 20 | 20.0 | 5 | 5 | 300 | 300 | 1.27 | 89.33 | 21.11 | 2.6E-08 |
| 08/06/18 | 43318 | 8 | 25 | 20.0 | 5 | 10 | 300 | 600 | 1.27 | 89.33 | 21.11 | 2.6E-08 |
| 08/06/18 | 43318 | 8 | 30 | 20.0 | 5 | 15 | 300 | 900 | 1.27 | 89.33 | 21.11 | 2.6E-08 * |
| 08/06/18 | 43318 | 8 | 35 | 20.0 | 5 | 20 | 300 | 1200 | 1.27 | 89.33 | 21.11 | 2.6E-08 * |
| 08/06/18 | 43318 | 8 | 40 | 20.0 | 5 | 25 | 300 | 1500 | 1.27 | 89.33 | 21.11 | 2.6E-08 * |
| 08/06/18 | 43318 | 8 | 45 | 20.0 | 5 | 30 | 300 | 1800 | 1.27 | 89.33 | 21.11 | 2.6E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.6E-08 cm/sec **

| | |
|---|---|
| DATE | 8/6/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 12 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-7A | - | Flow Pump Speed | 9 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.110 | B-Value, f | 0.99 | Height, inches | 3.112 |
| Diameter, inches | 2.867 | Cell Pres. | 90.0 | Diameter, inches | 2.861 |
| Area, cm² | 41.65 | Bot. Pres. | 80.0 | Area, cm² | 41.48 |
| Volume, cm³ | 329.01 | Top Pres. | 80.0 | Volume, cm³ | 327.84 |
| Mass, g | 657.21 | Tot. B.P. | 80.0 | Mass, g | 661.15 |
| Moisture Content, % | 22.4 | Head, max. | 171.63 | Moisture Content, % | 23.12 |
| Dry Density, pcf | 101.8 | Head, min. | 171.63 | Dry Density, pcf | 102.21 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 21.71 | Volume Solids, cm³ | 198.88 |
| Volume Solids, cm³ | 198.88 | Min. Grad. | 21.71 | Volume Voids, cm³ | 128.96 |
| Volume Voids, cm³ | 130.13 | | | Void Ratio | 0.65 |
| Void Ratio | 0.65 | | | Saturation, % | 96.3% |
| Saturation, % | 92.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 657.21 | 756.58 |
| Wt Soil & Tare, f | g | 536.98 | 631.48 |
| Wt Tare | g | 0.00 | 90.46 |
| Wt Moisture Lost | g | 120.23 | 125.10 |
| Wt Dry Soil | g | 536.98 | 541.02 |
| Water Content | % | 22.39% | 23.12% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/06/18 | 43318 | 10 | 45 | 20.5 | 0 | 0 | 0 | 0 | 2.44 | 171.63 | 21.71 | 4.7E-08 | |
| 08/06/18 | 43318 | 10 | 50 | 20.5 | 5 | 5 | 300 | 300 | 2.44 | 171.63 | 21.71 | 4.7E-08 | |
| 08/06/18 | 43318 | 10 | 55 | 20.5 | 5 | 10 | 300 | 600 | 2.44 | 171.63 | 21.71 | 4.7E-08 | |
| 08/06/18 | 43318 | 11 | 0 | 20.5 | 5 | 15 | 300 | 900 | 2.44 | 171.63 | 21.71 | 4.7E-08 | * |
| 08/06/18 | 43318 | 11 | 5 | 20.5 | 5 | 20 | 300 | 1200 | 2.44 | 171.63 | 21.71 | 4.7E-08 | * |
| 08/06/18 | 43318 | 11 | 10 | 20.5 | 5 | 25 | 300 | 1500 | 2.44 | 171.63 | 21.71 | 4.7E-08 | * |
| 08/06/18 | 43318 | 11 | 15 | 20.5 | 5 | 30 | 300 | 1800 | 2.44 | 171.63 | 21.71 | 4.7E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/6/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 15 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P2-8A - | Flow Pump Speed | 9 |
| SAMPLE TYPE | UD | Technician | PWM |

COMMENTS

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.007 | B-Value, f | 1.00 | Height, inches | 3.026 |
| Diameter, inches | 2.868 | Cell Pres. | 90.0 | Diameter, inches | 2.862 |
| Area, cm² | 41.68 | Bot. Pres. | 80.0 | Area, cm² | 41.50 |
| Volume, cm³ | 318.33 | Top Pres. | 80.0 | Volume, cm³ | 319.01 |
| Mass, g | 650.13 | Tot. B.P. | 80.0 | Mass, g | 660.76 |
| Moisture Content, % | 20.2 | Head, max. | 129.43 | Moisture Content, % | 22.16 |
| Dry Density, pcf | 106.0 | Head, min. | 129.43 | Dry Density, pcf | 105.80 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 16.84 | Volume Solids, cm³ | 196.68 |
| Volume Solids, cm³ | 196.68 | Min. Grad. | 16.84 | Volume Voids, cm³ | 122.32 |
| Volume Voids, cm³ | 121.65 | | | Void Ratio | 0.62 |
| Void Ratio | 0.62 | | | Saturation, % | 98.0% |
| Saturation, % | 89.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 650.13 | 668.87 |
| Wt Soil & Tare, f | g | 540.88 | 549.07 |
| Wt Tare | g | 0.00 | 8.56 |
| Wt Moisture Lost | g | 109.25 | 119.80 |
| Wt Dry Soil | g | 540.88 | 540.51 |
| Water Content | % | 20.20% | 22.16% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/06/18 | 43318 | 9 | 45 | 20.3 | 0 | 0 | 0 | 0 | 1.84 | 129.43 | 16.84 | 6.1E-08 |
| 08/06/18 | 43318 | 9 | 50 | 20.3 | 5 | 5 | 300 | 300 | 1.84 | 129.43 | 16.84 | 6.1E-08 |
| 08/06/18 | 43318 | 9 | 55 | 20.3 | 5 | 10 | 300 | 600 | 1.84 | 129.43 | 16.84 | 6.1E-08 |
| 08/06/18 | 43318 | 10 | 0 | 20.3 | 5 | 15 | 300 | 900 | 1.84 | 129.43 | 16.84 | 6.1E-08 * |
| 08/06/18 | 43318 | 10 | 5 | 20.3 | 5 | 20 | 300 | 1200 | 1.84 | 129.43 | 16.84 | 6.1E-08 * |
| 08/06/18 | 43318 | 10 | 10 | 20.3 | 5 | 25 | 300 | 1500 | 1.84 | 129.43 | 16.84 | 6.1E-08 * |
| 08/06/18 | 43318 | 10 | 15 | 20.3 | 5 | 30 | 300 | 1800 | 1.84 | 129.43 | 16.84 | 6.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 6.1E-08 cm/sec **

| | |
|---|---|
| DATE | 8/6/18 |
| CHECK | MJM |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-9A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.123 | B-Value, f | 1.00 | Height, inches | 3.122 |
| Diameter, inches | 2.871 | Cell Pres. | 90.0 | Diameter, inches | 2.862 |
| Area, cm² | 41.77 | Bot. Pres. | 80.0 | Area, cm² | 41.50 |
| Volume, cm³ | 331.31 | Top Pres. | 80.0 | Volume, cm³ | 329.13 |
| Mass, g | 654.38 | Tot. B.P. | 80.0 | Mass, g | 661.11 |
| Moisture Content, % | 23.0 | Head, max. | 147.71 | Moisture Content, % | 24.24 |
| Dry Density, pcf | 100.2 | Head, min. | 147.71 | Dry Density, pcf | 100.88 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 18.63 | Volume Solids, cm³ | 197.08 |
| Volume Solids, cm³ | 197.08 | Min. Grad. | 18.63 | Volume Voids, cm³ | 132.05 |
| Volume Voids, cm³ | 134.23 | | | Void Ratio | 0.67 |
| Void Ratio | 0.68 | | | Saturation, % | 97.7% |
| Saturation, % | 91.1% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 654.38 | 669.69 |
| Wt Soil & Tare, f | g | 532.11 | 540.72 |
| Wt Tare | g | 0.00 | 8.72 |
| Wt Moisture Lost | g | 122.27 | 128.97 |
| Wt Dry Soil | g | 532.11 | 532.00 |
| Water Content | % | 22.98% | 24.24% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/07/18 | 43319 | 10 | 30 | 20.6 | 0 | 0 | 0 | 0 | 2.10 | 147.71 | 18.63 | 2.9E-08 | |
| 08/07/18 | 43319 | 10 | 35 | 20.6 | 5 | 5 | 300 | 300 | 2.10 | 147.71 | 18.63 | 2.9E-08 | |
| 08/07/18 | 43319 | 10 | 40 | 20.6 | 5 | 10 | 300 | 600 | 2.10 | 147.71 | 18.63 | 2.9E-08 | |
| 08/07/18 | 43319 | 10 | 45 | 20.6 | 5 | 15 | 300 | 900 | 2.10 | 147.71 | 18.63 | 2.9E-08 | * |
| 08/07/18 | 43319 | 10 | 50 | 20.6 | 5 | 20 | 300 | 1200 | 2.10 | 147.71 | 18.63 | 2.9E-08 | * |
| 08/07/18 | 43319 | 10 | 55 | 20.6 | 5 | 25 | 300 | 1500 | 2.10 | 147.71 | 18.63 | 2.9E-08 | * |
| 08/07/18 | 43319 | 11 | 0 | 20.6 | 5 | 30 | 300 | 1800 | 2.10 | 147.71 | 18.63 | 2.9E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/7/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 4 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-10A | - | Flow Pump Speed | 9 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.111 | B-Value, f | 0.99 | Height, inches | 3.115 |
| Diameter, inches | 2.857 | Cell Pres. | 90.0 | Diameter, inches | 2.874 |
| Area, cm² | 41.36 | Bot. Pres. | 80.0 | Area, cm² | 41.85 |
| Volume, cm³ | 326.82 | Top Pres. | 80.0 | Volume, cm³ | 331.15 |
| Mass, g | 668.50 | Tot. B.P. | 80.0 | Mass, g | 674.56 |
| Moisture Content, % | 22.0 | Head, max. | 189.21 | Moisture Content, % | 23.10 |
| Dry Density, pcf | 104.6 | Head, min. | 189.21 | Dry Density, pcf | 103.26 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 23.91 | Volume Solids, cm³ | 202.96 |
| Volume Solids, cm³ | 202.96 | Min. Grad. | 23.91 | Volume Voids, cm³ | 128.19 |
| Volume Voids, cm³ | 123.86 | | | Void Ratio | 0.63 |
| Void Ratio | 0.61 | | | Saturation, % | 98.7% |
| Saturation, % | 97.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 668.50 | 893.76 |
| Wt Soil & Tare, f | g | 547.98 | 767.23 |
| Wt Tare | g | 0.00 | 219.44 |
| Wt Moisture Lost | g | 120.52 | 126.53 |
| Wt Dry Soil | g | 547.98 | 547.79 |
| Water Content | % | 21.99% | 23.10% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/08/18 | 43320 | 8 | 45 | 21.7 | 0 | 0 | 0 | 0 | 2.69 | 189.21 | 23.91 | 4.1E-08 | |
| 08/08/18 | 43320 | 8 | 50 | 21.7 | 5 | 5 | 300 | 300 | 2.69 | 189.21 | 23.91 | 4.1E-08 | |
| 08/08/18 | 43320 | 8 | 55 | 21.7 | 5 | 10 | 300 | 600 | 2.69 | 189.21 | 23.91 | 4.1E-08 | |
| 08/08/18 | 43320 | 9 | 0 | 21.7 | 5 | 15 | 300 | 900 | 2.69 | 189.21 | 23.91 | 4.1E-08 | * |
| 08/08/18 | 43320 | 9 | 5 | 21.7 | 5 | 20 | 300 | 1200 | 2.69 | 189.21 | 23.91 | 4.1E-08 | * |
| 08/08/18 | 43320 | 9 | 10 | 21.7 | 5 | 25 | 300 | 1500 | 2.69 | 189.21 | 23.91 | 4.1E-08 | * |
| 08/08/18 | 43320 | 9 | 15 | 21.7 | 5 | 30 | 300 | 1800 | 2.69 | 189.21 | 23.91 | 4.1E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.1E-08 cm/sec **

| | |
|---|---|
| DATE | 8/8/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 2 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-11A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.122 | B-Value, f | 1.00 | Height, inches | 3.124 |
| Diameter, inches | 2.860 | Cell Pres. | 90.0 | Diameter, inches | 2.865 |
| Area, cm² | 41.45 | Bot. Pres. | 80.0 | Area, cm² | 41.59 |
| Volume, cm³ | 328.67 | Top Pres. | 80.0 | Volume, cm³ | 330.03 |
| Mass, g | 669.42 | Tot. B.P. | 80.0 | Mass, g | 675.48 |
| Moisture Content, % | 22.2 | Head, max. | 117.47 | Moisture Content, % | 23.31 |
| Dry Density, pcf | 104.0 | Head, min. | 117.47 | Dry Density, pcf | 103.58 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 14.80 | Volume Solids, cm³ | 202.89 |
| Volume Solids, cm³ | 202.89 | Min. Grad. | 14.80 | Volume Voids, cm³ | 127.14 |
| Volume Voids, cm³ | 125.78 | | | Void Ratio | 0.63 |
| Void Ratio | 0.62 | | | Saturation, % | 100.0% |
| Saturation, % | 96.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 669.42 | 683.59 |
| Wt Soil & Tare, f | g | 547.81 | 555.95 |
| Wt Tare | g | 0.00 | 8.28 |
| Wt Moisture Lost | g | 121.61 | 127.64 |
| Wt Dry Soil | g | 547.81 | 547.67 |
| Water Content | % | 22.20% | 23.31% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/08/18 | 43320 | 10 | 15 | 22.0 | 0 | 0 | 0 | 0 | 1.67 | 117.47 | 14.80 | 3.5E-08 | |
| 08/08/18 | 43320 | 10 | 20 | 22.0 | 5 | 5 | 300 | 300 | 1.67 | 117.47 | 14.80 | 3.5E-08 | |
| 08/08/18 | 43320 | 10 | 25 | 22.0 | 5 | 10 | 300 | 600 | 1.67 | 117.47 | 14.80 | 3.5E-08 | |
| 08/08/18 | 43320 | 10 | 30 | 22.0 | 5 | 15 | 300 | 900 | 1.67 | 117.47 | 14.80 | 3.5E-08 | * |
| 08/08/18 | 43320 | 10 | 35 | 22.0 | 5 | 20 | 300 | 1200 | 1.67 | 117.47 | 14.80 | 3.5E-08 | * |
| 08/08/18 | 43320 | 10 | 40 | 22.0 | 5 | 25 | 300 | 1500 | 1.67 | 117.47 | 14.80 | 3.5E-08 | * |
| 08/08/18 | 43320 | 10 | 45 | 22.0 | 5 | 30 | 300 | 1800 | 1.67 | 117.47 | 14.80 | 3.5E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/8/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-12A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.124 | B-Value, f | 1.00 | Height, inches | 3.132 |
| Diameter, inches | 2.839 | Cell Pres. | 90.0 | Diameter, inches | 2.836 |
| Area, cm² | 40.84 | Bot. Pres. | 80.0 | Area, cm² | 40.75 |
| Volume, $cm^3$ | 324.07 | Top Pres. | 80.0 | Volume, $cm^3$ | 324.21 |
| Mass, g | 658.05 | Tot. B.P. | 80.0 | Mass, g | 669.68 |
| Moisture Content, % | 19.2 | Head, max. | 133.65 | Moisture Content, % | 21.33 |
| Dry Density, pcf | 106.3 | Head, min. | 133.65 | Dry Density, pcf | 106.23 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 16.80 | Volume Solids, $cm^3$ | 204.42 |
| Volume Solids, $cm^3$ | 204.42 | Min. Grad. | 16.80 | Volume Voids, $cm^3$ | 119.79 |
| Volume Voids, $cm^3$ | 119.65 | | | Void Ratio | 0.59 |
| Void Ratio | 0.59 | | | Saturation, % | 98.3% |
| Saturation, % | 88.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 658.05 | 677.70 |
| Wt Soil & Tare, f | g | 551.93 | 560.03 |
| Wt Tare | g | 0.00 | 8.45 |
| Wt Moisture Lost | g | 106.12 | 117.67 |
| Wt Dry Soil | g | 551.93 | 551.58 |
| Water Content | % | 19.23% | 21.33% |

Flow Pump Rate: 2.25E-05 $cm^3$/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/08/18 | 43320 | 12 | 40 | 21.8 | 0 | 0 | 0 | 0 | 1.90 | 133.65 | 16.80 | 3.1E-08 |
| 08/08/18 | 43320 | 12 | 45 | 21.8 | 5 | 5 | 300 | 300 | 1.90 | 133.65 | 16.80 | 3.1E-08 |
| 08/08/18 | 43320 | 12 | 50 | 21.8 | 5 | 10 | 300 | 600 | 1.90 | 133.65 | 16.80 | 3.1E-08 |
| 08/08/18 | 43320 | 12 | 55 | 21.8 | 5 | 15 | 300 | 900 | 1.90 | 133.65 | 16.80 | 3.1E-08 * |
| 08/08/18 | 43320 | 13 | 0 | 21.8 | 5 | 20 | 300 | 1200 | 1.90 | 133.65 | 16.80 | 3.1E-08 * |
| 08/08/18 | 43320 | 13 | 5 | 21.8 | 5 | 25 | 300 | 1500 | 1.90 | 133.65 | 16.80 | 3.1E-08 * |
| 08/08/18 | 43320 | 13 | 10 | 21.8 | 5 | 30 | 300 | 1800 | 1.90 | 133.65 | 16.80 | 3.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.1E-08 cm/sec **

| | |
|---|---|
| DATE | 8/8/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 7 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-13A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.107 | B-Value, f | 1.00 | Height, inches | 3.107 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.865 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 41.59 |
| Volume, cm³ | 327.55 | Top Pres. | 80.0 | Volume, cm³ | 328.23 |
| Mass, g | 660.32 | Tot. B.P. | 80.0 | Mass, g | 684.07 |
| Moisture Content, % | 18.2 | Head, max. | 171.63 | Moisture Content, % | 22.46 |
| Dry Density, pcf | 106.4 | Head, min. | 171.63 | Dry Density, pcf | 106.20 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 21.75 | Volume Solids, cm³ | 203.13 |
| Volume Solids, cm³ | 203.13 | Min. Grad. | 21.75 | Volume Voids, cm³ | 125.10 |
| Volume Voids, cm³ | 124.42 | | | Void Ratio | 0.62 |
| Void Ratio | 0.61 | | | Saturation, % | 100.0% |
| Saturation, % | 81.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 660.32 | 774.44 |
| Wt Soil & Tare, f | g | 558.61 | 648.99 |
| Wt Tare | g | 0.00 | 90.45 |
| Wt Moisture Lost | g | 101.71 | 125.45 |
| Wt Dry Soil | g | 558.61 | 558.54 |
| Water Content | % | 18.21% | 22.46% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/08/18 | 43320 | 12 | 0 | 21.8 | 0 | 0 | 0 | 0 | 2.44 | 171.63 | 21.75 | 2.4E-08 | |
| 08/08/18 | 43320 | 12 | 5 | 21.8 | 5 | 5 | 300 | 300 | 2.44 | 171.63 | 21.75 | 2.4E-08 | |
| 08/08/18 | 43320 | 12 | 10 | 21.8 | 5 | 10 | 300 | 600 | 2.44 | 171.63 | 21.75 | 2.4E-08 | |
| 08/08/18 | 43320 | 12 | 15 | 21.8 | 5 | 15 | 300 | 900 | 2.44 | 171.63 | 21.75 | 2.4E-08 | * |
| 08/08/18 | 43320 | 12 | 20 | 21.8 | 5 | 20 | 300 | 1200 | 2.44 | 171.63 | 21.75 | 2.4E-08 | * |
| 08/08/18 | 43320 | 12 | 25 | 21.8 | 5 | 25 | 300 | 1500 | 2.44 | 171.63 | 21.75 | 2.4E-08 | * |
| 08/08/18 | 43320 | 12 | 30 | 21.8 | 5 | 30 | 300 | 1800 | 2.44 | 171.63 | 21.75 | 2.4E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.4E-08 cm/sec **

| | |
|---|---|
| DATE | 8/8/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 4 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P2-14A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.103 | B-Value, f | 1.00 | Height, inches | 3.101 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 | Diameter, inches | 2.811 |
| Area, cm² | 41.10 | Bot. Pres. | 80.0 | Area, cm² | 40.04 |
| Volume, cm³ | 323.93 | Top Pres. | 80.0 | Volume, cm³ | 315.37 |
| Mass, g | 660.15 | Tot. B.P. | 80.0 | Mass, g | 644.17 |
| Moisture Content, % | 27.1 | Head, max. | 155.45 | Moisture Content, % | 24.02 |
| Dry Density, pcf | 100.1 | Head, min. | 155.45 | Dry Density, pcf | 102.77 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 19.74 | Volume Solids, cm³ | 188.87 |
| Volume Solids, cm³ | 188.87 | Min. Grad. | 19.74 | Volume Voids, cm³ | 126.49 |
| Volume Voids, cm³ | 135.06 | | | Void Ratio | 0.67 |
| Void Ratio | 0.72 | | | Saturation, % | 100.0% |
| Saturation, % | 100.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 660.15 | 651.67 |
| Wt Soil & Tare, f | g | 519.40 | 527.09 |
| Wt Tare | g | 0.00 | 8.49 |
| Wt Moisture Lost | g | 140.75 | 124.58 |
| Wt Dry Soil | g | 519.40 | 518.60 |
| Water Content | % | 27.10% | 24.02% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/09/18 | 43321 | 8 | 0 | 20.2 | 0 | 0 | 0 | 0 | 2.21 | 155.45 | 19.74 | 2.8E-08 |
| 08/09/18 | 43321 | 8 | 5 | 20.2 | 5 | 5 | 300 | 300 | 2.21 | 155.45 | 19.74 | 2.8E-08 |
| 08/09/18 | 43321 | 8 | 10 | 20.2 | 5 | 10 | 300 | 600 | 2.21 | 155.45 | 19.74 | 2.8E-08 |
| 08/09/18 | 43321 | 8 | 15 | 20.2 | 5 | 15 | 300 | 900 | 2.21 | 155.45 | 19.74 | 2.8E-08 * |
| 08/09/18 | 43321 | 8 | 20 | 20.2 | 5 | 20 | 300 | 1200 | 2.21 | 155.45 | 19.74 | 2.8E-08 * |
| 08/09/18 | 43321 | 8 | 25 | 20.2 | 5 | 25 | 300 | 1500 | 2.21 | 155.45 | 19.74 | 2.8E-08 * |
| 08/09/18 | 43321 | 8 | 30 | 20.2 | 5 | 30 | 300 | 1800 | 2.21 | 155.45 | 19.74 | 2.8E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.8E-08 cm/sec **

| | |
|---|---|
| DATE | 8/9/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 5 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-1A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.113 | B-Value, f | 0.99 | Height, inches | 3.117 |
| Diameter, inches | 2.845 | Cell Pres. | 90.0 | Diameter, inches | 2.839 |
| Area, cm² | 41.01 | Bot. Pres. | 80.0 | Area, cm² | 40.84 |
| Volume, $cm^3$ | 324.29 | Top Pres. | 80.0 | Volume, $cm^3$ | 323.34 |
| Mass, g | 655.45 | Tot. B.P. | 80.0 | Mass, g | 663.47 |
| Moisture Content, % | 23.0 | Head, max. | 101.99 | Moisture Content, % | 24.55 |
| Dry Density, pcf | 102.5 | Head, min. | 101.99 | Dry Density, pcf | 102.80 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 12.88 | Volume Solids, $cm^3$ | 193.70 |
| Volume Solids, $cm^3$ | 193.70 | Min. Grad. | 12.88 | Volume Voids, $cm^3$ | 129.64 |
| Volume Voids, $cm^3$ | 130.59 | | | Void Ratio | 0.67 |
| Void Ratio | 0.67 | | | Saturation, % | 100.0% |
| Saturation, % | 94.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 655.45 | 879.11 |
| Wt Soil & Tare, f | g | 532.69 | 748.57 |
| Wt Tare | g | 0.00 | 216.88 |
| Wt Moisture Lost | g | 122.76 | 130.54 |
| Wt Dry Soil | g | 532.69 | 531.69 |
| Water Content | % | 23.05% | 24.55% |

Flow Pump Rate: 2.25E-05 $cm^3$/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/09/18 | 43321 | 10 | 45 | 20.9 | 0 | 0 | 0 | 0 | 1.45 | 101.99 | 12.88 | 4.2E-08 |
| 08/09/18 | 43321 | 10 | 50 | 20.9 | 5 | 5 | 300 | 300 | 1.45 | 101.99 | 12.88 | 4.2E-08 |
| 08/09/18 | 43321 | 10 | 55 | 20.9 | 5 | 10 | 300 | 600 | 1.45 | 101.99 | 12.88 | 4.2E-08 |
| 08/09/18 | 43321 | 11 | 0 | 20.9 | 5 | 15 | 300 | 900 | 1.45 | 101.99 | 12.88 | 4.2E-08 * |
| 08/09/18 | 43321 | 11 | 5 | 20.9 | 5 | 20 | 300 | 1200 | 1.45 | 101.99 | 12.88 | 4.2E-08 * |
| 08/09/18 | 43321 | 11 | 10 | 20.9 | 5 | 25 | 300 | 1500 | 1.45 | 101.99 | 12.88 | 4.2E-08 * |
| 08/09/18 | 43321 | 11 | 15 | 20.9 | 5 | 30 | 300 | 1800 | 1.45 | 101.99 | 12.88 | 4.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.2E-08 cm/sec **

| | |
|---|---|
| DATE | 8/9/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-2A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.097 | B-Value, f | 1.00 | Height, inches | 3.105 |
| Diameter, inches | 2.835 | Cell Pres. | 90.0 | Diameter, inches | 2.864 |
| Area, cm² | 40.73 | Bot. Pres. | 80.0 | Area, cm² | 41.56 |
| Volume, cm³ | 320.36 | Top Pres. | 80.0 | Volume, cm³ | 327.79 |
| Mass, g | 663.62 | Tot. B.P. | 80.0 | Mass, g | 668.20 |
| Moisture Content, % | 21.8 | Head, max. | 151.23 | Moisture Content, % | 22.66 |
| Dry Density, pcf | 106.1 | Head, min. | 151.23 | Dry Density, pcf | 103.70 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 19.18 | Volume Solids, cm³ | 198.09 |
| Volume Solids, cm³ | 198.09 | Min. Grad. | 19.18 | Volume Voids, cm³ | 129.70 |
| Volume Voids, cm³ | 122.27 | | | Void Ratio | 0.65 |
| Void Ratio | 0.62 | | | Saturation, % | 100.0% |
| Saturation, % | 97.2% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 663.62 | 676.63 |
| Wt Soil & Tare, f | g | 544.75 | 553.19 |
| Wt Tare | g | 0.00 | 8.51 |
| Wt Moisture Lost | g | 118.87 | 123.44 |
| Wt Dry Soil | g | 544.75 | 544.68 |
| Water Content | % | 21.82% | 22.66% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/09/18 | 43321 | 11 | 30 | 21.1 | 0 | 0 | 0 | 0 | 2.15 | 151.23 | 19.18 | 2.7E-08 |
| 08/09/18 | 43321 | 11 | 35 | 21.1 | 5 | 5 | 300 | 300 | 2.15 | 151.23 | 19.18 | 2.7E-08 |
| 08/09/18 | 43321 | 11 | 40 | 21.1 | 5 | 10 | 300 | 600 | 2.15 | 151.23 | 19.18 | 2.7E-08 |
| 08/09/18 | 43321 | 11 | 45 | 21.1 | 5 | 15 | 300 | 900 | 2.15 | 151.23 | 19.18 | 2.7E-08 * |
| 08/09/18 | 43321 | 11 | 50 | 21.1 | 5 | 20 | 300 | 1200 | 2.15 | 151.23 | 19.18 | 2.7E-08 * |
| 08/09/18 | 43321 | 11 | 55 | 21.1 | 5 | 25 | 300 | 1500 | 2.15 | 151.23 | 19.18 | 2.7E-08 * |
| 08/09/18 | 43321 | 12 | 0 | 21.1 | 5 | 30 | 300 | 1800 | 2.15 | 151.23 | 19.18 | 2.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/9/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-3A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | PWM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.124 | B-Value, f | 0.98 | Height, inches | 3.134 |
| Diameter, inches | 2.854 | Cell Pres. | 90.0 | Diameter, inches | 2.875 |
| Area, cm² | 41.27 | Bot. Pres. | 80.0 | Area, cm² | 41.88 |
| Volume, cm³ | 327.50 | Top Pres. | 80.0 | Volume, cm³ | 333.40 |
| Mass, g | 664.84 | Tot. B.P. | 80.0 | Mass, g | 675.36 |
| Moisture Content, % | 19.4 | Head, max. | 208.21 | Moisture Content, % | 21.27 |
| Dry Density, pcf | 106.1 | Head, min. | 208.21 | Dry Density, pcf | 104.23 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 26.16 | Volume Solids, cm³ | 202.51 |
| Volume Solids, cm³ | 202.51 | Min. Grad. | 26.16 | Volume Voids, cm³ | 130.89 |
| Volume Voids, cm³ | 124.99 | | | Void Ratio | 0.65 |
| Void Ratio | 0.62 | | | Saturation, % | 100.0% |
| Saturation, % | 86.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 664.84 | 683.40 |
| Wt Soil & Tare, f | g | 556.89 | 564.99 |
| Wt Tare | g | 0.00 | 8.38 |
| Wt Moisture Lost | g | 107.95 | 118.41 |
| Wt Dry Soil | g | 556.89 | 556.61 |
| Water Content | % | 19.38% | 21.27% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/09/18 | 43321 | 12 | 30 | 21.2 | 0 | 0 | 0 | 0 | 2.96 | 208.21 | 26.16 | 2.0E-08 | |
| 08/09/18 | 43321 | 12 | 35 | 21.2 | 5 | 5 | 300 | 300 | 2.96 | 208.21 | 26.16 | 2.0E-08 | |
| 08/09/18 | 43321 | 12 | 40 | 21.2 | 5 | 10 | 300 | 600 | 2.96 | 208.21 | 26.16 | 2.0E-08 | |
| 08/09/18 | 43321 | 12 | 45 | 21.2 | 5 | 15 | 300 | 900 | 2.96 | 208.21 | 26.16 | 2.0E-08 | * |
| 08/09/18 | 43321 | 12 | 50 | 21.2 | 5 | 20 | 300 | 1200 | 2.96 | 208.21 | 26.16 | 2.0E-08 | * |
| 08/09/18 | 43321 | 12 | 55 | 21.2 | 5 | 25 | 300 | 1500 | 2.96 | 208.21 | 26.16 | 2.0E-08 | * |
| 08/09/18 | 43321 | 13 | 0 | 21.2 | 5 | 30 | 300 | 1800 | 2.96 | 208.21 | 26.16 | 2.0E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.0E-08 cm/sec **

| | |
|---|---|
| DATE | 8/9/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 8 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P3-4A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | PWM |

COMMENTS

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.087 | B-Value, f | 0.99 | Height, inches | 3.084 |
| Diameter, inches | 2.852 | Cell Pres. | 90.0 | Diameter, inches | 2.849 |
| Area, cm² | 41.22 | Bot. Pres. | 80.0 | Area, cm² | 41.13 |
| Volume, cm³ | 323.17 | Top Pres. | 80.0 | Volume, cm³ | 322.17 |
| Mass, g | 665.17 | Tot. B.P. | 80.0 | Mass, g | 684.78 |
| Moisture Content, % | 18.7 | Head, max. | 118.17 | Moisture Content, % | 22.16 |
| Dry Density, pcf | 108.2 | Head, min. | 118.17 | Dry Density, pcf | 108.57 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 15.09 | Volume Solids, cm³ | 203.84 |
| Volume Solids, cm³ | 203.84 | Min. Grad. | 15.09 | Volume Voids, cm³ | 118.33 |
| Volume Voids, cm³ | 119.32 | | | Void Ratio | 0.58 |
| Void Ratio | 0.59 | | | Saturation, % | 100.0% |
| Saturation, % | 87.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 665.17 | 693.14 |
| Wt Soil & Tare, f | g | 560.57 | 568.96 |
| Wt Tare | g | 0.00 | 8.53 |
| Wt Moisture Lost | g | 104.60 | 124.18 |
| Wt Dry Soil | g | 560.57 | 560.43 |
| Water Content | % | 18.66% | 22.16% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/09/18 | 43321 | 13 | 0 | 21.2 | 0 | 0 | 0 | 0 | 1.68 | 118.17 | 15.09 | 3.5E-08 |
| 08/09/18 | 43321 | 13 | 5 | 21.2 | 5 | 5 | 300 | 300 | 1.68 | 118.17 | 15.09 | 3.5E-08 |
| 08/09/18 | 43321 | 13 | 10 | 21.2 | 5 | 10 | 300 | 600 | 1.68 | 118.17 | 15.09 | 3.5E-08 |
| 08/09/18 | 43321 | 13 | 15 | 21.2 | 5 | 15 | 300 | 900 | 1.68 | 118.17 | 15.09 | 3.5E-08 * |
| 08/09/18 | 43321 | 13 | 20 | 21.2 | 5 | 20 | 300 | 1200 | 1.68 | 118.17 | 15.09 | 3.5E-08 * |
| 08/09/18 | 43321 | 13 | 25 | 21.2 | 5 | 25 | 300 | 1500 | 1.68 | 118.17 | 15.09 | 3.5E-08 * |
| 08/09/18 | 43321 | 13 | 30 | 21.2 | 5 | 30 | 300 | 1800 | 1.68 | 118.17 | 15.09 | 3.5E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/9/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-5A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | DA | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.123 | B-Value, f | 1.00 | Height, inches | 3.129 |
| Diameter, inches | 2.849 | Cell Pres. | 90.0 | Diameter, inches | 2.883 |
| Area, cm² | 41.13 | Bot. Pres. | 80.0 | Area, cm² | 42.12 |
| Volume, $cm^3$ | 326.25 | Top Pres. | 80.0 | Volume, $cm^3$ | 334.72 |
| Mass, g | 664.67 | Tot. B.P. | 80.0 | Mass, g | 675.78 |
| Moisture Content, % | 21.6 | Head, max. | 176.55 | Moisture Content, % | 23.67 |
| Dry Density, pcf | 104.5 | Head, min. | 176.55 | Dry Density, pcf | 101.87 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 22.21 | Volume Solids, $cm^3$ | 202.39 |
| Volume Solids, $cm^3$ | 202.39 | Min. Grad. | 22.21 | Volume Voids, $cm^3$ | 132.33 |
| Volume Voids, $cm^3$ | 123.86 | | | Void Ratio | 0.65 |
| Void Ratio | 0.61 | | | Saturation, % | 97.7% |
| Saturation, % | 95.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 664.67 | 683.94 |
| Wt Soil & Tare, f | g | 546.45 | 554.69 |
| Wt Tare | g | 0.00 | 8.58 |
| Wt Moisture Lost | g | 118.22 | 129.25 |
| Wt Dry Soil | g | 546.45 | 546.11 |
| Water Content | % | 21.63% | 23.67% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 $cm^3$/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/12/18 | 43324 | 16 | 30 | 20.9 | 0 | 0 | 0 | 0 | 2.51 | 176.55 | 22.21 | 2.4E-08 |
| 08/12/18 | 43324 | 16 | 35 | 20.9 | 5 | 5 | 300 | 300 | 2.51 | 176.55 | 22.21 | 2.4E-08 |
| 08/12/18 | 43324 | 16 | 40 | 20.9 | 5 | 10 | 300 | 600 | 2.51 | 176.55 | 22.21 | 2.4E-08 |
| 08/12/18 | 43324 | 16 | 45 | 20.9 | 5 | 15 | 300 | 900 | 2.51 | 176.55 | 22.21 | 2.4E-08 * |
| 08/12/18 | 43324 | 16 | 50 | 20.9 | 5 | 20 | 300 | 1200 | 2.51 | 176.55 | 22.21 | 2.4E-08 * |
| 08/12/18 | 43324 | 16 | 55 | 20.9 | 5 | 25 | 300 | 1500 | 2.51 | 176.55 | 22.21 | 2.4E-08 * |
| 08/12/18 | 43324 | 17 | 0 | 20.9 | 5 | 30 | 300 | 1800 | 2.51 | 176.55 | 22.21 | 2.4E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.4E-08 cm/sec **

| | |
|---|---|
| DATE | 8/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 8 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-6A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | DA | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.099 | B-Value, f | 1.00 | Height, inches | 3.118 |
| Diameter, inches | 2.961 | Cell Pres. | 90.0 | Diameter, inches | 2.869 |
| Area, cm² | 44.43 | Bot. Pres. | 80.0 | Area, cm² | 41.71 |
| Volume, cm³ | 349.69 | Top Pres. | 80.0 | Volume, cm³ | 330.31 |
| Mass, g | 675.72 | Tot. B.P. | 80.0 | Mass, g | 680.62 |
| Moisture Content, % | 20.7 | Head, max. | 142.09 | Moisture Content, % | 21.56 |
| Dry Density, pcf | 99.9 | Head, min. | 142.09 | Dry Density, pcf | 105.77 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 17.94 | Volume Solids, cm³ | 203.60 |
| Volume Solids, cm³ | 203.60 | Min. Grad. | 17.94 | Volume Voids, cm³ | 126.71 |
| Volume Voids, cm³ | 146.09 | | | Void Ratio | 0.62 |
| Void Ratio | 0.72 | | | Saturation, % | 95.3% |
| Saturation, % | 79.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 675.72 | 688.92 |
| Wt Soil & Tare, f | g | 559.90 | 568.25 |
| Wt Tare | g | 0.00 | 8.58 |
| Wt Moisture Lost | g | 115.82 | 120.67 |
| Wt Dry Soil | g | 559.90 | 559.67 |
| Water Content | % | 20.69% | 21.56% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/11/18 | 43323 | 16 | 45 | 20.8 | 0 | 0 | 0 | 0 | 2.02 | 142.09 | 17.94 | 2.9E-08 | |
| 08/11/18 | 43323 | 16 | 50 | 20.8 | 5 | 5 | 300 | 300 | 2.02 | 142.09 | 17.94 | 2.9E-08 | |
| 08/11/18 | 43323 | 16 | 55 | 20.8 | 5 | 10 | 300 | 600 | 2.02 | 142.09 | 17.94 | 2.9E-08 | |
| 08/11/18 | 43323 | 17 | 0 | 20.8 | 5 | 15 | 300 | 900 | 2.02 | 142.09 | 17.94 | 2.9E-08 | * |
| 08/11/18 | 43323 | 17 | 5 | 20.8 | 5 | 20 | 300 | 1200 | 2.02 | 142.09 | 17.94 | 2.9E-08 | * |
| 08/11/18 | 43323 | 17 | 10 | 20.8 | 5 | 25 | 300 | 1500 | 2.02 | 142.09 | 17.94 | 2.9E-08 | * |
| 08/11/18 | 43323 | 17 | 15 | 20.8 | 5 | 30 | 300 | 1800 | 2.02 | 142.09 | 17.94 | 2.9E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/11/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 4 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-7A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.119 | B-Value, f | 0.99 | Height, inches | 3.126 |
| Diameter, inches | 2.852 | Cell Pres. | 90.0 | Diameter, inches | 2.863 |
| Area, cm² | 41.22 | Bot. Pres. | 80.0 | Area, cm² | 41.53 |
| Volume, cm³ | 326.52 | Top Pres. | 80.0 | Volume, cm³ | 329.78 |
| Mass, g | 669.58 | Tot. B.P. | 80.0 | Mass, g | 674.97 |
| Moisture Content, % | 22.0 | Head, max. | 122.39 | Moisture Content, % | 22.95 |
| Dry Density, pcf | 104.9 | Head, min. | 122.39 | Dry Density, pcf | 103.88 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 15.41 | Volume Solids, cm³ | 203.33 |
| Volume Solids, cm³ | 203.33 | Min. Grad. | 15.41 | Volume Voids, cm³ | 126.45 |
| Volume Voids, cm³ | 123.19 | | | Void Ratio | 0.62 |
| Void Ratio | 0.61 | | | Saturation, % | 99.6% |
| Saturation, % | 97.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 669.58 | 894.22 |
| Wt Soil & Tare, f | g | 548.99 | 768.27 |
| Wt Tare | g | 0.00 | 219.43 |
| Wt Moisture Lost | g | 120.59 | 125.95 |
| Wt Dry Soil | g | 548.99 | 548.84 |
| Water Content | % | 21.97% | 22.95% |

DESCRIPTION

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/10/18 | 43322 | 11 | 30 | 20.9 | 0 | 0 | 0 | 0 | 1.74 | 122.39 | 15.41 | 3.4E-08 | |
| 08/10/18 | 43322 | 11 | 35 | 20.9 | 5 | 5 | 300 | 300 | 1.74 | 122.39 | 15.41 | 3.4E-08 | |
| 08/10/18 | 43322 | 11 | 40 | 20.9 | 5 | 10 | 300 | 600 | 1.74 | 122.39 | 15.41 | 3.4E-08 | |
| 08/10/18 | 43322 | 11 | 45 | 20.9 | 5 | 15 | 300 | 900 | 1.74 | 122.39 | 15.41 | 3.4E-08 | * |
| 08/10/18 | 43322 | 11 | 50 | 20.9 | 5 | 20 | 300 | 1200 | 1.74 | 122.39 | 15.41 | 3.4E-08 | * |
| 08/10/18 | 43322 | 11 | 55 | 20.9 | 5 | 25 | 300 | 1500 | 1.74 | 122.39 | 15.41 | 3.4E-08 | * |
| 08/10/18 | 43322 | 12 | 0 | 20.9 | 5 | 30 | 300 | 1800 | 1.74 | 122.39 | 15.41 | 3.4E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.4E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 5 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-8A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.113 | B-Value, f | 1.00 | Height, inches | 3.118 |
| Diameter, inches | 2.865 | Cell Pres. | 90.0 | Diameter, inches | 2.862 |
| Area, cm² | 41.59 | Bot. Pres. | 80.0 | Area, cm² | 41.50 |
| Volume, cm³ | 328.87 | Top Pres. | 80.0 | Volume, cm³ | 328.71 |
| Mass, g | 662.42 | Tot. B.P. | 80.0 | Mass, g | 667.80 |
| Moisture Content, % | 23.3 | Head, max. | 129.43 | Moisture Content, % | 24.28 |
| Dry Density, pcf | 102.0 | Head, min. | 129.43 | Dry Density, pcf | 102.00 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 16.34 | Volume Solids, cm³ | 195.39 |
| Volume Solids, cm³ | 195.39 | Min. Grad. | 16.34 | Volume Voids, cm³ | 133.31 |
| Volume Voids, cm³ | 133.47 | | | Void Ratio | 0.68 |
| Void Ratio | 0.68 | | | Saturation, % | 97.9% |
| Saturation, % | 93.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 662.42 | 676.12 |
| Wt Soil & Tare, f | g | 537.33 | 545.67 |
| Wt Tare | g | 0.00 | 8.44 |
| Wt Moisture Lost | g | 125.09 | 130.45 |
| Wt Dry Soil | g | 537.33 | 537.23 |
| Water Content | % | 23.28% | 24.28% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/10/18 | 43322 | 13 | 0 | 20.9 | 0 | 0 | 0 | 0 | 1.84 | 129.43 | 16.34 | 3.2E-08 | |
| 08/10/18 | 43322 | 13 | 5 | 20.9 | 5 | 5 | 300 | 300 | 1.84 | 129.43 | 16.34 | 3.2E-08 | |
| 08/10/18 | 43322 | 13 | 10 | 20.9 | 5 | 10 | 300 | 600 | 1.84 | 129.43 | 16.34 | 3.2E-08 | |
| 08/10/18 | 43322 | 13 | 15 | 20.9 | 5 | 15 | 300 | 900 | 1.84 | 129.43 | 16.34 | 3.2E-08 | * |
| 08/10/18 | 43322 | 13 | 20 | 20.9 | 5 | 20 | 300 | 1200 | 1.84 | 129.43 | 16.34 | 3.2E-08 | * |
| 08/10/18 | 43322 | 13 | 25 | 20.9 | 5 | 25 | 300 | 1500 | 1.84 | 129.43 | 16.34 | 3.2E-08 | * |
| 08/10/18 | 43322 | 13 | 30 | 20.9 | 5 | 30 | 300 | 1800 | 1.84 | 129.43 | 16.34 | 3.2E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.2E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 7 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-9A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.308 | B-Value, f | 0.99 | Height, inches | 2.308 |
| Diameter, inches | 2.861 | Cell Pres. | 90.0 | Diameter, inches | 2.861 |
| Area, cm² | 41.48 | Bot. Pres. | 80.0 | Area, cm² | 41.48 |
| Volume, cm³ | 243.14 | Top Pres. | 80.0 | Volume, cm³ | 243.14 |
| Mass, g | 488.91 | Tot. B.P. | 80.0 | Mass, g | 502.63 |
| Moisture Content, % | 19.4 | Head, max. | 59.79 | Moisture Content, % | 22.70 |
| Dry Density, pcf | 105.1 | Head, min. | 59.79 | Dry Density, pcf | 105.13 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 10.20 | Volume Solids, cm³ | 148.96 |
| Volume Solids, cm³ | 148.96 | Min. Grad. | 10.20 | Volume Voids, cm³ | 94.18 |
| Volume Voids, cm³ | 94.18 | | | Void Ratio | 0.63 |
| Void Ratio | 0.63 | | | Saturation, % | 98.7% |
| Saturation, % | 84.2% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 488.91 | 510.86 |
| Wt Soil & Tare, f | g | 409.64 | 417.89 |
| Wt Tare | g | 0.00 | 8.32 |
| Wt Moisture Lost | g | 79.27 | 92.97 |
| Wt Dry Soil | g | 409.64 | 409.57 |
| Water Content | % | 19.35% | 22.70% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/10/18 | 43322 | 11 | 0 | 20.9 | 0 | 0 | 0 | 0 | 0.85 | 59.79 | 10.20 | 5.2E-08 |
| 08/10/18 | 43322 | 11 | 5 | 20.9 | 5 | 5 | 300 | 300 | 0.85 | 59.79 | 10.20 | 5.2E-08 |
| 08/10/18 | 43322 | 11 | 10 | 20.9 | 5 | 10 | 300 | 600 | 0.85 | 59.79 | 10.20 | 5.2E-08 |
| 08/10/18 | 43322 | 11 | 15 | 20.9 | 5 | 15 | 300 | 900 | 0.85 | 59.79 | 10.20 | 5.2E-08 * |
| 08/10/18 | 43322 | 11 | 20 | 20.9 | 5 | 20 | 300 | 1200 | 0.85 | 59.79 | 10.20 | 5.2E-08 * |
| 08/10/18 | 43322 | 11 | 25 | 20.9 | 5 | 25 | 300 | 1500 | 0.85 | 59.79 | 10.20 | 5.2E-08 * |
| 08/10/18 | 43322 | 11 | 30 | 20.9 | 5 | 30 | 300 | 1800 | 0.85 | 59.79 | 10.20 | 5.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 5.2E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 2 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-10A | - | Flow Pump Speed | 9 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.112 | B-Value, f | 0.99 | Height, inches | 3.116 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 | Diameter, inches | 2.843 |
| Area, cm² | 41.10 | Bot. Pres. | 80.0 | Area, cm² | 40.96 |
| Volume, cm³ | 324.87 | Top Pres. | 80.0 | Volume, cm³ | 324.15 |
| Mass, g | 662.35 | Tot. B.P. | 80.0 | Mass, g | 671.31 |
| Moisture Content, % | 19.6 | Head, max. | 98.48 | Moisture Content, % | 21.21 |
| Dry Density, pcf | 106.4 | Head, min. | 98.48 | Dry Density, pcf | 106.62 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 12.44 | Volume Solids, cm³ | 201.40 |
| Volume Solids, cm³ | 201.40 | Min. Grad. | 12.44 | Volume Voids, cm³ | 122.74 |
| Volume Voids, cm³ | 123.47 | | | Void Ratio | 0.61 |
| Void Ratio | 0.61 | | | Saturation, % | 95.7% |
| Saturation, % | 87.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 662.35 | 679.83 |
| Wt Soil & Tare, f | g | 553.86 | 562.39 |
| Wt Tare | g | 0.00 | 8.60 |
| Wt Moisture Lost | g | 108.49 | 117.44 |
| Wt Dry Soil | g | 553.86 | 553.79 |
| Water Content | % | 19.59% | 21.21% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/10/18 | 43322 | 12 | 0 | 20.9 | 0 | 0 | 0 | 0 | 1.40 | 98.48 | 12.44 | 8.2E-08 |
| 08/10/18 | 43322 | 12 | 5 | 20.9 | 5 | 5 | 300 | 300 | 1.40 | 98.48 | 12.44 | 8.2E-08 |
| 08/10/18 | 43322 | 12 | 10 | 20.9 | 5 | 10 | 300 | 600 | 1.40 | 98.48 | 12.44 | 8.2E-08 |
| 08/10/18 | 43322 | 12 | 15 | 20.9 | 5 | 15 | 300 | 900 | 1.40 | 98.48 | 12.44 | 8.2E-08 * |
| 08/10/18 | 43322 | 12 | 20 | 20.9 | 5 | 20 | 300 | 1200 | 1.40 | 98.48 | 12.44 | 8.2E-08 * |
| 08/10/18 | 43322 | 12 | 25 | 20.9 | 5 | 25 | 300 | 1500 | 1.40 | 98.48 | 12.44 | 8.2E-08 * |
| 08/10/18 | 43322 | 12 | 30 | 20.9 | 5 | 30 | 300 | 1800 | 1.40 | 98.48 | 12.44 | 8.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 8.2E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-11A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | DA | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.121 | B-Value, f | 1.00 | Height, inches | 3.120 |
| Diameter, inches | 2.850 | Cell Pres. | 90.0 | Diameter, inches | 2.884 |
| Area, cm² | 41.16 | Bot. Pres. | 80.0 | Area, cm² | 42.15 |
| Volume, cm³ | 326.27 | Top Pres. | 80.0 | Volume, cm³ | 333.99 |
| Mass, g | 645.22 | Tot. B.P. | 80.0 | Mass, g | 667.70 |
| Moisture Content, % | 19.2 | Head, max. | 111.14 | Moisture Content, % | 23.35 |
| Dry Density, pcf | 103.5 | Head, min. | 111.14 | Dry Density, pcf | 101.13 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 14.02 | Volume Solids, cm³ | 200.48 |
| Volume Solids, cm³ | 200.48 | Min. Grad. | 14.02 | Volume Voids, cm³ | 133.51 |
| Volume Voids, cm³ | 125.78 | | | Void Ratio | 0.67 |
| Void Ratio | 0.63 | | | Saturation, % | 94.7% |
| Saturation, % | 82.6% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 645.22 | 675.76 |
| Wt Soil & Tare, f | g | 541.31 | 549.46 |
| Wt Tare | g | 0.00 | 8.56 |
| Wt Moisture Lost | g | 103.91 | 126.30 |
| Wt Dry Soil | g | 541.31 | 540.90 |
| Water Content | % | 19.20% | 23.35% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/12/18 | 43324 | 17 | 45 | 20.6 | 0 | 0 | 0 | 0 | 1.58 | 111.14 | 14.02 | 3.8E-08 | |
| 08/12/18 | 43324 | 17 | 50 | 20.6 | 5 | 5 | 300 | 300 | 1.58 | 111.14 | 14.02 | 3.8E-08 | |
| 08/12/18 | 43324 | 17 | 55 | 20.6 | 5 | 10 | 300 | 600 | 1.58 | 111.14 | 14.02 | 3.8E-08 | |
| 08/12/18 | 43324 | 18 | 0 | 20.6 | 5 | 15 | 300 | 900 | 1.58 | 111.14 | 14.02 | 3.8E-08 | * |
| 08/12/18 | 43324 | 18 | 5 | 20.6 | 5 | 20 | 300 | 1200 | 1.58 | 111.14 | 14.02 | 3.8E-08 | * |
| 08/12/18 | 43324 | 18 | 10 | 20.6 | 5 | 25 | 300 | 1500 | 1.58 | 111.14 | 14.02 | 3.8E-08 | * |
| 08/12/18 | 43324 | 18 | 15 | 20.6 | 5 | 30 | 300 | 1800 | 1.58 | 111.14 | 14.02 | 3.8E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.8E-08 cm/sec **

| | |
|---|---|
| DATE | 8/12/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-12A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.118 | B-Value, f | 1.00 | Height, inches | 3.119 |
| Diameter, inches | 2.818 | Cell Pres. | 90.0 | Diameter, inches | 2.821 |
| Area, cm² | 40.24 | Bot. Pres. | 80.0 | Area, cm² | 40.32 |
| Volume, cm³ | 318.68 | Top Pres. | 80.0 | Volume, cm³ | 319.46 |
| Mass, g | 657.33 | Tot. B.P. | 80.0 | Mass, g | 668.40 |
| Moisture Content, % | 20.8 | Head, max. | 137.16 | Moisture Content, % | 22.88 |
| Dry Density, pcf | 106.5 | Head, min. | 137.16 | Dry Density, pcf | 106.25 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 17.31 | Volume Solids, cm³ | 197.81 |
| Volume Solids, cm³ | 197.81 | Min. Grad. | 17.31 | Volume Voids, cm³ | 121.65 |
| Volume Voids, cm³ | 120.87 | | | Void Ratio | 0.62 |
| Void Ratio | 0.61 | | | Saturation, % | 100.0% |
| Saturation, % | 93.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 657.33 | 676.92 |
| Wt Soil & Tare, f | g | 543.97 | 552.53 |
| Wt Tare | g | 0.00 | 8.75 |
| Wt Moisture Lost | g | 113.36 | 124.39 |
| Wt Dry Soil | g | 543.97 | 543.78 |
| Water Content | % | 20.84% | 22.88% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/10/18 | 43322 | 13 | 30 | 20.9 | 0 | 0 | 0 | 0 | 1.95 | 137.16 | 17.31 | 3.2E-08 |
| 08/10/18 | 43322 | 13 | 35 | 20.9 | 5 | 5 | 300 | 300 | 1.95 | 137.16 | 17.31 | 3.2E-08 |
| 08/10/18 | 43322 | 13 | 40 | 20.9 | 5 | 10 | 300 | 600 | 1.95 | 137.16 | 17.31 | 3.2E-08 |
| 08/10/18 | 43322 | 13 | 45 | 20.9 | 5 | 15 | 300 | 900 | 1.95 | 137.16 | 17.31 | 3.2E-08 * |
| 08/10/18 | 43322 | 13 | 50 | 20.9 | 5 | 20 | 300 | 1200 | 1.95 | 137.16 | 17.31 | 3.2E-08 * |
| 08/10/18 | 43322 | 13 | 55 | 20.9 | 5 | 25 | 300 | 1500 | 1.95 | 137.16 | 17.31 | 3.2E-08 * |
| 08/10/18 | 43322 | 14 | 0 | 20.9 | 5 | 30 | 300 | 1800 | 1.95 | 137.16 | 17.31 | 3.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.2E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P3-13A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.590 | B-Value, f | 1.00 | Height, inches | 2.589 |
| Diameter, inches | 2.817 | Cell Pres. | 90.0 | Diameter, inches | 2.817 |
| Area, cm² | 40.21 | Bot. Pres. | 80.0 | Area, cm² | 40.21 |
| Volume, cm³ | 264.52 | Top Pres. | 80.0 | Volume, cm³ | 264.42 |
| Mass, g | 530.43 | Tot. B.P. | 80.0 | Mass, g | 536.92 |
| Moisture Content, % | 22.0 | Head, max. | 132.94 | Moisture Content, % | 23.50 |
| Dry Density, pcf | 102.6 | Head, min. | 132.94 | Dry Density, pcf | 102.60 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 20.22 | Volume Solids, cm³ | 158.10 |
| Volume Solids, cm³ | 158.10 | Min. Grad. | 20.22 | Volume Voids, cm³ | 106.32 |
| Volume Voids, cm³ | 106.43 | | | Void Ratio | 0.67 |
| Void Ratio | 0.67 | | | Saturation, % | 96.1% |
| Saturation, % | 89.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 530.43 | 545.14 |
| Wt Soil & Tare, f | g | 434.77 | 443.03 |
| Wt Tare | g | 0.00 | 8.43 |
| Wt Moisture Lost | g | 95.66 | 102.11 |
| Wt Dry Soil | g | 434.77 | 434.60 |
| Water Content | % | 22.00% | 23.50% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 08/10/18 | 43322 | 10 | 0 | 20.9 | 0 | 0 | 0 | 0 | 1.89 | 132.94 | 20.22 | 2.7E-08 | |
| 08/10/18 | 43322 | 10 | 5 | 20.9 | 5 | 5 | 300 | 300 | 1.89 | 132.94 | 20.22 | 2.7E-08 | |
| 08/10/18 | 43322 | 10 | 10 | 20.9 | 5 | 10 | 300 | 600 | 1.89 | 132.94 | 20.22 | 2.7E-08 | |
| 08/10/18 | 43322 | 10 | 15 | 20.9 | 5 | 15 | 300 | 900 | 1.89 | 132.94 | 20.22 | 2.7E-08 | * |
| 08/10/18 | 43322 | 10 | 20 | 20.9 | 5 | 20 | 300 | 1200 | 1.89 | 132.94 | 20.22 | 2.7E-08 | * |
| 08/10/18 | 43322 | 10 | 25 | 20.9 | 5 | 25 | 300 | 1500 | 1.89 | 132.94 | 20.22 | 2.7E-08 | * |
| 08/10/18 | 43322 | 10 | 30 | 20.9 | 5 | 30 | 300 | 1800 | 1.89 | 132.94 | 20.22 | 2.7E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 8 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P3-14A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.169 | B-Value, f | 1.00 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 |
| Area, cm² | 41.10 | Bot. Pres. | 80.0 |
| Volume, cm³ | 226.43 | Top Pres. | 80.0 |
| Mass, g | 460.44 | Tot. B.P. | 80.0 |
| Moisture Content, % | 19.5 | Head, max. | 108.32 |
| Dry Density, pcf | 106.2 | Head, min. | 108.32 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 19.66 |
| Volume Solids, cm³ | 142.66 | Min. Grad. | 19.66 |
| Volume Voids, cm³ | 83.77 | | |
| Void Ratio | 0.59 | | |
| Saturation, % | 89.8% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.169 |
| Diameter, inches | 2.849 |
| Area, cm² | 41.13 |
| Volume, cm³ | 226.59 |
| Mass, g | 468.58 |
| Moisture Content, % | 21.65 |
| Dry Density, pcf | 106.08 |
| Volume Solids, cm³ | 142.66 |
| Volume Voids, cm³ | 83.92 |
| Void Ratio | 0.59 |
| Saturation, % | 99.4% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 460.44 | 477.16 |
| Wt Soil & Tare, f | g | 385.19 | 393.79 |
| Wt Tare | g | 0.00 | 8.69 |
| Wt Moisture Lost | g | 75.25 | 83.37 |
| Wt Dry Soil | g | 385.19 | 385.10 |
| Water Content | % | 19.54% | 21.65% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/10/18 | 43322 | 15 | 0 | 20.9 | 0 | 0 | 0 | 0 | 1.54 | 108.32 | 19.66 | 2.7E-08 |
| 08/10/18 | 43322 | 15 | 5 | 20.9 | 5 | 5 | 300 | 300 | 1.54 | 108.32 | 19.66 | 2.7E-08 |
| 08/10/18 | 43322 | 15 | 10 | 20.9 | 5 | 10 | 300 | 600 | 1.54 | 108.32 | 19.66 | 2.7E-08 |
| 08/10/18 | 43322 | 15 | 15 | 20.9 | 5 | 15 | 300 | 900 | 1.54 | 108.32 | 19.66 | 2.7E-08 * |
| 08/10/18 | 43322 | 15 | 20 | 20.9 | 5 | 20 | 300 | 1200 | 1.54 | 108.32 | 19.66 | 2.7E-08 * |
| 08/10/18 | 43322 | 15 | 25 | 20.9 | 5 | 25 | 300 | 1500 | 1.54 | 108.32 | 19.66 | 2.7E-08 * |
| 08/10/18 | 43322 | 15 | 30 | 20.9 | 5 | 30 | 300 | 1800 | 1.54 | 108.32 | 19.66 | 2.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/10/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 5 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P4-1A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.123 | B-Value, f | 0.99 | Height, inches | 3.150 |
| Diameter, inches | 2.871 | Cell Pres. | 90.0 | Diameter, inches | 2.869 |
| Area, cm² | 41.77 | Bot. Pres. | 80.0 | Area, cm² | 41.71 |
| Volume, cm³ | 331.31 | Top Pres. | 80.0 | Volume, cm³ | 333.70 |
| Mass, g | 675.83 | Tot. B.P. | 80.0 | Mass, g | 685.93 |
| Moisture Content, % | 20.2 | Head, max. | 102.70 | Moisture Content, % | 21.97 |
| Dry Density, pcf | 105.9 | Head, min. | 102.70 | Dry Density, pcf | 105.16 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 12.84 | Volume Solids, cm³ | 204.49 |
| Volume Solids, cm³ | 204.49 | Min. Grad. | 12.84 | Volume Voids, cm³ | 129.21 |
| Volume Voids, cm³ | 126.81 | | | Void Ratio | 0.63 |
| Void Ratio | 0.62 | | | Saturation, % | 95.6% |
| Saturation, % | 89.5% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 675.83 | 694.24 |
| Wt Soil & Tare, f | g | 562.35 | 570.71 |
| Wt Tare | g | 0.00 | 8.56 |
| Wt Moisture Lost | g | 113.48 | 123.53 |
| Wt Dry Soil | g | 562.35 | 562.15 |
| Water Content | % | 20.18% | 21.97% |

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/14/18 | 43326 | 9 | 0 | 20.6 | 0 | 0 | 0 | 0 | 1.46 | 102.70 | 12.84 | 4.1E-08 |
| 08/14/18 | 43326 | 9 | 5 | 20.6 | 5 | 5 | 300 | 300 | 1.46 | 102.70 | 12.84 | 4.1E-08 |
| 08/14/18 | 43326 | 9 | 10 | 20.6 | 5 | 10 | 300 | 600 | 1.46 | 102.70 | 12.84 | 4.1E-08 |
| 08/14/18 | 43326 | 9 | 15 | 20.6 | 5 | 15 | 300 | 900 | 1.46 | 102.70 | 12.84 | 4.1E-08 * |
| 08/14/18 | 43326 | 9 | 20 | 20.6 | 5 | 20 | 300 | 1200 | 1.46 | 102.70 | 12.84 | 4.1E-08 * |
| 08/14/18 | 43326 | 9 | 25 | 20.6 | 5 | 25 | 300 | 1500 | 1.46 | 102.70 | 12.84 | 4.1E-08 * |
| 08/14/18 | 43326 | 9 | 30 | 20.6 | 5 | 30 | 300 | 1800 | 1.46 | 102.70 | 12.84 | 4.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.1E-08 cm/sec **

| | |
|---|---|
| DATE | 8/14/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P4-2A | - | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.109 | B-Value, f | 0.99 | Height, inches | 3.113 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.863 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 41.53 |
| Volume, cm³ | 327.76 | Top Pres. | 80.0 | Volume, cm³ | 328.41 |
| Mass, g | 674.07 | Tot. B.P. | 80.0 | Mass, g | 679.65 |
| Moisture Content, % | 20.1 | Head, max. | 108.32 | Moisture Content, % | 21.13 |
| Dry Density, pcf | 106.8 | Head, min. | 108.32 | Dry Density, pcf | 106.61 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 13.70 | Volume Solids, cm³ | 204.03 |
| Volume Solids, cm³ | 204.03 | Min. Grad. | 13.70 | Volume Voids, cm³ | 124.38 |
| Volume Voids, cm³ | 123.72 | | | Void Ratio | 0.61 |
| Void Ratio | 0.61 | | | Saturation, % | 95.3% |
| Saturation, % | 91.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 674.07 | 687.92 |
| Wt Soil & Tare, f | g | 561.09 | 569.39 |
| Wt Tare | g | 0.00 | 8.45 |
| Wt Moisture Lost | g | 112.98 | 118.53 |
| Wt Dry Soil | g | 561.09 | 560.94 |
| Water Content | % | 20.14% | 21.13% |

DESCRIPTION: -

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/15/18 | 43327 | 13 | 0 | 20.0 | 0 | 0 | 0 | 0 | 1.54 | 108.32 | 13.70 | 2.1E-08 |
| 08/15/18 | 43327 | 13 | 5 | 20.0 | 5 | 5 | 300 | 300 | 1.54 | 108.32 | 13.70 | 2.1E-08 |
| 08/15/18 | 43327 | 13 | 10 | 20.0 | 5 | 10 | 300 | 600 | 1.54 | 108.32 | 13.70 | 2.1E-08 |
| 08/15/18 | 43327 | 13 | 15 | 20.0 | 5 | 15 | 300 | 900 | 1.54 | 108.32 | 13.70 | 2.1E-08 * |
| 08/15/18 | 43327 | 13 | 20 | 20.0 | 5 | 20 | 300 | 1200 | 1.54 | 108.32 | 13.70 | 2.1E-08 * |
| 08/15/18 | 43327 | 13 | 25 | 20.0 | 5 | 25 | 300 | 1500 | 1.54 | 108.32 | 13.70 | 2.1E-08 * |
| 08/15/18 | 43327 | 13 | 30 | 20.0 | 5 | 30 | 300 | 1800 | 1.54 | 108.32 | 13.70 | 2.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.1E-08 cm/sec **

| | |
|---|---|
| DATE | 8/15/18 |
| CHECK | DA |
| REVIEW | TWH |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 2 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-3A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.138 | B-Value, f | 0.99 | Height, inches | 3.186 |
| Diameter, inches | 2.872 | Cell Pres. | 90.0 | Diameter, inches | 2.900 |
| Area, cm² | 41.80 | Bot. Pres. | 80.0 | Area, cm² | 42.61 |
| Volume, cm³ | 333.13 | Top Pres. | 80.0 | Volume, cm³ | 344.85 |
| Mass, g | 647.77 | Tot. B.P. | 80.0 | Mass, g | 676.99 |
| Moisture Content, % | 19.6 | Head, max. | 140.68 | Moisture Content, % | 24.97 |
| Dry Density, pcf | 101.5 | Head, min. | 140.68 | Dry Density, pcf | 98.02 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 17.38 | Volume Solids, cm³ | 200.64 |
| Volume Solids, cm³ | 200.64 | Min. Grad. | 17.38 | Volume Voids, cm³ | 144.21 |
| Volume Voids, cm³ | 132.49 | | | Void Ratio | 0.72 |
| Void Ratio | 0.66 | | | Saturation, % | 93.8% |
| Saturation, % | 80.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 647.77 | 685.02 |
| Wt Soil & Tare, f | g | 541.72 | 549.81 |
| Wt Tare | g | 0.00 | 8.32 |
| Wt Moisture Lost | g | 106.05 | 135.21 |
| Wt Dry Soil | g | 541.72 | 541.49 |
| Water Content | % | 19.58% | 24.97% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/15/18 | 43327 | 9 | 30 | 20.0 | 0 | 0 | 0 | 0 | 2.00 | 140.68 | 17.38 | 3.0E-08 |
| 08/15/18 | 43327 | 9 | 35 | 20.0 | 5 | 5 | 300 | 300 | 2.00 | 140.68 | 17.38 | 3.0E-08 |
| 08/15/18 | 43327 | 9 | 40 | 20.0 | 5 | 10 | 300 | 600 | 2.00 | 140.68 | 17.38 | 3.0E-08 |
| 08/15/18 | 43327 | 9 | 45 | 20.0 | 5 | 15 | 300 | 900 | 2.00 | 140.68 | 17.38 | 3.0E-08 * |
| 08/15/18 | 43327 | 9 | 50 | 20.0 | 5 | 20 | 300 | 1200 | 2.00 | 140.68 | 17.38 | 3.0E-08 * |
| 08/15/18 | 43327 | 9 | 55 | 20.0 | 5 | 25 | 300 | 1500 | 2.00 | 140.68 | 17.38 | 3.0E-08 * |
| 08/15/18 | 43327 | 10 | 0 | 20.0 | 5 | 30 | 300 | 1800 | 2.00 | 140.68 | 17.38 | 3.0E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.0E-08 cm/sec **

| | |
|---|---|
| DATE | 8/15/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**

**ASTM D 5084**

**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P4-4A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 1.868 | B-Value, f | 0.98 | Height, inches | 1.891 |
| Diameter, inches | 2.854 | Cell Pres. | 90.0 | Diameter, inches | 2.857 |
| Area, cm² | 41.27 | Bot. Pres. | 80.0 | Area, cm² | 41.36 |
| Volume, cm³ | 195.83 | Top Pres. | 80.0 | Volume, cm³ | 198.66 |
| Mass, g | 398.07 | Tot. B.P. | 80.0 | Mass, g | 402.85 |
| Moisture Content, % | 22.0 | Head, max. | 175.15 | Moisture Content, % | 23.43 |
| Dry Density, pcf | 104.0 | Head, min. | 175.15 | Dry Density, pcf | 102.52 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 36.47 | Volume Solids, cm³ | 120.88 |
| Volume Solids, cm³ | 120.88 | Min. Grad. | 36.47 | Volume Voids, cm³ | 77.78 |
| Volume Voids, cm³ | 74.95 | | | Void Ratio | 0.64 |
| Void Ratio | 0.62 | | | Saturation, % | 98.3% |
| Saturation, % | 95.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 398.07 | 485.09 |
| Wt Soil & Tare, f | g | 326.38 | 408.64 |
| Wt Tare | g | 0.00 | 82.35 |
| Wt Moisture Lost | g | 71.69 | 76.45 |
| Wt Dry Soil | g | 326.38 | 326.29 |
| Water Content | % | 21.97% | 23.43% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/16/18 | 43328 | 9 | 0 | 21.4 | 0 | 0 | 0 | 0 | 2.49 | 175.15 | 36.47 | 1.4E-08 |
| 08/16/18 | 43328 | 9 | 5 | 21.4 | 5 | 5 | 300 | 300 | 2.49 | 175.15 | 36.47 | 1.4E-08 |
| 08/16/18 | 43328 | 9 | 10 | 21.4 | 5 | 10 | 300 | 600 | 2.49 | 175.15 | 36.47 | 1.4E-08 |
| 08/16/18 | 43328 | 9 | 15 | 21.4 | 5 | 15 | 300 | 900 | 2.49 | 175.15 | 36.47 | 1.4E-08 * |
| 08/16/18 | 43328 | 9 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 2.49 | 175.15 | 36.47 | 1.4E-08 * |
| 08/16/18 | 43328 | 9 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 2.49 | 175.15 | 36.47 | 1.4E-08 * |
| 08/16/18 | 43328 | 9 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 2.49 | 175.15 | 36.47 | 1.4E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.4E-08 cm/sec **

| | |
|---|---|
| DATE | 8/16/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 7 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P4-5A | - | Flow Pump Speed | 9 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.119 | B-Value, f | 0.99 | Height, inches | 3.117 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.856 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 41.33 |
| Volume, cm³ | 328.81 | Top Pres. | 80.0 | Volume, cm³ | 327.22 |
| Mass, g | 656.16 | Tot. B.P. | 80.0 | Mass, g | 665.73 |
| Moisture Content, % | 23.6 | Head, max. | 159.67 | Moisture Content, % | 25.44 |
| Dry Density, pcf | 100.7 | Head, min. | 159.67 | Dry Density, pcf | 101.20 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 20.17 | Volume Solids, cm³ | 192.98 |
| Volume Solids, cm³ | 192.98 | Min. Grad. | 20.17 | Volume Voids, cm³ | 134.24 |
| Volume Voids, cm³ | 135.83 | | | Void Ratio | 0.70 |
| Void Ratio | 0.70 | | | Saturation, % | 100.0% |
| Saturation, % | 92.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 656.16 | 747.31 |
| Wt Soil & Tare, f | g | 530.71 | 612.44 |
| Wt Tare | g | 0.00 | 82.33 |
| Wt Moisture Lost | g | 125.45 | 134.87 |
| Wt Dry Soil | g | 530.71 | 530.11 |
| Water Content | % | 23.64% | 25.44% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/16/18 | 43328 | 14 | 0 | 22.0 | 0 | 0 | 0 | 0 | 2.27 | 159.67 | 20.17 | 4.9E-08 |
| 08/16/18 | 43328 | 14 | 5 | 22.0 | 5 | 5 | 300 | 300 | 2.27 | 159.67 | 20.17 | 4.9E-08 |
| 08/16/18 | 43328 | 14 | 10 | 22.0 | 5 | 10 | 300 | 600 | 2.27 | 159.67 | 20.17 | 4.9E-08 |
| 08/16/18 | 43328 | 14 | 15 | 22.0 | 5 | 15 | 300 | 900 | 2.27 | 159.67 | 20.17 | 4.9E-08 * |
| 08/16/18 | 43328 | 14 | 20 | 22.0 | 5 | 20 | 300 | 1200 | 2.27 | 159.67 | 20.17 | 4.9E-08 * |
| 08/16/18 | 43328 | 14 | 25 | 22.0 | 5 | 25 | 300 | 1500 | 2.27 | 159.67 | 20.17 | 4.9E-08 * |
| 08/16/18 | 43328 | 14 | 30 | 22.0 | 5 | 30 | 300 | 1800 | 2.27 | 159.67 | 20.17 | 4.9E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.9E-08 cm/sec **

| | |
|---|---|
| DATE | 8/16/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 2 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P4-6A | - | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.124 | B-Value, f | 0.99 | Height, inches | 3.117 |
| Diameter, inches | 2.836 | Cell Pres. | 90.0 | Diameter, inches | 2.856 |
| Area, cm² | 40.75 | Bot. Pres. | 80.0 | Area, cm² | 41.33 |
| Volume, cm³ | 323.38 | Top Pres. | 80.0 | Volume, cm³ | 327.22 |
| Mass, g | 640.44 | Tot. B.P. | 80.0 | Mass, g | 648.94 |
| Moisture Content, % | 23.5 | Head, max. | 92.85 | Moisture Content, % | 25.09 |
| Dry Density, pcf | 100.1 | Head, min. | 92.85 | Dry Density, pcf | 98.93 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 11.73 | Volume Solids, cm³ | 188.65 |
| Volume Solids, cm³ | 188.65 | Min. Grad. | 11.73 | Volume Voids, cm³ | 138.57 |
| Volume Voids, cm³ | 134.73 | | | Void Ratio | 0.73 |
| Void Ratio | 0.71 | | | Saturation, % | 93.9% |
| Saturation, % | 90.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 640.44 | 657.18 |
| Wt Soil & Tare, f | g | 518.78 | 527.07 |
| Wt Tare | g | 0.00 | 8.47 |
| Wt Moisture Lost | g | 121.66 | 130.11 |
| Wt Dry Soil | g | 518.78 | 518.60 |
| Water Content | % | 23.45% | 25.09% |

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/14/18 | 43326 | 11 | 0 | 20.6 | 0 | 0 | 0 | 0 | 1.32 | 92.85 | 11.73 | 2.4E-08 |
| 08/14/18 | 43326 | 11 | 5 | 20.6 | 5 | 5 | 300 | 300 | 1.32 | 92.85 | 11.73 | 2.4E-08 |
| 08/14/18 | 43326 | 11 | 10 | 20.6 | 5 | 10 | 300 | 600 | 1.32 | 92.85 | 11.73 | 2.4E-08 |
| 08/14/18 | 43326 | 11 | 15 | 20.6 | 5 | 15 | 300 | 900 | 1.32 | 92.85 | 11.73 | 2.4E-08 * |
| 08/14/18 | 43326 | 11 | 20 | 20.6 | 5 | 20 | 300 | 1200 | 1.32 | 92.85 | 11.73 | 2.4E-08 * |
| 08/14/18 | 43326 | 11 | 25 | 20.6 | 5 | 25 | 300 | 1500 | 1.32 | 92.85 | 11.73 | 2.4E-08 * |
| 08/14/18 | 43326 | 11 | 30 | 20.6 | 5 | 30 | 300 | 1800 | 1.32 | 92.85 | 11.73 | 2.4E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.4E-08 cm/sec **

| | |
|---|---|
| DATE | 8/14/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | | Board # | 15 | COMMENTS |
| PROJECT NUMBER | 18102853 | | Flow Pump | 2 | |
| SAMPLE ID | P4-7A | - | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | FT | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.132 | B-Value, f | 0.97 | Height, inches | 3.136 |
| Diameter, inches | 2.868 | Cell Pres. | 90.0 | Diameter, inches | 2.860 |
| Area, cm² | 41.68 | Bot. Pres. | 80.0 | Area, cm² | 41.45 |
| Volume, cm³ | 331.57 | Top Pres. | 80.0 | Volume, cm³ | 330.14 |
| Mass, g | 687.81 | Tot. B.P. | 80.0 | Mass, g | 693.68 |
| Moisture Content, % | 18.9 | Head, max. | 166.71 | Moisture Content, % | 19.92 |
| Dry Density, pcf | 108.9 | Head, min. | 166.71 | Dry Density, pcf | 109.33 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 20.93 | Volume Solids, cm³ | 210.35 |
| Volume Solids, cm³ | 210.35 | Min. Grad. | 20.93 | Volume Voids, cm³ | 119.79 |
| Volume Voids, cm³ | 121.22 | | | Void Ratio | 0.57 |
| Void Ratio | 0.58 | | | Saturation, % | 96.2% |
| Saturation, % | 90.2% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 687.81 | 774.94 |
| Wt Soil & Tare, f | g | 578.46 | 659.76 |
| Wt Tare | g | 0.00 | 81.52 |
| Wt Moisture Lost | g | 109.35 | 115.18 |
| Wt Dry Soil | g | 578.46 | 578.24 |
| Water Content | % | 18.90% | 19.92% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/16/18 | 43328 | 16 | 0 | 22.0 | 0 | 0 | 0 | 0 | 2.37 | 166.71 | 20.93 | 2.5E-08 |
| 08/16/18 | 43328 | 16 | 5 | 22.0 | 5 | 5 | 300 | 300 | 2.37 | 166.71 | 20.93 | 2.5E-08 |
| 08/16/18 | 43328 | 16 | 10 | 22.0 | 5 | 10 | 300 | 600 | 2.37 | 166.71 | 20.93 | 2.5E-08 |
| 08/16/18 | 43328 | 16 | 15 | 22.0 | 5 | 15 | 300 | 900 | 2.37 | 166.71 | 20.93 | 2.5E-08 * |
| 08/16/18 | 43328 | 16 | 20 | 22.0 | 5 | 20 | 300 | 1200 | 2.37 | 166.71 | 20.93 | 2.5E-08 * |
| 08/16/18 | 43328 | 16 | 25 | 22.0 | 5 | 25 | 300 | 1500 | 2.37 | 166.71 | 20.93 | 2.5E-08 * |
| 08/16/18 | 43328 | 16 | 30 | 22.0 | 5 | 30 | 300 | 1800 | 2.37 | 166.71 | 20.93 | 2.5E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/16/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 4 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-8A - | Flow Pump Speed | 9 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.146 | B-Value, f | 0.97 |
| Diameter, inches | 2.878 | Cell Pres. | 90.0 |
| Area, cm² | 41.97 | Bot. Pres. | 80.0 |
| Volume, cm³ | 335.38 | Top Pres. | 80.0 |
| Mass, g | 683.45 | Tot. B.P. | 80.0 |
| Moisture Content, % | 20.2 | Head, max. | 92.15 |
| Dry Density, pcf | 105.8 | Head, min. | 92.15 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 11.54 |
| Volume Solids, cm³ | 206.74 | Min. Grad. | 11.54 |
| Volume Voids, cm³ | 128.63 | | |
| Void Ratio | 0.62 | | |
| Saturation, % | 89.3% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.144 |
| Diameter, inches | 2.857 |
| Area, cm² | 41.36 |
| Volume, cm³ | 330.29 |
| Mass, g | 690.32 |
| Moisture Content, % | 21.42 |
| Dry Density, pcf | 107.41 |
| Volume Solids, cm³ | 206.74 |
| Volume Voids, cm³ | 123.55 |
| Void Ratio | 0.60 |
| Saturation, % | 98.6% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 683.45 | 771.00 |
| Wt Soil & Tare, f | g | 568.54 | 649.36 |
| Wt Tare | g | 0.00 | 81.48 |
| Wt Moisture Lost | g | 114.91 | 121.64 |
| Wt Dry Soil | g | 568.54 | 567.88 |
| Water Content | % | 20.21% | 21.42% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/16/18 | 43328 | 17 | 0 | 21.4 | 0 | 0 | 0 | 0 | 1.31 | 92.15 | 11.54 | 8.6E-08 |
| 08/16/18 | 43328 | 17 | 5 | 21.4 | 5 | 5 | 300 | 300 | 1.31 | 92.15 | 11.54 | 8.6E-08 |
| 08/16/18 | 43328 | 17 | 10 | 21.4 | 5 | 10 | 300 | 600 | 1.31 | 92.15 | 11.54 | 8.6E-08 |
| 08/16/18 | 43328 | 17 | 15 | 21.4 | 5 | 15 | 300 | 900 | 1.31 | 92.15 | 11.54 | 8.6E-08 * |
| 08/16/18 | 43328 | 17 | 20 | 21.4 | 5 | 20 | 300 | 1200 | 1.31 | 92.15 | 11.54 | 8.6E-08 * |
| 08/16/18 | 43328 | 17 | 25 | 21.4 | 5 | 25 | 300 | 1500 | 1.31 | 92.15 | 11.54 | 8.6E-08 * |
| 08/16/18 | 43328 | 17 | 30 | 21.4 | 5 | 30 | 300 | 1800 | 1.31 | 92.15 | 11.54 | 8.6E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 8.6E-08 cm/sec **

| | |
|---|---|
| DATE | 8/16/18 |
| CHECK | DA |
| REVIEW | MDL |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 5 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-9A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.120 | B-Value, f | 0.99 |
| Diameter, inches | 2.861 | Cell Pres. | 90.0 |
| Area, cm² | 41.48 | Bot. Pres. | 80.0 |
| Volume, cm³ | 328.69 | Top Pres. | 80.0 |
| Mass, g | 630.12 | Tot. B.P. | 80.0 |
| Moisture Content, % | 20.9 | Head, max. | 89.33 |
| Dry Density, pcf | 99.0 | Head, min. | 89.33 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 11.12 |
| Volume Solids, cm³ | 189.60 | Min. Grad. | 11.12 |
| Volume Voids, cm³ | 139.09 | | |
| Void Ratio | 0.73 | | |
| Saturation, % | 78.2% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.163 |
| Diameter, inches | 2.881 |
| Area, cm² | 42.06 |
| Volume, cm³ | 337.89 |
| Mass, g | 656.97 |
| Moisture Content, % | 26.00 |
| Dry Density, pcf | 96.29 |
| Volume Solids, cm³ | 189.60 |
| Volume Voids, cm³ | 148.29 |
| Void Ratio | 0.78 |
| Saturation, % | 91.4% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 630.12 | 739.10 |
| Wt Soil & Tare, f | g | 521.40 | 603.58 |
| Wt Tare | g | 0.00 | 82.37 |
| Wt Moisture Lost | g | 108.72 | 135.52 |
| Wt Dry Soil | g | 521.40 | 521.21 |
| Water Content | % | 20.85% | 26.00% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/17/18 | 43329 | 12 | 0 | 21.0 | 0 | 0 | 0 | 0 | 1.27 | 89.33 | 11.12 | 4.7E-08 |
| 08/17/18 | 43329 | 12 | 5 | 21.0 | 5 | 5 | 300 | 300 | 1.27 | 89.33 | 11.12 | 4.7E-08 |
| 08/17/18 | 43329 | 12 | 10 | 21.0 | 5 | 10 | 300 | 600 | 1.27 | 89.33 | 11.12 | 4.7E-08 |
| 08/17/18 | 43329 | 12 | 15 | 21.0 | 5 | 15 | 300 | 900 | 1.27 | 89.33 | 11.12 | 4.7E-08 * |
| 08/17/18 | 43329 | 12 | 20 | 21.0 | 5 | 20 | 300 | 1200 | 1.27 | 89.33 | 11.12 | 4.7E-08 * |
| 08/17/18 | 43329 | 12 | 25 | 21.0 | 5 | 25 | 300 | 1500 | 1.27 | 89.33 | 11.12 | 4.7E-08 * |
| 08/17/18 | 43329 | 12 | 30 | 21.0 | 5 | 30 | 300 | 1800 | 1.27 | 89.33 | 11.12 | 4.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/17/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 9 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-10A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.131 | B-Value, f | 0.99 |
| Diameter, inches | 2.859 | Cell Pres. | 90.0 |
| Area, cm² | 41.42 | Bot. Pres. | 80.0 |
| Volume, cm³ | 329.38 | Top Pres. | 80.0 |
| Mass, g | 673.81 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.0 | Head, max. | 151.23 |
| Dry Density, pcf | 104.6 | Head, min. | 151.23 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 19.01 |
| Volume Solids, cm³ | 200.86 | Min. Grad. | 19.01 |
| Volume Voids, cm³ | 128.53 | | |
| Void Ratio | 0.64 | | |
| Saturation, % | 94.5% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.132 |
| Diameter, inches | 2.868 |
| Area, cm² | 41.68 |
| Volume, cm³ | 331.57 |
| Mass, g | 680.16 |
| Moisture Content, % | 23.14 |
| Dry Density, pcf | 103.95 |
| Volume Solids, cm³ | 200.86 |
| Volume Voids, cm³ | 130.71 |
| Void Ratio | 0.65 |
| Saturation, % | 97.8% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 673.81 | 688.19 |
| Wt Soil & Tare, f | g | 552.36 | 560.44 |
| Wt Tare | g | 0.00 | 8.30 |
| Wt Moisture Lost | g | 121.45 | 127.75 |
| Wt Dry Soil | g | 552.36 | 552.14 |
| Water Content | % | 21.99% | 23.14% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/17/18 | 43329 | 16 | 0 | 21.0 | 0 | 0 | 0 | 0 | 2.15 | 151.23 | 19.01 | 2.8E-08 |
| 08/17/18 | 43329 | 16 | 5 | 21.0 | 5 | 5 | 300 | 300 | 2.15 | 151.23 | 19.01 | 2.8E-08 |
| 08/17/18 | 43329 | 16 | 10 | 21.0 | 5 | 10 | 300 | 600 | 2.15 | 151.23 | 19.01 | 2.8E-08 |
| 08/17/18 | 43329 | 16 | 15 | 21.0 | 5 | 15 | 300 | 900 | 2.15 | 151.23 | 19.01 | 2.8E-08 * |
| 08/17/18 | 43329 | 16 | 20 | 21.0 | 5 | 20 | 300 | 1200 | 2.15 | 151.23 | 19.01 | 2.8E-08 * |
| 08/17/18 | 43329 | 16 | 25 | 21.0 | 5 | 25 | 300 | 1500 | 2.15 | 151.23 | 19.01 | 2.8E-08 * |
| 08/17/18 | 43329 | 16 | 30 | 21.0 | 5 | 30 | 300 | 1800 | 2.15 | 151.23 | 19.01 | 2.8E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.8E-08 cm/sec **

| | |
|---|---|
| DATE | 8/17/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 2 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-11A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.117 | B-Value, f | 0.99 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 |
| Area, $cm^2$ | 41.50 | Bot. Pres. | 80.0 |
| Volume, $cm^3$ | 328.60 | Top Pres. | 80.0 |
| Mass, g | 648.67 | Tot. B.P. | 80.0 |
| Moisture Content, % | 26.7 | Head, max. | 94.96 |
| Dry Density, pcf | 97.2 | Head, min. | 94.96 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 11.96 |
| Volume Solids, $cm^3$ | 189.56 | Min. Grad. | 11.96 |
| Volume Voids, $cm^3$ | 139.04 | | |
| Void Ratio | 0.73 | | |
| Saturation, % | 98.4% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.126 |
| Diameter, inches | 2.869 |
| Area, $cm^2$ | 41.71 |
| Volume, $cm^3$ | 331.16 |
| Mass, g | 649.38 |
| Moisture Content, % | 26.88 |
| Dry Density, pcf | 96.44 |
| Volume Solids, $cm^3$ | 189.56 |
| Volume Voids, $cm^3$ | 141.60 |
| Void Ratio | 0.75 |
| Saturation, % | 97.1% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 648.67 | 763.67 |
| Wt Soil & Tare, f | g | 511.81 | 626.13 |
| Wt Tare | g | 0.00 | 114.41 |
| Wt Moisture Lost | g | 136.86 | 137.54 |
| Wt Dry Soil | g | 511.81 | 511.72 |
| Water Content | % | 26.74% | 26.88% |

Flow Pump Rate: 2.25E-05 $cm^3$/sec

USCS: -

DESCRIPTION: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/17/18 | 43329 | 13 | 0 | 21.0 | 0 | 0 | 0 | 0 | 1.35 | 94.96 | 11.96 | 4.4E-08 |
| 08/17/18 | 43329 | 13 | 5 | 21.0 | 5 | 5 | 300 | 300 | 1.35 | 94.96 | 11.96 | 4.4E-08 |
| 08/17/18 | 43329 | 13 | 10 | 21.0 | 5 | 10 | 300 | 600 | 1.35 | 94.96 | 11.96 | 4.4E-08 |
| 08/17/18 | 43329 | 13 | 15 | 21.0 | 5 | 15 | 300 | 900 | 1.35 | 94.96 | 11.96 | 4.4E-08 * |
| 08/17/18 | 43329 | 13 | 20 | 21.0 | 5 | 20 | 300 | 1200 | 1.35 | 94.96 | 11.96 | 4.4E-08 * |
| 08/17/18 | 43329 | 13 | 25 | 21.0 | 5 | 25 | 300 | 1500 | 1.35 | 94.96 | 11.96 | 4.4E-08 * |
| 08/17/18 | 43329 | 13 | 30 | 21.0 | 5 | 30 | 300 | 1800 | 1.35 | 94.96 | 11.96 | 4.4E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.4E-08 cm/sec **

| | |
|---|---|
| DATE | 8/17/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

**FLEXIBLE WALL PERMEABILITY**
**ASTM D 5084**
**METHOD D, CONSTANT RATE OF FLOW**

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 4 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-12A - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS:

**Sample Data, Initial**

| | | | |
|---|---|---|---|
| Height, inches | 3.121 | B-Value, f | 0.99 |
| Diameter, inches | 2.875 | Cell Pres. | 90.0 |
| Area, cm² | 41.88 | Bot. Pres. | 80.0 |
| Volume, cm³ | 332.02 | Top Pres. | 80.0 |
| Mass, g | 661.19 | Tot. B.P. | 80.0 |
| Moisture Content, % | 25.3 | Head, max. | 98.48 |
| Dry Density, pcf | 99.2 | Head, min. | 98.48 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 12.40 |
| Volume Solids, cm³ | 191.90 | Min. Grad. | 12.40 |
| Volume Voids, cm³ | 140.12 | | |
| Void Ratio | 0.73 | | |
| Saturation, % | 95.3% | | |

**Sample Data, Final**

| | |
|---|---|
| Height, inches | 3.126 |
| Diameter, inches | 2.877 |
| Area, cm² | 41.94 |
| Volume, cm³ | 333.01 |
| Mass, g | 665.14 |
| Moisture Content, % | 26.04 |
| Dry Density, pcf | 98.88 |
| Volume Solids, cm³ | 191.90 |
| Volume Voids, cm³ | 141.12 |
| Void Ratio | 0.74 |
| Saturation, % | 97.4% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 661.19 | 778.53 |
| Wt Soil & Tare, f | g | 527.71 | 641.15 |
| Wt Tare | g | 0.00 | 113.61 |
| Wt Moisture Lost | g | 133.48 | 137.38 |
| Wt Dry Soil | g | 527.71 | 527.54 |
| Water Content | % | 25.29% | 26.04% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/17/18 | 43329 | 11 | 0 | 21.0 | 0 | 0 | 0 | 0 | 1.40 | 98.48 | 12.40 | 4.2E-08 |
| 08/17/18 | 43329 | 11 | 5 | 21.0 | 5 | 5 | 300 | 300 | 1.40 | 98.48 | 12.40 | 4.2E-08 |
| 08/17/18 | 43329 | 11 | 10 | 21.0 | 5 | 10 | 300 | 600 | 1.40 | 98.48 | 12.40 | 4.2E-08 |
| 08/17/18 | 43329 | 11 | 15 | 21.0 | 5 | 15 | 300 | 900 | 1.40 | 98.48 | 12.40 | 4.2E-08 * |
| 08/17/18 | 43329 | 11 | 20 | 21.0 | 5 | 20 | 300 | 1200 | 1.40 | 98.48 | 12.40 | 4.2E-08 * |
| 08/17/18 | 43329 | 11 | 25 | 21.0 | 5 | 25 | 300 | 1500 | 1.40 | 98.48 | 12.40 | 4.2E-08 * |
| 08/17/18 | 43329 | 11 | 30 | 21.0 | 5 | 30 | 300 | 1800 | 1.40 | 98.48 | 12.40 | 4.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.2E-08 cm/sec **

| | |
|---|---|
| DATE | 8/17/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 6 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-13A - | Flow Pump Speed | 9 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.121 | B-Value, f | 0.98 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 |
| Volume, cm³ | 329.02 | Top Pres. | 80.0 |
| Mass, g | 676.03 | Tot. B.P. | 80.0 |
| Moisture Content, % | 18.9 | Head, max. | 139.27 |
| Dry Density, pcf | 107.9 | Head, min. | 139.27 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 17.47 |
| Volume Solids, cm³ | 206.84 | Min. Grad. | 17.47 |
| Volume Voids, cm³ | 122.18 | | |
| Void Ratio | 0.59 | | |
| Saturation, % | 87.8% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.139 |
| Diameter, inches | 2.867 |
| Area, cm² | 41.65 |
| Volume, cm³ | 332.08 |
| Mass, g | 689.34 |
| Moisture Content, % | 21.19 |
| Dry Density, pcf | 106.88 |
| Volume Solids, cm³ | 206.84 |
| Volume Voids, cm³ | 125.24 |
| Void Ratio | 0.61 |
| Saturation, % | 96.2% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 676.03 | 770.73 |
| Wt Soil & Tare, f | g | 568.80 | 650.25 |
| Wt Tare | g | 0.00 | 81.71 |
| Wt Moisture Lost | g | 107.23 | 120.48 |
| Wt Dry Soil | g | 568.80 | 568.54 |
| Water Content | % | 18.85% | 21.19% |

DESCRIPTION: -

Flow Pump Rate: 4.26E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/17/18 | 43329 | 14 | 30 | 21.0 | 0 | 0 | 0 | 0 | 1.98 | 139.27 | 17.47 | 5.7E-08 |
| 08/17/18 | 43329 | 14 | 35 | 21.0 | 5 | 5 | 300 | 300 | 1.98 | 139.27 | 17.47 | 5.7E-08 |
| 08/17/18 | 43329 | 14 | 40 | 21.0 | 5 | 10 | 300 | 600 | 1.98 | 139.27 | 17.47 | 5.7E-08 |
| 08/17/18 | 43329 | 14 | 45 | 21.0 | 5 | 15 | 300 | 900 | 1.98 | 139.27 | 17.47 | 5.7E-08 * |
| 08/17/18 | 43329 | 14 | 50 | 21.0 | 5 | 20 | 300 | 1200 | 1.98 | 139.27 | 17.47 | 5.7E-08 * |
| 08/17/18 | 43329 | 14 | 55 | 21.0 | 5 | 25 | 300 | 1500 | 1.98 | 139.27 | 17.47 | 5.7E-08 * |
| 08/17/18 | 43329 | 15 | 0 | 21.0 | 5 | 30 | 300 | 1800 | 1.98 | 139.27 | 17.47 | 5.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 5.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/17/18 |
| CHECK | |
| REVIEW | MJM |
| APPROVE | |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | Board # | 7 |
| PROJECT NUMBER | 18102853 | Flow Pump | 2 |
| SAMPLE ID | P4-14AE - | Flow Pump Speed | 10 |
| SAMPLE TYPE | UD | Technician | FT |

COMMENTS

**Sample Data, Initial**

| | | | |
|---|---|---|---|
| Height, inches | 3.121 | B-Value, f | 0.99 |
| Diameter, inches | 2.816 | Cell Pres. | 90.0 |
| Area, cm² | 40.18 | Bot. Pres. | 80.0 |
| Volume, cm³ | 318.53 | Top Pres. | 80.0 |
| Mass, g | 631.23 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.6 | Head, max. | 85.81 |
| Dry Density, pcf | 100.9 | Head, min. | 85.81 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 10.83 |
| Volume Solids, cm³ | 187.29 | Min. Grad. | 10.83 |
| Volume Voids, cm³ | 131.24 | | |
| Void Ratio | 0.70 | | |
| Saturation, % | 88.5% | | |

**Sample Data, Final**

| | |
|---|---|
| Height, inches | 3.121 |
| Diameter, inches | 2.789 |
| Area, cm² | 39.41 |
| Volume, cm³ | 312.45 |
| Mass, g | 638.37 |
| Moisture Content, % | 23.95 |
| Dry Density, pcf | 102.86 |
| Volume Solids, cm³ | 187.29 |
| Volume Voids, cm³ | 125.16 |
| Void Ratio | 0.67 |
| Saturation, % | 98.5% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 631.23 | 857.68 |
| Wt Soil & Tare, f | g | 515.04 | 734.39 |
| Wt Tare | g | 0.00 | 219.52 |
| Wt Moisture Lost | g | 116.19 | 123.29 |
| Wt Dry Soil | g | 515.04 | 514.87 |
| Water Content | % | 22.56% | 23.95% |

DESCRIPTION: -

Flow Pump Rate: 2.25E-05 cm³/sec

USCS: -

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/17/18 | 43329 | 9 | 30 | 21.0 | 0 | 0 | 0 | 0 | 1.22 | 85.81 | 10.83 | 5.1E-08 |
| 08/17/18 | 43329 | 9 | 35 | 21.0 | 5 | 5 | 300 | 300 | 1.22 | 85.81 | 10.83 | 5.1E-08 |
| 08/17/18 | 43329 | 9 | 40 | 21.0 | 5 | 10 | 300 | 600 | 1.22 | 85.81 | 10.83 | 5.1E-08 |
| 08/17/18 | 43329 | 9 | 45 | 21.0 | 5 | 15 | 300 | 900 | 1.22 | 85.81 | 10.83 | 5.1E-08 * |
| 08/17/18 | 43329 | 9 | 50 | 21.0 | 5 | 20 | 300 | 1200 | 1.22 | 85.81 | 10.83 | 5.1E-08 * |
| 08/17/18 | 43329 | 9 | 55 | 21.0 | 5 | 25 | 300 | 1500 | 1.22 | 85.81 | 10.83 | 5.1E-08 * |
| 08/17/18 | 43329 | 10 | 0 | 21.0 | 5 | 30 | 300 | 1800 | 1.22 | 85.81 | 10.83 | 5.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 5.1E-08 cm/sec **

| | |
|---|---|
| DATE | 8/17/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# APPENDIX L

**Geomembrane Installation Company Qualifications**

**GSE Lining Technology, Inc.**

19103 Gundle Road
Houston, Texas 77073
800-435-2008
281-443-8564
Fax: 281-230-8650

**December 9, 2008**

**Plastic Fusion Fabricators, Inc.**
**3455 Stanwood Blvd., N.E.**
**Huntsville, AL 35811**

## CERTIFICATION

This letter is to certify that**, Plastic Fusion Fabricators, Inc.,** has been provided with a copy of GSE's proprietary product manual containing the data sheets of all GSE's products for this project, and the GSE Field Installation Quality Assurance Manual.

With the information provided by GSE referenced herein or similar information supplied by the independent installer, and the use of qualified technical field personnel, **Plastic Fusion Fabricators, Inc.,** can undertake this installation of GSE's products. GSE's Technical Department representatives are available to respond to questions on specifications and installation techniques.

Regards,



Nathan Ivy
Inside Sales Manager

**PROJECT REFERENCES**

Plastic Fusion Fabricators, Inc.

Your Total Containment Resource

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| CARGILL MEAT SOLUTIONS<br>WYALUSING, PA | CARGILL MEAT SOLUTIONS<br>BOX 188, ROUTE #706<br>WYALUSING, PA 18853<br>ERIC KEENEY<br>570-746-3000 (X7286) | FLOATING COVER | 80 HDPE | 3/11/14 | L. HICE |
| UPPER CUMBERLAND MSWLF<br>AREA 11<br>RED BOILING, TN | UPPER CUMBERLAND SWA<br>1175 TERRY ODLE ROAD<br>RED BOILING, TN 37150<br>CORNELL SMITH<br>931-258-3954 | LANDFILL LINER | 60 MIL HDPE<br>GEOTEXTILE | 8/4/13 | L. HICE |
| CITY OF TY TY WWTP<br>TY TY, GA | CITY OF TY TY<br>141 E. ELMAN ST.<br>TY TY, GA 31795<br>ANDY HANCOCK<br>229-776-3059 | LAGOON LINER | 60 - HDT | 11/1/13 | P. ELLIOTT |
| TENNESSEE EASTMAN<br>KINGSPORT, TN | EASTMAN CHEMICAL<br>PO BOX 511<br>KINGSPORT, TN 37662<br>KENT BEGLEY<br>423-229-8492 | LANDFILL LINER | 60 HDT<br>GEOCOMP | 6/8/13 | P. ELLIOTT |
| JOHN MORRELL CO.<br>SIOUX FALLS, SD | JOHN MORRELL COMPANY<br>PO BOX 5266<br>SIOUX FALLS, SD 57117<br>SCOTT LAGNER<br>605-330-3138 | FLOATING COVER | 100 - HDPE<br>60 - LLDPE | 12/21/13 | L. HICE |
| GP - MONTICELLO<br>MONTICELLO, MS | GEORGIA PACIFIC<br>604 N.A. SANDIFER ROAD<br>MONTICELLO, MS 39654<br>KARL VONLINDENBERG<br>443-489-9033 | SECONDARY CONTAINMENT LINER | 10 WCPE | 8/23/13 | P. ELLIOTT |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| WEST CARROLL PARISH LANDFILL<br>OAK GROVE, LA | WEST CARROLL PARISH<br>PO DRAWER 630<br>OAK GROVE, LA 71263<br>DION AUGUER<br>318-428-2437 | LANDFILL LINER | 60- HDPE | 9/4/13 | P. ELLIOTT |
| CAMPBELL SOUP<br>MAXTON, NC | CAMPBELL SOUP SUPPLY CO.<br>PO BOX 9193<br>CANTON, MA 02021<br>GREG WESTBROOK<br>910-844-1331 | LAGOON LINER | 60 HDW<br>GEOCOMP. | 12/21/13 | L. HICE |
| BI-COUNTY LANDFILL<br>CLASS I BALEFILL EXPANSION<br>WOODLAWN, TN | BI-COUNTY SWM<br>PO BOX 1112<br>CLARKSVILLE, TN 37041<br>MARK NEBLETT<br>931-553-5190 | LANDFILL LINER | 60 MIL HD | 10/6/13 | P. ELLIOTT |
| ENVIRONMENTAL WASTE SOLUTIONS<br>CAMDEN, TN | ENv. WASTE SOLUTIONS<br>4521 TROUSDALE DR.<br>NASHVILLE, TN 37204<br>CHRIS WHITE<br>615-717-5564 | LANDFILL LINER | 60 - HDT<br>GCL<br>GEOCOMP. | 11/8/13 | P. ELLIOTT |
| FIELDALE FARMS<br>EASTANOLLE, GA | FIELDALE FARMS<br>270 FDC BYPRODUCT DRIVE<br>EASTANOLLE, GA 30538<br>RAY ARCHER<br>770-536-8617 | LAGOON LINER | 60 HDPE<br>GEOCOMP. | 1/26/14 | P; ELLIOTT |
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | MONTGOMERY COUNTY, TN<br>PO BOX 368<br>CLARKSVILLE, TN 37041-0368<br>MARK NEBLETT<br>931-553-5190 | LANDFILL CAP LINER | 50 LLDPT<br>TURF | 7/13/13 | P. ELLIOTT |
| MOUNTAIRE FARMS, INC.<br>LUMBER BRIDGE, NC | MOUNTAIRE FARMS, INC.<br>PO BOX 339<br>LUMBER BRIDGE, NC 28375<br>JIM ZUNIGA<br>910-359-5300 | LAGOON LINER | 60 HDW<br>GEOCOMP.<br>ADS PIPE | 8/28/14 | L. HICE |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| UOP / HONEYWELL INT'L<br>MOBILE, AL | UOP LLC C/O HONEYWELL INT'L<br>PO BOX 981762<br>EL PASO, TX 79998<br>ST. CLAIRE ADAMS<br>251-330-7474 | FLOATING COVER | 80 HDPE | 4/14/14 | L. HICE |
| TYSON FOODS<br>BLOUNTSVILLE, AL | TYSON FOODS<br>67240 MAIN STREET<br>BLOUNTSVILLE, AL 35031<br>LANCE TAYLOR<br>256-835-1800 | LAGOON LINER | 80 - HDPE<br>GEOCOMP. | 8/4/15 | L. HICE |
| IOWA PREMIUM BEEF<br>TAMA, IA | IOWA PREMIUM BEEF<br>3337 "L" AVENUE<br>TAMA, IA 52339<br>GREGG SCHREINER<br>763-746-9075 | FLOATING COVER | 100 - HDPE | 12/6/15 | L. HICE |
| MT. OLIVE LANDFILL<br>GARDENDALE, AL | SANTEK ENVIRONMENTAL, INC.<br>650 25TH STREET, NW, SUITE 100<br>CLEVELAND, TN 37311<br>SAM DILLENDER<br>423-599-5168 | LANDFILL LINER | 60 HDT<br>GCL<br>GEOCOMP. | 8/15/14 | P. ELLIOTT |
| HOUSTON COUNTY LANDFILL<br>KATHLEEN, GA | HOUSTON COUNTY<br>200 CARL VINSON PARKWAY<br>WARNER ROBINS, GA 31088<br>CHARLES LANCE<br>478-862-5238 | LANDFILL LINER | 60 - HDT | 9/11/14 | P. ELLIOTT |
| CRITTENDEN COUNTY LANDFILL<br>WEST MEMPHIS, AR | SANTEK WASTE SERVICES, INC.<br>650 25TH ST. NW, SUITE 100<br>CLEVELAND, TN 37311<br>MARTIN DAVIS<br>901-309-3855 | LANDFILL LINER | 60 HDT<br>GCL<br>GEOCOMP. | 9/1/14 | P. ELLIOTT |
| THE GROVE<br>COLLEGE GROVE, TN | TERRA VERDE GROUP, LLC<br>6200 WILDINGS BLVD.<br>COLLEGE GROVE, TN 37046<br>NEIL BALES<br>615-368-2600 | LAGOON LINER | 60 HDT | 6/28/14 | P. ELLIOTT |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| MARION CO LANDFILL<br>JASPER, TN | MARION CO SWD, INC.<br>700 CHASEY SIMPSON ROAD<br>JASPER, TN 37347<br>MARK PAYNE<br>423-942-8011 | LANDFILL LINER | 60 - HDT<br>GEOCOMP. | 7/15/15 | P. ELLIOTT |
| TOOMBS COUNTY LANDFILL<br>CELLS 13 - 19<br>LYONS, GA | TOOMBS CO. BOARD OF COMM.<br>PO BOX 112<br>LYONS, GA 30436<br>SHANE HOLLAND<br>912-537-7887 | LANDFILL LINER | 60 - HDPE<br>60 - HDT | 2/25/15 | P. ELLIOTT |
| TAYLOR COUNTY LANDFILL<br>CELL 14<br>MAUK, GA | TAYLOR CO. LANDFILL<br>33 STEWART ROAD<br>MAUK, GA 31058<br>ED MARKS<br>252-536-2660 | LANDFILL LINER | 60 - HDT<br>GCL<br>12 - RAIN | 4/6/14 | P. ELLIOTT |
| LAMPTON SEWER DISTRICT<br>COLUMBIA, MS | LAMPTON SEWER DISTRICT<br>1072 HWY 13 SOUTH<br>COLUMBIA, MS 39429<br>BOBBY CARTER<br>601-736-4525 | LAGOON LINER | 60 HDWC | 10/27/14 | P. ELLIOTT |
| PERDUE FARMS<br>ACCOMAC, VA | PERDUE FARMS<br>22520 LANKFORD HWY.<br>ACCOMAC, VA 23301<br>CARL JOHNSON<br>410-543-3066 | LAGOON LINER | 60 - HD<br>GEOCOMP.<br>12” ADS | 9/26/14 | L. HICE |
| McCALL FARMS<br>EFFINGHAM, SC | McCALL FARMS INC.<br>6615 IRBY STREET<br>EFFINGHAM, SC 29541<br>JEFF HOLLENBACK<br>843-662-2223 | FLOATING<br>COVER | 60 - HDPE<br>80 - HDPE | 5/20/15 | L. HICE |
| MCMINN COUNTY LANDFILL<br>SECTION 2, PHASE III<br>ATHENS, TN | MCMINN COUNTY LANDFILL<br>391 COUNTY ROAD 750<br>ATHENS, TN 37303<br>MATT ARP<br>423-336-2261 | LAGOON LINER | 60 - HD<br>60 - HDT<br>GEOCOMP<br>12 OZ GEOT.<br>6 OZ GEOT. | 11/29/14 | P. ELLIOTT |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| ENVIRONMENTAL WASTE SOLUTIONS<br>CAMDEN, TN | ENV. WASTE SOLUTIONS<br>4521 TROUSDALE DR.<br>NASHVILLE, TN 37204<br>CHRIS WHITE<br>615-717-5564 | LANDFILL LINER | 60 - HDT<br>GCL<br>GEOCOMP. | 8/2/15 | P. ELLIOTT |
| 3M CORPORATION<br>DECATUR, AL | 3M CORPORATION<br>1400 STATE DOCKS ROAD<br>DECATUR, AL 35601<br>JUSTIN BOOZER<br>256-383-0313 | LAGOON LINER | 60 - HDWT | 11/16/16 | P. ELLIOTT |
| WILDHORSE RESOURCES<br>RUSTON, LA | WILDHORSE RESOURCES<br>RUSTON, LA<br>WESLEY PILGRIM<br>318-368-9111 | SLOPE PROTECTIVE LINER | 60 HDPE | 10/15/14 | P. ELLIOTT |
| HARDEMAN COUNTY LANDFILL<br>MEDON, TN | US EPA - REGION 4<br>61 FORSYTH STREET, SW<br>ATLANTA, GA 30303<br>MARK HANNAH<br>859-885-4955 | LANDFILL CAP LINER | 40 - LLDPT<br>GEOCOMP<br>GCL | 7/27/15 | P. ELLIOTT |
| EMERALD COAST UTILITY AUTHORITY<br>CANTONMENT, FL | EMERALD COAST UTILITY AUTHORITY<br>2980 OLD CHEMSTRAND ROAD<br>DANIEL ELLER<br>850-932-5342 | LAGOON LINER | 60 - HD<br>GEOCOMP | 6/7/15 | P. ELLIOTT |
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | MONTGOMERY COUNTY, TN<br>PO BOX 368<br>CLARKSVILLE, TN 37041-0368<br>MARK NEBLETT<br>931-553-5190 | LANDFILL CAP LINER | 50 LLDPT<br>TURF | 11/5/15 | P. ELLIOTT |
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | MONTGOMERY COUNTY, TN<br>PO BOX 368<br>CLARKSVILLE, TN 37041-0368<br>MARK NEBLETT<br>931-553-5190 | LANDFILL CAP LINER | 40 - LLDPE | 7/3/15 | P. ELLIOTT |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| SOLUTIA<br>ANNISTON, AL | EASTMAN<br>702 CLYDESDALE AVENUE<br>ANNISTON, AL 36201<br>ELLIS BENNETT<br>256-835-1800 | LANDFILL CAP LINER | 40 HDT<br>GEOCOMP. | 5/6/16 | P. ELLIOTT |
| DUKE ENERGY - MARSHALL STEAM STATION<br>TERRELL, NC | DUKE POWER<br>8320 EAST NC HWY 150<br>TERRELL, NC 28682<br>FRED BROWN<br>704-601-4290 | SECONDARY CONTAINMENT LINER | 60 HDPE | 10/31/15 | P. ELLIIOTT |
| USWRSWMD<br>NASHVILLE, AR | USWRSWMD<br>319 LANDFILL ROAD<br>NASHVILLE, AR 71852<br>RENE MORADEL<br>318-549-1928 (24) | LANDFILL LINER | 60 - HDPE<br>GEOCOMP. | 10/1/15 | P. ELLIOTT |
| TVA- BROWNS FERRY NUCLEAR PLANT | TVA<br>PO BOX 15500<br>KNOXVILLE, TN 37901<br>BEN GRAVES<br>256-729-7923 | LAGOON LINER | 40 HDPE<br>GEOTEXTILE | 1/14/16 | P. ELLIOTT |
| 3M COMPANY<br>CORDOVA, IL | 3M COMPANY<br>PO BOX 3428<br>ST. PAUL, MN 55133<br>MIKE MURPHY<br>563-322-2503 | LAGOON LINER | 100 - HDWTX | 11/19/15 | P. ELLIOTT |
| COASTAL PROCESSING<br>LOUISVILLE, GA | COASTAL PROCESSING, LLC<br>23452 US HWY 80 EAST<br>STATESBORO, GA 30461<br>KEITH CLANCY<br>478-279-2696 | LAGOON LINER | 80 -HDPE<br>GEOCOMP. | 1/11/16 | P. ELLIOTT |
| ECM OF RIDGELY<br>LANDFILL CELL 1C<br>RIDGELY, TN | ECM OF RIDGELY<br>3141 CHANDLERS MILL ROAD<br>RIDGELY, TN 38080<br>KRITT ALBRITTON<br>270-236-3102 | LANDFILL LINER | 60 - HDT<br>GEOCOMP. | 4/20/16 | P. ELLIOTT |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| STRICKLAND LOOP ROAD LANDFILL<br>CELLS 18 - 22<br>FORSYTH, GA | MONROE CO. GEORGIA<br>HWY. 83 NORTH<br>FORSYTH, GA 31029<br>CHARLES LANCE<br>912-746-8987 | LANDFILL LINER | 60 - HDPE<br>GCL<br>GEOCOMP. | 7/18/16 | P. ELLIOTT |
| McCALL FARMS<br>EFFINGHAM, SC | McCALL FARMS INC.<br>6615 IRBY STREET<br>EFFINGHAM, SC 29541<br>JEFF HOLLENBACK<br>843-662-2223 | LAGOON LINER | 60 - HDPE<br>GEOCOMP.<br>BAFFLE<br>GEOTEXTILE | 8/21/15 | L. HICE |
| SEECO - JUDSONIA REUSE FACILITY<br>IMPOUNDMENT EXPANSION<br>SUNNYDALE, AR | SOUTHWEST ENERGY CO., INC.<br>100 SWN DRIVE<br>CONWAY, AR 72032<br>TODD HENDRICKS<br>501-589-4008 | LAGOON LINER | 40 HDT<br>40 HDPE<br>GEOCOMP,<br>GEOTEXTILE | 10/31/16 | P. ELLIOTT |
| JOHN W. TURK POWER PLANT<br>MAKE-UP WATER POND<br>FULTON, AR | JOHN W. TURK POWER PLANT<br>3711 HWY 35 SOUTH<br>FULTON, AR 71838<br>THOMAS WEST<br>903-831-1552 | LAGOON LINER | 60 HDWT | 11/4/16 | P. ELLIOTT |
| JACKSON COUNTY LANDFILL<br>AMAGON, AR | JACKSON COUNTY ARKANSAS<br>208 MAIN ST. #5<br>NEWPORT, AR 72112<br>BRADLEY GRISSOM<br>870-259-3126 | LANDFILL LINER | 60 - HDT | 8/17/16 | P. ELLIOTT |
| WESTROCK - MAHRT MILL<br>COTTONTON, AL | WESTROCK<br>145 HWY. 165 S.<br>COTTONTON, AL 36851<br>TONY WRIGHT<br>706-324-5765 | LANDFILL LINER | 60 HDPE<br>60 HDT<br>GCL<br>GEOTEXTILE | 8/7/16 | P. ELLIOTT |
| GP - ALABAMA RIVER CELLULOSE<br>PERDUE HILL, AL | GP - ALABAMA RIVER CELLULOSE<br>2373 LENA LANDEGGER ROAD<br>EDDIE MCILWAIN<br>251-679-1965 | LANDFILL LINER | 60 - HDPE<br>60 - HDT<br>GCL<br>GEOTEXTILE | 4/17/17 | P. ELLIOTT |

| PROJECT NAME/LOCATION | OWNER/CUSTOMER | PROJECT TYPE | MIL/TYPE | COMP. DATE | PROJECT MGR. |
|---|---|---|---|---|---|
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | MONTGOMERY COUNTY, TN<br>PO BOX 368<br>CLARKSVILLE, TN 37041-0368<br>MARK NEBLETT<br>931-553-5190 | LANDFILL LINER | 60 - HDT<br>GEOCOMP. | 11/23/16 | P. ELLIOTT |
| CITY OF TY TY WWTP<br>TY TY, GA | CITY OF VIENNA<br>203 WEST COTTON STREET<br>VIENNA, GA 31092<br>ANDY HANCOCK<br>229-776-3059 | LAGOON LINER | 60 - HDT<br>GEOTEXTUL | 12/19/16 | P. ELLIOTT |
| TELFAIR COUNTY LANDFILL<br>MCRAE, GA | TELFAIR CO. BOARD OF COMM.<br>SHANE HOLLAND<br>912-537-7887 | LANDFILL LINER | 60 - HDPE | 1/16/18 | P. ELLIOTT |
| WM - RICHLAND LANDFILL<br>ELGIN, SC | WASTE MANAGEMENT, INC.<br>1047 HIGHWAY CHURCH ROAD<br>ELGIN, SC 29437<br>TERRY DARAGH<br>770-590-3323 | RAIN COVER | 12 MIL SRPE | 1/12/16 | P. ELLIOTT |
| OPTIMA KV, LLC<br>KENANSVILLE, NC | OPTIMA KV, LLC<br>2249 W. ERIE<br>CHICAGO, IL 60612<br>KEVIN GREENE<br>303-916-3001 | FLOATING<br>COVER | 60-HDPE<br>100-HDPE<br>Baffles | 1/31/18 | L. HICE |
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | MONTGOMERY COUNTY, TN<br>PO BOX 368<br>CLARKSVILLE, TN 37041-0368<br>MARK NEBLETT<br>931-553-5190 | LANDFILL LINER | 60 - HDT<br>GEOCOMP. | 5/18/18 | P. ELLIOTT |

Plastic Fusion Fabricators, Inc.

Your Total Containment Resource

# RESUME

**Name:** Albert Corbitt

**Position:** Field Supervisor/Quality Control/Master Seamer

| JOB NAME/LOCATION | SQ. FT. INST. |
|---|---|
| BFI - CMS CELL 1 B<br>HARRISBURG, NC | 1,348,181 |
| WESTINGHOUSE SAVANNAH RIVER<br>AIKEN, SC | 169,140 |
| BFI-TIMBERLANDS PHASE II<br>BREWTON, AL | 660,516 |
| BFI - SAMPSON COUNTY PHASE II<br>ROSEBORO, NC | 706,842 |
| WEST CARROLL PARRISH<br>OAK GROVE, LA | 191,000 |
| GEORGIA PACIFIC CORPORATION<br>RUSSELVILLE, SC | 52,000 |
| ENVIRONMENTAL TECH.<br>RICHMOND, VA | 60,434 |
| ENVIRONMENTAL TECH.<br>RICHMOND, VA | 160,875 |
| RIVER BEND STATION WWT PLANT<br>ST. FRANCISVILLE, LA | 113,850 |
| BI-COUNTY SOLID WASTE LANDFILL<br>CLARKSVILLE, TN | 266,381 |
| CITY OF BOLIVAR<br>BOLIVAR, VA | 245,700 |
| VIRO GROUP<br>MORGAN CITY | 122,850 |
| KIAWAH ISLAND WWTP<br>KIAWAH ISLAND, SC | 195,115 |
| BFI TIMBERLANDS - PHASE III<br>BREWTON, AL | 374,362 |
| RSA-49 LANDFILL CLOSURE<br>REDSTONE ARSENAL, AL | 513,045 |
| LEDBETTER WWT LAGOONS<br>PADUCAH, KY | 250,000 |

| JOB NAME/LOCATION | SQ. FT. INST |
|---|---|
| W. L. CONSTRUCTION & PAVING<br>CHILHOWIE, VA | 457,000 |
| INTERNATIONAL PAPER<br>PINEVILLE, LA | 212,000 |
| COLUMBIA HEIGHTS WWTP<br>COLUMBIA HEIGHTS, LA | 90,000 |
| N.E. WWTP LAGOONS<br>OUACHITA PARRISH, LA | 155,000 |
| CIBA-GEIGY DIST. CENTER<br>THEODORE, AL | 67,238 |
| ENTERGY WWTP LAGOONS<br>ST. FRANCISVILLE, LA | 93,955 |
| APAC - TRICO STEEL<br>DECATUR, AL | 1,004,882 |
| CALCASIEU PARISH LANDFILL<br>LAKE CHARLES, LA | 229,030 |
| SOUTHEAST REGIONAL WWTF<br>MINDEN, LA | 155,112 |
| WARREN COUNTY LANDFILL<br>WARREN COUNTY, NC | 56,976 |
| HAMILTON COUNTY<br>CHATTANOOGA, TN | 94,600 |
| AMERICAN PROTEINS, INC.<br>HANCEVILLE, AL | 224,200 |
| AQUATIC BIOENHANCEMENT<br>FALLS CITY, TX | 108,460 |
| AMERICAN PROTEINS, INC.<br>CUMMING, GA | 51,364 |
| ROBESON COUNTY LANDFILL<br>ST. PAULS, NC | 854,000 |
| ARNOLD AIR FORCE BASE<br>TULLAHOMA, TN | 64,000 |
| OXYCHEM PIPELINE<br>MARKHAM, TX | 242,270 |
| GEORGIA FEED PRODUCTS<br>CUTHBERT, GA | 139,454 |
| GEORGIA FEED PRODUCTS<br>CUTHBERT, GA | 105,000 |

| JOB NAME/LOCATION | SQ. FT. INST |
|---|---|
| BFI-SAMPSON CO PHASE IIIB<br>ROSEBORO, NC | 261,508 |
| CAJUN CONTRACTORS<br>ALBANY, KY | 763,800 |
| LEBANON LANDFILL<br>COLLINSVILLE, AL | 54,765 |
| SIMMONS FOODS, INC.<br>SOUTHWEST CITY, MO | 130,000 |
| LEBANON LANDFILL<br>COLLINSVILLE, AL | 145,500 |
| PHILIP INDUSTRIAL SERVICES<br>PHALBA, TX | 80,325 |
| SAMPSON CO. LANDFILL CELL 1 & 2<br>ROSEBORO, NC | 746,258 |
| BFI<br>BUFORD, GA | 446,490 |
| GEK, INC.<br>COLLINSVILLE, AL | 153,340 |
| WEST CARROLL PARISH LANDFILL<br>OAK GROVE, LA | 225,000 |
| MINE ROAD REGIONAL LANDFILL<br>ATHENS, TN | 398,566 |
| GEORGIA FEED PRODUCTS<br>CUTHBERT, GA | 123,200 |
| EAST CAROLINA LANDFILL<br>AULANDER, NC | 184,585 |
| INTERNATIONAL PAPER<br>PRATTVILLE, AL | 292,600 |
| CULLMAN ENVIRONMENTAL<br>CULLMAN, AL | 269,028 |
| AMERISTEEL<br>JACKSON, TN | 138,000 |
| STEELE WWTP<br>STEELE, AL | 307,996 |
| SAMPSON CO. LANDFILL<br>ROSEBORO, NC | 870,000 |
| CLIFT'S COVE<br>MADISON, AL | 154,000 |

| JOB NAME/LOCATION | SQ. FT. INST |
|---|---|
| REPUBLIC SERVICES, INC.<br>ROUGEMONT, NC | 307,634 |
| CANDLER CO. LANDFILL<br>CANDLER CO., GA | 155,367 |
| TAYLOR ROAD LANDFILL<br>CHESTERFIELD, VA | 214,000 |
| RIVERSIDE FARM<br>CLAXTON, GA | 79,325 |
| GASTON CO. LANDFILL<br>DALLAS, NC<br>CELL 2 CONSTRUCTION | 493,300 |
| SOUTHERN REGIONAL WWTP<br>WAVELAND, MS | 70,500 |
| AMERISTEEL, INC.<br>JACKSON, TN | 149,765 |
| UWHARRIE MSW LANDFILL CELL 8<br>MT. GILEAD, NC | 245,000 |
| UWHARRIE MSW LANDFILL CLOSURE<br>MT. GILEAD, NC | 594,502 |
| COPPERMINE LAS EXPANSION<br>HIRAM, GA | 221,500 |
| LENOIR CO. LANDFILL PHASE I<br>LA GRANGE, NC | 510,000 |
| EAGLE POINT CELLS 5 & 6<br>BALL GROUND, GA | 893,943 |
| UPPER CUMBERLAND MSWLF<br>AREA 10<br>RED BOILING, TN | 127,952 |
| DUKE POWER<br>MARSHALL STEAM STATION<br>TERRELL, NC | 90,817 |
| TUSCARORA LANDFILL<br>NEW BERN, NC | 1,524,000 |
| SAMPSON COUNTY LANDFILL<br>CELL 6<br>ROSEBORO, NC | 925,900 |
| BRISTOL QUARRY LANDFILL<br>SIDEWALL EXTENSION<br>BRISTOL, VA | 68,180 |
| FARBEST FOODS, INC.<br>HUNTINGBURG, IN | 118,200 |
| DUKE ENERGY - BELEWS CREEK<br>BELEWS CREEK, NC | 362,710 |

| JOB NAME/LOCATION | SQ. FT. INST |
|---|---|
| TYSON FOODS, INC.<br>TEMPERANCEVILLE, VA | 52,783 |
| AMERICAN PROTEIN<br>CUTHBERT, GA | 203,310 |
| WALKER MOUNTAIN ROAD LANDFILL<br>PHASE 7<br>ROME, GA | 500,000 |
| WOLF CREEK LANDFILL<br>CELL 5<br>DRY BRANCH, GA | 244,891 |
| DUKE ENERGY - RESIDUE LANDFILL<br>BELEWS CREEK, NC | 1,094,600 |
| NUCOR STEEL<br>TRINITY, AL | 94,303 |
| S. WAKE LANDFILL<br>PHASE 1A<br>HOLLY SPRINGS, NC | 1,161,500 |
| BRISTOL QUARRY LANDFILL<br>SIDEWALL EXTENSION<br>BRISTOL, VA | 60,000 |
| NUCOR STEEL<br>TRINITY, AL | 55,650 |
| GP - PLANT BOWEN<br>GYPSUM DEWATERING CELLS<br>CARTERSVILLE, GA | 754,050 |
| FLORENCE SPORTS COMPLEX<br>FLORENCE, AL | 80,570 |
| WEST CARROLL PARISH LANDFILL<br>OAK GROVE, LA | 128,450 |
| EASTMAN CHEMICAL<br>KINGSPORT, TN | 78,000 |
| DUKE ENERGY<br>BELMONT, NC | 122,988 |
| DUKE ENERGY<br>ASH LANDFILL<br>BELMONT, NC | 1,091,073 |
| BRISTOL QUARRY LANDFILL<br>SIDEWALL EXTENSION<br>BRISTOL, VA | 97,315 |
| DUKE ENERGY<br>ASH LANDFILL<br>BELMONT, NC | 1,214,258 |
| BRISTOL QUARRY LANDFILL<br>SIDEWALL EXTENSION<br>BRISTOL, VA | 59,700 |
| TUSCARORA LANDFILL CLOSURE<br>NEW BERN, NC | 197,010 |

| JOB NAME/LOCATION | SQ. FT. INST |
|---|---|
| LOUISVILLE LANDFILL<br>CELL 4<br>LOUISVILLE, MS | 109,732 |
| GLENN SPRINGS HOLDINGS, INC.<br>COLUMBIA, TN | 481,200 |
| CANDLER COUNTY LANDFILL<br>AREA 3 CONSTRUCTION<br>METTER, GA | 159,920 |
| US PET/CHICKEN OF THE SEA<br>LYONS, GA | 129,400 |
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | 575,100 |
| KENNEDY VALVE<br>ELMIRA, NY | 53,500 |
| GREEN MOUNTAIN LANDFILL<br>ADAMSVILLE, AL | 441,400 |
| GLENN SPRINGS HOLDINGS, INC.<br>COLUMBIA, TN | 620,004 |
| TENNESSEE EASTMAN<br>KINGSPORT, TN | 792,147 |
| THYSSENKRUPP STAINLESS USA<br>SCRAP YARD LINER<br>CALVERT, AL | 610,200 |
| TENNESSEE EASTMAN<br>KINGSPORT, TN | 736,196 |
| CAMPBELL SOUP<br>MAXTON, NC | 614,500 |
| ISLE OF CAPRI CASINO<br>LULA, MS | 136,350 |
| BI-COUNTY LANDFILL<br>WOODLAWN, TN | 394,760 |
| BRISTOL QUARRY LANDFILL<br>SIDEWALL EXTENSION<br>BRISTOL, VA | 115,600 |
| MOUNTAIRE FARMS, INC.<br>LUMBER BRIDGE, NC | 277,000 |
| TYSON FOODS<br>BLOUNTSVILLE, AL | 393,700 |
| MARION CO LANDFILL<br>JASPER, TN | 77,370 |
| TOOMBS COUNTY LANDFILL<br>CELLS 13 - 19<br>LYONS, GA | 584,809 |

| JOB NAME/LOCATION | | SQ. FT. INST |
|---|---|---|
| TAYLOR COUNTY LANDFILL<br>CELL 14<br>MAUK, GA | | 498,000 |
| PERDUE FARMS<br>ACCOMAC, VA | | 79,000 |
| McCALL FARMS<br>EFFINGHAM, SC | | 350,000 |
| DUKE ENERGY - MARSHALL STEAM STATION<br>TERRELL, NC | | 116,200 |
| COASTAL PROCESSING<br>LOUISVILLE, GA | | 140,000 |
| WHITEWATER CREEK WPCP<br>FAYETTEVILLE, GA | | 101,000 |
| JACKSON COUNTY LANDFILL<br>AMAGON, AR | | 127,120.5 |
| EASTMAN CHEMICAL<br>KINGSPORT, TN | | 853,616 |
| JEFFERSON COUNTY LANDFILL<br>LOUISVILLE, GA | | 107,939 |
| HILMAR CHEESE<br>DALHART, TX | | 371,000 |
| EAGLE POINT LANDFILL<br>BALL GROUND, GA | | 101,733 |
| | **TOTAL SQ. FT. INST** | 40,171,335.5 |

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info@plasticfusion.com e-mail · www.plasticfusion.com

# QA/QC MANUAL

**FOR THE INSTALLATION OF**

**FLEXIBLE MEMBRANE LINING SYSTEMS**

***WE SOLVE CONTAINMENT PROBLEMS!***

## INTRODUCTION

### 1.0 Terms of Reference

#### 1.1.1 Purpose

This manual addresses the quality assurance and quality control procedures for the installation of flexible membrane liners used by Plastic Fusion Fabricators (PFF) in landfills, surface impoundments and other installations as specified by the owner and/or engineer.

#### 1.1.2 Quality Control

In the context of this manual, quality assurance and quality control are defined as follows:

Quality Assurance – A planned and systematic pattern of all means and actions designed to provide adequate confidence that items or services meet contractual and regulatory requirements and will perform satisfactorily in service.

Quality Control – Those actions that provide a means to measure and regulate the characteristics of an item or service to contractual and regulatory requirements.

In the context of liner production and installation:

Quality assurance refers to means and actions employed by Plastic Fusion Fabricators and the geomembrane manufacturer to assure conformity of the lining system production and installation with the Quality Assurance Plan, drawings and specifications.

Quality control refers to those actions taken by the Manufacturer, Fabricator and Installer to ensure that the materials and the workmanship meet the requirements of the plans and specifications.

#### 1.1.3 Lining Materials

The materials comprising the lining system include geomembranes, bentonite blankets, geotextiles and geonets manufactured from synthetic polymers.

For purposes of this document, the term “geomembrane” is applied to flexible membrane liners. More specifically “geomembrane” refers to polyethylene geomembranes, with either smooth surface or textured surface for increased friction. These geomembranes include 1) high density polyethylene (HDPE) membranes which are made from resins with specific gravity greater than 0.935 and 2) linear low density polyethylene (LLDPE) membranes which are made from resins with specific gravity between 0.89 and 0.91 prior to the addition of carbon black and additives.

The geomembranes are utilized either alone or in conjunction with low permeability soils and/or bentonite blankets as composite liners. Geomembranes are the key components of the lining system and, therefore, none of the geomembrane requirements contained herein should be compromised in any way. Geotextiles, geonets and granular soils are utilized in combination for leachate collection systems.

The quality assurance of a geomembrane liner system installation is addressed herein in its entirety. Quality assurance of soils is only discussed relative to their interaction with the geosynthetics.

### 1.1.4 Scope of Quality Assurance and Quality Control

The scope of this manual includes the quality assurance applicable to shipment, handling and installation of geomembrane liners. In particular, full time quality assurance of the installation of geomembranes is essential.

This manual does not address design guidelines, installation specifications or selection of geomembranes, bentonite blankets and other geosynthetics (which includes compatibility between geosynthetic and contained material).

This manual does not address the quality assurance of soils, except in cases where soil placement may have an influence on the geosynthetics.

### 1.1.5 Units

In this manual all properties and dimensions are expressed in U.S. units, with "equivalent" SI units in parentheses. It should be noted that the conversion is typically only accurate within ten percent. In cases of conflict or clarification the U.S. units shall be deemed to govern.

### 1.1.6 References

The manual includes references to test procedures of the American Society for Testing and Materials (ASTM), the Federal Test Method Standards (FTMS). Recognizing the changing nature of the above standards and the geosynthetic industry at large, this manual is subject to periodic revision.

## 1.1 Parties

The completion of a particular lined system is dependent on the interaction of many parties. The parties discussed below are those associated with the ownership, design, specification, manufacture, fabrication, transportation, installation and quality assurance of the liner system. The qualifications of the Installer and Geosynthetic Quality Assurance Consultant (CQAC) are particularly critical to the successful completion of the lining systems and must be emphasized in the Quality Assurance Plans.

### 1.2.1 Designer

The Designer is responsible for the design, drawings, plans and specifications of the lining system.

### 1.2.2 Earthwork Contractor

The Earthwork contractor is responsible for the preparation of the supporting soil on which the lining system is to be installed and may also be the party responsible for placing earth and granular materials (if any) over the installed lining system.

### 1.2.3 Resin Supplier

The resin supplier produces and delivers the resin to the Manufacturer.

### 1.2.4 Geomembrane Manufacturer

The Geomembrane Manufacturer is responsible for the production of geomembrane rolls from resin.

### 1.2.5 Installer (PFF)

The installer is responsible for field handling, placing, seaming, field testing, temporary loading (against wind) and other aspects of the geosynthetics installation.

### 1.2.6 Transporter

The transporter transports the rolls of geomembrane between the manufacturer and the site.

### 1.2.7 Geosynthetic Quality Assurance Consultant

The Geosynthetic Quality Assurance Consultant is normally a party, independent from the Owner, Manufacturer, Fabricator and Installer that is responsible for observing, testing and documenting activities related to the quality assurance of the geosynthetics installation at the site. He is also responsible for issuing a certification report.

### 1.2.8 Geosynthetic Quality Assurance Laboratory

The Geosynthetic Quality Assurance Laboratory is a party responsible for conducting tests on samples of geosynthetics.

### 1.2.9 Owner

The Owner owns and/or is responsible for the lined facility. In this manual the term “Owner” shall apply equally to “Operator”; i.e.: the party responsible for operating the lined facility.

### 1.2.10 Project Manager

The Project Manger is the official representative of the owner. In this manual the term “Project Manager” shall apply equally to “Construction Coordinator”; i.e.: the individual in charge of coordinating field activities.

## 1.2 Meetings and Visits

To guarantee a high degree of quality during installation, open channels of communication are essential. To that end, meetings are critical.

### 1.3.1 Pre-Construction Meeting

Following the completion of the design, plans and specifications for the project, a Pre-Construction Meeting may be held. This meeting should include all parties involved, including the Owner, PFF, the
Geosynthetic Quality Assurance Consultant, the Design Engineer and the Project Manager.

The purpose of this meeting is to begin planning for coordination of tasks, anticipate any problems which might cause difficulties and delays in construction and, above all, present the Geosynthetic Quality Assurance Plan to all the parties involved. It is very important that the rules regarding testing, repair, etc. be known and accepted by all.

This meeting should include (but not be limited to) all of the following activities:

Communicate to all parties any relevant documents;

Review critical design details of the project;
If a panel layout drawing is required by Specifications it should be reviewed at this meeting; (Panel layout is tentative and may be revised by PFF site manager with the approval of the field engineer to suit field conditions at the time of installation).

Review the Geosynthetic Quality Assurance Manual and make any appropriate modifications;

Make any appropriate modifications to the design specifications or performance standards can be determined through the implementation of the site-specific addendum;

Reach a consensus on the quality control procedures, especially on methods of determining acceptability of the lining system;

Establish lines of authority and communication;

Prepare a time schedule for all operations;

Review the responsibilities of each party;

Review methods for documenting and reporting and for distributing documents and reports;

Establish rules for writing on the geomembrane; i.e.: who is authorized to write, what can be written and in which color;

Outline procedures for packing and storing archive samples;

Conduct a site walk around to verify that earthwork construction is proceeding on schedule and to review material storage locations;

Develop a numbering system for Panels and Seams;

Finalize field cutout sample sizes;

Review seam-testing procedures;

Review repair procedures;

Review precautions to be taken against clay cracking (surface desiccation).

Discuss any other site specific items pertinent to the lining installation.

A person designated at the beginning of the meeting shall document the meeting and minutes shall be transmitted to all parties.

### 1.3.2 Progress Meetings

A daily or weekly progress meeting shall be held between the Earthwork Manager, PFF, the Project Manager, and any other concerned parties. This meeting shall discuss current progress. Any matter requiring action, which is raised in this meeting, shall be reported to the appropriate parties in writing.

### 1.3.3 Manufacturing Plant Visits

A representative of the Owner or his designated alternate may carry out a geomembrane manufacturing plant visit if he so chooses.

## GEOMEMBRANE MANUFACTURING AND DELIVERY

## 2.1 Manufacturing

### 2.1.1 Geomembrane Manufacturing

PFF shall provide the Project Manager/Owner with the following:

A properties sheet including, at a minimum, all specified properties measured using test methods indicated in the specifications, or equivalent;

The Owner or Owner's Representative shall verify that:

The property values certified by the Geomembrane Manufacturer meet all of the specifications; and

The measurements of properties by the Geomembrane Manufacturer are properly documented, and that the test methods used are acceptable.

### 2.1.2 Rolls

After receipt of material, PFF shall provide the Project Manager with one quality control certificate for every roll of geomembrane provided. The quality control certificate shall be signed by the Manufacturer and include the results of the quality control tests performed by the Manufacturer. The quality control certificate shall include the resin information including origin (supplier's name), identification (brand name, lot number) and production

date. A resin certificate for each lot used in production of the geomembrane shall also be provided to the Project Manager.

### 2.1.1 Delivery

#### 2.2.1 Transportation and Handling

PFF or the Manufacturer will provide transportation of the geomembrane through an independent trucking company. If the geomembrane arrives on site prior to project personnel, the customer or contractor is responsible for off-loading rolls. The geomembrane should be placed on a smooth well drained surface, free of rocks or any other protrusions which may damage the material. No special covering is necessary for protection of the geomembrane from sunlight or rain.

The following should be verified prior to off-loading either geomembrane:

Handling equipment used on the site is adequate and does not pose any risk of damage to the geomembrane; and

Personnel will handle the geomembrane with care.

Any welding rod delivered to the site prior to PFF arriving should be kept covered and dry or placed in a storage facility.

Upon arrival at the site, PFF shall conduct a surface observation of all rolls for defects and for damage. This inspection shall be conducted without unrolling rolls unless defects or damages are found or suspected. PFF shall indicate any damage to the Project Manager.

#### 2.2.2 Storage

The Project Manager shall provide storage space in a location (or several locations) such that on-site transportation and handling are minimized. Storage space should be protected from theft, vandalism, passage of vehicles and be adjacent to the area to be lined.

## GEOMEMBRANE INSTALLATION

### 3.1 Anchor Trench Systems

All Anchor Trench Systems shall be excavated by the Earthwork Contractor (unless otherwise specified) to the lines and widths shown on the design drawings, prior to geomembrane placement. No large rocks or clay lumps shall be allowed to underlie the geomembrane in the anchor trench.

Backfilling of the anchor trench shall be conducted in accordance with Section3.5.

### 3.2 Geosynthetic Placement

Immediately prior to installation of either of the designed geomembrane liners, PFF and the owner or the owner’s representative shall observe the surface. The decision to repair

cracks, if any, shall be made only by the Project Manager. PFF and the Project Manager for joint approval shall walk the subgrade. PFF will sign acceptance of the surface condition of the subgrade. The integrity of the underlying soil is the responsibility of the owner/earth work contractor.

Subgrade Preparation Recommendations

No liner shall be placed on surfaces not previously found acceptable by the PFF supervisor or his agent.

No sharp stones or other hard objects that could penetrate the liner shall be present in the top 1 inch of the surfaces to be covered.

Surfaces to be lined shall be smooth and free of all rocks, sharp stones, sticks, roots, sharp objects, or debris of any kind. The surface should provide a firm, unyielding foundation for the geosynthetic with no sudden, sharp or abrupt changes or break in grade.

### 3.2.1 Field Panel Identification

A field panel is the unit area of geomembrane, which is to be seamed in the field; i.e.: a field panel is a roll or a portion of roll cut in the field.

At the time of installation, the PFF Field Supervisor shall give each field panel an "identification code" (number or letter/number). The Project Manager shall agree upon this identification code. This field panel identification code shall be as simple and logical as possible.

### 3.2.2 Field Panel Placement

#### 3.2.2.1 Location

Field panels are located by the PFF Field Supervisor in a manner consistent with the Specification and best suited to existing site conditions.

#### 3.2.2.2 Installation Schedule

Field panels are placed one at a time, and each field panel is seamed immediately after its placement (in order to minimize the number of unseamed field panels). PFF shall record the identification code, location and date of installation of each geomembrane field panel.

#### 3.2.2.3 Weather Conditions

Neither welding nor bentonite blanket placement shall take place during any precipitation or in the presence of excessive moisture, blowing dust, or in the presence of excessive winds (unless wind barriers are provided). In addition, welding shall not take place in areas of ponded water.

#### 3.2.2.4 Method of Placement

PFF shall verify the following:

Any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage or hydrocarbons or other means;

The prepared surface underlying the geomembrane has not deteriorated since previous acceptance and is still acceptable immediately prior to geosynthetic placement;

Any geosynthetic elements immediately underlying the geomembrane are clean and free of debris;

All personnel working on the geomembrane should not smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane;

The method used to unroll the panels does not cause crimps in the geomembrane and does not damage the supporting soil;

The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);

Adequate temporary loading and/or anchoring (e.g.; sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind (in case of high winds, continuous loading, e.g. by adjacent sand bags, or soil is recommended along edges of panels to minimize risk of wind flow under the panels);

PFF shall inform the Project Manager if the above conditions are not fulfilled.

#### 3.2.2.5 Damage

PFF shall inspect each geosynthetic after placement and geomembrane prior to seaming for damage. PFF shall advise the Project Manager which geosynthetic or portions of geosynthetic should be repaired or accepted. Damaged geosynthetic or portions of damaged geosynthetics, which have been rejected, shall be marked and their removal from the work are recorded by PFF. Repairs to geomembrane shall be made according to procedures described in Section 3.4.

## 3.3 Field Seaming

### 3.3.1 Seam Layout

In general, seams should be oriented parallel to the line of maximum slope; i.e.: oriented along, not across, the slope. In corners and odd-shaped locations, the number of seams should be minimized. No horizontal seam should be less than 2 feet (1.5m) from the toe of the slope or areas of potential stress concentrations unless otherwise authorized. When full roll lengths do not extend past the toe of slope, panel ends may be seamed provided the panel end is cut at an angle greater than or equal to 45 degrees.

A seam numbering system compatible with a panel numbering system shall be agreed upon at the Resolution and/or Pre-Construction Meeting.

**3.3.1.1** Field joints shall be made by overlapping adjacent sheets 4 inches for hot wedge welding.

**3.3.1.2** Polyethylene pipe sleeves shall be used for pipe sleeves penetrating through the lined area. When the pipe composition is polyethylene the sleeve should be extrusion welded directly to the pipe if space permits. For dissimilar materials, the sleeve should be fastened by mechanical means and sealant applied between the pipe and sleeve.

### 3.3.2 Seaming Equipment and Products

The approved processes for field seaming are extrusion welding and fusion (hot wedge) welding. Proposed alternate processes shall be documented and submitted to the Owner or his representative for his approval.

The extrusion welding apparatus shall be equipped with gauges giving the temperature of the apparatus at the nozzle and extruder barrel.

The fusion-welding apparatus must be an automated vehicular mounted device, which produces a double seam with an enclosed space or solid seam on thin mil material as specified.

The fusion welding apparatus shall be equipped with gauges giving the applicable temperatures.

PFF shall verify that:

Equipment used for seaming is not likely to damage geomembrane;

The extrusion welder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;

The electric generator is equipped such that no damage occurs to the geomembrane;

Buffing shall be completed no more than one (1) hour prior to extrusion welding (buffing is not necessary for hot wedge welding);

The geomembrane is protected from damage in heavily trafficked areas.

### 3.3.3 Seam Preparations

PFF shall verify that:

Prior to seaming the seam area is clean and free of moisture, dust, dirt, debris of any kind and foreign material;

Seams are aligned with the fewest possible number of wrinkles and “fishmouths”.

### 3.3.4 Weather Conditions for Seaming

The normally required weather conditions for seaming are as follows:

The high temperature limit for welding is the temperature at which one or all of the following takes place:

- the well-being of the crew becomes uncertain
- air pressure channels begin to close
- passing welds are unobtainable

Unless authorized in writing by the Project Manager, no seaming shall be attempted at ambient temperatures below 35 degrees Fahrenheit. This decision is based upon the ability of the crew to obtain passing trial and field welds.

In all cases the geomembrane shall be dry and protected from wind.

### 3.3.5 Trial Seams

Trial seams shall be made on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. Such trial seams shall be made at the beginning of each seaming period (start of day, midday and anytime equipment is turned off and allowed to cool down) for each seaming apparatus used. Trial seams shall be made under the same conditions as actual seams.

The trial seam sample shall be approximately 3 feet (1.0m) long by 1 foot (0.3) wide (after seaming) with the seam centered lengthwise. Seam overlap shall be nominally 4 inches with 3 inches minimum.

Two adjoining specimens each 1 inch (25 mm) wide shall be cut from the trial seam sample by the installer. The specimens shall be tested respectively in shear and peel using a field tensometer and they should not fail in the seam. If the additional specimen fails, the entire operation shall be repeated. If the additional specimen fails the seaming apparatus and seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful full trial welds are achieved.

### 3.3.6 General Seaming Procedures

Unless otherwise specified, the general seaming procedure used by PFF shall be as follows:

Approximately four (4) inches (100mm) for fusion welding and three (3) inches (75mm) for extrusion welding shall overlap the rolls of membrane.

“Fishmouths” or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a first overlap. The cut “fishmouths” or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

All seaming shall be performed through the anchor trench.

All “T” seams at fusion welded panel intersections shall be performed using the methods shown per the details shown on PFF-0112A and PFF-0112B attached.

For fusion welding on wet or mud subgrade a protective layer of plastic may be required that is placed directly below the overlapped membranes being seamed. This is to prevent any moisture buildup between the sheet to be welded and/or to provide a consistent rate of speed for the wedge-welding device.

### 3.3.7 Nondestructive Seam Continuity Testing

#### 3.3.7.1 Concept

PFF shall nondestructively test all field seams over their full length using a vacuum test unit, air pressure testing or other approved method. (Vacuum testing is described in section 3.3.7.2 and air pressure testing is described in section 3.3.7.3). The purpose of nondestructive tests is to check the continuity of seams. It does not provide information on seam strength. Continuity testing shall be carried out as the seaming work progresses, not at the completion of all field seaming. Spark testing, as described in section 3.3.7.5, is an alternate method of nondestructive testing that is used in corners, around penetrations and other areas where vacuum testing or air pressure testing cannot be performed.

#### 3.3.7.2 Vacuum Testing

The equipment shall be comprised of the following:

A vacuum box assembly consisting of a rigid housing, a transparent viewing window and a soft neoprene gasket attached to the bottom;

A steel vacuum tank and pump assembly equipped with a pressure controller gauge to indicate chamber vacuum and pipe connections;

A rubber pressure/vacuum hose with fittings and connections;

A bucket and wide brush, mop or spray assembly;

A soapy solution;

The following procedures shall be followed:

Energize the vacuum pump and reduce the tank pressure to approximately 5-psi (10 inches of HG);

Wet a strip of geomembrane approximately 12 inches by 48 inches (0.3 m by 1.2m) with the soapy solution;

Place the box over the wetted area;

Close the bleed valve and open the vacuum valve;

Ensure that a leak-tight seal is created;

For a period of approximately 5 to 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches (75 mm) overlap and repeat the process;

All areas where soap bubbles appear shall be marked and repaired in accordance with Section 3.4.

### 3.3.7.3 Pressure Test Specifications For Dual Track Hot Wedge Welds

Test Pressure (after 5 min) PSI max pressure

| Sheet Thickness | Min. | Drop Allowed |
|---|---|---|
| 30 mil | 30 | 4 psi |
| 40 mil | 30 | 4 psi |
| 60 mil | 30 | 4 psi |
| 80 mil | 30 | 4 psi |
| 100 mil and thicker | 30 | 4 psi |

### 3.3.7.4 Air Pressure Testing (For Double Fusion Seam Only)

The equipment shall be comprised of the following;

An air pump (manual or motor driven) equipped with pressure gauge capable of generating and sustaining a minimum pressure of 30 psi (210 kPa);

A rubber hose with fittings and connections;

A sharp hollow needle or other approved pressure feed device

The following procedures shall be followed:

Seal both ends of the seam to be tested;

Insert needle or other approved pressure fed device into the tunnel created by the fusion weld;

Energize the air pump to a minimum pressure of 30-psi (210 kPa), close valve and sustain pressure approximately five minuets;

If loss of pressure exceeds above listed values or does not stabilize, locate faulty area and repair in accordance with Section 3.4;

Remove needle or other approved pressure fed device and seal.

### 3.3.7.5 Spark Testing

The equipment shall be comprised of the following:

A high-frequency spark generator capable of producing a 12,000 to 30,000 volt spark (similar to an Electro-Technic, Model BD-50);

Metallic foil spark tape (adhesive backed);

The procedures are as follows:

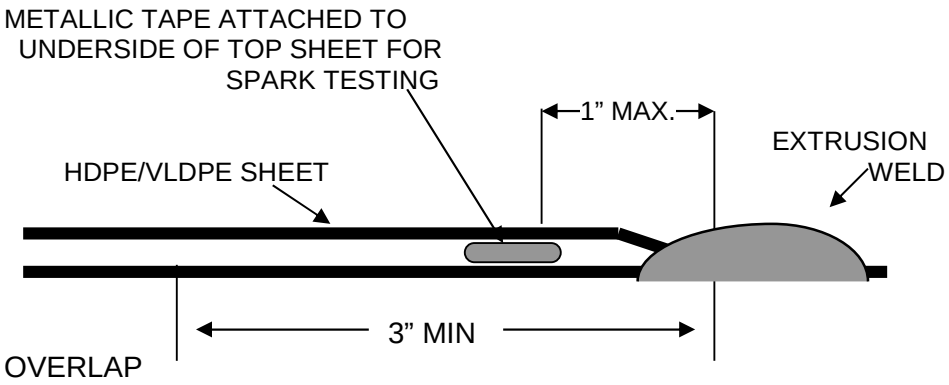
Place the adhesive backed foil tape continuously along the edge on the mating side of the HDPE liner to be welded. It shall be placed no greater than 1” from edge (see “Typical Extrusion Weld Detail”);

Position and weld materials per section 3.3.6;

When welding is complete, set spark generator to maximum voltage. Position the spark generator electrode above the middle of the extrusion weld at a distance where a consistent spark is achieved. The spark should be bluish in color and a slight humming sound will be heard from the generator.

Continue along the weld slowly observing any change in the characteristics of the spark. Any defect detected in the weld will cause the spark to become white in appearance and be accompanied by an intense cracking sound;

If a defect is found, mark for repairs (see Section 3.4.3 for repair procedures).




**TYPICAL EXTRUSION WELD DETAIL**

### 3.3.8 Destructive Testing

#### 3.3.8.1 Concept

Destructive seam tests shall be performed at random selected locations. The purpose of these tests is to check that welds are fully integrated with each other

and to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

### 3.3.8.2 Location and Frequency

The owner and/or owner's representative shall select locations where seam samples will be cut. These locations shall be established as follows:

A frequency shall be agreed upon by PFF and the Project Manager at the Resolution and/or Pre-Construction meeting at intervals not to exceed one sample for every 500 linear feet of weld.

The seaming technician shall not be informed in advance of the locations where the seam samples will be taken.

### 3.3.8.3 Sampling Procedures

Samples shall be cut by PFF as the seaming progresses in order to have test results before the geomembrane is covered by another material and to insure that there are no problems with the welding apparatus.

Each sample shall be assigned a number and the sample location shall be recorded for future reference.

All holes in the geomembrane resulting from destructive seam sampling shall be repaired tin accordance with repair procedures described in Section 3.4. The continuity of the new seams in the repaired area shall be tested according to Section 3.3.7.

### 3.3.8.4 Size of Samples

At a given sampling location the Installer shall take two types of samples.

First, two sample coupons for field-testing should be taken. Each of these sample coupons shall be 1 inch (0.25 mm) wide by 12 inches (0.3 m) long with the seam centered parallel to the length. The distance between these two samples shall be 30 inches.

If both sample coupons pass the field test described in Section 3.3.8.5, a sample shall be cut between the two coupons. This sample shall be cut into parts and distributed as follows:

One portion to the Geosynthetic Quality Assurance Laboratory for testing if applicable, 12 inches x 12 inches (0.3 m x 0.3 m), and

One portion to the Owner for archive storage, 12 inches x 12 inches (0.3 m x 0.3 m).

Final determination of the sample sizes shall be made at the Pre-Construction Meeting.

#### 3.3.8.5 Field Testing

The two 1 inch (25 mm) wide strips, mentioned in Section 3.3.8.4 shall be tested in the field in peel and shear and shall not fail in the seam. Shear testing applies a tensile stress from the top sheet through the weld and into the bottom sheet. Peel testing, on the other hand, peels the top sheet back against the overlapped edge of the bottom sheet in order to observe how separation occurs. If any field test sample fails to pass, then the procedures outlined in 3.3.8.6 shall be followed.

Destructive testing in the field is to be carried out using a calibrated tensiometer. All seams shall fail in film tear bond (FTB) which means that the parent material fails before the weld. Test results in shear shall be not less than 95% of the minimum tensile strength at yield for the parent material specified. Test results in peel shall be not less than 62% of the minimum tensile strength at yield for the parent material specified.

#### 3.3.8.6 Procedures for Destructive Test Failure

The following procedures shall apply whenever a sample fails a destructive test. PFF has two options:

1) Reconstruct the seam between any two passed test locations;

2) Trace the welding path to an intermediate location (10 feet maximum from the point of the failed test in each direction) and take a small sample coupon for an additional field test at each location. If these additional samples pass the field test, then full samples are taken. If these samples pass the tests, then the seam is reconstructed between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed.

All acceptable seams must be rounded by two locations from which samples passing destructive tests have been taken.

## 3.4 DEFECTS AND REPAIRS

### 3.4.1 Identification

All seams and non-seam areas of the geomembrane shall be examined by PFF for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter.

Defective/damaged materials shall be identified and repaired per section 3.4.3.

### 3.4.2 Evaluation

Each suspect location, both in seam and non-seam areas, shall be nondestructively tested using the methods described in Section 3.3.7 as appropriate. Each location, which fails the non-destructive testing, shall be marked by PFF and repaired. Work shall not proceed with any materials which will cover locations which have been repaired until laboratory test results with passing values are available.

### 3.4.3 Repair Procedures

#### 3.4.3.1 Geomembrane Repair Procedures

Any portion of the geomembrane failing a destructive or nondestructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Project Manager and PFF. The procedures available include:

Patching – to repair large holes, tears and contamination by foreign matter;
Buffing and re-welding – to repair small sections of extruded seams;
Spot welding or seaming – to repair pinholes or other minor localized flaws;
Capping – to repair large lengths of failed seams;
Topping – repair areas of inadequate seams which have an exposed edge;

In addition, the following provisions shall be satisfied:

Surfaces of the geomembrane that are to be repaired shall be abraded no more than one hour prior to the repair;
All surfaces must be clean and dry at the time of the repair;
All seaming equipment used in repairing procedures must be approved;
The repair procedures, materials and techniques shall be approved in advance of the specific repair by the Project Manger and PFF;
Patches or caps shall extend at least 6 inches beyond the edge of the defect and all corners of patches shall be rounded with a radius of at least 3 inches.

#### 3.4.3.2. Geomembrane Verification of Repairs

Each repair shall be nondestructively tested using the methods described in Section 3.3.7 as appropriate. Repairs, which pass the nondestructive test, shall be taken as an indication of an adequate repair. Failed tests shall be redone and retested until a passing test is obtained.

## 3.5 Backfilling of Anchor Trench

The anchor trench, if any, shall be adequately drained by Owner/Earthwork Construction to prevent ponding or otherwise softening of the adjacent soils while the trench is open. The anchor trench shall be backfilled by the Earthwork Contractor or as outlined in the specifications and bid documents.

Since backfilling the anchor trench can affect material bridging at toe of slope, consideration should be given to backfill the liner at it's most contracted state, preferable during the cool of the morning or extended period of overcast skies. Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetics.

## 3.6 Lining System Acceptance

The geosynthetic lining system shall be accepted when:

The installation of all materials re deployed and welded;

Verification of the adequacy of all seams and repairs including associated testing is complete.

### 3.7 Soil In Contact With the Geomembrane

Important points for quality assurance of soils in contact with geomembranes include:

A geotextile or other cushion approved by the designer may be installed between angular aggregate and the geomembrane.

Equipment used for placing soil shall not be driven directly on the geomembrane.

A minimum thickness of 1 foot (0.3 m) of soil is recommended between a light dozer (such as a CAT D-3 or wide track caterpillar D-6 or lighter) and he geomembrane.

In heavily trafficked areas such as access ramps, soil thickness should be at least 2 to 3 feet (0.6 – 0.9 m).

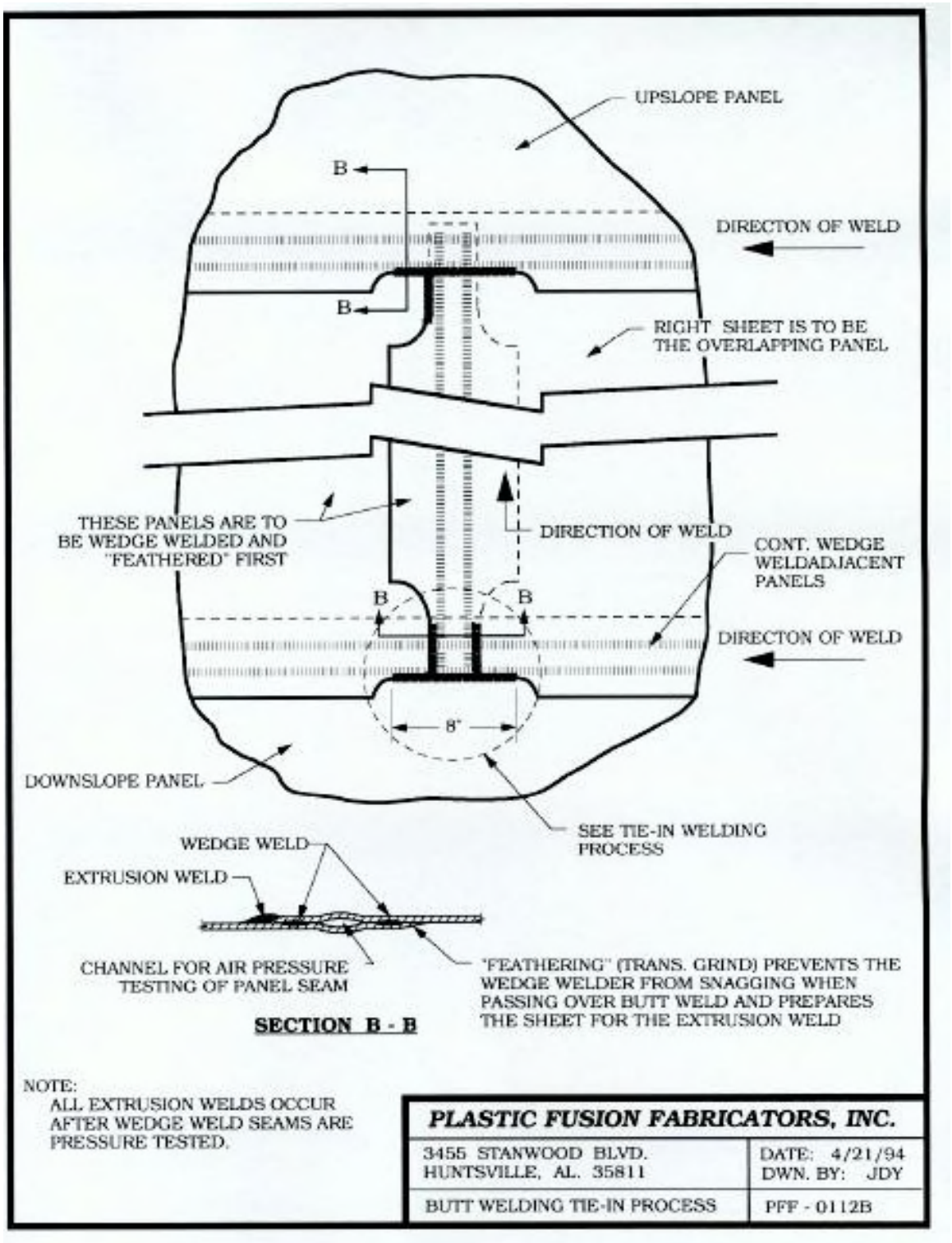
Soil/Earth Cover on top of Geomembrane

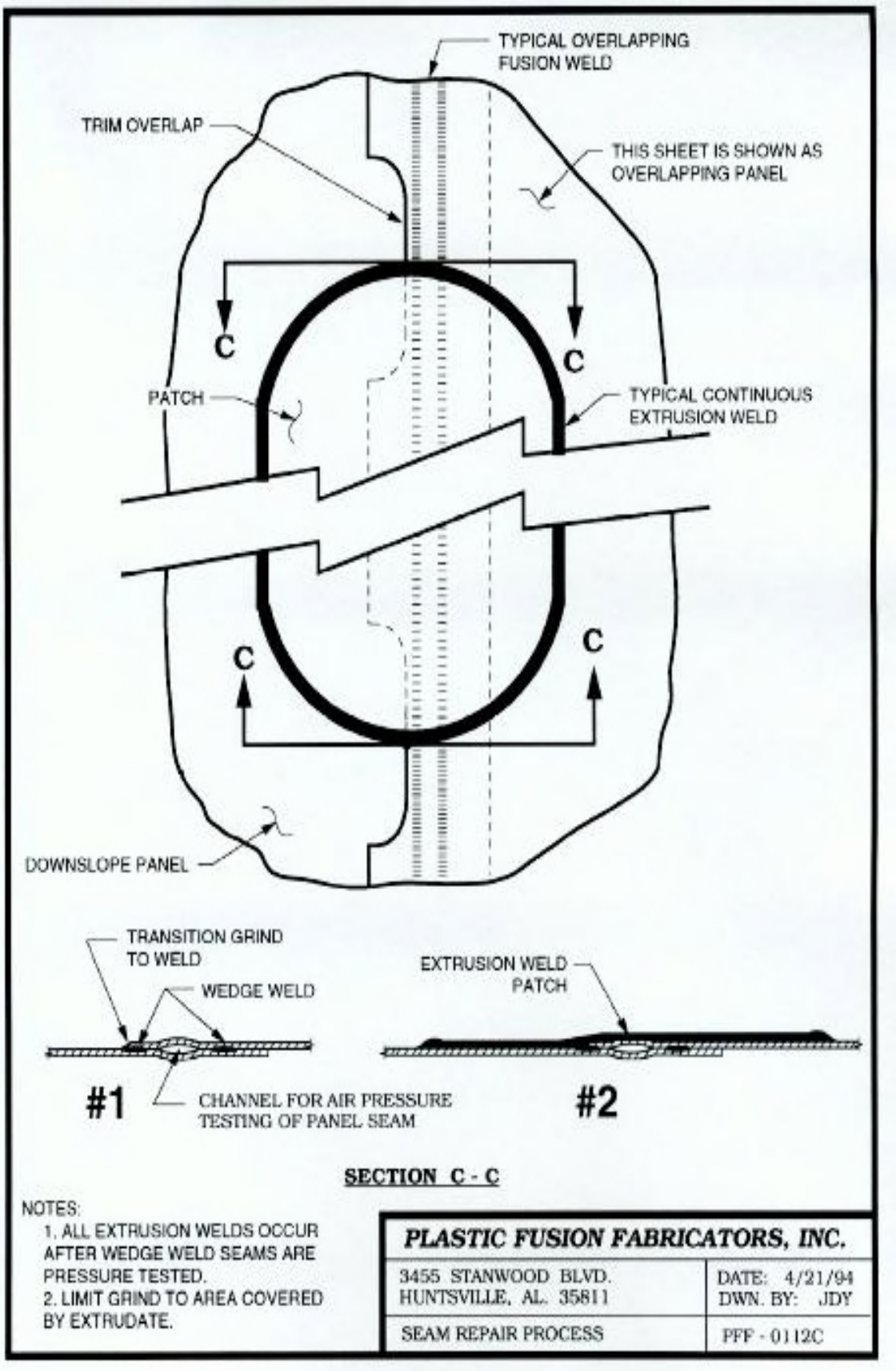
Placement of soils, sand or other types of earth cover on top of the liner shall not be performed until all destructive and on destructive testing has been performed and accepted.
Placement should be preformed to minimize wrinkles. Equipment operators should be briefed on method of placement and affects of thermal expansion and contraction of the liner.

Material placed on top of the liner should be back-dumped on liner and, in order to avoid the formation of wrinkles, efforts should be made to load the soil so that it comes down on top of the liner rather than being pushed across the sheet. This is done by 1) using a front-end loader to place soil ahead of spreading soil cover and, 2) spreading soil by building a mound at the edge of soil, then pushing soil up and over the mound causing it to come down on the liner.

If wrinkle forms, every effort should be made to walk the wrinkle out.

Minor folding over of wrinkles is acceptable providing an even transition occurs at the tail of the wrinkle. If excessive stress points re created at the tail of the wrinkle, the wrinkle should be cut out and repaired per Section 3.4.


UPSLOPE PANEL
B
B
DIRECTON OF WELD
RIGHT SHEET IS TO BE THE OVERLAPPING PANEL
THESE PANELS ARE TO BE WEDGE WELDED AND "FEATHERED" FIRST
DIRECTION OF WELD
CONT. WEDGE WELDADJACENT PANELS
B
B
DIRECTON OF WELD
8"
DOWNSLOPE PANEL
SEE TIE-IN WELDING PROCESS
WEDGE WELD
EXTRUSION WELD
CHANNEL FOR AIR PRESSURE TESTING OF PANEL SEAM
"FEATHERING" (TRANS. GRIND) PREVENTS THE WEDGE WELDER FROM SNAGGING WHEN PASSING OVER BUTT WELD AND PREPARES THE SHEET FOR THE EXTRUSION WELD
SECTION B - B
NOTE:
ALL EXTRUSION WELDS OCCUR AFTER WEDGE WELD SEAMS ARE PRESSURE TESTED.
PLASTIC FUSION FABRICATORS, INC.
3455 STANWOOD BLVD.
HUNTSVILLE, AL. 35811
DATE: 4/21/94
DWN. BY: JDY
BUTT WELDING TIE-IN PROCESS
PFF - 0112B


TYPICAL OVERLAPPING
FUSION WELD
TRIM OVERLAP
THIS SHEET IS SHOWN AS
OVERLAPPING PANEL
C
C
PATCH
TYPICAL CONTINUOUS
EXTRUSION WELD
C
C
DOWNSLOPE PANEL
TRANSITION GRIND
TO WELD
WEDGE WELD
EXTRUSION WELD
PATCH
#1
CHANNEL FOR AIR PRESSURE
TESTING OF PANEL SEAM
#2
SECTION C - C
NOTES:
1. ALL EXTRUSION WELDS OCCUR AFTER WEDGE WELD SEAMS ARE PRESSURE TESTED.
2. LIMIT GRIND TO AREA COVERED BY EXTRUDATE.
PLASTIC FUSION FABRICATORS, INC.
3455 STANWOOD BLVD.
HUNTSVILLE, AL. 35811
DATE: 4/21/94
DWN. BY: JDY
SEAM REPAIR PROCESS
PFF - 0112C

# APPENDIX M

**Geomembrane Manufacturer's QC Certificates**

GSE Environmental, LLC

# ROLL TEST DATA REPORT

GSE QC APPROVED

**Report Date:** Jun/20/2018

| Sales Order No. | Customer Name | Project Location | Product Name | BOL Number |
|---|---|---|---|---|
| SO-084762 | Plastic Fusion Fabricators, Inc. | Jonesboro AR US | HDT-060AE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108197216 | 62 | 55 | 166 | 173 | 17 | 17 | 198 | 182 | 503 | 446 | 56 | 54 | 157 | 0.945 | 2.4 | 10 | 23 | 21 |
| 108197217 | 62 | 55 | 167 | 175 | 17 | 17 | 227 | 189 | 596 | 494 | 56 | 54 | 152 | 0.945 | 2.3 | 10 | 23 | 21 |
| 108197218 | 62 | 55 | 167 | 175 | 17 | 17 | 227 | 189 | 596 | 494 | 56 | 54 | 152 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108197219 | 61 | 55 | 167 | 175 | 17 | 17 | 227 | 189 | 596 | 494 | 56 | 54 | 152 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108197220 | 61 | 55 | 167 | 175 | 17 | 17 | 227 | 189 | 596 | 494 | 56 | 54 | 152 | 0.945 | 2.3 | 10 | 22 | 20 |
| 108197221 | 62 | 54 | 166 | 180 | 16 | 17 | 197 | 188 | 503 | 518 | 56 | 53 | 151 | 0.945 | 2.3 | 10 | 22 | 20 |
| 108197222 | 61 | 57 | 166 | 180 | 16 | 17 | 197 | 188 | 503 | 518 | 56 | 53 | 151 | 0.945 | 2.3 | 10 | 22 | 21 |
| 108197223 | 61 | 56 | 166 | 180 | 16 | 17 | 197 | 188 | 503 | 518 | 56 | 53 | 151 | 0.945 | 2.3 | 10 | 22 | 21 |
| 108197224 | 62 | 57 | 166 | 180 | 16 | 17 | 197 | 188 | 503 | 518 | 56 | 53 | 151 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108197225 | 61 | 57 | 159 | 160 | 18 | 18 | 204 | 167 | 536 | 447 | 55 | 52 | 149 | 0.945 | 2.4 | 10 | 21 | 21 |
| 108197226 | 61 | 57 | 159 | 160 | 18 | 18 | 204 | 167 | 536 | 447 | 55 | 52 | 149 | 0.945 | 2.4 | 10 | 22 | 21 |
| 108197227 | 60 | 55 | 159 | 160 | 18 | 18 | 204 | 167 | 536 | 447 | 55 | 52 | 149 | 0.945 | 2.4 | 10 | 22 | 21 |
| 108197228 | 61 | 57 | 159 | 160 | 18 | 18 | 204 | 167 | 536 | 447 | 55 | 52 | 149 | 0.945 | 2.4 | 10 | 23 | 21 |
| 108197229 | 61 | 58 | 165 | 170 | 17 | 17 | 206 | 194 | 539 | 550 | 56 | 54 | 151 | 0.945 | 2.3 | 10 | 23 | 21 |
| 108197230 | 61 | 56 | 165 | 170 | 17 | 17 | 206 | 194 | 539 | 550 | 56 | 54 | 151 | 0.945 | 2.3 | 10 | 22 | 23 |
| 108197231 | 61 | 57 | 165 | 170 | 17 | 17 | 206 | 194 | 539 | 550 | 56 | 54 | 151 | 0.945 | 2.3 | 10 | 22 | 23 |
| 108197232 | 61 | 56 | 165 | 170 | 17 | 17 | 206 | 194 | 539 | 550 | 56 | 54 | 151 | 0.945 | 2.3 | 10 | 22 | 23 |
| 108197233 | 61 | 55 | 167 | 167 | 18 | 18 | 194 | 194 | 497 | 529 | 56 | 53 | 154 | 0.945 | 2.3 | 10 | 22 | 22 |
| 108197234 | 61 | 57 | 167 | 167 | 18 | 18 | 194 | 194 | 497 | 529 | 56 | 53 | 154 | 0.945 | 2.3 | 10 | 22 | 22 |
| 108197235 | 60 | 54 | 167 | 167 | 18 | 18 | 194 | 194 | 497 | 529 | 56 | 53 | 154 | 0.945 | 2.3 | 10 | 21 | 22 |
| 108197236 | 61 | 54 | 167 | 167 | 18 | 18 | 194 | 194 | 497 | 529 | 56 | 53 | 154 | 0.945 | 2.3 | 10 | 21 | 22 |
| 108197237 | 61 | 56 | 160 | 166 | 18 | 17 | 200 | 197 | 503 | 544 | 57 | 54 | 152 | 0.945 | 2.5 | 10 | 22 | 22 |
| 108197238 | 61 | 56 | 160 | 166 | 18 | 17 | 200 | 197 | 503 | 544 | 57 | 54 | 152 | 0.945 | 2.5 | 10 | 22 | 22 |
| 108197239 | 61 | 56 | 160 | 166 | 18 | 17 | 200 | 197 | 503 | 544 | 57 | 54 | 152 | 0.945 | 2.5 | 10 | 20 | 21 |
| 108197240 | 61 | 57 | 160 | 166 | 18 | 17 | 200 | 197 | 503 | 544 | 57 | 54 | 152 | 0.945 | 2.5 | 10 | 20 | 21 |
| 108197241 | 60 | 56 | 154 | 161 | 18 | 18 | 187 | 164 | 479 | 405 | 55 | 53 | 154 | 0.945 | 2.4 | 10 | 19 | 18 |
| 108197242 | 60 | 56 | 154 | 161 | 18 | 18 | 187 | 164 | 479 | 405 | 55 | 53 | 154 | 0.945 | 2.4 | 10 | 19 | 18 |
| 108197243 | 60 | 57 | 154 | 161 | 18 | 18 | 187 | 164 | 479 | 405 | 55 | 53 | 154 | 0.945 | 2.4 | 10 | 21 | 19 |
| 108197244 | 60 | 57 | 154 | 161 | 18 | 18 | 187 | 164 | 479 | 405 | 55 | 53 | 154 | 0.945 | 2.4 | 10 | 21 | 19 |
| 108197245 | 60 | 56 | 152 | 162 | 18 | 18 | 207 | 175 | 545 | 487 | 53 | 51 | 145 | 0.945 | 2.3 | 10 | 22 | 20 |
| 108197246 | 60 | 57 | 152 | 162 | 18 | 18 | 207 | 175 | 545 | 487 | 53 | 51 | 145 | 0.945 | 2.3 | 10 | 22 | 20 |
| 108197247 | 60 | 56 | 152 | 162 | 18 | 18 | 207 | 175 | 545 | 487 | 53 | 51 | 145 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108197248 | 60 | 57 | 152 | 162 | 18 | 18 | 207 | 175 | 545 | 487 | 53 | 51 | 145 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108197249 | 60 | 56 | 157 | 165 | 18 | 18 | 197 | 180 | 518 | 499 | 54 | 51 | 150 | 0.945 | 2.4 | 10 | 20 | 21 |

GSE Environmental, LLC

# ROLL TEST DATA REPORT

**Report Date:** Jun/20/2018

| Sales Order No. | Customer Name | Project Location | Product Name | BOL Number |
|---|---|---|---|---|
| SO-084762 | Plastic Fusion Fabricators, Inc. | Jonesboro AR US | HDT-060AE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108197250 | 60 | 56 | 157 | 165 | 18 | 18 | 197 | 180 | 518 | 499 | 54 | 51 | 150 | 0.945 | 2.4 | 10 | 20 | 21 |
| 108197251 | 61 | 55 | 157 | 165 | 18 | 18 | 197 | 180 | 518 | 499 | 54 | 51 | 150 | 0.945 | 2.4 | 10 | 21 | 22 |
| 108197252 | 61 | 55 | 157 | 165 | 18 | 18 | 197 | 180 | 518 | 499 | 54 | 51 | 150 | 0.945 | 2.4 | 10 | 21 | 22 |
| 108197253 | 61 | 55 | 164 | 165 | 18 | 17 | 210 | 181 | 547 | 500 | 55 | 52 | 151 | 0.945 | 2.4 | 10 | 22 | 23 |
| 108197254 | 61 | 55 | 164 | 165 | 18 | 17 | 210 | 181 | 547 | 500 | 55 | 52 | 151 | 0.945 | 2.4 | 10 | 22 | 23 |
| 108197255 | 61 | 56 | 164 | 165 | 18 | 17 | 210 | 181 | 547 | 500 | 55 | 52 | 151 | 0.945 | 2.4 | 10 | 21 | 21 |
| 108197256 | 60 | 56 | 164 | 165 | 18 | 17 | 210 | 181 | 547 | 500 | 55 | 52 | 151 | 0.945 | 2.4 | 10 | 21 | 21 |
| 108197257 | 61 | 55 | 166 | 167 | 17 | 17 | 206 | 150 | 535 | 329 | 55 | 54 | 149 | 0.945 | 2.3 | 10 | 22 | 22 |
| 108197258 | 61 | 55 | 166 | 167 | 17 | 17 | 206 | 150 | 535 | 329 | 55 | 54 | 149 | 0.945 | 2.3 | 10 | 22 | 22 |
| 108197259 | 61 | 55 | 166 | 167 | 17 | 17 | 206 | 150 | 535 | 329 | 55 | 54 | 149 | 0.945 | 2.3 | 10 | 22 | 22 |
| 108197260 | 60 | 56 | 166 | 167 | 17 | 17 | 206 | 150 | 535 | 329 | 55 | 54 | 149 | 0.945 | 2.3 | 10 | 22 | 22 |
| 108197261 | 60 | 57 | 152 | 161 | 17 | 17 | 195 | 141 | 518 | 293 | 56 | 53 | 151 | 0.945 | 2.5 | 10 | 21 | 22 |
| 108197262 | 60 | 56 | 152 | 161 | 17 | 17 | 195 | 141 | 518 | 293 | 56 | 53 | 151 | 0.945 | 2.5 | 10 | 21 | 22 |
| 108197263 | 60 | 57 | 152 | 161 | 17 | 17 | 195 | 141 | 518 | 293 | 56 | 53 | 151 | 0.945 | 2.5 | 10 | 21 | 22 |
| 108197265 | 60 | 55 | 152 | 161 | 17 | 17 | 195 | 141 | 518 | 293 | 56 | 53 | 151 | 0.945 | 2.5 | 10 | 21 | 22 |
| 108197266 | 60 | 57 | 154 | 163 | 17 | 18 | 201 | 149 | 526 | 381 | 55 | 53 | 153 | 0.945 | 2.5 | 10 | 21 | 21 |
| 108197267 | 60 | 56 | 154 | 163 | 17 | 18 | 201 | 149 | 526 | 381 | 55 | 53 | 153 | 0.945 | 2.5 | 10 | 21 | 21 |
| 108197268 | 60 | 57 | 154 | 163 | 17 | 18 | 201 | 149 | 526 | 381 | 55 | 53 | 153 | 0.945 | 2.5 | 10 | 20 | 20 |
| 108197269 | 60 | 56 | 154 | 163 | 17 | 18 | 201 | 149 | 526 | 381 | 55 | 53 | 153 | 0.945 | 2.5 | 10 | 20 | 20 |
| 108197270 | 60 | 56 | 155 | 164 | 18 | 18 | 214 | 184 | 568 | 509 | 55 | 54 | 154 | 0.946 | 2.4 | 10 | 21 | 22 |
| 108197271 | 61 | 55 | 155 | 164 | 18 | 18 | 214 | 184 | 568 | 509 | 55 | 54 | 154 | 0.946 | 2.4 | 10 | 21 | 22 |
| 108197272 | 61 | 56 | 155 | 164 | 18 | 18 | 214 | 184 | 568 | 509 | 55 | 54 | 154 | 0.946 | 2.4 | 10 | 21 | 22 |
| 108197273 | 61 | 57 | 155 | 164 | 18 | 18 | 214 | 184 | 568 | 509 | 55 | 54 | 154 | 0.946 | 2.4 | 10 | 21 | 22 |
| 108197274 | 61 | 55 | 157 | 154 | 17 | 18 | 196 | 182 | 508 | 501 | 52 | 50 | 153 | 0.945 | 2.4 | 10 | 24 | 25 |

**Laboratory Manager**

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Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS
201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978
PHONE:( 888 )FPCUSA3

# Certificate of Analysis

(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
UP TRACK 14732 WESTFIELD
19103 GUNDLE ROAD
HOUSTON TX 77070
PRODUCT :HL3812
RAILCAR ACFX041867

S/O NO : ET5B040
CUSTOMER PO : 03-512629
DATE SHIPPED: 5/31/18
LOT NO : 18E1092
WEIGHT (LB) : 191,300.00
CUSTID:FT03112 SPIDE3

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .070 |
| HLMI, g/10 min. | ASTM D1238 | 11.8 |
| Density, g/cm3 | ASTM D1505 | .9360 |

Notes:
Notes: Additive levels were tested and meet the min specification for this lot As a result Standard OIT (by ASTM D3895) is greater than 120 mins ( nominal values not tested on every lot). As a result, High Pres sure OI T (by ASTM D5885) is greater than 1000 mins.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS
201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978
PHONE:( 888 )FPCUSA3

# Certificate of Analysis

(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
UP TRACK 14732 WESTFIELD
19103 GUNDLE ROAD
HOUSTON TX 77070
PRODUCT :HL3812
RAILCAR FPAX201274

S/O NO : ET5B057
CUSTOMER PO : 03-512629
DATE SHIPPED: 5/31/18
LOT NO : 18E1116
WEIGHT (LB) : 196,650.00
CUSTID:FT03112 SPIDE3

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .080 |
| HLMI, g/10 min. | ASTM D1238 | 11.8 |
| Density, g/cm3 | ASTM D1505 | .9358 |

Notes:
Notes: Additive levels were tested and meet the min specification for this lot As a result Standard OIT (by ASTM D3895) is greater than 120 mins ( nominal values not tested on every lot). As a result, High Pres sure OI T (by ASTM D5885) is greater than 1000 mins.

Linda Kao

QC SUPERVISOR: LINDA KAO

Report Date
6/20/2018

# Quality Assurance Laboratory Test Results

**Job Name:** PFF/Legacy Landfill Cell 1 South
**Sales Order:** 84762

**Required Testing:** ASTM D 1238, 190 / 2.16 -- Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

**Specification:** ≤ 1.0 g/10 minutes

| Product Code | Lot Number | Result |
|---|---|---|
| HDT-060AE-BBB-B-W0 | 18E1092 | 0.07 |
| HDT-060AE-BBB-B-W0 | 18E1116 | 0.08 |

| | |
|---|---|
| Approved by: | Lana Hickman |
| Date: | June 20, 2018 |

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Report Date
6/20/2018

# Quality Assurance Laboratory Test Results

**Job Name:** PFF/Legacy Landfill Cell 1 South
**Sales Order:** 84762

**Required Testing:** ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D 5397 -- Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**Specification:** D 3895 - > 100 Minutes
D 5397 - > 500 Hours

**Frequency:** 1/200,000 lbs.

| Product Code | Resin Lot Number | Test Results |
|---|---|---|
| HDT-060AE-BBB-B-W0 | 18E1092 | PASS |
| HDT-060AE-BBB-B-W0 | 18E1116 | PASS |

| | |
|---|---|
| Approved By: | Lana Hickman |
| Date Approved: | June 20, 2018 |

*The above stated data shall not be reproduced except in full, without the written approval of the laboratory.*

# APPENDIX N

**Geomembrane Inventory Listing**

# GSE Roll Allocation

**Order** SO-084762
**Customer** Plastic Fusion Fabricators, Inc.
**Project Name** Legacy Landfill Cell 1 South

| Roll# | Resin Lot | Product Code | Mfg Date | Length |
|---|---|---|---|---|
| 108197216 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197217 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197218 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197219 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197220 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197221 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197222 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197223 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197224 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197225 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/15/2018 | 520 |
| 108197226 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197227 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197228 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197229 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197230 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197231 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197232 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197233 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197234 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197235 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197236 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197237 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197238 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197239 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197240 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197241 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197242 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197243 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197244 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/16/2018 | 520 |
| 108197245 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197246 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197247 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197248 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197249 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197250 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197251 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197252 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197253 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197254 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197255 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197256 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197257 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |

| | | | | |
|---|---|---|---|---|
| 108197258 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197259 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197260 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197261 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197262 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197263 | 18E1092 | HDT-060AE-BBB-B-W0 | 6/17/2018 | 520 |
| 108197265 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197266 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197267 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197268 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197269 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197270 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197271 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197272 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197273 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |
| 108197274 | 18E1116 | HDT-060AE-BBB-B-W0 | 6/18/2018 | 520 |

# APPENDIX O

**Geomembrane Conformance Test Report**

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197220**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 63.6 | 56.8 | 56.6 | 1 | 103 |
| 2. | 67.6 | 59.1 | 56.0 | 1 | 44 |
| 3. | 62.4 | 54.7 | 56.4 | 1 | 340 |
| 4. | 60.8 | 55.6 | 54.0 | 1 | 361 |
| 5. | 64.4 | 53.7 | 58.3 | 2 | 1417 |
| 6. | 64.8 | 56.9 | 57.4 | 1 | 410 |
| 7. | 70.1 | 59.1 | 54.6 | 1 | 736 |
| 8. | 65.0 | 58.7 | 56.8 | 1 | 575 |
| 9. | 61.4 | 58.0 | 56.6 | 1 | 932 |
| 10. | 67.2 | 57.3 | 59.6 | 1 | 203 |
| AVG | 64.7 | 57.0 | 56.6 | 1 | 512 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.948 | 2.43 |
| 2. | 0.949 | 2.39 |
| 3. | 0.948 | |
| AVG | 0.948 | 2.41 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 180.0 | 172.0 | 15.4 | 15.1 | 148.0 | 203.0 | 64.9 | 540.8 |
| 2. | 171.0 | 176.0 | 16.6 | 15.5 | 195.0 | 195.0 | 462.8 | 502.3 |
| 3. | 174.0 | 173.0 | 16.9 | 15.3 | 212.0 | 194.0 | 511.8 | 496.5 |
| 4. | 171.0 | 191.0 | 17.3 | 15.5 | 236.0 | 187.0 | 567.5 | 447.2 |
| 5. | 177.0 | 185.0 | 18.2 | 16.0 | 213.0 | 205.0 | 498.8 | 502.8 |
| AVG | 174.6 | 179.4 | 16.9 | 15.5 | 200.8 | 196.8 | 421 | 498 |

***Golder Associates Inc.***

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197223**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 65.2 | 54.1 | 56.2 | 1 | 54 |
| 2. | 71.2 | 56.6 | 54.7 | 1 | 147 |
| 3. | 66.8 | 54.0 | 55.0 | 1 | 559 |
| 4. | 60.3 | 54.7 | 54.3 | 1 | 687 |
| 5. | 65.5 | 55.9 | 57.6 | 1 | 501 |
| 6. | 63.0 | 55.2 | 55.0 | 1 | 520 |
| 7. | 70.7 | 56.9 | 57.3 | 1 | 201 |
| 8. | 68.4 | 56.6 | 60.2 | 1 | 138 |
| 9. | 70.0 | 55.5 | 55.7 | 1 | 936 |
| 10. | 62.8 | 57.7 | 57.6 | 1 | 374 |
| AVG | 66.4 | 55.7 | 56.4 | 1 | 412 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.948 | 2.48 |
| 2. | 0.949 | 2.47 |
| 3. | 0.948 | |
| AVG | 0.948 | 2.48 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 171.7 | 171.2 | 16.4 | 14.5 | 188.9 | 125.5 | 460.5 | 85.0 |
| 2. | 175.5 | 173.4 | 16.1 | 15.5 | 213.9 | 193.0 | 514.3 | 527.0 |
| 3. | 162.5 | 172.5 | 17.2 | 13.7 | 209.0 | 141.1 | 528.3 | 361.4 |
| 4. | 177.1 | 178.1 | 16.8 | 16.0 | 232.8 | 197.6 | 548.9 | 513.3 |
| 5. | 179.0 | 182.4 | 17.2 | 14.9 | 212.1 | 205.9 | 507.8 | 513.0 |
| AVG | 173.1 | 175.5 | 16.8 | 14.9 | 211.3 | 172.6 | 512 | 400 |

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197226**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 65.6 | 56.4 | 59.0 | 2 | 1136 |
| 2. | 62.3 | 57.6 | 53.4 | 1 | 156 |
| 3. | 63.1 | 56.1 | 52.6 | 1 | 651 |
| 4. | 63.3 | 55.7 | 54.3 | 1 | 552 |
| 5. | 68.8 | 57.3 | 56.5 | 2 | 973 |
| 6. | 63.9 | 62.0 | 55.9 | 1 | 166 |
| 7. | 67.7 | 58.1 | 56.6 | 2 | 1583 |
| 8. | 60.8 | 58.4 | 55.0 | 1 | 552 |
| 9. | 64.8 | 57.9 | 57.0 | 1 | 135 |
| 10. | 68.3 | 55.5 | 57.5 | 1 | 150 |
| AVG | 64.9 | 57.5 | 55.8 | 1 | 605 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.948 | 2.44 |
| 2. | 0.946 | 2.48 |
| 3. | 0.949 | |
| AVG | 0.948 | 2.46 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 161.0 | 171.0 | 15.8 | 15.8 | 222.0 | 148.0 | 540.4 | 394.8 |
| 2. | 166.0 | 174.0 | 16.2 | 17.1 | 230.0 | 168.0 | 577.6 | 445.0 |
| 3. | 179.0 | 175.0 | 15.7 | 16.0 | 212.0 | 133.0 | 502.0 | 251.1 |
| 4. | 175.0 | 188.0 | 16.3 | 16.6 | 240.0 | 177.0 | 590.1 | 433.1 |
| 5. | 168.0 | 179.0 | 16.1 | 15.2 | 201.0 | 133.0 | 478.1 | 79.6 |
| AVG | 169.8 | 177.4 | 16.0 | 16.1 | 221.0 | 151.8 | 538 | 321 |

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197237**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 59.2 | 56.2 | 52.1 | 2 | 3667 |
| 2. | 63.0 | 59.2 | 54.6 | 1 | 350 |
| 3. | 58.4 | 55.5 | 53.0 | 1 | 479 |
| 4. | 61.7 | 55.3 | 52.1 | 1 | 609 |
| 5. | 59.2 | 56.4 | 55.4 | 1 | 545 |
| 6. | 64.8 | 55.3 | 54.1 | 1 | 131 |
| 7. | 62.4 | 57.1 | 53.7 | 1 | 85 |
| 8. | 63.8 | 58.1 | 50.8 | 1 | 1973 |
| 9. | 64.7 | 55.9 | 55.7 | 3 | 4465 |
| 10. | 64.8 | 58.1 | 55.9 | 1 | 497 |
| AVG | 62.2 | 56.7 | 53.7 | 1 | 1280 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.947 | 2.54 |
| 2. | 0.950 | 2.56 |
| 3. | 0.949 | |
| AVG | 0.949 | 2.55 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 168.6 | 168.2 | 16.0 | 14.2 | 214.3 | 141.1 | 541.9 | 191.4 |
| 2. | 174.4 | 175.0 | 16.3 | 15.7 | 200.7 | 198.7 | 497.6 | 540.9 |
| 3. | 176.0 | 171.1 | 16.0 | 16.1 | 214.2 | 198.2 | 535.2 | 542.0 |
| 4. | 162.6 | 183.9 | 17.5 | 15.0 | 220.8 | 138.2 | 558.0 | 45.9 |
| 5. | 179.7 | 186.0 | 16.1 | 14.4 | 236.8 | 191.0 | 576.8 | 491.5 |
| AVG | 172.2 | 176.8 | 16.4 | 15.1 | 217.4 | 173.4 | 542 | 362 |

***Golder Associates Inc.***

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197253**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 70.0 | 54.8 | 55.7 | 1 | 665 |
| 2. | 68.6 | 56.4 | 53.9 | 1 | 174 |
| 3. | 60.0 | 57.5 | 54.1 | 1 | 157 |
| 4. | 62.8 | 57.6 | 52.5 | 1 | 937 |
| 5. | 64.3 | 61.6 | 54.7 | 1 | 881 |
| 6. | 66.9 | 58.4 | 56.2 | 1 | 80 |
| 7. | 69.9 | 56.0 | 52.2 | 1 | 628 |
| 8. | 61.7 | 55.6 | 55.8 | 1 | 485 |
| 9. | 64.8 | 59.1 | 57.2 | 1 | 768 |
| 10. | 61.8 | 59.6 | 55.3 | 2 | 1112 |
| AVG | 65.1 | 57.7 | 54.8 | 1 | 589 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.946 | 2.49 |
| 2. | 0.946 | 2.41 |
| 3. | 0.947 | |
| AVG | 0.946 | 2.45 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 169.0 | 170.0 | 16.7 | 15.6 | 202.0 | 139.0 | 484.3 | 199.1 |
| 2. | 161.0 | 165.0 | 16.7 | 15.7 | 195.0 | 201.0 | 485.0 | 529.1 |
| 3. | 163.0 | 183.0 | 16.1 | 15.7 | 195.0 | 210.0 | 471.6 | 531.6 |
| 4. | 175.0 | 178.0 | 15.2 | 16.6 | 213.0 | 198.0 | 488.8 | 496.0 |
| 5. | 167.0 | 179.0 | 14.7 | 14.5 | 209.0 | 199.0 | 477.5 | 502.6 |
| AVG | 167.0 | 175.0 | 15.9 | 15.6 | 202.8 | 189.4 | 481 | 452 |

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197256**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 69.5 | 56.1 | 52.5 | 1 | 27 |
| 2. | 67.6 | 56.6 | 55.2 | 1 | 802 |
| 3. | 59.6 | 56.1 | 53.6 | 1 | 37 |
| 4. | 70.0 | 50.6 | 53.0 | 1 | 159 |
| 5. | 63.9 | 57.7 | 57.5 | 1 | 958 |
| 6. | 65.3 | 57.3 | 56.3 | 2 | 1401 |
| 7. | 63.1 | 57.9 | 57.9 | 1 | 883 |
| 8. | 65.3 | 58.3 | 59.1 | 1 | 332 |
| 9. | 68.8 | 54.6 | 55.5 | 1 | 255 |
| 10. | 62.8 | 54.9 | 55.9 | 1 | 648 |
| AVG | 65.6 | 56.0 | 55.6 | 1 | 550 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.946 | 2.38 |
| 2. | 0.946 | 2.36 |
| 3. | 0.946 | |
| AVG | 0.946 | 2.37 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 163.0 | 164.0 | 16.2 | 15.3 | 178.0 | 125.7 | 436.7 | 294.8 |
| 2. | 157.5 | 168.6 | 16.3 | 16.3 | 155.3 | 126.6 | 365.9 | 328.1 |
| 3. | 172.2 | 167.3 | 16.0 | 15.6 | 211.1 | 185.0 | 520.4 | 490.3 |
| 4. | 161.6 | 171.3 | 17.5 | 14.8 | 232.5 | 194.1 | 597.2 | 482.1 |
| 5. | 170.5 | 176.0 | 15.0 | 16.0 | 215.2 | 139.0 | 497.6 | 297.4 |
| AVG | 165.0 | 169.4 | 16.2 | 15.6 | 198.4 | 154.1 | 484 | 379 |

**JUNE 2018** **18102853**

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**SAMPLE NUMBER:** **108197270**

| | THICKNESS (mils) | TEAR RESISTANCE (lbs) MD | TEAR RESISTANCE (lbs) TD | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 64.2 | 59.4 | 56.0 | 1 | 330 |
| 2. | 64.2 | 59.4 | 55.0 | 1 | 266 |
| 3. | 62.7 | 55.8 | 51.9 | 1 | 668 |
| 4. | 62.4 | 55.5 | 53.5 | 1 | 37 |
| 5. | 70.6 | 57.6 | 56.2 | 1 | 767 |
| 6. | 66.5 | 57.3 | 53.9 | 2 | 3063 |
| 7. | 63.0 | 57.9 | 53.7 | 1 | 870 |
| 8. | 70.3 | 57.6 | 56.2 | 1 | 250 |
| 9. | 62.8 | 57.6 | 55.0 | 1 | 1287 |
| 10. | 69.8 | 61.7 | 56.4 | 1 | 153 |
| AVG | 65.7 | 58.0 | 54.8 | 1 | 769 |

| | DENSITY (g/cc) | CARBON BLACK CONTENT (%) |
|---|---|---|
| 1. | 0.946 | 2.35 |
| 2. | 0.946 | 2.36 |
| 3. | 0.946 | |
| AVG | 0.946 | 2.36 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 154.3 | 172.2 | 15.7 | 15.8 | 177.7 | 180.4 | 439.7 | 461.3 |
| 2. | 162.6 | 177.6 | 16.3 | 14.9 | 205.6 | 200.5 | 519.4 | 533.0 |
| 3. | 170.5 | 190.4 | 14.9 | 15.5 | 204.5 | 162.9 | 495.0 | 434.0 |
| 4. | 180.8 | 165.6 | 15.8 | 14.9 | 207.6 | 197.5 | 475.1 | 498.9 |
| 5. | 179.7 | 167.5 | 16.6 | 14.1 | 185.2 | 149.0 | 426.4 | 382.9 |
| AVG | 169.6 | 174.7 | 15.9 | 15.1 | 196.1 | 178.1 | 471 | 462 |

***Golder Associates Inc.***

# APPENDIX P

**Geomembrane Subgrade Acceptance Certificates**

# PLASTIC FUSION FABRICATORS, INC

Date: 8-23-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: Al Corbitt

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

DANEL I-35

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 9.24.18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: [signature]

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

PANEL 36 - 53

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 8-25-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: JL Collett

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

PANELS 54-69

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 8-28-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: [signature]

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

DANIELS 70 - 89

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 8-29-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: [signature]

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

DANIELS 90-105

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 9-3-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: Al Cornett

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

PANELS 31-106 — P1-E P2-E P3-E P4E P5E P6-E

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 9-4-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: Al Corbett

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

panel 107–111

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# PLASTIC FUSION FABRICATORS, INC

Date: 9-5-18

## CERTIFICATE OF ACCEPTANCE
## OF SUBGRADE SURFACE BY GEOSYNTHETIC INSTALLER

Project Name: Legacy Landfill – Cell 1 South/2North

Project Location: Jonesboro, AR

PFF Customer: Dumey Contracting, Inc.

For Plastic Fusion Fabricators, Inc.: Al Corbett

For Quality Assurance Consultant: _____

For Customer/Owners Representative: _____

DANIELS 112 - 140

Note: PFF's representative is only certifying that the subgrade surface is acceptable for the installation of geosynthetics products. PFF does not accept any responsibility for the structural integrity of the subgrade including but not limited to grade elevations, compaction, moisture content and surface maintenance during deployment.

# APPENDIX Q

**Geomembrane Deployment Logs**

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 08/23/18 | P-1 | 108197260 | 76 | NONE | 60T | 22 | 520 | Y | RPG |
| 08/23/18 | P-2 | 108197252 | 76 | NONE | 60T | 22 | 45 | Y | RPG |
| 08/23/18 | P-3 | 108197254 | 76 | NONE | 60T | 22 | 520 | Y | RPG |
| 08/23/18 | P-4 | 108197221 | 76 | NONE | 60T | 22 | 98 | Y | RPG |
| 08/23/18 | P-5 | 108197221 | 76 | NONE | 60T | 22 | 410 | Y | RPG |
| 08/23/18 | P-6 | 108197222 | 76 | NONE | 60T | 22 | 155 | Y | RPG |
| 08/23/18 | P-7 | 108197222 | 76 | NONE | 60T | 22 | 30 | Y | RPG |
| 08/23/18 | P-8 | 108197222 | 76 | NONE | 60T | 22 | 31 | Y | RPG |
| 08/23/18 | P-9 | 108197222 | 80 | NONE | 60T | 22 | 36 | Y | RPG |
| 08/23/18 | P-10 | 108197222 | 80 | NONE | 60T | 22 | 37 | Y | RPG |
| 08/23/18 | P-11 | 108197222 | 80 | NONE | 60T | 22 | 38 | Y | RPG |
| 08/23/18 | P-12 | 108197222 | 80 | NONE | 60T | 22 | 39 | Y | RPG |
| 08/23/18 | P-13 | 108197222 | 80 | NONE | 60T | 22 | 43 | Y | RPG |
| 08/23/18 | P-14 | 108197222 | 80 | NONE | 60T | 22 | 45 | Y | RPG |
| 08/23/18 | P-15 | 108197222 | 80 | NONE | 60T | 22 | 47 | Y | RPG |
| 08/23/18 | P-16 | 108197229 | 80 | NONE | 60T | 22 | 49 | Y | RPG |
| 08/23/18 | P-17 | 108197229 | 85 | LIGHT | 60T | 22 | 50 | Y | RPG |
| 08/23/18 | P-18 | 108197229 | 85 | LIGHT | 60T | 22 | 54 | Y | RPG |
| 08/23/18 | P-19 | 108197229 | 85 | LIGHT | 60T | 22 | 54 | Y | RPG |
| 08/23/18 | P-20 | 108197229 | 85 | LIGHT | 60T | 22 | 54 | Y | RPG |
| 08/23/18 | P-21 | 108197229 | 85 | LIGHT | 60T | 22 | 49 | Y | RPG |
| 08/23/18 | P-22 | 108197229 | 85 | LIGHT | 60T | 22 | 49 | Y | RPG |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 8/23/2018 | P-23 | 108197229 | 80 | LIGHT | 60T | 22 | 47 | Y | RPG |
| 8/23/2018 | P-24 | 108197229 | 80 | LIGHT | 60T | 22 | 44 | Y | RPG |
| 8/23/2018 | P-25 | 108197229 | 80 | LIGHT | 60T | 22 | 45 | Y | RPG |
| 8/23/2018 | P-26 | 108197252 | 80 | LIGHT | 60T | 22 | 39 | Y | RPG |
| 8/23/2018 | P-27 | 108197255 | 80 | LIGHT | 60T | 22 | 38 | Y | RPG |
| 8/23/2018 | P-28 | 108197255 | 80 | LIGHT | 60T | 22 | 37 | Y | RPG |
| 8/23/2018 | P-29 | 108197255 | 80 | LIGHT | 60T | 22 | 36 | Y | RPG |
| 8/23/2018 | P-30 | 108197255 | 80 | LIGHT | 60T | 22 | 34 | Y | RPG |
| 8/23/2018 | P-31 | 108197255 | 80 | LIGHT | 60T | 22 | 32 | Y | RPG |
| 8/23/2018 | P-32 | 108197255 | 80 | LIGHT | 60T | 22 | 315 | Y | RPG |
| 8/23/2018 | P-33 | 108197256 | 80 | LIGHT | 60T | 22 | 250 | Y | RPG |
| 8/23/2018 | P-34 | 108197256 | 80 | LIGHT | 60T | 22 | 250 | Y | RPG |
| 8/23/2018 | P-35 | 108197253 | 80 | LIGHT | 60T | 22 | 315 | Y | RPG |
| 8/24/2018 | P-36 | 108197253 | 80 | LIGHT | 60T | 22 | 203 | Y | RPG |
| 8/24/2018 | P-37 | 108197244 | 80 | LIGHT | 60T | 22 | 362 | Y | RPG |
| 8/24/2018 | P-38 | 108197244 | 80 | LIGHT | 60T | 22 | 150 | Y | RPG |
| 8/24/2018 | P-39 | 108197243 | 80 | LIGHT | 60T | 22 | 415 | Y | RPG |
| 8/24/2018 | P-40 | 108197223 | 80 | LIGHT | 60T | 22 | 107 | Y | RPG |
| 8/24/2018 | P-41 | 108197249 | 80 | LIGHT | 60T | 22 | 458 | Y | RPG |
| 8/24/2018 | P-42 | 108197249 | 80 | LIGHT | 60T | 22 | 56 | Y | RPG |
| 8/24/2018 | P-43 | 108197220 | 80 | LIGHT | 60T | 22 | 509 | Y | RPG |
| 8/24/2018 | P-44 | 108197259 | 80 | LIGHT | 60T | 22 | 520 | Y | RPG |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 8/24/2018 | P-45 | 108197236 | 85 | WINDY | 60T | 22 | 48 | Y | RPG |
| 8/24/2018 | P-46 | 108197236 | 85 | WINDY | 60T | 22 | 472 | Y | RPG |
| 8/24/2018 | P-47 | 108197216 | 85 | WINDY | 60T | 22 | 95 | Y | RPG |
| 8/24/2018 | P-48 | 108197218 | 85 | WINDY | 60T | 22 | 427 | Y | RPG |
| 8/24/2018 | P-49 | 108197219 | 85 | WINDY | 60T | 22 | 139 | Y | RPG |
| 8/24/2018 | P-50 | 108197219 | 85 | WINDY | 60T | 22 | 380 | Y | RPG |
| 8/24/2018 | P-51 | 108197216 | 85 | WINDY | 60T | 22 | 185 | Y | RPG |
| 8/24/2018 | P-52 | 108197234 | 85 | WINDY | 60T | 22 | 338 | Y | RPG |
| 8/24/2018 | P-53 | 108197225 | 85 | WINDY | 60T | 22 | 227 | Y | RPG |
| 8/25/2018 | P-54 | 108197225 | 67 | WINDY | 60T | 22 | 293 | Y | RPG |
| 8/25/2018 | P-55 | 108197226 | 67 | WINDY | 60T | 22 | 275 | Y | RPG |
| 8/25/2018 | P-56 | 108197237 | 67 | WINDY | 60T | 22 | 249 | Y | RPG |
| 8/25/2018 | P-57 | 108197238 | 67 | WINDY | 60T | 22 | 319 | Y | RPG |
| 8/25/2018 | P-58 | 108197224 | 67 | WINDY | 60T | 22 | 109 | Y | RPG |
| 8/25/2018 | P-59 | 108197224 | 67 | WINDY | 60T | 22 | 378 | Y | RPG |
| 8/25/2018 | P-60 | 108197227 | 67 | WINDY | 60T | 22 | 139 | Y | RPG |
| 8/25/2018 | P-61 | 108197271 | 70 | WINDY | 60T | 22 | 429 | Y | RPG |
| 8/25/2018 | P-62 | 108197216 | 70 | WINDY | 60T | 22 | 95 | Y | RPG |
| 8/25/2018 | P-63 | 108197217 | 70 | WINDY | 60T | 22 | 473 | Y | RPG |
| 8/25/2018 | P-64 | 108197271 | 70 | WINDY | 60T | 22 | 43 | Y | RPG |
| 8/25/2018 | P-65 | 108197246 | 70 | WINDY | 60T | 22 | 477 | Y | RPG |
| 8/25/2018 | P-66 | 108197235 | 70 | WINDY | 60T | 22 | 520 | Y | RPG |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 8/24/2018 | P-67 | 108197230 | 90 | WINDY | 60T | 22 | 44 | Y | RPG |
| 8/24/2018 | P-68 | 108197230 | 90 | WINDY | 60T | 22 | 462 | Y | RPG |
| 8/24/2018 | P-69 | 108197216 | 90 | WINDY | 60T | 22 | 102 | Y | RPG |
| 8/28/2018 | P-70 | 108197233 | 70 | WINDY | 60T | 22 | 422 | Y | RPG |
| 8/28/2018 | P-71 | 108197234 | 70 | WINDY | 60T | 22 | 146 | Y | RPG |
| 8/28/2018 | P-72 | 108197227 | 70 | WINDY | 60T | 22 | 374 | Y | RPG |
| 8/28/2018 | P-73 | 108197238 | 70 | WINDY | 60T | 22 | 194 | Y | RPG |
| 8/28/2018 | P-74 | 108197223 | 70 | LIGHT | 60T | 22 | 320 | Y | RPG |
| 8/28/2018 | P-75 | 108197232 | 70 | LIGHT | 60T | 22 | 248 | Y | RPG |
| 8/28/2018 | P-76 | 108197232 | 70 | LIGHT | 60T | 22 | 263 | Y | RPG |
| 8/28/2018 | P-77 | 108197252 | 70 | LIGHT | 60T | 22 | 305 | Y | RPG |
| 8/28/2018 | P-78 | 108197272 | 70 | LIGHT | 60T | 22 | 218 | Y | RPG |
| 8/28/2018 | P-79 | 108197269 | 70 | LIGHT | 60T | 22 | 350 | Y | RPG |
| 8/28/2018 | P-80 | 108197269 | 70 | LIGHT | 60T | 22 | 167 | Y | RPG |
| 8/28/2018 | P-81 | 108197270 | 70 | LIGHT | 60T | 22 | 399 | Y | RPG |
| 8/28/2018 | P-82 | 108197270 | 70 | LIGHT | 60T | 22 | 115 | Y | RPG |
| 8/28/2018 | P-83 | 108197231 | 70 | LIGHT | 60T | 22 | 453 | Y | RPG |
| 8/28/2018 | P-84 | 108197231 | 70 | LIGHT | 60T | 22 | 60 | Y | RPG |
| 8/28/2018 | P-85 | 108197228 | 70 | LIGHT | 60T | 22 | 508 | Y | RPG |
| 8/28/2018 | P-86 | 108197245 | 70 | LIGHT | 60T | 22 | 520 | Y | RPG |
| 8/28/2018 | P-87 | 108197267 | 70 | LIGHT | 60T | 22 | 48 | Y | RPG |
| 8/28/2018 | P-88 | 108197267 | 70 | LIGHT | 60T | 22 | 472 | Y | RPG |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 8/28/2018 | P-89 | 108197263 | 75 | LIGHT W | 60T | 22 | 90 | Y | RPG |
| 8/29/2018 | P-90 | 108197263 | 75 | LIGHT W | 60T | 22 | 430 | Y | RPG |
| 8/29/2018 | P-91 | 108197265 | 75 | LIGHT W | 60T | 22 | 138 | Y | RPG |
| 8/29/2018 | P-92 | 108197265 | 75 | LIGHT W 5-10 | 60T | 22 | 372 | Y | RPG |
| 8/29/2018 | P-93 | 108197258 | 70 | WINDY | 60T | 22 | 196 | Y | RPG |
| 8/29/2018 | P-94 | 108197258 | 70 | WINDY | 60T | 22 | 322 | Y | RPG |
| 8/29/2018 | P-95 | 108197274 | 70 | WINDY | 60T | 22 | 246 | Y | RPG |
| 8/29/2018 | P-96 | 108197274 | 70 | WINDY | 60T | 22 | 268 | Y | RPG |
| 8/29/2018 | P-97 | 108197257 | 70 | WINDY | 60T | 22 | 300 | Y | RPG |
| 8/29/2018 | P-98 | 108197257 | 70 | WINDY | 60T | 22 | 212 | Y | RPG |
| 8/29/2018 | P-99 | 108197262 | 70 | WINDY | 60T | 22 | 356 | Y | RPG |
| 8/29/2018 | P-100 | 108197262 | 70 | WINDY | 60T | 22 | 155 | Y | RPG |
| 8/29/2018 | P-101 | 108197266 | 70 | WINDY | 60T | 22 | 413 | Y | RPG |
| 8/29/2018 | P-102 | 108197266 | 85 | WINDY | 60T | 22 | 103 | Y | RPG |
| 8/29/2018 | P-103 | 108197261 | 85 | WINDY | 60T | 22 | 465 | Y | RPG |
| 8/29/2018 | P-104 | 108197268 | 85 | WINDY | 60T | 22 | 473 | Y | RPG |
| 8/29/2018 | P-105 | 108197242 | 85 | WINDY | 60T | 22 | 520 | Y | RPG |
| 9/3/2018 | P-106 | 108197234 | 70 | WINDY | 60T | 22 | 34 | Y | RPG |
| 9/3/2018 | P-1E | 108197237 | 70 | WINDY | 60T | 22 | 244 | Y | RPG |
| 9/3/2018 | P-2E | 108197239 | 85 | WINDY | 60T | 22 | 80 | Y | RPG |
| 9/3/2018 | P-3E | 108197237 | 85 | WINDY | 60T | 22 | 21 | Y | RPG |
| 9/4/2018 | P-4E | 108197239 | 70 | CALM | 60T | 22 | 134 | Y | RPG |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 9/4/2018 | P-5E | 108197239 | 70 | CALM | 60T | 6 | 95 | Y | RPG |
| 9/4/2018 | P-6E | 108197246 | 70 | CALM | 60T | 22 | 34 | Y | RPG |
| 9/4/2018 | P-107 | 108197247 | 75 | WINDY | 60T | 22 | 321 | Y | RPG |
| 9/4/2018 | P-108 | 108197247 | 75 | WINDY | 60T | 22 | 138 | Y | RPG |
| 9/4/2018 | P-109 | 108197250 | 75 | WINDY | 60T | 22 | 141 | Y | RPG |
| 9/5/2018 | P-110 | 108197252 | 70 | WINDY | 60T | 22 | 95 | Y | RPG |
| 9/5/2018 | P-111 | 108197250 | 70 | WINDY | 60T | 22 | 100 | Y | RPG |
| 9/5/2018 | P-112 | 108197250 | 70 | WINDY | 60T | 22 | 40 | Y | RPG |
| 9/5/2018 | P-113 | 108197250 | 70 | WINDY | 60T | 22 | 47 | Y | RPG |
| 9/5/2018 | P-114 | 108197250 | 70 | WINDY | 60T | 22 | 43 | Y | RPG |
| 9/5/2018 | P-115 | 108197250 | 70 | WINDY | 60T | 22 | 46 | Y | RPG |
| 9/5/2018 | P-116 | 108197250 | 70 | WINDY | 60T | 22 | 50 | Y | RPG |
| 9/5/2018 | P-117 | 108197247 | 70 | WINDY | 60T | 22 | 52 | Y | RPG |
| 9/5/2018 | P-118 | 108197240 | 70 | WINDY | 60T | 22 | 52 | Y | RPG |
| 9/5/2018 | P-119 | 108197240 | 70 | WINDY | 60T | 22 | 61 | Y | RPG |
| 9/5/2018 | P-120 | 108197240 | 70 | WINDY | 60T | 22 | 65 | Y | RPG |
| 9/5/2018 | P-121 | 108197240 | 70 | WINDY | 60T | 22 | 66 | Y | RPG |
| 9/5/2018 | P-122 | 108197240 | 70 | WINDY | 60T | 22 | 73 | Y | RPG |
| 9/5/2018 | P-123 | 108197240 | 70 | WINDY | 60T | 22 | 80 | Y | RPG |
| 9/5/2018 | P-124 | 108197240 | 70 | WINDY | 60T | 22 | 93 | Y | RPG |
| 9/5/2018 | P-125 | 108197251 | 70 | WINDY | 60T | 22 | 96 | Y | RPG |
| 9/5/2018 | P-126 | 108197251 | 70 | WINDY | 60T | 22 | 109 | Y | RPG |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# GEOMEMBRANE DEPLOYMENT LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| Date | Panel ID | Roll Number | Weather Conditions | | Material Type | Approximate Panel Dimensions | | Panel Visually Inspected (Y or N) | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ambient Temp (F) | Weather Conditions/ Wind | | Width (Feet) | Length (Feet) | | |
| 9/5/2018 | P-127 | 108197251 | 70 | WINDY | 60T | 22 | 113 | Y | RPG |
| 9/5/2018 | P-128 | 108197251 | 70 | WINDY | 60T | 22 | 110 | Y | RPG |
| 9/5/2018 | P-129 | 108197251 | 70 | WINDY | 60T | 22 | 70 | Y | RPG |
| 9/5/2018 | P-130 | 108197216 | 70 | CALM | 60T | 22 | 40 | Y | RPG |
| 9/5/2018 | P-131 | 108197241 | 70 | CALM | 60T | 22 | 103 | Y | RPG |
| 9/5/2018 | P-132 | 108197241 | 70 | CALM | 60T | 22 | 101 | Y | RPG |
| 9/5/2018 | P-133 | 108197241 | 70 | CALM | 60T | 22 | 94 | Y | RPG |
| 9/5/2018 | P-134 | 108197241 | 70 | CALM | 60T | 22 | 95 | Y | RPG |
| 9/5/2018 | P-135 | 108197241 | 70 | CALM | 60T | 22 | 91 | Y | RPG |
| 9/5/2018 | P-136 | 108197248 | 70 | CALM | 60T | 22 | 88 | Y | RPG |
| 9/5/2018 | P-137 | 108197248 | 70 | CALM | 60T | 22 | 85 | Y | RPG |
| 9/5/2018 | P-138 | 108197248 | 70 | CALM | 60T | 22 | 82 | Y | RPG |
| 9/5/2018 | P-139 | 108197248 | 70 | CALM | 60T | 11 | 41 | Y | RPG |
| 9/5/2018 | P-140 | 108197248 | 70 | CALM | 60T | 11 | 40 | Y | RPG |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane
40S - 40-Mil Smooth HDPE Geomembrane
40T - 40-Mil Textured HDPE Geomembrane

# APPENDIX R

**Geomembrane Trial Seam Logs**

# FUSION AND EXTRUSION TRIAL SEAM LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

**Project Specifications:**

| Fusion Welds: | | Extrusion Welds: | |
|---|---|---|---|
| Peel: | ≥ 90 psi | Peel: | ≥ 78 psi |
| Shear: | ≥ 120 psi | Shear: | ≥ 120 psi |

| | | | | Seaming Machine Settings | | | | | | Peel Tests | | | | | | Shear Tests | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fusion/ Extrusion (F or E) | Material/ Material (S or T) | Date | Time | Ambient Temp (F) | Operator ID | Machine ID | Machine Temp or Ext. P.H. | Speed | Side | 1 A/B (psi) | 2 A/B (psi) | 3 A/B (psi) | 4 A/B (psi) | 5 A/B (psi) | 1 (psi) | 2 (psi) | 3 (psi) | 4 (psi) | 5 (psi) | Pass/ Fail | CQA Monitor |
| F | T/T | 8/23/18 | 0720 | 63 | JRL | 777 | 410 | 5.0 | A | 115 | 123 | 111 | | | 163 | 165 | 158 | | | P | RPG |
| | | | | | | | | | B | 119 | 129 | 124 | | | | | | | | | |
| F | T/T | 8/23/18 | 0720 | 63 | JA | 516 | 405 | 5.0 | A | 112 | 122 | 128 | | | 161 | 170 | 162 | | | P | RPG |
| | | | | | | | | | B | 123 | 122 | 126 | | | | | | | | | |
| F | T/T | 8/23/18 | 1219 | 80 | JA | 516 | 405 | 5.0 | A | 102 | 108 | 104 | | | 148 | 148 | 146 | | | P | RPG |
| | | | | | | | | | B | 105 | 108 | 108 | | | | | | | | | |
| F | T/T | 8/23/18 | 1000 | 80 | JRL | 777 | 410 | 5.0 | A | 103 | 115 | 123 | | | 143 | 146 | 144 | | | P | RPG |
| | | | | | | | | | B | 113 | 113 | 115 | | | | | | | | | |
| F | T/T | 8/24/18 | 0655 | 65 | JA | 516 | 405 | 5.0 | A | 116 | 126 | 110 | | | 170 | 173 | 169 | | | P | RPG |
| | | | | | | | | | B | 116 | 132 | 119 | | | | | | | | | |
| F | T/T | 8/24/18 | 0700 | 65 | JRL | 777 | 410 | 5.0 | A | 134 | 141 | 130 | | | 180 | 177 | 174 | | | P | RPG |
| | | | | | | | | | B | 139 | 120 | 127 | | | | | | | | | |
| F | T/T | 8/24/18 | 1305 | 75 | JA | 516 | 410 | 5.0 | A | 106 | 107 | 109 | | | 136 | 130 | 134 | | | P | RPG |
| | | | | | | | | | B | 100 | 109 | 103 | | | | | | | | | |
| F | T/T | 8/24/18 | 1300 | 75 | JRL | 777 | 410 | 5.0 | A | 100 | 103 | 102 | | | 132 | 136 | 133 | | | P | RPG |
| | | | | | | | | | B | 100 | 102 | 106 | | | | | | | | | |
| F | T/T | 8/25/18 | 0655 | 70 | JA | 516 | 410 | 5.0 | A | 107 | 114 | 129 | | | 166 | 163 | 160 | | | P | RPG |
| | | | | | | | | | B | 107 | 105 | 118 | | | | | | | | | |
| F | T/T | 8/25/18 | 0700 | 70 | JRL | 777 | 410 | 5.0 | A | 133 | 128 | 119 | | | 160 | 167 | 163 | | | P | RPG |
| | | | | | | | | | B | 118 | 112 | 129 | | | | | | | | | |
| F | T/T | 8/25/18 | 0800 | 70 | JRL | 051 | 410 | 5.0 | A | 114 | 109 | 124 | | | 157 | 157 | 161 | | | P | RPG |
| | | | | | | | | | B | 113 | 116 | 116 | | | | | | | | | |
| F | T/T | 8/25/18 | 1300 | 85 | JA | 777 | 410 | 5.0 | A | 111 | 107 | 104 | | | 133 | 136 | 134 | | | P | RPG |
| | | | | | | | | | B | 106 | 111 | 109 | | | | | | | | | |
| F | T/T | 8/25/18 | 1305 | 85 | JRL | 051 | 410 | 5.0 | A | 104 | 98 | 104 | | | 128 | 130 | 129 | | | P | RPG |
| | | | | | | | | | B | 102 | 100 | 109 | | | | | | | | | |
| E | T/T | 8/26/18 | 0700 | 70 | BA | 47 | 250/260 | | A | 119 | 110 | 114 | | | 129 | 130 | 133 | | | P | RPG |
| | | | | | | | | | B | | | | | | | | | | | | |
| E | T/T | 8/26/18 | 1300 | 70 | BA | 47 | 250/266 | | A | 112 | 103 | 106 | | | 123 | 128 | 131 | | | P | RPG |
| | | | | | | | | | B | | | | | | | | | | | | |

# FUSION AND EXTRUSION TRIAL SEAM LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

**Project Specifications:**

| Fusion Welds: | | Extrusion Welds: | |
|---|---|---|---|
| Peel: | ≥ 90 psi | Peel: | ≥ 78 psi |
| Shear: | ≥ 120 psi | Shear: | ≥ 120 psi |

| | | | | Seaming Machine Settings | | | | | | Peel Tests | | | | | | Shear Tests | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fusion/ Extrusion (F or E) | Material/ Material (S or T) | Date | Time | Ambient Temp (F) | Operator ID | Machine ID | Machine Temp or Ext. P.H. | Speed | Side | 1 A/B (psi) | 2 A/B (psi) | 3 A/B (psi) | 4 A/B (psi) | 5 A/B (psi) | 1 (psi) | 2 (psi) | 3 (psi) | 4 (psi) | 5 (psi) | Pass/ Fail | CQA Monitor |
| E | T/T | 8/27/18 | 0700 | 70 | BA | 47 | 250/260 | | A | 117 | 109 | 110 | | | 132 | 136 | 128 | | | P | RPG |
| | | | | | | | | | B | | | | | | | | | | | | |
| F | T/T | 8/28/18 | 0700 | 75 | JRL | 051 | 410 | 5.0 | A | 152 | 132 | 127 | | | 157 | 123 | 132 | | | P | RPG |
| | | | | | | | | | B | 155 | 124 | 129 | | | | | | | | | |
| F | T/T | 8/28/18 | 0700 | 75 | JA | 516 | 410 | 5.0 | A | 153 | 119 | 126 | | | 155 | 122 | 129 | | | P | RPG |
| | | | | | | | | | B | 150 | 115 | 128 | | | | | | | | | |
| F | T/T | 8/28/18 | 1300 | 80 | JRL | 051 | 410 | 5.0 | A | 106 | 109 | 106 | | | 128 | 131 | 133 | | | P | RPG |
| | | | | | | | | | B | 103 | 105 | 105 | | | | | | | | | |
| F | T/T | 8/28/18 | 1305 | 80 | JA | 516 | 410 | 5.0 | A | 116 | 108 | 113 | | | 127 | 123 | 130 | | | P | RPG |
| | | | | | | | | | B | 106 | 116 | 105 | | | | | | | | | |
| F | T/T | 8/29/18 | 0730 | 70 | JA | 516 | 410 | 5.0 | A | 106 | 96 | 120 | | | 160 | 163 | 161 | | | P | RPG |
| | | | | | | | | | B | 119 | 120 | 112 | | | | | | | | | |
| F | T/T | 8/29/18 | 0730 | 70 | JRL | LEIC | 76.1 | 13.5 | A | 127 | 130 | 107 | | | 166 | 169 | 165 | | | P | RPG |
| | | | | | | | | | B | 113 | 110 | 130 | | | | | | | | | |
| F | T/T | 8/29/18 | 1230 | 85 | JA | 516 | 405 | 5.0 | A | 118 | 106 | 113 | | | 129 | 133 | 122 | | | P | RPG |
| | | | | | | | | | B | 121 | 116 | 117 | | | | | | | | | |
| F | T/T | 8/29/18 | 1230 | 85 | JRL | 051 | 410 | 2.3 | A | 106 | 116 | 107 | | | 130 | 126 | 122 | | | P | RPG |
| | | | | | | | | | B | 113 | 113 | 105 | | | | | | | | | |
| E | T/T | 8/30/18 | 0700 | 70 | BA | 47 | 250/260 | | A | 118 | 97 | 99 | | | 128 | 130 | 123 | | | P | RPG |
| | | | | | | | | | B | | | | | | | | | | | | |
| E | T/T | 8/30/18 | 1300 | 80 | BA | 47 | 250/260 | | A | 90 | 103 | 111 | | | 126 | 133 | 136 | | | P | RPG |
| | | | | | | | | | B | | | | | | | | | | | | |
| F | T/T | 9/4/18 | 1015 | 80 | JA | 516 | 400 | 5.0 | A | 116 | 120 | 122 | | | 137 | 139 | 141 | | | P | RPG |
| | | | | | | | | | B | 114 | 118 | 124 | | | | | | | | | |
| F | T/T | 9/4/18 | 1015 | 80 | JRL | 051 | 410 | 5.0 | A | 107 | 106 | 112 | | | 137 | 138 | 136 | | | P | RPG |
| | | | | | | | | | B | 106 | 110 | 114 | 124 | | | | | | | | |
| E | T/T | 9/4/18 | 1020 | 85 | BH | 47 | 250/260 | | A | 94 | 106 | 109 | 115 | | 130 | 135 | 136 | | | P | RPG |
| | | | | | | | | | B | | | | | | | | | | | | |
| F | T/T | 9/5/18 | 0650 | 78 | JR | 051 | 415 | 5.5 | A | 119 | 121 | 126 | | | 170 | 167 | 151 | | | P | RPG |
| | | | | | | | | | B | 134 | 120 | 131 | | | | | | | | | |
| F | T/T | 9/5/18 | 0653 | 78 | JA | 516 | 410 | 5.5 | A | 124 | 122 | 125 | | | 170 | 167 | 168 | | | P | RPG |
| | | | | | | | | | B | 118 | 125 | 117 | | | | | | | | | |

# APPENDIX S

**Geomembrane Seam Continuity Test Logs**

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 1 & P - 2 | T/T | 8/23/18 | 22 | JRL | 777 | 8/23/18 | 07:50 / 30 | 07:55 / 30 | P | RPG |
| P - 2 & P - 4 | T/T | 8/23/18 | 45 | JA | 516 | 8/23/18 | 15:48 / 30 | 15:53 / 30 | P | RPG |
| P - 1 & P - 4 | T/T | 8/23/18 | 50 | JA | 516 | 8/23/18 | 15:48 / 30 | 15:53 / 30 | P | RPG |
| P - 1 & P - 3 | T/T | 8/23/18 | 420 | JA | 516 | 8/23/18 | 15:48 / 30 | 15:53 / 30 | P | RPG |
| P - 3 & P - 4 | T/T | 8/23/18 | 22 | JRL | 777 | 8/23/18 | 08:01 / 30 | 08:06 / 30 | P | RPG |
| P - 5 & P - 6 | T/T | 8/23/18 | 22 | JRL | 777 | 8/23/18 | 08:06 / 30 | 08:11 / 30 | P | RPG |
| P - 7 & P - 8 | T/T | 8/23/18 | 29 | JA | 516 | 8/23/18 | 11:33 / 30 | 11:38 / 30 | P | RPG |
| P - 8 & P - 9 | T/T | 8/23/18 | 34 | JA | 516 | 8/23/18 | 11:34 / 30 | 11:39 / 29 | P | RPG |
| P - 9 & P - 10 | T/T | 8/23/18 | 35 | JA | 516 | 8/23/18 | 11:35 / 30 | 11:40 / 29 | P | RPG |
| P - 10 & P - 11 | T/T | 8/23/18 | 36 | JA | 516 | 8/23/18 | 11:36 / 30 | 11:41 / 30 | P | RPG |
| P - 11 & P - 12 | T/T | 8/23/18 | 37 | JRL | 777 | 8/23/18 | 11:36 / 30 | 11:41 / 30 | P | RPG |
| P - 12 & P - 13 | T/T | 8/23/18 | 41 | JA | 516 | 8/23/18 | 11:45 / 30 | 11:50 / 30 | P | RPG |
| P - 13 & P - 14 | T/T | 8/23/18 | 43 | JRL | 777 | 8/23/18 | 11:46 / 30 | 11:51 / 30 | P | RPG |
| P - 14 & P - 15 | T/T | 8/23/18 | 45 | JA | 516 | 8/23/18 | 11:47 / 30 | 11:52 / 30 | P | RPG |
| P - 15 & P - 16 | T/T | 8/23/18 | 47 | JRL | 777 | 8/23/18 | 11:48 / 30 | 11:53 / 30 | P | RPG |
| P - 16 & P - 17 | T/T | 8/23/18 | 48 | JRL | 777 | 8/23/18 | 11:49 / 30 | 11:54 / 30 | P | RPG |
| P - 17 & P - 18 | T/T | 8/23/18 | 52 | JRL | 777 | 8/23/18 | 11:55 / 30 | 12:00 / 30 | P | RPG |
| P - 18 & P - 19 | T/T | 8/23/18 | 52 | JA | 516 | 8/23/18 | 11:56 / 30 | 12:01 30 | P | RPG |
| P - 19 & P - 20 | T/T | 8/23/18 | 52 | JRL | 777 | 8/23/18 | 11:57 / 30 | 12:02 / 30 | P | RPG |
| P - 20 & P - 21 | T/T | 8/23/18 | 52 | JRL | 777 | 8/23/18 | 11:58 / 30 | 12:03 / 30 | P | RPG |
| P - 21 & P - 22 | T/T | 8/23/18 | 47 | JRL | 777 | 8/23/18 | 11:59 / 30 | 12:04 / 30 | P | RPG |
| P - 22 & P - 23 | T/T | 8/23/18 | 45 | JRL | 777 | 8/23/18 | 12:00 / 30 | 12:05 / 30 | P | RPG |
| P - 23 & P - 24 | T/T | 8/23/18 | 42 | JA | 516 | 8/23/18 | 12:40 / 30 | 12:45 / 30 | P | RPG |
| P - 24 & P - 25 | T/T | 8/23/18 | 43 | JRL | 777 | 8/23/18 | 12:41 / 30 | 12:46 / 30 | P | RPG |
| P - 25 & P - 26 | T/T | 8/23/18 | 34 | JA | 516 | 8/23/18 | 12:42 / 30 | 12:47 / 30 | P | RPG |
| P - 26 & P - 27 | T/T | 8/23/18 | 36 | JA | 516 | 8/23/18 | 12:43 / 30 | 12:48 / 30 | P | RPG |
| P - 27 & P - 28 | T/T | 8/23/18 | 35 | JRL | 777 | 8/23/18 | 12:44 / 30 | 12:49 / 29 | P | RPG |
| P - 28 & P - 29 | T/T | 8/23/18 | 34 | JA | 516 | 8/23/18 | 12:45 / 30 | 12:50 / 30 | P | RPG |
| P - 29 & P - 30 | T/T | 8/23/18 | 32 | JRL | 777 | 8/23/18 | 12:46 / 30 | 12:51 / 29 | P | RPG |

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 34 & P - 35 | T/T | 8/23/18 | 22 | JA | 516 | 8/23/18 | 15:05 / 30 | 15:10 / 30 | P | RPG |
| P - 32 & P - 5 | T/T | 8/23/18 | 53 | JRL | 777 | 8/23/18 | 15:25 / 30 | 15:30 / 30 | P | RPG |
| P - 33 & P - 5 | T/T | 8/23/18 | 410 | JRL | 777 | 8/23/18 | 15:30 / 30 | 15:35 / 30 | P | RPG |
| P - 33 & P - 6 | T/T | 8/23/18 | 155 | JA | 516 | 8/23/18 | 15:36 / 30 | 15:41 / 30 | P | RPG |
| P - 32 & P - 34 | T/T | 8/23/18 | 250 | JA | 516 | 8/23/18 | 15:36 / 30 | 15:41 / 30 | P | RPG |
| P - 32 & P - 35 | T/T | 8/23/18 | 60 | JRL | 777 | 8/23/18 | 08:00 / 30 | 08:05 / 30 | P | RPG |
| P - 33 & P - 35 | T/T | 8/23/18 | 230 | JRL | 777 | 8/23/18 | 15:25 / 30 | 15:30 / 30 | P | RPG |
| P - 1 & P - 23-19 | T/T | 8/23/18 | 176 | JA | 516 | 8/23/18 | 15:25 / 30 | 15:30 / 30 | P | RPG |
| P - 1 & P - 19-18 | T/T | 8/23/18 | 13 | JA | 516 | 8/23/18 | 15:30 / 30 | 15:35 / 30 | P | RPG |
| P - 1 & P - 18-9 | T/T | 8/23/18 | 198 | JA | 516 | 8/23/18 | 15:36 / 30 | 15:41 / 30 | P | RPG |
| P - 1 & P - 9-7 | T/T | 8/23/18 | 44 | JA | 516 | 8/23/18 | 15:42 / 30 | 15:47 / 30 | P | RPG |
| P - 4 & P - 6 | T/T | 8/23/18 | 516 | JRL | 777 | 8/23/18 | 15:50 / 30 | 15:55 / 30 | P | RPG |
| P - 32 & P - 33 | T/T | 8/23/18 | 22 | JA | 516 | 8/23/18 | 13:10 / 30 | 13:15 / 30 | P | RPG |
| P - 36 & P - 37 | T/T | 8/24/18 | 22 | JRL | 777 | 8/24/18 | 14:26 / 30 | 14:31 / 30 | P | RPG |
| P - 38 & P - 34 | T/T | 8/24/18 | 22 | JRL | 777 | 8/24/18 | 14:37 / 30 | 14:42 / 30 | P | RPG |
| P - 34 & P - 36 | T/T | 8/24/18 | 200 | JA | 516 | 8/24/18 | 08:20 / 30 | 08:25 / 30 | P | RPG |
| P - 34 & P - 37 | T/T | 8/24/18 | 50 | JA | 516 | 8/24/18 | 08:20 / 30 | 08:25 / 30 | P | RPG |
| P - 35 & P - 37 | T/T | 8/24/18 | 315 | JRL | 777 | 8/24/18 | 08:20 / 30 | 08:25 / 30 | P | RPG |
| P - 36 & P - 38 | T/T | 8/24/18 | 150 | JA | 516 | 8/24/18 | 09:00 / 30 | 09:05 / 30 | P | RPG |
| P - 36 & P - 39 | T/T | 8/24/18 | 50 | JRL | 777 | 8/24/18 | 09:00 / 30 | 09:05 / 30 | P | RPG |
| P - 40 & P - 41 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 09:00 / 30 | 09:05 / 30 | P | RPG |
| P - 42 & P - 43 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 09:43 / 30 | 09:48 / 30 | P | RPG |
| P - 38 & P - 40 | T/T | 8/24/18 | 103 | JRL | 777 | 8/24/18 | 10:13 / 30 | 10:18 / 30 | P | RPG |
| P - 38 & P - 41 | T/T | 8/24/18 | 75 | JA | 516 | 8/24/18 | 10:13 / 30 | 10:18 / 30 | P | RPG |
| P - 39 & P - 41 | T/T | 8/24/18 | 458 | JRL | 777 | 8/24/18 | 11:25 / 30 | 11:30 / 30 | P | RPG |
| P - 40 & P - 42 | T/T | 8/24/18 | 56 | JA | 516 | 8/24/18 | 11:25 / 30 | 11:30 / 30 | P | RPG |
| P - 40 & P - 43 | T/T | 8/24/18 | 50 | JRL | 777 | 8/24/18 | 11:26 / 30 | 11:31 / 30 | P | RPG |
| P - 41 & P - 43 | T/T | 8/24/18 | 458 | JA | 516 | 8/24/18 | 11:26 / 30 | 11:31 / 30 | P | RPG |
| P - 42 & P - 44 | T/T | 8/24/18 | 50 | JRL | 777 | 8/24/18 | 12:06 / 30 | 12:11 / 30 | P | RPG |

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 43 & P - 44 | T/T | 8/24/18 | 225 | JA | 516 | 8/24/18 | 12:06 / 30 | 12:11 / 30 | P | RPG |
| P - 43 & P - 45 | T/T | 8/24/18 | 235 | JRL | 777 | 8/24/18 | 12:06 / 30 | 12:11 / 30 | P | RPG |
| P - 44 & P - 45 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 11:00 / 30 | 11:05 / 30 | P | RPG |
| P - 46 & P - 47 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 11:10 / 30 | 11:15 / 30 | P | RPG |
| P - 48 & P - 49 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 13:28 / 30 | 13:33 / 30 | P | RPG |
| P - 44 & P - 46 | T/T | 8/24/18 | 472 | JRL | 777 | 8/24/18 | 13:20 / 30 | 13:25 / 30 | P | RPG |
| P - 44 & P - 47 | T/T | 8/24/18 | 50 | JRL | 777 | 8/24/18 | 13:20 / 10 | 13:25 / 10 | P | RPG |
| P - 45 & P - 47 | T/T | 8/24/18 | 35 | JA | 516 | 8/24/18 | 15:36 / 30 | 15:41 / 30 | P | RPG |
| P - 46 & P - 48 | T/T | 8/24/18 | 427 | JRL | 777 | 8/24/18 | 15:36 / 30 | 15:41 / 30 | P | RPG |
| P - 46 & P - 49 | T/T | 8/24/18 | 75 | JA | 516 | 8/24/18 | 15:40 / 30 | 15:45 / 30 | P | RPG |
| P - 47 & P - 49 | T/T | 8/24/18 | 95 | JA | 516 | 8/24/18 | 15:40 / 30 | 15:45 / 30 | P | RPG |
| P - 50 & P - 51 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 15:20 / 30 | 15:25 / 30 | P | RPG |
| P - 52 & P - 53 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 15:11 / 30 | 15:16 / 30 | P | RPG |
| P - 48 & P - 50 | T/T | 8/24/18 | 380 | JRL | 777 | 8/24/18 | 15:20 / 30 | 15:25 / 30 | P | RPG |
| P - 48 & P - 51 | T/T | 8/24/18 | 185 | JRL | 777 | 8/24/18 | 15:20 / 30 | 15:25 / 30 | P | RPG |
| P - 50 & P - 52 | T/T | 8/24/18 | 338 | JA | 516 | 8/24/18 | 15:20 / 30 | 15:25 / 30 | P | RPG |
| P - 54 & P - 55 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 07:30 / 30 | 07:35 / 30 | P | RPG |
| P - 58 & P - 59 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 07:45 / 30 | 07:50 / 30 | P | RPG |
| P - 56 & P - 57 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 07:40 / 30 | 07:45 / 30 | P | RPG |
| P - 54 & P - 56 | T/T | 8/24/18 | 250 | JRL | 777 | 8/24/18 | 11:11 / 30 | 11:16 / 30 | P | RPG |
| P - 54 & P - 57 | T/T | 8/24/18 | 50 | JA | 516 | 8/24/18 | 11:11 / 30 | 11:16 / 30 | P | RPG |
| P - 55 & P - 57 | T/T | 8/24/18 | 260 | JRL | 777 | 8/24/18 | 13:14 / 30 | 13:19 / 30 | P | RPG |
| P - 56 & P - 58 | T/T | 8/24/18 | 195 | JA | 516 | 8/24/18 | 13:14 / 30 | 13:19 / 30 | P | RPG |
| P - 56 & P - 59 | T/T | 8/24/18 | 50 | JRL | 777 | 8/24/18 | 11:17 / 30 | 11:22 / 30 | P | RPG |
| P - 57 & P - 59 | T/T | 8/24/18 | 300 | JA | 516 | 8/24/18 | 11:17 / 30 | 11:22 / 30 | P | RPG |
| P - 58 & P - 60 | T/T | 8/24/18 | 125 | JRL | 051 | 8/24/18 | 11:17 / 30 | 11:22 / 30 | P | RPG |
| P - 58 & P - 61 | T/T | 8/24/18 | 75 | JA | 516 | 8/24/18 | 11:35 / 30 | 11:40 / 30 | P | RPG |
| P - 59 & P - 61 | T/T | 8/24/18 | 378 | JRL | 051 | 8/24/18 | 11:35 / 30 | 11:40 / 30 | P | RPG |
| P - 62 & P - 63 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 08:50 / 30 | 08:55 / 30 | P | RPG |

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 60 & P - 62 | T/T | 8/24/18 | 95 | JRL | 051 | 8/24/18 | 11:25 / 30 | 11:30 / 30 | P | RPG |
| P - 60 & P - 63 | T/T | 8/24/18 | 50 | JA | 516 | 8/24/18 | 14:50 / 30 | 14:55 / 30 | P | RPG |
| P - 61 & P - 63 | T/T | 8/24/18 | 450 | JRL | 051 | 8/24/18 | 14:50 / 30 | 14:55 / 30 | P | RPG |
| P - 64 & P - 65 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 11:10 / 30 | 11:15 / 30 | P | RPG |
| P - 62 & P - 64 | T/T | 8/24/18 | 40 | JA | 516 | 8/24/18 | 14:30 / 30 | 14:35 / 30 | P | RPG |
| P - 62 & P - 65 | T/T | 8/24/18 | 60 | JRL | 051 | 8/24/18 | 14:35 / 30 | 14:40 / 30 | P | RPG |
| P - 63 & P - 65 | T/T | 8/24/18 | 473 | JA | 516 | 8/24/18 | 14:52 / 30 | 14:57 / 30 | P | RPG |
| P - 64 & P - 66 | T/T | 8/24/18 | 50 | JRL | 051 | 8/24/18 | 14:52 / 30 | 14:57 / 30 | P | RPG |
| P - 65 & P - 67 | T/T | 8/24/18 | 475 | JRL | 051 | 8/24/18 | 14:55 / 30 | 15:00 / 30 | P | RPG |
| P - 61 & P - 63A | T/T | 8/24/18 | 100 | JA | 516 | 8/24/18 | 11:55 / 30 | 12:00 / 30 | P | RPG |
| P - 61 & P - 63B | T/T | 8/24/18 | 163 | JA | 516 | 8/24/18 | 11:48 / 30 | 11:53 / 30 | P | RPG |
| P - 61 & P - 63C | T/T | 8/24/18 | 5 | JA | 516 | 8/24/18 | 11:48 / 30 | 11:53 / 30 | P | RPG |
| P - 66 & P - 67 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 15:05 / 30 | 15:10 / 30 | P | RPG |
| P - 68 & P - 69 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 08:00 / 30 | 08:05 / 30 | P | RPG |
| P - 67 & P - 69 | T/T | 8/24/18 | 80 | JRL | 051 | 8/24/18 | 15:05 / 30 | 15:10 / 30 | P | RPG |
| P - 70 & P - 71 | T/T | 8/24/18 | 22 | JA | 516 | 8/24/18 | 07:35 / 30 | 07:40 / 30 | P | RPG |
| P - 72 & P - 73 | T/T | 8/28/18 | 22 | JA | 516 | 8/28/18 | 07:45 / 30 | 07:50 / 30 | P | RPG |
| P - 74 & P - 75 | T/T | 8/28/18 | 22 | JA | 516 | 8/28/18 | 08:52 / 30 | 08:57 / 30 | P | RPG |
| P - 68 & P - 70 | T/T | 8/28/18 | 422 | JRL | 051 | 8/28/18 | 08:40 / 30 | 08:45 / 30 | P | RPG |
| P - 68 & P - 71 | T/T | 8/28/18 | 50 | JA | 516 | 8/28/18 | 08:50 / 30 | 08:55 / 30 | P | RPG |
| P - 69 & P - 71 | T/T | 8/28/18 | 102 | JRL | 051 | 8/28/18 | 11:33 / 30 | 11:38 / 30 | P | RPG |
| P - 70 & P - 72 | T/T | 8/28/18 | 372 | JA | 516 | 8/28/18 | 11:20 / 30 | 11:25 / 30 | P | RPG |
| P - 70 & P - 73 | T/T | 8/28/18 | 50 | JRL | 051 | 8/28/18 | 09:41 / 30 | 09:46 / 30 | P | RPG |
| P - 71 & P - 73 | T/T | 8/28/18 | 125 | JA | 516 | 8/28/18 | 09:40 / 30 | 09:45 / 30 | P | RPG |
| P - 72 & P - 74 | T/T | 8/28/18 | 320 | JRL | 051 | 8/28/18 | 10:00 / 30 | 10:05 / 30 | P | RPG |
| P - 72 & P - 75 | T/T | 8/28/18 | 50 | JA | 516 | 8/28/18 | 11:50 / 30 | 11:55 / 30 | P | RPG |
| P - 73 & P - 75 | T/T | 8/28/18 | 194 | JA | 051 | 8/28/18 | 11:50 / 30 | 11:55 / 30 | P | RPG |
| P - 74 & P - 76 | T/T | 8/28/18 | 325 | JA | 516 | 8/28/18 | 11:05 / 30 | 11:10 / 30 | P | RPG |
| P - 76 & P - 77 | T/T | 8/28/18 | 22 | JRL | 051 | 8/28/18 | 09:05 / 30 | 09:10 / 30 | P | RPG |

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 80 & P - 81 | T/T | 8/28/18 | 22 | JRL | 051 | 8/28/18 | 09:20 / 30 | 09:25 / 30 | P | RPG |
| P - 78 & P - 79 | T/T | 8/28/18 | 22 | JA | 516 | 8/28/18 | 11:42 / 30 | 11:47 / 30 | P | RPG |
| P - 79 & P - 76 | T/T | 8/28/18 | 22 | JRL | 051 | 8/28/18 | 10:55 / 30 | 11:00 / 30 | P | RPG |
| P - 79 & P - 72 | T/T | 8/28/18 | 25 | JA | 516 | 8/28/18 | 11:99 / 30 | 12:04 / 30 | P | RPG |
| P - 79 & P - 81 | T/T | 8/28/18 | 350 | JRL | 051 | 8/28/18 | 13:00 / 30 | 13:05 / 30 | P | RPG |
| P - 82 & P - 83 | T/T | 8/28/18 | 22 | JA | 516 | 8/28/18 | 15:28 / 30 | 15:33 / 30 | P | RPG |
| P - 84 & P - 85 | T/T | 8/28/18 | 22 | JRL | 051 | 8/28/18 | 13:48 / 30 | 13:53 / 30 | P | RPG |
| P - 80 & P - 82 | T/T | 8/28/18 | 115 | JA | 516 | 8/28/18 | 13:48 / 30 | 13:53 / 30 | P | RPG |
| P - 82 & P - 85 | T/T | 8/28/18 | 50 | JRL | 051 | 8/28/18 | 13:48 / 30 | 13:53 / 30 | P | RPG |
| P - 83 & P - 85 | T/T | 8/28/18 | 453 | JA | 516 | 8/28/18 | 15:40 / 30 | 15:45 / 30 | P | RPG |
| P - 84 & P - 86 | T/T | 8/28/18 | 50 | JRL | 051 | 8/28/18 | 15:40 / 30 | 15:45 / 30 | P | RPG |
| P - 85 & P - 86 | T/T | 8/28/18 | 508 | JA | 516 | 8/28/18 | 15:30 / 30 | 15:35 / 30 | P | RPG |
| P - 86 & P - 87 | T/T | 8/28/18 | 22 | JRL | 051 | 8/28/18 | 15:30 / 30 | 15:35 / 30 | P | RPG |
| P - 88 & P - 89 | T/T | 8/28/18 | 22 | JA | 516 | 8/28/18 | 15:45 / 30 | 15:50 / 30 | P | RPG |
| P - 90 & P - 91 | T/T | 8/28/18 | 22 | JA | 516 | 8/29/18 | 07:30 / 30 | 07:35 / 30 | P | RPG |
| P - 92 & P - 93 | T/T | 8/28/18 | 22 | JA | 516 | 8/29/18 | 07:48 / 30 | 07:53 / 30 | P | RPG |
| P - 86 & P - 88 | T/T | 8/28/18 | 475 | JRL | C-1 | 8/29/18 | 07:50 / 30 | 07:55 / 30 | P | RPG |
| P - 86 & P - 89 | T/T | 8/28/18 | 100 | JA | 516 | 8/29/18 | 07:55 / 30 | 08:00 / 30 | P | RPG |
| P - 87 & P - 89 | T/T | 8/28/18 | 60 | JRL | C-1 | 8/29/18 | 08:00 / 30 | 08:05 / 30 | P | RPG |
| P - 88 & P - 90 | T/T | 8/28/18 | 450 | JA | 516 | 8/29/18 | 08:00 / 30 | 08:05 / 30 | P | RPG |
| P - 89 & P - 91 | T/T | 8/28/18 | 175 | JRL | C-1 | 8/29/18 | 10:25 / 30 | 10:30 / 30 | P | RPG |
| P - 90 & P - 92 | T/T | 8/28/18 | 350 | JA | 516 | 8/29/18 | 10:05 / 30 | 10:10 / 30 | P | RPG |
| P - 91 & P - 93 | T/T | 8/29/18 | 175 | JRL | C-1 | 8/29/18 | 07:05 / 30 | 07:10 / 30 | P | RPG |
| P - 92 & P - 94 | T/T | 8/29/18 | 325 | JA | 516 | 8/29/18 | 07:15 / 30 | 07:20 / 30 | P | RPG |
| P - 93 & P - 95 | T/T | 8/29/18 | 196 | JRL | C-1 | 8/29/18 | 07:20 / 30 | 07:25 / 30 | P | RPG |
| P - 96 & P - 97 | T/T | 8/29/18 | 22 | JA | 516 | 8/29/18 | 09:35 / 30 | 09:40 / 30 | P | RPG |
| P - 98 & P - 99 | T/T | 8/29/18 | 22 | JA | 516 | 8/29/18 | 10:06 / 30 | 10:11 / 30 | P | RPG |
| P - 94 & P - 95 | T/T | 8/29/18 | 22 | JRL | 051 | 8/29/18 | 08:30 / 30 | 08:35 / 30 | P | RPG |
| P - 91 & P - 93A | T/T | 8/29/18 | 22 | JA | 516 | 8/29/18 | 10:58 / 30 | 11:03 / 30 | P | RPG |

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 91 & P - 93B | T/T | 8/29/18 | 22 | JRL | 051 | 8/29/18 | 10:58 / 30 | 11:03 / 30 | P | RPG |
| P - 95 & P - 97 | T/T | 8/29/18 | 246 | JA | 516 | 8/29/18 | 11:12 / 30 | 11:17 / 30 | P | RPG |
| P - 93 & P - 95 | T/T | 8/29/18 | 196 | JRL | 051 | 8/29/18 | 11:07 / 30 | 11:12 / 30 | P | RPG |
| P - 102 & P - 103 | T/T | 8/29/18 | 22 | JA | 516 | 8/29/18 | 12:40 / 30 | 12:45 / 30 | P | RPG |
| P - 100 & P - 101 | T/T | 8/29/18 | 22 | JRL | 051 | 8/29/18 | 12:55 / 30 | 13:00 / 30 | P | RPG |
| P - 102 & P - 103 | T/T | 8/29/18 | 22 | JA | 516 | 8/29/18 | 12:50 / 30 | 12:55 / 30 | P | RPG |
| P - 100 & P - 102 | T/T | 8/29/18 | 100 | JRL | 051 | 8/29/18 | 10:05 / 30 | 10:10 / 30 | P | RPG |
| P - 101 & P - 103 | T/T | 8/29/18 | 413 | JA | 516 | 8/29/18 | 10:15 / 30 | 10:20 / 30 | P | RPG |
| P - 104 & P - 105 | T/T | 8/29/18 | 22 | JA | 516 | 8/29/18 | 09:23 / 30 | 09:28 / 30 | P | RPG |
| P - 108 & P - 109 | T/T | 9/4/18 | 22 | JA | 516 | 9/4/18 | 11:45 / 30 | 11:50 / 30 | P | RPG |
| P - 105 & P - 107 | T/T | 9/4/18 | 321 | JA | 516 | 9/4/18 | 11:55 / 30 | 12:00 / 30 | P | RPG |
| P - 107 & P - 108 | T/T | 9/4/18 | 138 | JRL | 051 | 9/4/18 | 11:55 / 30 | 12:00 / 30 | P | RPG |
| P - 107 & P - 109 | T/T | 9/4/18 | 141 | JA | 516 | 9/4/18 | 07:00 / 30 | 07:05 / 30 | P | RPG |
| P - 109 & P - 110 | T/T | 9/4/18 | 95 | JRL | 051 | 9/4/18 | 07:05 / 30 | 07:10 / 30 | P | RPG |
| P - 109 & P - 111 | T/T | 9/4/18 | 75 | JA | 516 | 9/4/18 | 08:05 / 30 | 08:10 / 30 | P | RPG |
| P - 108 & P - 111 | T/T | 9/4/18 | 22 | JA | 516 | 9/4/18 | 08:19 / 30 | 08:24 / 30 | P | RPG |
| P - 108 & P - 109 | T/T | 9/5/18 | 22 | JA | 516 | 9/5/18 | 08:25 / 30 | 08:30 / 30 | P | RPG |
| P - 112 & P - 113 | T/T | 9/5/18 | 47 | JA | 516 | 9/5/18 | 11:24 / 30 | 11:29 / 30 | P | RPG |
| P - 113 & P - 114 | T/T | 9/5/18 | 43 | JRL | 051 | 9/5/18 | 11:18 / 30 | 11:23 / 30 | P | RPG |
| P - 114 & P - 115 | T/T | 9/5/18 | 46 | JRL | 051 | 9/5/18 | 11:17 / 30 | 11:22 / 30 | P | RPG |
| P - 115 & P - 116 | T/T | 9/5/18 | 50 | JRL | 051 | 9/5/18 | 11:16 / 30 | 11:21 / 30 | P | RPG |
| P - 116 & P - 117 | T/T | 9/5/18 | 52 | JRL | 051 | 9/5/18 | 11:15 / 30 | 11:20 / 30 | P | RPG |
| P - 117 & P - 118 | T/T | 9/5/18 | 52 | JA | 516 | 9/5/18 | 11:14 / 30 | 11:19 / 30 | P | RPG |
| P - 118 & P - 119 | T/T | 9/5/18 | 61 | JRL | 051 | 9/5/18 | 11:13 / 30 | 11:18 / 30 | P | RPG |
| P - 119 & P - 120 | T/T | 9/5/18 | 65 | JRL | 051 | 9/5/18 | 11:12 / 30 | 11:17 / 30 | P | RPG |
| P - 120 & P - 121 | T/T | 9/5/18 | 66 | JRL | 051 | 9/5/18 | 11:11 / 30 | 11:16 / 30 | P | RPG |
| P - 121 & P - 122 | T/T | 9/5/18 | 73 | JA | 516 | 9/5/18 | 11:10 / 30 | 11:15 / 30 | P | RPG |
| P - 122 & P - 123 | T/T | 9/5/18 | 80 | JRL | 051 | 9/5/18 | 11:09 / 30 | 11:14 / 30 | P | RPG |
| P - 123 & P - 124 | T/T | 9/5/18 | 93 | JA | 516 | 9/5/18 | 11:08 / 30 | 11:13 / 30 | P | RPG |

# GEOMEMBRANE PRODUCTION SEAMING AND CONTINUITY TEST LOG

PROJECT NAME: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

PROJECT LOCATION: **Craighead County, Arkansas**

PROJECT NUMBER: **R04469-1869-001**

ftn Associates Ltd.
water resources / environmental consultants

| SEAM IDENTIFICATION | MATERIAL/ MATERIAL | WELD DATE | SEAM LENGTH | OPERATOR ID | MACHINE ID | TEST DATE | START TIME - PRESSURE | END TIME - PRESSURE | PASS/ FAIL | CQA MONITOR |
|---|---|---|---|---|---|---|---|---|---|---|
| P - 124 & P - 125 | T/T | 9/5/18 | 96 | JRL | 051 | 9/5/18 | 11:07 / 30 | 11:12 / 30 | P | RPG |
| P - 125 & P - 126 | T/T | 9/5/18 | 109 | JA | 516 | 9/5/18 | 11:06 / 30 | 11:11 / 30 | P | RPG |
| P - 126 & P - 127 | T/T | 9/5/18 | 113 | JRL | 051 | 9/5/18 | 11:05 / 30 | 11:10 / 30 | P | RPG |
| P - 127 & P - 129 | T/T | 9/5/18 | 110 | JA | 516 | 9/5/18 | 11:04 / 30 | 11:09 / 30 | P | RPG |
| P - 128 & P - 129 | T/T | 9/5/18 | 70 | JRL | 051 | 9/5/18 | 09:13 / 30 | 09:18 / 30 | P | RPG |
| P - 129 & P - 130 | T/T | 9/5/18 | 22 | JA | 516 | 9/5/18 | 09:13 / 30 | 09:18 / 30 | P | RPG |
| P - 128 & P - 130 | T/T | 9/5/18 | 40 | JRL | 051 | 9/5/18 | 10:55 / 30 | 11:00 / 30 | P | RPG |
| P - 111 & P - 110 | T/T | 9/5/18 | 40 | JRL | 516 | 9/5/18 | 13:15 / 30 | 13:20 / 30 | P | RPG |
| P - 130 & P - 131 | T/T | 9/5/18 | 40 | JRL | 051 | 9/5/18 | 13:05 / 30 | 13:10 / 30 | P | RPG |
| P - 129 & P - 131 | T/T | 9/5/18 | 70 | JA | 516 | 9/5/18 | 10:53 / 30 | 10:58 / 30 | P | RPG |
| P - 131 & P - 132 | T/T | 9/5/18 | 101 | JRL | 051 | 9/5/18 | 10:53 / 30 | 10:58 / 30 | P | RPG |
| P - 132 & P - 133 | T/T | 9/5/18 | 94 | JA | 516 | 9/5/18 | 10:53 / 30 | 10:58 / 30 | P | RPG |
| P - 133 & P - 134 | T/T | 9/5/18 | 95 | JRL | 051 | 9/5/18 | 10:52 / 30 | 10:57 / 30 | P | RPG |
| P - 134 & P - 135 | T/T | 9/5/18 | 91 | JA | 516 | 9/5/18 | 10:05 / 30 | 10:10 / 30 | P | RPG |
| P - 135 & P - 136 | T/T | 9/5/18 | 88 | JRL | 051 | 9/5/18 | 10:51 / 30 | 10:56 / 30 | P | RPG |
| P - 136 & P - 137 | T/T | 9/5/18 | 85 | JA | 516 | 9/5/18 | 10:50 / 30 | 10:55 / 30 | P | RPG |
| P - 137 & P - 138 | T/T | 9/5/18 | 82 | JRL | 051 | 9/5/18 | 10:59 / 30 | 11:04 / 30 | P | RPG |
| P - 138 & P - 139 | T/T | 9/5/18 | 40 | JA | 516 | 9/5/18 | 10:59 / 30 | 11:04 / 30 | P | RPG |
| P - 138 & P - 140 | T/T | 9/5/18 | 41 | JRL | 051 | 9/5/18 | 10:59 / 30 | 11:04 / 30 | P | RPG |
| P - 136 & P - 140 | T/T | 9/5/18 | 22 | JA | 516 | 9/5/18 | 11:05 / 30 | 11:10 / 30 | P | RPG |

# APPENDIX T

**Geomembrane Defect, Repair, and Non-Destructive Test Log**

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

| | | Repair Information | | Non-Destructive Test Data | | |
|---|---|---|---|---|---|---|
| **Panel and/or Seam Number** | **Approximate Location** | **Repair Date** | **Repair Type** | **Date Vacuum Test Completed** | **Pass/ Fail** | **CQA Monitor** |
| P 1 / P 3 | 110' South of North Exp Berm (DS-1) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 3 / P 5 | 300' South of North Exp Berm (DS-2) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 14 / P 15 | 30' West of East Berm (DS-3) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 25 / P 26 | 30' West of East Berm (DS-4) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 33 / P 6 | 110' South of North Exp. Berm (DS-5) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 22 / P 1 | 49' West of East Berm P1 | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 1 / P 23-19 | 54' West of East Berm P2 | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 1 / P 29-P9 | 36' West of East Berm P3 | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 34 / P 32 | 175' North of Toe of Cell 2 South (DS-6) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 35 / P 37 | 200' South of North Exp Berm (DS-7) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 32 / P 33 | P4, 200' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 37 / P 39 | 110' South of North Exp Berm (DS-8) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 38 / P 39 | P5, 175' North of Toe of Cell 2 South | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 39 / P 41 | 200' South of North Exp Berm (DS-9) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 40 / P 43 | 475' South of North Exp Berm (DS-10) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 43 / P 44 | 300' South of North Exp Berm (DS-11) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 43 / P 44 | P6, 275' South of N Exp Berm Near DS-11 | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 44 / P 46 | 110' South of North Exp Berm (DS-12) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 46 / P 48 | 150' North of Toe of Cell 2 South (DS-13) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 46 / P 48 | 240' North of Toe of Cell 2 South | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 48 / P 50 | 200' South of North Exp Berm (DS-14) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 51 / P 53 | 110' South of North Exp Berm (DS-15) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 52 / P 54 | 150' North of Toe of Cell 2 South (DS-16) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 52 / P 54 | 150' North of Toe of Cell 2 South P7 | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 55 / P 57 | 200' South of North Exp Berm (DS-17) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 57 / P 59 | 110' South of North Exp Berm (DS-18) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 58 / P 61 | 150' North of Toe of Cell 2 South (DS-19) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 61 / P 63 | 225' South of North Exp Berm (DS-20) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 63 / P 65 | 100' South of North Exp Berm (DS-21) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 63 / P 69 | P8, 60' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |

**Repair Codes:**

P = Patch B = Bead GW = Grind and Weld R = Reconstructed Seam T = Topping Along Fusion Seam CAP = Cap on Seam

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

| | | Repair Information | | Non-Destructive Test Data | | |
|---|---|---|---|---|---|---|
| **Panel and/or Seam Number** | **Approximate Location** | **Repair Date** | **Repair Type** | **Date Vacuum Test Completed** | **Pass/ Fail** | **CQA Monitor** |
| P 63 / P 69 | P9, 65' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 63 / P 69 | P10, 210' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 65 / P 66 | 110' North of Toe of Cell 2 South (DS-22) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 66 / P 68 | 280' North of Toe of Cell 2 South (DS-23) | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-2 | P-11, 40' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-2 | P-12, 45' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-2 | P-13, 47' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-2 | P-14, 49' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-2 | P-15, 49' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-2 | P-16, 60' South of North Exp Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 9 / P 10 | P-17, Top of Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-6 | P-18, 110' South of North Berm | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-42 | P21, 3 Patches 75' North of Toe of Cell 25 | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P-41 | P20, 14 Small Patches at Seam of P-40-P41, 20' North | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 52 / P 54 | P-19, 110' North of Toe of Cell 2 South | 8/26/18 | GW, P | 8/26/18 | Pass | RPG |
| P 1 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 3 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 5 / C 2S | P-22, P-23 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 32 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 34 / C 2S | P-24 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 36 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 38 / C 2S | P-25, P-26 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 40 / C 2S | P-27, A&B North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 42 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 44 / C 2S | P-28, P-29 North of Toe of Cell 2 South | 8/27/18 | GW, B | 8/27/18 | Pass | RPG |
| P 46 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 48 / C 2S | P-30, P-31 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 50 / C 2S | P-32 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 52 / C 2S | P-33 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 54 / C 2S | P-34 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |

**Repair Codes:**

P = Patch B = Bead GW = Grind and Weld R = Reconstructed Seam T = Topping Along Fusion Seam CAP = Cap on Seam

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

| Panel and/or Seam Number | Approximate Location | Repair Information | | Non-Destructive Test Data | | |
|---|---|---|---|---|---|---|
| | | Repair Date | Repair Type | Date Vacuum Test Completed | Pass/ Fail | CQA Monitor |
| P 56 / C 2S | P-35 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 58 / C 2S | P-36, P-37, P-38 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 60 / C 2S | P-39, P-40, P-41 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 62 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 54 / C 2S | 51' North of Toe of Cell 2 South | 8/27/18 | GW, B | 8/27/18 | Pass | RPG |
| P 64 / C 2S | 4' North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 66 / C 2S | P44, P45 North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 68 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 70 / C 2S | North of Toe of Cell 2 South | 8/27/18 | B | 8/27/18 | Pass | RPG |
| P 69 / P 71 | 120' South of North Exp Berm (DS-25) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 70 / P 72 | 150' North of Toe of Cell 2 South (DS-26) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 72 / P 74 | 28' North of Toe of Cell 2 South (DS-27) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 75 / P 77 | 120' South of North Exp Berm (DS-28) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 76 / P 78 | 150' North of Toe of Cell 2 South (DS-29) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 79 / P 81 | 225' South of North Exp Berm (DS-30) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 81 / P 83 | 100' South of North Exp Berm (DS-31) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 82 / P 85 | 80' North of Toe of Cell 2 South (DS-32) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 85 / P 86 | 280' South of North Exp Berm (DS-33) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 86 / P 88 | 150' South of North Exp Berm (DS-34) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 86 / P 88 | P-46, 175' South of North Exp Berm | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 88 / P 90 | 150' North of Toe of Cell 2 South (DS-35) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 90 / P 92 | 200' South of North Exp Berm (DS-36) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 93 / P 95 | 100' South of North Exp Berm (DS-37) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 94 / P 96 | 150' North of Toe of Cell 2 South (DS-38) | 8/28/18 | GW, B | 8/31/18 | Pass | RPG |
| P 97 / P 99 | 250' South of North Exp Berm (DS-39) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 89 / P 91 | P-47, 10' South of North Exp Berm | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 92 / P 93 | P-48 At Cross Seam | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 99 / P 101 | 100' South of North Exp Berm (DS-40) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 98 / P 101 | 100' North of Toe of Cell 2 South (DS-41) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 101 / P 103 | 50' South of North Exp Berm (DS-42) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |

**Repair Codes:**

P = Patch B = Bead GW = Grind and Weld R = Reconstructed Seam T = Topping Along Fusion Seam CAP = Cap on Seam

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

| | | Repair Information | | Non-Destructive Test Data | | |
|---|---|---|---|---|---|---|
| **Panel and/or Seam Number** | **Approximate Location** | **Repair Date** | **Repair Type** | **Date Vacuum Test Completed** | **Pass/ Fail** | **CQA Monitor** |
| P 101 / P 103 | 250' South of North Exp Berm (DS-43) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 100 / P 102 | 50' North of Toe of Cell 2 South (DS-44) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 103 / P 105 | P49, 200' South of North Exp Berm | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 103 / P 105 | 200' North of Toe of Cell 2 South (DS-45) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 103 / P 105 | 100' South of North Exp Berm (DS-46) | 8/31/18 | GW, B | 8/31/18 | Pass | RPG |
| P 92 / P 94 | 250' North of Toe of Cell 2 South (DS-47) | 9/4/18 | GW, B | 9/4/18 | Pass | RPG |
| P 92 / P 94 | 100' North of Toe of Cell 2 South (DS-48) | 9/4/18 | GW, B | 9/4/18 | Pass | RPG |
| P 86 / P 88 | 300' South of North Exp Berm (DS-49) | 9/4/18 | GW, B | 9/4/18 | Pass | RPG |
| P 86 / P 88 | 100' North of Toe of Cell 2 South (DS-50) | 9/4/18 | GW, B | 9/4/18 | Pass | RPG |
| P 31 / P 106 | SE Corner of Cell 2N & East Connection | 9/3/18 | B | 9/3/18 | Pass | RPG |
| P 106 / P 1E | 24' East Side of Cell 2 South along Toe of Slope | 9/3/18 | B | 9/3/18 | Pass | RPG |
| P 1E / P 2E | 80' East Side of Cell 2 South along Toe of Slope | 9/3/18 | B | 9/3/18 | Pass | RPG |
| P 2E / P 3E | 22' East Side of Cell 2 South along Toe of Slope | 9/3/18 | B | 9/3/18 | Pass | RPG |
| P 72 / C 2S | North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 74 / C 2S | P68, P69 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |
| P 76 / C 2S | P65, P66, P67 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |
| P 78 / C 2S | P63, P64 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |
| P 80 / C 2S | P62 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |
| P 82 / C 2S | North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 84 / C 2S | North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 86 / C 2S | P61 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |
| P 88 / C 2S | P60 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |
| P 90 / C 2S | North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 92 / C 2S | North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 94 / C 2S | P59 North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 96 / C 2S | P56, P57, P58 North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 98 / C 2S | P54, P55 North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 100 / C 2S | P53 North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 102 / C 2S | P51, P52 North of Toe of Cell 2 South | 8/30/18 | B | 8/30/18 | Pass | RPG |
| P 104 / C 2S | P50 North of Toe of Cell 2 South | 8/30/18 | GW, P | 8/30/18 | Pass | RPG |

**Repair Codes:**

P = Patch B = Bead GW = Grind and Weld R = Reconstructed Seam T = Topping Along Fusion Seam CAP = Cap on Seam

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

| Panel and/or Seam Number | Approximate Location | Repair Information | | Non-Destructive Test Data | | |
|---|---|---|---|---|---|---|
| | | Repair Date | Repair Type | Date Vacuum Test Completed | Pass/ Fail | CQA Monitor |
| P 3E / P 4E | 21' East Side of Cell 2 South along Toe of Slope | 9/4/18 | B | 9/4/18 | Pass | RPG |
| P 3E / P 5E | 6' East Side of Cell 2 South along Toe of Slope | 9/4/18 | B | 9/4/18 | Pass | RPG |
| P 5E / P 4E | 95' East Side of Cell 2 South along Toe of Slope | 9/4/18 | B | 9/4/18 | Pass | RPG |
| P 4E / P 6E | 16' East Side of Cell 2 South along Toe of Slope | 9/4/18 | B | 9/4/18 | Pass | RPG |
| P 105 / P 107 | 200' South of North Exp Berm (DS-51) | 9/4/18 | GW, P | 9/4/18 | Pass | RPG |
| P 105 / P 107 | 100' South of North Exp Berm (DS-52) | 9/4/18 | GW, P | 9/4/18 | Pass | RPG |
| P 107 / P 108 | 150' South of North Exp Berm (DS-53) | 9/4/18 | GW, P | 9/4/18 | Pass | RPG |
| P 107 / P 109 | 100' South of North Exp Berm (DS-54) | 9/4/18 | GW, P | 9/4/18 | Pass | RPG |
| P 105 / P 135 | P61 at Intersection of P105/P135 | 9/5/18 | GW, P | 9/5/18 | Pass | RPG |
| P 126 / P 105 | P62 at Intersection of P126/P105 | 9/5/18 | GW, P | 9/5/18 | Pass | RPG |
| P 112 / P 113 | P63 at Top of Berm | 9/5/18 | GW, P | 9/5/18 | Pass | RPG |
| P 140 / C 2S | At Intersection of P140 and Cell 2 South | 9/11/18 | B | 9/11/18 | Pass | RPG |
| P 104 / C 2S | P59 at Intersection of P104 and Cell 2 South | 9/11/18 | B | 9/11/18 | Pass | RPG |
| P 105 / P 137 | Intersection of P105 and P137 (DS-24) | 9/11/18 | GW, P | 9/11/18 | Pass | RPG |

**Repair Codes:**

P = Patch B = Bead GW = Grind and Weld R = Reconstructed Seam T = Topping Along Fusion Seam CAP = Cap on Seam

# APPENDIX U

**Geomembrane Destructive Sample Field Log and Laboratory Reports**

# DESTRUCTIVE SAMPLE FIELD TEST LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

**Project Specifications:**

| Fusion Welds: | | Extrusion Welds: | |
|---|---|---|---|
| Peel: | ≥ 90 psi | Peel: | ≥ 78 psi |
| Shear: | ≥ 120 psi | Shear: | ≥ 120 psi |

| | | | | | Seaming Machine Settings | | | | | Peel Tests | | | | | | Shear Tests | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Seam Number P / P | Material/ Material | Date | Time | Ambient Temp (F) | Operator ID | Machine ID | Machine Temp or Ext. P.H. | Speed | Side | 1 A/B (psi) | 2 A/B (psi) | 3 A/B (psi) | 4 A/B (psi) | 5 A/B (psi) | 1 (psi) | 2 (psi) | 3 (psi) | 4 (psi) | 5 (psi) | Pass/ Fail Field | Pass/ Fail Lab | CQA Monitor |
| DS-1 | P 1 / P 3 | T/T | 8/26/18 | 0730 | 70 | JA | 516 | 405 | 5.0 | A | 123 | 122 | 136 | 135 | 155 | 153 | 156 | 156 | 155 | 183 | P | P | RPG |
| | | | | | | | | | | B | 123 | 129 | 124 | 119 | 131 | | | | | | | | |
| DS-2 | P 3 / P 5 | T/T | 8/26/18 | 0730 | 70 | JRL | 777 | 410 | 5.0 | A | 122 | 119 | 114 | 114 | 120 | 151 | 153 | 144 | 149 | | P | P | RPG |
| | | | | | | | | | | B | 123 | 130 | 118 | 120 | 125 | | | | | | | | |
| DS-3 | P 14 / P 15 | T/T | 8/26/18 | 0730 | 70 | JA | 516 | 405 | 5.0 | A | 107 | 127 | 122 | 113 | 123 | 164 | 158 | 130 | 157 | | P | P | RPG |
| | | | | | | | | | | B | 105 | 103 | 121 | 101 | 117 | | | | | | | | |
| DS-4 | P 25 / P 26 | T/T | 8/26/18 | 0730 | 70 | JRL | 777 | 410 | 5.0 | A | 103 | 104 | 105 | 103 | 102 | 129 | 135 | 131 | 129 | 139 | P | P | RPG |
| | | | | | | | | | | B | 98 | 110 | 99 | 100 | 99 | | | | | | | | |
| DS-5 | P 6 / P 33 | T/T | 8/26/18 | 0730 | 80 | JRL | 777 | 410 | 5.0 | A | 103 | 114 | 126 | 104 | 106 | 153 | 153 | 150 | 152 | 153 | P | P | RPG |
| | | | | | | | | | | B | 118 | 112 | 130 | 113 | 115 | | | | | | | | |
| DS-6 | P 34 / P 32 | T/T | 8/26/18 | 0730 | 80 | JRL | 777 | 410 | 5.0 | A | 118 | 114 | 104 | 106 | 101 | 136 | 136 | 110 | 137 | 133 | P | P | RPG |
| | | | | | | | | | | B | 140 | 106 | 110 | 110 | 108 | | | | | | | | |
| DS-7 | P 35 / P 37 | T/T | 8/26/18 | 0800 | 80 | JA | 516 | 405 | 5.0 | A | 110 | 124 | 121 | 125 | 119 | 146 | 143 | 148 | 145 | | P | P | RPG |
| | | | | | | | | | | B | 110 | 102 | 115 | 113 | 113 | | | | | | | | |
| DS-8 | P 37 / P 39 | T/T | 8/26/18 | 0930 | 80 | JRL | 777 | 410 | 5.0 | A | 105 | 116 | 123 | 115 | 116 | 142 | 147 | 143 | 140 | 142 | P | P | RPG |
| | | | | | | | | | | B | 110 | 104 | 112 | 114 | 102 | | | | | | | | |
| DS-9 | P 39 / P 41 | T/T | 8/26/18 | 0930 | 93 | JRL | 777 | 410 | 5.0 | A | 102 | 102 | 114 | 103 | 106 | 146 | 144 | 141 | 142 | | P | P | RPG |
| | | | | | | | | | | B | 100 | 100 | 105 | 109 | 105 | | | | | | | | |
| DS-10 | P 40 / P 43 | T/T | 8/26/18 | 0930 | 93 | JA | 516 | 410 | 5.0 | A | 110 | 105 | 102 | 101 | 110 | 139 | 134 | 136 | 131 | 135 | P | P | RPG |
| | | | | | | | | | | B | 105 | 100 | 99 | 100 | 99 | | | | | | | | |
| DS-11 | P 43 / P 44 | T/T | 8/26/18 | 1030 | 93 | JRL | 777 | 410 | 5.0 | A | 103 | 94 | 92 | 115 | 107 | 149 | 145 | 148 | 145 | 149 | P | P | RPG |
| | | | | | | | | | | B | 98 | 94 | 95 | 101 | 103 | | | | | | | | |
| DS-12 | P 44 / P 46 | T/T | 8/26/18 | 1030 | 93 | JRL | 777 | 410 | 5.0 | A | 114 | 115 | 100 | 107 | 105 | 128 | 140 | 144 | 144 | 149 | P | P | RPG |
| | | | | | | | | | | B | 114 | 116 | 113 | 118 | 116 | | | | | | | | |
| DS-13 | P 46 / P 48 | T/T | 8/26/18 | 1030 | 93 | JA | 513 | 410 | 5.0 | A | 107 | 120 | 117 | 114 | 119 | 122 | 123 | 137 | 144 | 129 | P | P | RPG |
| | | | | | | | | | | B | 107 | 108 | 96 | 103 | 103 | | | | | | | | |
| DS-14 | P 48 / P 50 | T/T | 8/26/18 | 1300 | 93 | JRL | 777 | 410 | 5.0 | A | 110 | 99 | 106 | 103 | 113 | 137 | 140 | 142 | 141 | 135 | P | P | RPG |
| | | | | | | | | | | B | 99 | 99 | 105 | 98 | 105 | | | | | | | | |
| DS-15 | P 51 / P 53 | T/T | 8/26/18 | 1300 | 95 | JA | 516 | 410 | 5.0 | A | 102 | 100 | 96 | 98 | 115 | 134 | 134 | 132 | 135 | 141 | P | P | RPG |
| | | | | | | | | | | B | 114 | 94 | 104 | 100 | 102 | | | | | | | | |
| DS-16 | P 52 / P 54 | T/T | 8/26/18 | 1300 | 95 | JRL | 777 | 410 | 5.0 | A | 113 | 117 | 122 | 118 | 120 | 138 | 133 | 135 | 136 | | P | P | RPG |
| | | | | | | | | | | B | 108 | 110 | 110 | 116 | 108 | | | | | | | | |
| DS-17 | P 55 / P 57 | T/T | 8/26/18 | 1300 | 95 | JRL | 051 | 410 | 5.0 | A | 112 | 116 | 110 | 115 | 110 | 129 | 134 | 132 | 126 | 134 | P | P | RPG |
| | | | | | | | | | | B | 103 | 108 | 105 | 110 | 101 | | | | | | | | |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane 40S - 40-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane 40T - 40-Mil Textured HDPE Geomembrane

# DESTRUCTIVE SAMPLE FIELD TEST LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

**Project Specifications:**

| Fusion Welds: | | Extrusion Welds: | |
|---|---|---|---|
| Peel: | ≥ 90 psi | Peel: | ≥ 78 psi |
| Shear: | ≥ 120 psi | Shear: | ≥ 120 psi |

| | | | | | Seaming Machine Settings | | | | | Peel Tests | | | | | | Shear Tests | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Seam Number P / P | Material/ Material | Date | Time | Ambient Temp (F) | Operator ID | Machine ID | Machine Temp or Ext. P.H. | Speed | Side | 1 A/B (psi) | 2 A/B (psi) | 3 A/B (psi) | 4 A/B (psi) | 5 A/B (psi) | 1 (psi) | 2 (psi) | 3 (psi) | 4 (psi) | 5 (psi) | Pass/ Fail Field | Pass/ Fail Lab | CQA Monitor |
| DS-18 | P 57 / P 59 | T/T | 8/27/18 | 0720 | 95 | JA | 777 | 410 | 5.0 | A | 130 | 110 | 135 | 139 | 121 | 155 | 155 | 155 | 155 | 154 | P | P | RPG |
| | | | | | | | | | | B | 120 | 119 | 112 | 111 | 112 | | | | | | | | |
| DS-19 | P 58 / P 61 | T/T | 8/27/18 | 0720 | 95 | JRL | 051 | 410 | 5.0 | A | 113 | 115 | 130 | 127 | 117 | 153 | 153 | 155 | 153 | 155 | P | P | RPG |
| | | | | | | | | | | B | 117 | 112 | 121 | 112 | 115 | | | | | | | | |
| DS-20 | P 61 / P 63 | T/T | 8/27/18 | 0725 | 95 | JA | 777 | 410 | 5.0 | A | 111 | 111 | 112 | 108 | 117 | 161 | 163 | 160 | 164 | 159 | P | P | RPG |
| | | | | | | | | | | B | 106 | 106 | 128 | 109 | 110 | | | | | | | | |
| DS-21 | P 63 / P 65 | T/T | 8/27/18 | 0725 | 95 | JA | 777 | 410 | 5.0 | A | 129 | 122 | 128 | 121 | 127 | 156 | 156 | 156 | 158 | 157 | P | P | RPG |
| | | | | | | | | | | B | 127 | 117 | 122 | 119 | 117 | | | | | | | | |
| DS-22 | P 65 / P 66 | T/T | 8/27/18 | 0725 | 95 | JRL | 051 | 410 | 5.0 | A | 117 | 104 | 123 | 111 | 115 | 150 | 148 | 148 | 149 | 146 | P | P | RPG |
| | | | | | | | | | | B | 115 | 115 | 121 | 105 | 108 | | | | | | | | |
| DS-23 | P 66 / P 68 | T/T | 8/27/18 | 0730 | 95 | JA | 777 | 410 | 5.0 | A | 93 | 111 | 103 | 104 | 122 | 150 | 147 | 144 | 112 | 143 | P | P | RPG |
| | | | | | | | | | | B | 101 | 110 | 97 | 114 | 109 | | | | | | | | |
| DS-24 | P 105 P 137 | T/T | 9/11/18 | 1500 | 70 | JRL | 051 | 410 | 5.0 | A | 119 | 114 | 118 | 101 | 118 | 138 | 191 | 139 | 142 | 140 | P | P | RPG |
| | | | | | | | | | | B | 110 | 115 | 116 | 100 | 129 | | | | | | | | |
| DS-25 | P 69 / P 71 | T/T | 8/31/18 | 0845 | 70 | JRL | 051 | 410 | 5.0 | A | 125 | 126 | 120 | 129 | 128 | 171 | 172 | 170 | 174 | | P | P | RPG |
| | | | | | | | | | | B | 110 | 120 | 126 | 124 | 128 | | | | | | | | |
| DS-26 | P 70 / P 72 | T/T | 8/31/18 | 0850 | 70 | JA | 516 | 410 | 5.0 | A | 135 | 133 | 121 | 122 | 124 | 167 | 163 | 165 | 163 | 165 | P | P | RPG |
| | | | | | | | | | | B | 103 | 110 | 139 | 137 | 130 | | | | | | | | |
| DS-27 | P 72 / P 74 | T/T | 8/31/18 | 0900 | 70 | JRL | 051 | 410 | 5.0 | A | 119 | 133 | 130 | 131 | 136 | 172 | 174 | 174 | 173 | 174 | P | P | RPG |
| | | | | | | | | | | B | 130 | 112 | 130 | 114 | 125 | | | | | | | | |
| DS-28 | P 75 / P 77 | T/T | 8/31/18 | 0905 | 70 | JA | 516 | 410 | 5.0 | A | 110 | 124 | 143 | 137 | 108 | 168 | 162 | 169 | 162 | 165 | P | P | RPG |
| | | | | | | | | | | B | 134 | 135 | 115 | 103 | 131 | | | | | | | | |
| DS-29 | P 76 / P 78 | T/T | 8/31/18 | 0910 | 80 | JRL | 051 | 410 | 5.0 | A | 115 | 104 | 113 | 120 | 115 | 153 | 153 | 151 | 152 | 153 | P | P | RPG |
| | | | | | | | | | | B | 122 | 113 | 122 | 119 | 114 | | | | | | | | |
| DS-30 | P 79 / P 81 | T/T | 8/31/18 | 0915 | 80 | JA | 516 | 410 | 5.0 | A | 111 | 128 | 114 | 107 | 115 | 142 | 103 | 114 | 144 | 142 | P | P | RPG |
| | | | | | | | | | | B | 141 | 113 | 114 | 111 | 110 | | | | | | | | |
| DS-31 | P 81 / P 83 | T/T | 8/31/18 | 0920 | 80 | JRL | 051 | 410 | 5.0 | A | 104 | 113 | 123 | 126 | 111 | 152 | 149 | 196 | 147 | 139 | P | P | RPG |
| | | | | | | | | | | B | 108 | 112 | 111 | 107 | 116 | | | | | | | | |
| DS-32 | P 82 / P 85 | T/T | 8/31/18 | 0929 | 80 | JA | 516 | 410 | 5.0 | A | 104 | 114 | 110 | 115 | 116 | 155 | 150 | 151 | 149 | 153 | P | P | RPG |
| | | | | | | | | | | B | 107 | 116 | 122 | 112 | 116 | | | | | | | | |
| DS-33 | P 85 / P 86 | T/T | 8/31/18 | 1040 | 80 | JRL | 051 | 410 | 5.0 | A | 115 | 115 | 108 | 105 | 114 | 161 | 152 | 150 | 149 | 153 | P | P | RPG |
| | | | | | | | | | | B | 100 | 108 | 108 | 106 | 120 | | | | | | | | |
| DS-34 | P 86 / P 88 | T/T | 8/31/18 | 1050 | 80 | JA | 516 | 410 | 5.0 | A | 113 | 112 | 106 | 105 | 110 | 132 | 142 | 146 | 139 | 151 | P | P | RPG |
| | | | | | | | | | | B | 114 | 112 | 102 | 109 | 106 | | | | | | | | |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane 40S - 40-Mil Smooth HDPE Geomembrane
60T - 60-Mil Textured HDPE Geomembrane 40T - 40-Mil Textured HDPE Geomembrane

# DESTRUCTIVE SAMPLE FIELD TEST LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

**Project Specifications:**

Fusion Welds: Peel: ≥ 90 psi Shear: ≥ 120 psi

Extrusion Welds: Peel: ≥ 78 psi Shear: ≥ 120 psi

| | | | | | Seaming Machine Settings | | | | | Peel Tests | | | | | | Shear Tests | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Seam Number P / P | Material/ Material | Date | Time | Ambient Temp (F) | Operator ID | Machine ID | Machine Temp or Ext. P.H. | Speed | Side | 1 A/B (psi) | 2 A/B (psi) | 3 A/B (psi) | 4 A/B (psi) | 5 A/B (psi) | 1 (psi) | 2 (psi) | 3 (psi) | 4 (psi) | 5 (psi) | Pass/ Fail Field | Pass/ Fail Lab | CQA Monitor |
| DS-35 | P 88 / P 90 | T/T | 8/31/18 | 0900 | 80 | JRL | C-1 | 761 | 13.5 | A | 123 | 133 | 115 | 129 | 133 | 153 | 156 | 158 | 153 | 135 | P | P | RPG |
| | | | | | | | | | | B | 130 | 126 | 143 | 112 | 116 | | | | | | | | |
| DS-36 | P 90 / P 92 | T/T | 8/31/18 | 1100 | 80 | JA | 516 | 410 | 5.0 | A | 115 | 117 | 115 | 110 | 115 | 144 | 140 | 139 | 137 | 141 | P | P | RPG |
| | | | | | | | | | | B | 104 | 116 | 117 | 124 | 102 | | | | | | | | |
| DS-37 | P 93 / P 95 | T/T | 8/31/18 | 1105 | 85 | JRL | C-1 | 761 | 13.5 | A | 108 | 102 | 106 | 104 | 105 | 138 | 136 | 135 | 134 | 144 | P | P | RPG |
| | | | | | | | | | | B | 105 | 105 | 100 | 101 | 106 | | | | | | | | |
| DS-38 | P 94 / P 96 | T/T | 8/31/18 | 1105 | 85 | JA | 516 | 410 | 5.0 | A | 115 | 114 | 109 | 109 | 108 | 130 | 141 | 146 | 134 | 135 | P | P | RPG |
| | | | | | | | | | | B | 100 | 100 | 95 | 96 | 94 | | | | | | | | |
| DS-39 | P 97 / P 99 | T/T | 8/31/18 | 1110 | 85 | JRL | 051 | 410 | 5.0 | A | 104 | 103 | 102 | 110 | 102 | 129 | 126 | 133 | 137 | 129 | P | P | RPG |
| | | | | | | | | | | B | 103 | 100 | 99 | 100 | 108 | | | | | | | | |
| DS-40 | P 99 / P 101 | T/T | 8/31/18 | 1230 | 85 | JA | 516 | 410 | 5.0 | A | 101 | 103 | 105 | 107 | 109 | 125 | 125 | 126 | 124 | 125 | P | P | RPG |
| | | | | | | | | | | B | 108 | 107 | 99 | 104 | 93 | | | | | | | | |
| DS-41 | P 98 / P 101 | T/T | 8/31/18 | 1230 | 85 | JRL | 051 | 410 | 5.0 | A | 98 | 118 | 108 | 111 | 115 | 136 | 140 | 133 | 141 | 132 | P | P | RPG |
| | | | | | | | | | | B | 104 | 125 | 112 | 105 | 119 | | | | | | | | |
| DS-42 | P 101 / P 103 | T/T | 8/31/18 | 1230 | 85 | JA | 516 | 410 | 5.0 | A | 103 | 117 | 109 | 109 | 114 | 140 | 145 | 140 | 135 | 140 | P | P | RPG |
| | | | | | | | | | | B | 117 | 116 | 110 | 108 | 110 | | | | | | | | |
| DS-43 | P 101 / P 103 | T/T | 9/4/18 | 1330 | 80 | JA | 516 | 410 | 5.0 | A | 110 | 93 | 104 | 102 | 97 | 130 | 141 | 130 | 140 | 141 | P | P | RPG |
| | | | | | | | | | | B | 99 | 109 | 91 | 93 | 104 | | | | | | | | |
| DS-44 | P 100 / P 102 | T/T | 9/5/18 | 0810 | 80 | JRL | 051 | 410 | 5.0 | A | 118 | 124 | 114 | 144 | 108 | 130 | 137 | 141 | 130 | 129 | P | P | RPG |
| | | | | | | | | | | B | 103 | 107 | 107 | 104 | 109 | | | | | | | | |
| DS-45 | P 103 / P 105 | T/T | 9/5/18 | 0812 | 80 | JA | 516 | 410 | 5.0 | A | 116 | 112 | 109 | 110 | 109 | 130 | 134 | 135 | 136 | 144 | P | P | RPG |
| | | | | | | | | | | B | 109 | 110 | 109 | 109 | 105 | | | | | | | | |
| DS-46 | P 103 / P 105 | T/T | 9/5/18 | 0814 | 80 | JRL | 051 | 410 | 5.0 | A | 107 | 112 | 108 | 115 | 113 | 133 | 135 | 132 | 129 | 131 | P | P | RPG |
| | | | | | | | | | | B | 109 | 112 | 112 | 106 | 97 | | | | | | | | |
| DS-47 | P 92 / P 94 | T/T | 9/5/18 | 0815 | 85 | JA | 516 | 410 | 5.0 | A | 115 | 112 | 107 | 109 | 120 | 138 | 120 | 142 | 142 | 133 | P | P | RPG |
| | | | | | | | | | | B | 106 | 105 | 109 | 105 | 104 | | | | | | | | |
| DS-48 | P 92 / P 94 | T/T | 9/5/18 | 0817 | 85 | JA | 516 | 410 | 5.0 | A | 110 | 109 | 113 | 101 | 120 | 140 | 136 | 140 | 140 | 141 | P | P | RPG |
| | | | | | | | | | | B | 111 | 107 | 110 | 104 | 114 | | | | | | | | |
| DS-49 | P 86 / P 88 | T/T | 9/5/18 | 0820 | 85 | JRL | 01 | 410 | 5.0 | A | 112 | 116 | 117 | 109 | 126 | 150 | 142 | 136 | 142 | 136 | P | P | RPG |
| | | | | | | | | | | B | 113 | 117 | 120 | 113 | 119 | | | | | | | | |
| DS-50 | P 86 / P 88 | T/T | 9/5/18 | 0822 | 85 | JRL | 01 | 410 | 5.0 | A | 117 | 119 | 114 | 108 | 117 | 147 | 141 | 142 | 146 | 137 | P | P | RPG |
| | | | | | | | | | | B | 121 | 116 | 111 | 111 | 119 | | | | | | | | |
| DS-51 | P 105 / P 107 | T/T | 9/5/18 | 0825 | 90 | JA | 516 | 410 | 5.0 | A | 106 | 108 | 110 | 107 | 106 | 133 | 136 | 137 | 134 | 134 | P | P | RPG |
| | | | | | | | | | | B | 109 | 109 | 112 | 104 | 108 | | | | | | | | |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane 40S - 40-Mil Smooth HDPE Geomembrane

60T - 60-Mil Textured HDPE Geomembrane 40T - 40-Mil Textured HDPE Geomembrane

# DESTRUCTIVE SAMPLE FIELD TEST LOG

Project Name: **Legacy Landfill Cell 1 South/Cell 2 North 2018**

Project Location: **Craighead County, Arkansas**

Project Number: **R04469-1869-001**

**Project Specifications:**

Fusion Welds: Peel: ≥ 90 psi Shear: ≥ 120 psi

Extrusion Welds: Peel: ≥ 78 psi Shear: ≥ 120 psi

| | | | | | Seaming Machine Settings | | | | | Peel Tests | | | | | | Shear Tests | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Seam Number P / P | Material/ Material | Date | Time | Ambient Temp (F) | Operator ID | Machine ID | Machine Temp or Ext. P.H. | Speed | Side | 1 A/B (psi) | 2 A/B (psi) | 3 A/B (psi) | 4 A/B (psi) | 5 A/B (psi) | 1 (psi) | 2 (psi) | 3 (psi) | 4 (psi) | 5 (psi) | Pass/ Fail Field | Pass/ Fail Lab | CQA Monitor |
| DS-52 | P 105 / P 107 | T/T | 9/5/18 | 0830 | 90 | JA | 516 | 410 | 5.0 | A | 104 | 111 | 108 | 103 | 104 | 134 | 137 | 134 | 133 | 130 | P | P | RPG |
| | | | | | | | | | | B | 106 | 109 | 104 | 108 | 102 | | | | | | | | |
| DS-53 | P 107 / P 108 | T/T | 9/5/18 | 0832 | 90 | JRL | 051 | 410 | 5.0 | A | 109 | 117 | 110 | 116 | 110 | 130 | 136 | 138 | 135 | 132 | P | P | RPG |
| | | | | | | | | | | B | 111 | 118 | 112 | 118 | 114 | | | | | | | | |
| DS-54 | P 107 / P 109 | T/T | 9/5/18 | 0834 | 90 | JRL | 051 | 410 | 5.0 | A | 116 | 114 | 114 | 110 | 119 | 140 | 134 | 130 | 137 | 139 | P | P | RPG |
| | | | | | | | | | | B | 118 | 117 | 113 | 116 | 122 | | | | | | | | |

**Material Type Legend:**

60S - 60-Mil Smooth HDPE Geomembrane 40S - 40-Mil Smooth HDPE Geomembrane

60T - 60-Mil Textured HDPE Geomembrane 40T - 40-Mil Textured HDPE Geomembrane

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-1 | 167.6 | BRK | 128.0 | SE 1 | 124.1 | SE 1 | - |
| | 167.0 | BRK | 140.9 | SE 1 | 124.6 | SE 1 | |
| | 167.8 | BRK | 141.6 | SE 1 | 118.2 | SE 1 | |
| | 168.5 | BRK | 136.4 | SE 1 | 127.0 | SE 1 | |
| | 167.3 | BRK | 134.0 | SE 1 | 135.4 | SE 1 | |
| DS-2 | 186.8 | BRK | 146.7 | SE 1 | 140.0 | SE 1 | - |
| | 188.0 | BRK | 134.4 | SE 1 | 133.7 | SE 1 | |
| | 187.6 | BRK | 136.6 | SE 1 | 136.7 | SE 1 | |
| | 188.2 | BRK | 132.7 | SE 1 | 141.3 | SE 1 | |
| | 187.0 | BRK | 134.1 | SE 1 | 139.1 | SE 1 | |
| DS-3 | 176.5 | BRK | 127.9 | SE 1 | 116.1 | SE 1 | - |
| | 175.5 | BRK | 127.1 | SE 1 | 108.9 | SE 1 | |
| | 177.3 | BRK | 123.0 | SE 1 | 129.4 | SE 1 | |
| | 177.6 | BRK | 127.9 | SE 1 | 130.7 | SE 1 | |
| | 176.7 | BRK | 127.3 | SE 1 | 116.6 | SE 1 | |
| DS-4 | 186.4 | BRK | 134.9 | SE 1 | 134.7 | SE 1 | - |
| | 179.9 | BRK | 140.9 | SE 1 | 137.1 | SE 1 | |
| | 185.4 | BRK | 141.0 | SE 1 | 130.2 | SE 1 | |
| | 186.4 | BRK | 139.6 | SE 1 | 134.8 | SE 1 | |
| | 184.2 | BRK | 138.6 | SE 1 | 134.1 | SE 1 | |
| DS-5 | 174.4 | BRK | 146.5 | SE 1 | 133.7 | SE 1 | - |
| | 174.1 | BRK | 143.4 | SE 1 | 129.5 | SE 1 | |
| | 175.2 | BRK | 143.9 | SE 1 | 130.7 | SE 1 | |
| | 174.7 | BRK | 141.9 | SE 1 | 125.5 | SE 1 | |
| | 169.9 | BRK | 145.4 | SE 1 | 128.9 | SE 1 | |
| DS-6 | 171.4 | BRK | 136.8 | SE 1 | 118.0 | SE 1 | - |
| | 170.9 | BRK | 135.0 | SE 1 | 126.3 | SE 1 | |
| | 172.3 | BRK | 146.9 | SE 1 | 111.7 | SE 1 | |
| | 172.7 | BRK | 131.9 | SE 1 | 144.1 | SE 1 | |
| | 172.5 | BRK | 129.9 | SE 1 | 120.6 | SE 1 | |
| DS-7 | 187.9 | BRK | 150.7 | SE 1 | 131.7 | SE 1 | - |
| | 187.5 | BRK | 149.5 | SE 1 | 135.3 | SE 1 | |
| | 188.5 | BRK | 147.3 | SE 1 | 144.1 | SE 1 | |
| | 188.7 | BRK | 149.6 | SE 1 | 132.5 | SE 1 | |
| | 187.1 | BRK | 155.7 | SE 1 | 135.7 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-8 | 177.9 | BRK | 135.4 | SE 1 | 121.0 | SE 1 | - |
| | 178.1 | BRK | 131.1 | SE 1 | 137.8 | SE 1 | |
| | 178.5 | BRK | 137.3 | SE 1 | 124.9 | SE 1 | |
| | 178.6 | BRK | 132.9 | SE 1 | 130.7 | SE 1 | |
| | 178.9 | BRK | 131.1 | SE 1 | 137.8 | SE 1 | |
| DS-9 | 185.3 | BRK | 133.3 | SE 1 | 133.8 | SE 1 | - |
| | 179.7 | BRK | 126.7 | SE 1 | 133.8 | SE 1 | |
| | 184.2 | BRK | 134.8 | SE 1 | 130.9 | SE 1 | |
| | 185.3 | BRK | 127.4 | SE 1 | 128.9 | SE 1 | |
| | 186.4 | BRK | 114.2 | **AD-BRK (20%)** | 127.7 | SE 1 | |
| DS-10 | 178.3 | BRK | 135.4 | SE 1 | 119.7 | SE 1 | - |
| | 178.4 | BRK | 134.5 | SE 1 | 121.4 | SE 1 | |
| | 179.0 | BRK | 130.7 | SE 1 | 133.1 | SE 1 | |
| | 178.5 | BRK | 128.1 | SE 1 | 131.5 | SE 1 | |
| | 176.2 | BRK | 132.5 | SE 1 | 118.7 | SE 1 | |
| DS-11 | 177.4 | BRK | 106.7 | SE 1 | 117.7 | SE 1 | - |
| | 171.2 | BRK | 107.9 | SE 1 | 123.4 | SE 1 | |
| | 175.8 | BRK | 117.5 | SE 1 | 123.5 | SE 1 | |
| | 175.9 | BRK | 106.6 | SE 1 | 125.4 | SE 1 | |
| | 176.3 | BRK | 111.8 | SE 1 | 128.7 | SE 1 | |
| DS-12 | 188.3 | BRK | 128.0 | SE 1 | 153.1 | SE 1 | - |
| | 187.4 | BRK | 133.5 | SE 1 | 147.5 | SE 1 | |
| | 189.6 | BRK | 130.2 | SE 1 | 144.7 | SE 1 | |
| | 188.9 | BRK | 136.7 | SE 1 | 145.8 | SE 1 | |
| | 188.1 | BRK | 132.0 | SE 1 | 151.8 | SE 1 | |
| DS-13 | 177.0 | BRK | 149.8 | SE 1 | 121.8 | SE 1 | - |
| | 173.0 | BRK | 138.5 | SE 1 | 126.7 | SE 1 | |
| | 176.3 | BRK | 134.2 | SE 1 | 116.1 | SE 1 | |
| | 177.4 | BRK | 141.3 | SE 1 | 128.0 | SE 1 | |
| | 176.9 | BRK | 145.5 | SE 1 | 133.1 | SE 1 | |
| DS-14 | 189.0 | BRK | 136.8 | SE 1 | 139.1 | SE 1 | - |
| | 175.2 | BRK | 136.0 | SE 1 | 131.4 | SE 1 | |
| | 188.0 | BRK | 135.9 | SE 1 | 131.7 | SE 1 | |
| | 190.5 | BRK | 131.3 | SE 1 | 133.0 | SE 1 | |
| | 188.5 | BRK | 132.3 | SE 1 | 131.3 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-15 | 174.6 | BRK | 134.8 | SE 1 | 125.2 | SE 1 | - |
| | 174.6 | BRK | 114.3 | SE 1 | 125.2 | SE 1 | |
| | 174.1 | BRK | 135.9 | SE 1 | 132.1 | SE 1 | |
| | 174.3 | BRK | 129.3 | SE 1 | 127.6 | SE 1 | |
| | 173.2 | BRK | 111.6 | SE 1 | 124.2 | SE 1 | |
| DS-16 | 183.2 | BRK | 141.2 | SE 1 | 137.7 | SE 1 | - |
| | 181.9 | BRK | 145.5 | SE 1 | 132.1 | SE 1 | |
| | 183.1 | BRK | 164.8 | SE 1 | 137.3 | SE 1 | |
| | 182.6 | BRK | 151.7 | SE 1 | 135.0 | SE 1 | |
| | 182.9 | BRK | 148.4 | SE 1 | 136.1 | SE 1 | |
| DS-17 | 178.9 | BRK | 143.6 | SE 1 | 132.0 | SE 1 | - |
| | 166.2 | BRK | 146.1 | SE 1 | 132.1 | SE 1 | |
| | 178.6 | BRK | 137.5 | SE 1 | 132.8 | SE 1 | |
| | 178.8 | BRK | 147.6 | SE 1 | 151.7 | SE 1 | |
| | 178.3 | BRK | 139.0 | SE 1 | 144.8 | SE 1 | |
| DS-18 | 177.2 | BRK | 145.3 | SE 1 | 126.7 | SE 1 | - |
| | 176.0 | BRK | 143.4 | SE 1 | 126.9 | SE 1 | |
| | 178.7 | BRK | 144.6 | SE 1 | 124.8 | SE 1 | |
| | 178.9 | BRK | 150.1 | SE 1 | 125.3 | SE 1 | |
| | 178.6 | BRK | 149.0 | SE 1 | 127.0 | SE 1 | |
| DS-19 | 166.2 | BRK | 129.7 | SE 1 | 129.3 | SE 1 | - |
| | 167.3 | BRK | 130.5 | SE 1 | 128.7 | SE 1 | |
| | 167.0 | BRK | 127.8 | SE 1 | 128.9 | SE 1 | |
| | 167.2 | BRK | 135.3 | SE 1 | 128.1 | SE 1 | |
| | 166.1 | BRK | 129.0 | SE 1 | 133.6 | SE 1 | |
| DS-20 | 188.1 | BRK | 148.5 | SE 1 | 136.9 | SE 1 | - |
| | 188.9 | BRK | 147.2 | SE 1 | 124.4 | SE 1 | |
| | 187.3 | BRK | 146.0 | SE 1 | 135.2 | SE 1 | |
| | 188.9 | BRK | 156.4 | SE 1 | 130.4 | SE 1 | |
| | 187.4 | BRK | 156.9 | SE 1 | 152.7 | SE 1 | |
| DS-21 | 175.4 | BRK | 154.5 | SE 1 | 138.3 | SE 1 | - |
| | 175.4 | BRK | 141.8 | SE 1 | 139.6 | SE 1 | |
| | 174.7 | BRK | 139.9 | SE 1 | 123.6 | SE 1 | |
| | 174.4 | BRK | 145.5 | SE 1 | 127.6 | SE 1 | |
| | 175.0 | BRK | 144.7 | SE 1 | 130.8 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-22 | 181.1 | BRK | 139.0 | SE 1 | 148.5 | SE 1 | - |
| | 182.3 | BRK | 140.5 | SE 1 | 149.8 | SE 1 | |
| | 180.9 | BRK | 143.3 | SE 1 | 150.1 | SE 1 | |
| | 182.8 | BRK | 133.2 | SE 1 | 142.4 | SE 1 | |
| | 182.1 | BRK | 144.7 | SE 1 | 145.1 | SE 1 | |
| DS-23 | 186.6 | BRK | 144.5 | SE 1 | 134.8 | SE 1 | - |
| | 187.1 | BRK | 137.0 | SE 1 | 124.2 | SE 1 | |
| | 186.2 | BRK | 118.1 | SE 1 | 126.7 | SE 1 | |
| | 187.0 | BRK | 114.7 | SE 1 | 129.2 | SE 1 | |
| | 188.3 | BRK | 137.9 | SE 1 | 137.1 | SE 1 | |
| DS-24 | 170.1 | BRK | 139.4 | SE 1 | 148.7 | SE 1 | - |
| | 168.3 | BRK | 125.8 | SE 1 | 138.4 | SE 1 | |
| | 164.7 | BRK | 118.3 | SE 1 | 139.0 | SE 1 | |
| | 170.3 | BRK | 125.7 | SE 1 | 135.0 | SE 1 | |
| | 166.1 | BRK | 123.4 | SE 1 | 142.6 | SE 1 | |
| DS-25 | 182.3 | BRK | 130.5 | SE 1 | 118.9 | SE 1 | - |
| | 173.7 | BRK | 134.9 | SE 1 | 124.5 | SE 1 | |
| | 181.4 | BRK | 137.9 | SE 1 | 125.5 | SE 1 | |
| | 180.8 | BRK | 137.9 | SE 1 | 124.6 | SE 1 | |
| | 178.9 | BRK | 135.6 | SE 1 | 128.2 | SE 1 | |
| DS-26 | 176.6 | BRK | 139.7 | SE 1 | 116.1 | SE 1 | - |
| | 175.4 | BRK | 122.7 | SE 1 | 115.9 | SE 1 | |
| | 177.7 | BRK | 138.7 | SE 1 | 117.9 | SE 1 | |
| | 176.7 | BRK | 139.5 | SE 1 | 120.3 | SE 1 | |
| | 176.5 | BRK | 122.1 | SE 1 | 121.6 | SE 1 | |
| DS-27 | 180.3 | BRK | 129.6 | SE 1 | 131.8 | SE 1 | - |
| | 180.2 | BRK | 126.2 | SE 1 | 142.7 | SE 1 | |
| | 179.7 | BRK | 132.0 | SE 1 | 139.0 | SE 1 | |
| | 179.8 | BRK | 136.8 | SE 1 | 138.9 | SE 1 | |
| | 177.8 | BRK | 128.6 | SE 1 | 132.5 | SE 1 | |
| DS-28 | 177.9 | BRK | 119.3 | SE 1 | 132.6 | SE 1 | - |
| | 177.4 | BRK | 113.2 | SE 1 | 125.3 | SE 1 | |
| | 177.2 | BRK | 131.7 | SE 1 | 131.1 | SE 1 | |
| | 176.1 | BRK | 136.4 | SE 1 | 118.0 | SE 1 | |
| | 175.7 | BRK | 136.1 | SE 1 | 119.7 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-29 | 176.4 | BRK | 147.4 | SE 1 | 120.5 | SE 1 | - |
| | 175.6 | BRK | 148.7 | SE 1 | 128.9 | SE 1 | |
| | 176.5 | BRK | 149.4 | SE 1 | 141.3 | SE 1 | |
| | 177.0 | BRK | 148.1 | SE 1 | 117.8 | SE 1 | |
| | 178.1 | BRK | 149.4 | SE 1 | 122.5 | SE 1 | |
| DS-30 | 174.8 | BRK | 126.5 | SE 1 | 118.5 | SE 1 | - |
| | 175.0 | BRK | 128.7 | SE 1 | 121.9 | SE 1 | |
| | 174.9 | BRK | 132.1 | SE 1 | 124.3 | SE 1 | |
| | 175.3 | BRK | 134.8 | SE 1 | 124.0 | SE 1 | |
| | 175.1 | BRK | 136.7 | SE 1 | 131.0 | SE 1 | |
| DS-31 | 178.7 | BRK | 147.3 | SE 1 | 127.1 | SE 1 | - |
| | 179.1 | BRK | 138.6 | SE 1 | 146.1 | SE 1 | |
| | 180.1 | BRK | 124.5 | SE 1 | 120.3 | SE 1 | |
| | 180.6 | BRK | 130.0 | SE 1 | 148.9 | SE 1 | |
| | 180.3 | BRK | 137.5 | SE 1 | 118.8 | SE 1 | |
| DS-32 | 179.3 | BRK | 135.2 | SE 1 | 124.8 | SE 1 | - |
| | 177.0 | BRK | 136.2 | SE 1 | 126.4 | SE 1 | |
| | 178.4 | BRK | 137.4 | SE 1 | 121.3 | SE 1 | |
| | 177.3 | BRK | 131.0 | SE 1 | 118.1 | SE 1 | |
| | 173.4 | BRK | 134.0 | SE 1 | 122.7 | SE 1 | |
| DS-33 | 181.7 | BRK | 126.9 | SE 1 | 117.4 | SE 1 | - |
| | 181.5 | BRK | 119.2 | SE 1 | 121.4 | SE 1 | |
| | 181.1 | BRK | 126.8 | SE 1 | 115.0 | SE 1 | |
| | 181.0 | BRK | 115.7 | SE 1 | 119.8 | SE 1 | |
| | 181.0 | BRK | 120.9 | SE 1 | 123.9 | SE 1 | |
| DS-34 | 173.7 | BRK | 111.7 | SE 1 | 119.3 | SE 1 | - |
| | 173.4 | BRK | 113.5 | SE 1 | 123.5 | SE 1 | |
| | 173.4 | BRK | 118.6 | SE 1 | 127.4 | SE 1 | |
| | 171.8 | BRK | 124.2 | SE 1 | 117.1 | SE 1 | |
| | 172.9 | BRK | 124.2 | SE 1 | 121.6 | SE 1 | |
| DS-35 | 174.8 | BRK | 129.7 | SE 1 | 120.9 | SE 1 | - |
| | 173.3 | BRK | 136.2 | SE 1 | 124.1 | SE 1 | |
| | 174.2 | BRK | 134.3 | SE 1 | 128.4 | SE 1 | |
| | 173.9 | BRK | 130.1 | SE 1 | 122.7 | SE 1 | |
| | 173.3 | BRK | 135.4 | SE 1 | 134.1 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-36 | 173.8 | BRK | 136.5 | SE 1 | 119.3 | SE 1 | - |
| | 172.9 | BRK | 138.9 | SE 1 | 129.6 | SE 1 | |
| | 174.1 | BRK | 138.5 | SE 1 | 120.4 | SE 1 | |
| | 173.5 | BRK | 137.1 | SE 1 | 141.4 | SE 1 | |
| | 173.7 | BRK | 135.2 | SE 1 | 117.4 | SE 1 | |
| DS-37 | 176.0 | BRK | 130.1 | SE 1 | 122.3 | SE 1 | - |
| | 174.9 | BRK | 132.9 | SE 1 | 123.3 | SE 1 | |
| | 175.5 | BRK | 130.6 | SE 1 | 131.0 | SE 1 | |
| | 175.3 | BRK | 127.8 | SE 1 | 124.7 | SE 1 | |
| | 177.6 | BRK | 135.5 | SE 1 | 129.9 | SE 1 | |
| DS-38 | 174.8 | BRK | 123.2 | SE 1 | 110.4 | SE 1 | - |
| | 174.5 | BRK | 145.0 | SE 1 | 125.6 | SE 1 | |
| | 175.3 | BRK | 152.2 | SE 1 | 121.4 | SE 1 | |
| | 174.9 | BRK | 146.4 | SE 1 | 132.7 | SE 1 | |
| | 175.3 | BRK | 147.1 | SE 1 | 125.7 | SE 1 | |
| DS-39 | 175.1 | BRK | 129.2 | SE 1 | 129.7 | SE 1 | - |
| | 175.6 | BRK | 131.5 | SE 1 | 127.3 | SE 1 | |
| | 175.9 | BRK | 132.3 | SE 1 | 120.4 | SE 1 | |
| | 175.3 | BRK | 133.9 | SE 1 | 126.0 | SE 1 | |
| | 174.3 | BRK | 134.6 | SE 1 | 123.9 | SE 1 | |
| DS-40 | 182.4 | BRK | 137.6 | SE 1 | 130.3 | SE 1 | - |
| | 181.9 | BRK | 134.8 | SE 1 | 130.7 | SE 1 | |
| | 182.4 | BRK | 144.2 | SE 1 | 129.6 | SE 1 | |
| | 181.6 | BRK | 141.4 | SE 1 | 131.1 | SE 1 | |
| | 182.0 | BRK | 141.2 | SE 1 | 129.5 | SE 1 | |
| DS-41 | 185.3 | BRK | 131.6 | SE 1 | 135.2 | SE 1 | - |
| | 184.5 | BRK | 119.0 | SE 1 | 147.1 | SE 1 | |
| | 185.4 | BRK | 136.5 | SE 1 | 146.8 | SE 1 | |
| | 184.9 | BRK | 132.7 | SE 1 | 129.6 | SE 1 | |
| | 184.3 | BRK | 132.7 | SE 1 | 128.2 | SE 1 | |
| DS-42 | 180.6 | BRK | 156.8 | SE 1 | 138.6 | SE 1 | - |
| | 180.8 | BRK | 153.5 | SE 1 | 132.2 | SE 1 | |
| | 181.9 | BRK | 129.1 | SE 1 | 130.8 | SE 1 | |
| | 182.7 | BRK | 137.3 | SE 1 | 130.1 | SE 1 | |
| | 179.6 | BRK | 135.7 | SE 1 | 135.7 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-43 | 180.2 | BRK | 122.0 | SE 1 | 119.0 | SE 1 | - |
| | 178.4 | BRK | 124.2 | SE 1 | 115.1 | SE 1 | |
| | 180.2 | BRK | 142.8 | SE 1 | 132.9 | SE 1 | |
| | 179.7 | BRK | 128.4 | SE 1 | 114.5 | SE 1 | |
| | 179.4 | BRK | 125.9 | SE 1 | 120.4 | SE 1 | |
| DS-44 | 177.6 | BRK | 155.5 | SE 1 | 127.9 | SE 1 | - |
| | 178.5 | BRK | 150.1 | SE 1 | 122.7 | SE 1 | |
| | 177.9 | BRK | 147.4 | SE 1 | 123.0 | SE 1 | |
| | 178.3 | BRK | 149.3 | SE 1 | 129.3 | SE 1 | |
| | 177.0 | BRK | 148.5 | SE 1 | 125.9 | SE 1 | |
| DS-45 | 182.9 | BRK | 134.9 | SE 1 | 149.8 | SE 1 | - |
| | 183.0 | BRK | 136.1 | SE 1 | 147.5 | SE 1 | |
| | 183.8 | BRK | 136.5 | SE 1 | 144.2 | SE 1 | |
| | 184.0 | BRK | 139.4 | SE 1 | 132.2 | SE 1 | |
| | 183.0 | BRK | 138.4 | SE 1 | 132.3 | SE 1 | |
| DS-46 | 182.2 | BRK | 149.7 | SE 1 | 137.0 | SE 1 | - |
| | 182.7 | BRK | 141.4 | SE 1 | 137.8 | SE 1 | |
| | 184.0 | BRK | 147.9 | SE 1 | 129.2 | SE 1 | |
| | 183.7 | BRK | 150.6 | SE 1 | 123.8 | SE 1 | |
| | 183.2 | BRK | 131.6 | SE 1 | 127.1 | SE 1 | |
| DS-47 | 181.6 | BRK | 135.4 | SE 1 | 126.6 | SE 1 | - |
| | 180.5 | BRK | 141.8 | SE 1 | 125.7 | SE 1 | |
| | 181.0 | BRK | 140.6 | SE 1 | 132.3 | SE 1 | |
| | 181.3 | BRK | 144.7 | SE 1 | 128.3 | SE 1 | |
| | 179.7 | BRK | 133.3 | SE 1 | 133.8 | SE 1 | |
| DS-48 | 182.2 | BRK | 138.0 | SE 1 | 115.3 | SE 1 | - |
| | 181.5 | BRK | 137.6 | SE 1 | 127.0 | SE 1 | |
| | 181.3 | BRK | 146.8 | SE 1 | 135.7 | SE 1 | |
| | 182.0 | BRK | 142.7 | SE 1 | 130.3 | SE 1 | |
| | 182.0 | BRK | 136.2 | SE 1 | 157.4 | SE 1 | |
| DS-49 | 182.0 | BRK | 139.4 | SE 1 | 129.7 | SE 1 | - |
| | 183.2 | BRK | 139.0 | SE 1 | 139.7 | SE 1 | |
| | 183.9 | BRK | 136.7 | SE 1 | 133.2 | SE 1 | |
| | 184.0 | BRK | 141.0 | SE 1 | 126.6 | SE 1 | |
| | 182.7 | BRK | 140.5 | SE 1 | 128.7 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**FTN**
**CCSW-LEGACY LF- CELL 15-2N**
**ARKANSAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-50 | 184.7 | BRK | 144.0 | SE 1 | 135.8 | SE 1 | - |
| | 183.4 | BRK | 146.1 | SE 1 | 148.8 | SE 1 | |
| | 183.6 | BRK | 144.9 | SE 1 | 154.6 | SE 1 | |
| | 183.1 | BRK | 142.1 | SE 1 | 145.7 | SE 1 | |
| | 182.7 | BRK | 141.5 | SE 1 | 146.6 | SE 1 | |
| DS-51 | 189.0 | BRK | 147.3 | SE 1 | 115.5 | SE 1 | - |
| | 188.4 | BRK | 146.1 | SE 1 | 112.0 | SE 1 | |
| | 189.0 | BRK | 147.6 | SE 1 | 119.6 | SE 1 | |
| | 189.5 | BRK | 141.6 | SE 1 | 132.3 | SE 1 | |
| | 187.4 | BRK | 138.7 | SE 1 | 137.7 | SE 1 | |
| DS-52 | 189.7 | BRK | 131.1 | SE 1 | 149.6 | SE 1 | - |
| | 188.7 | BRK | 146.5 | SE 1 | 149.4 | SE 1 | |
| | 188.8 | BRK | 124.7 | SE 1 | 146.2 | SE 1 | |
| | 188.5 | BRK | 121.9 | SE 1 | 147.6 | SE 1 | |
| | 187.6 | BRK | 127.0 | SE 1 | 144.9 | SE 1 | |
| DS-53 | 189.9 | BRK | 147.4 | SE 1 | 136.8 | SE 1 | - |
| | 189.2 | BRK | 154.2 | SE 1 | 139.8 | SE 1 | |
| | 189.9 | BRK | 149.3 | SE 1 | 154.4 | SE 1 | |
| | 189.9 | BRK | 138.4 | SE 1 | 148.0 | SE 1 | |
| | 189.1 | BRK | 138.6 | SE 1 | 156.7 | SE 1 | |
| DS-54 | 184.7 | BRK | 129.1 | SE 1 | 127.1 | SE 1 | - |
| | 184.6 | BRK | 144.6 | SE 1 | 129.6 | SE 1 | |
| | 184.5 | BRK | 144.9 | SE 1 | 127.1 | SE 1 | |
| | 184.6 | BRK | 149.9 | SE 1 | 128.9 | SE 1 | |
| | 185.0 | BRK | 134.5 | SE 1 | 138.4 | SE 1 | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ASTM D6392.

# APPENDIX V

**Protective Cover and Washed Gravel Test Reports**

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

P.O. Box 30970
Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

# REPORT OF LABORATORY TESTS

Project: LEGACY LANDFILL-CELL 2N/1S Job No.: 18-5087

Material Description: REDDISH TAN SAND W/ GRAVEL Protective Cover

Location Sampled/Source: POINSETT PIT RUN

Sample No.: 4/26B Date Submitted: 4/26/18 Submitted By: FTN

Date Tested: 5/3/18 Tested By: LLC Report Date: 5/4/18

## SIEVE ANALYSIS OF COARSE AGGREGATE (ASTM D-6913):

| SIEVE NO. (TYLER STD) | SIEVE NO. (U.S. BUREAU OF STDS) | PERCENT PASSING | |
|---|---|---|---|
| | | SAMPLE | |
| Dry Weight | (grams) | 14,166.5 | |
| 2-1/2 in. | 63.0 mm | | |
| 2 in. | 50.0 mm | 100 | |
| 1-1/2 in. | 37.5 mm | 99 | |
| 1 in. | 25.0 mm | 91 | |
| 3/4 in. | 19.0 mm | 84 | |
| 1/2 in. | 12.5 mm | 73 | |
| 3/8 in. | 9.5 mm | 67 | |
| No. 4 | 4.75 mm | 53 | |
| No. 8 | 2.36 mm | 47 | |
| No. 30 | 0.600 mm | 33 | |
| No. 50 | 0.300 mm | 9 | |
| No. 100 | 0.150 mm | 0.8 | |

PLATE 2

# CONSTANT HEAD PERMEABILITY TEST
# MODIFIED - ASTM D 2434

Protective Cover

| | | | |
|---|---|---|---|
| **PROJECT TITLE** | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR | **SAMPLE ID** | DL-1 |
| **PROJECT NUMBER** | 18102853 | **SAMPLE TYPE** | Bag |
| **REMARKS** | - | **SAMPLE DEPTH** | - |

| | TIME IN SECONDS | VOLUME (ml) | TEMP. °C | (ml/sec) | |
|---|---|---|---|---|---|
| 1. | 60.00 | 260 | 26.0 | 4.33 | |
| 2. | 60.00 | 355 | 26.0 | 5.92 | |
| 3. | 60.00 | 370 | 26.0 | 6.17 | * |
| 4. | 60.00 | 380 | 26.0 | 6.33 | * |
| 5. | 60.00 | 375 | 26.0 | 6.25 | * |
| 6. | 70.00 | 420 | 26.0 | 6.00 | * |

## INITIAL UNIT WEIGHT DETERMINATION

| | |
|---|---|
| APPARATUS & WET SAMPLE (g): | 7565.0 |
| APPARATUS WEIGHT (g): | 3665.0 |
| WET SAMPLE WEIGHT (g): | 3900.0 |
| SAMPLE LENGTH (in): | 11.0 |
| SAMPLE DIAMETER (in): | 4.0 |
| SAMPLE AREA (in²): | 12.57 |
| SAMPLE AREA (cm²): | 81.07 |
| SAMPLE VOLUME ($in^3$): | 138.23 |
| SAMPLE VOLUME ($ft^3$): | 0.080 |
| WET DENSITY (pcf): | 107.5 |
| DRY DENSITY (pcf): | 107.5 |

## INITIAL MOISTURE CONTENT

| | |
|---|---|
| WET SAMPLE & TARE (g): | |
| DRY SAMPLE & TARE (g): | |
| WEIGHT OF TARE (g): | |
| WEIGHT OF WATER (g): | |
| DRY SAMPLE WEIGHT (g): | |
| MOISTURE CONTENT (%): | |

## FINAL DIMENSIONS

| | |
|---|---|
| SAMPLE LENGTH (in): | 10.5 |
| SAMPLE DIAMETER (in): | 4.0 |
| AVERAGE Q VALUE (ml/sec): | 6.19 |
| AVERAGE TEMP (°C): | 26.0 |
| TEMPERATURE CORRECTION: | 0.869 |
| HEAD OF WATER (in): | 5.3 |
| HYDRAULIC GRADIENT (i): | 0.50 |

$K_{\text{VALUE CORRECTED FOR 20 DEGREES C}}$ = 1.3E-01 cm/sec

NOTE: *Non-ASTM due to the amount of sample received , the entire sample received was tested (+/- 3/4" material), in a 4" mold.*

| | |
|---|---|
| **TECH** | PWM |
| **DATE** | 8/7/18 |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

# CARBONATE CONTENT
# ASTM D 3042 - MODIFIED

| | |
|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR |
| PROJECT NUMBER | 18102853 |
| SAMPLE ID | DL-1 Protective Cover |

| | | | |
|---|---|---|---|
| Residue +Tare weight (g) | 545.81 | 545.23 | 540.99 |
| Tare Weight (g) | 82.25 | 79.83 | 79.93 |
| Residue weight (g) | 463.56 | 465.40 | 461.06 |

**After Acid Application and Wash**

| | | | |
|---|---|---|---|
| Residue + Tare weight (g) | 545.41 | 544.79 | 540.48 |
| Residue weight (g) | 463.16 | 464.96 | 460.55 |
| Carbonate Content (%) | 0.1 | 0.1 | 0.1 |

**Average Carbonate Content (%)** **0.1**

**REMARKS**

**SAMPLE DESCRIPTION** -

USCS -

MODIFIED: Only the Plus No.200 Size material used in the test.

| | |
|---|---|
| **TECH** | **HH** |
| **DATE** | **8/7/18** |
| **CHECK** | |
| **REVIEW** | |
| **APPROVE** | |

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

P.O. Box 30970
Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

# REPORT OF LABORATORY TESTS

Project: LEGACY LANDFILL-CELL 2N/1S Job No.: 18-5087

Material Description: OVERSIZED ROCK Gravel for Leachate Collection Trench and Sump

Location Sampled/Source: DRUM SAND & GRAVEL

Sample No.: 4/26A Date Submitted: 4/26/18 Submitted By: FTN

Date Tested: 5/2/18 Tested By: LLC Report Date: 5/4/18

## SIEVE ANALYSIS OF COARSE AGGREGATE (ASTM C-136):

| SIEVE NO. (TYLER STD) | SIEVE NO. (U.S. BUREAU OF STDS) | PERCENT PASSING | |
|---|---|---|---|
| | | SAMPLE | |
| Dry Weight | (grams) | 29,905.8 | |
| 2-1/2 in. | 63.0 mm | 100 | |
| 2 in. | 50.0 mm | 99 | |
| 1-1/2 in. | 37.5 mm | 87 | |
| 1 in. | 25.0 mm | 20 | |
| 3/4 in. | 19.0 mm | 5 | |
| 1/2 in. | 12.5 mm | 2 | |
| 3/8 in. | 9.5 mm | 1.6 | |
| No. 4 | 4.75 mm | 1.4 | |
| No. 8 | 2.36 mm | 1.3 | |

PLATE 1

# CARBONATE CONTENT
# ASTM D 3042 - MODIFIED

| | |
|---|---|
| PROJECT TITLE | FTN/CCSW-LEGACY LF - CELL 1S-2N/AR |
| PROJECT NUMBER | 18102853 |
| SAMPLE ID | G-1 Gravel for Leachate Collection Trench and Sump |

| | | | |
|---|---|---|---|
| Residue +Tare weight (g) | 573.69 | 581.91 | 581.54 |
| Tare Weight (g) | 74.13 | 81.56 | 82.37 |
| Residue weight (g) | 499.56 | 500.35 | 499.17 |

**After Acid Application and Wash**

| | | | |
|---|---|---|---|
| Residue + Tare weight (g) | 572.87 | 581.58 | 581.24 |
| Residue weight (g) | 498.74 | 500.02 | 498.87 |
| Carbonate Content (%) | 0.2 | 0.1 | 0.1 |

**Average Carbonate Content (%)** **0.1**

**REMARKS**

**SAMPLE DESCRIPTION** GRAVEL, fine to coarse; brown, gray, and white.

USCS GP

MODIFIED: Only the Plus No.200 Size material used in the test.

| | |
|---|---|
| TECH | BA |
| DATE | 7/18/18 |
| CHECK | |
| REVIEW | |
| APPROVE | |

# APPENDIX W

**Geotextile Conformance Test Report**

**JUNE 2018** **18102853**

# GEOTEXTILE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**ROLL DESIGNATION:** **52930.10**

| | MASS PER UNIT AREA ($oz/yd^2$) | PUNCTURE STRENGTH (pounds) | APPARENT OPENING SIZE (mm) | PERMITTIVITY (sec-1) |
|---|---|---|---|---|
| 1. | 8.57 | 128.9 | 0.075 | 1.90 |
| 2. | 8.37 | 108.4 | 0.075 | 1.92 |
| 3. | 7.20 | 154.1 | 0.075 | 1.69 |
| 4. | 9.42 | 147.4 | 0.086 | 1.62 |
| 5. | 9.65 | 158.2 | 0.075 | |
| AVG | 8.6 | 139.4 | 0.077 | 1.8 |

| EQUIVALENT SIEVE SIZE | PERMEABILITY (cm/sec) | FLOW RATE ($gal/min/ft^2$) |
|---|---|---|
| 170 | 0.52 | 133.4 |

| | GRAB STRENGTH (pounds) | | GRAB ELONGATION (%) | | TRAPEZOIDAL TEAR (pounds) | |
|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD |
| 1. | 363.6 | 235.2 | 24.3 | 72.8 | 108.5 | 109.3 |
| 2. | 264.8 | 236.1 | 63.1 | 71.2 | 103.1 | 135.1 |
| 3. | 263.1 | 269.7 | 63.6 | 64.6 | 126.6 | 121.4 |
| 4. | 260.0 | 276.9 | 66.3 | 60.6 | 110.2 | 133.9 |
| 5. | 252.2 | 260.3 | 61.1 | 60.5 | 126.1 | 140.2 |
| 6. | 360.4 | 271.0 | 56.1 | 79.2 | 127.8 | 128.9 |
| 7. | 261.5 | 273.6 | 61.8 | 71.9 | 129.8 | 116.9 |
| 8. | 224.4 | 266.7 | 56.8 | 63.2 | 110.9 | 139.5 |
| 9. | 218.8 | 296.6 | 61.9 | 67.2 | 119.0 | 120.9 |
| 10. | 233.3 | 280.1 | 63.5 | 63.9 | 113.2 | 126.4 |
| AVG | 270.2 | 266.6 | 57.8 | 67.5 | 117.5 | 127.3 |

**JUNE 2018** **18102853**

# GEOTEXTILE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**ROLL DESIGNATION:** **52930.22**

| | MASS PER UNIT AREA (oz/yd²) | PUNCTURE STRENGTH (pounds) | APPARENT OPENING SIZE (mm) | PERMITTIVITY (sec-1) |
|---|---|---|---|---|
| 1. | 8.70 | 139.3 | 0.084 | 1.58 |
| 2. | 9.07 | 188.8 | 0.089 | 1.72 |
| 3. | 9.02 | 143.1 | 0.089 | 1.66 |
| 4. | 8.93 | 163.1 | 0.087 | 1.30 |
| 5. | 9.64 | 165.5 | 0.089 | |
| AVG | 9.1 | 160.0 | 0.088 | 1.6 |

| EQUIVALENT SIEVE SIZE | PERMEABILITY (cm/sec) | FLOW RATE (gal/min/ft²) |
|---|---|---|
| 170 | 0.46 | 117.1 |

| | GRAB STRENGTH (pounds) | | GRAB ELONGATION (%) | | TRAPEZOIDAL TEAR (pounds) | |
|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD |
| 1. | 343.8 | 225.2 | 47.5 | 75.1 | 139.8 | 109.3 |
| 2. | 220.7 | 257.2 | 58.3 | 70.8 | 123.4 | 112.6 |
| 3. | 202.4 | 283.9 | 51.9 | 64.1 | 113.5 | 112.3 |
| 4. | 220.1 | 312.1 | 62.2 | 65.1 | 117.7 | 133.5 |
| 5. | 252.8 | 298.8 | 66.9 | 67.9 | 111.7 | 140.1 |
| 6. | 407.0 | 278.3 | 62.2 | 78.5 | 135.1 | 126.3 |
| 7. | 244.0 | 280.9 | 57.9 | 72.0 | 111.5 | 173.1 |
| 8. | 281.6 | 288.3 | 60.9 | 69.9 | 113.1 | 145.2 |
| 9. | 240.7 | 267.5 | 64.5 | 67.7 | 99.9 | 172.5 |
| 10. | 240.4 | 308.6 | 63.7 | 68.2 | 89.4 | 172.2 |
| AVG | 265.4 | 280.1 | 59.6 | 69.9 | 115.5 | 139.7 |

**JUNE 2018** **18102853**

# GEOTEXTILE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**ROLL DESIGNATION:** **52930.25**

| | MASS PER UNIT AREA ($oz/yd^2$) | PUNCTURE STRENGTH (pounds) | APPARENT OPENING SIZE (mm) | PERMITTIVITY (sec-1) |
|---|---|---|---|---|
| 1. | 7.65 | 142.9 | 0.089 | 1.73 |
| 2. | 8.46 | 131.4 | 0.086 | 1.67 |
| 3. | 9.14 | 186.0 | 0.075 | 1.52 |
| 4. | 8.86 | 183.9 | 0.075 | 1.54 |
| 5. | 8.16 | 167.0 | 0.075 | |
| AVG | 8.5 | 162.2 | 0.080 | 1.6 |

| EQUIVALENT SIEVE SIZE | PERMEABILITY (cm/sec) | FLOW RATE ($gal/min/ft^2$) |
|---|---|---|
| 170 | 0.48 | 121.0 |

| | GRAB STRENGTH (pounds) | | GRAB ELONGATION (%) | | TRAPEZOIDAL TEAR (pounds) | |
|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD |
| 1. | 345.0 | 217.7 | 56.8 | 72.6 | 120.6 | 121.4 |
| 2. | 342.4 | 242.1 | 49.1 | 72.6 | 94.4 | 156.5 |
| 3. | 216.2 | 228.2 | 57.5 | 60.8 | 110.8 | 136.5 |
| 4. | 229.5 | 270.9 | 61.1 | 67.9 | 112.5 | 137.1 |
| 5. | 227.5 | 255.4 | 65.0 | 71.9 | 103.9 | 172.1 |
| 6. | 194.4 | 314.8 | 70.1 | 69.2 | 132.9 | 143.2 |
| 7. | 291.4 | 321.1 | 62.9 | 68.4 | 108.3 | 113.4 |
| 8. | 317.0 | 289.5 | 62.2 | 69.1 | 113.4 | 128.9 |
| 9. | 270.5 | 279.3 | 63.8 | 71.2 | 114.2 | 126.4 |
| 10. | 250.9 | 239.1 | 64.6 | 75.1 | 128.1 | 114.8 |
| AVG | 268.5 | 265.8 | 61.3 | 69.9 | 113.9 | 135.0 |

**JUNE 2018** **18102853**

# GEOTEXTILE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**ROLL DESIGNATION:** **52930.34**

| | MASS PER UNIT AREA ($oz/yd^2$) | PUNCTURE STRENGTH (pounds) | APPARENT OPENING SIZE (mm) | PERMITTIVITY (sec-1) |
|---|---|---|---|---|
| 1. | 9.66 | 168.5 | 0.101 | 1.44 |
| 2. | 8.64 | 133.0 | 0.080 | 1.47 |
| 3. | 7.55 | 131.9 | 0.105 | 1.82 |
| 4. | 8.00 | 116.1 | 0.091 | 1.59 |
| 5. | 8.79 | 135.5 | 0.114 | |
| AVG | 8.5 | 137.0 | 0.098 | 1.6 |

| EQUIVALENT SIEVE SIZE | PERMEABILITY (cm/sec) | FLOW RATE ($gal/min/ft^2$) |
|---|---|---|
| 140 | 0.47 | 118.2 |

| | GRAB STRENGTH (pounds) | | GRAB ELONGATION (%) | | TRAPEZOIDAL TEAR (pounds) | |
|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD |
| 1. | 356.7 | 252.0 | 57.0 | 75.7 | 150.6 | 127.0 |
| 2. | 290.0 | 258.5 | 65.3 | 74.3 | 121.2 | 124.0 |
| 3. | 261.2 | 242.7 | 63.0 | 72.0 | 103.2 | 155.3 |
| 4. | 227.2 | 259.7 | 60.0 | 64.7 | 95.1 | 123.7 |
| 5. | 245.0 | 258.5 | 64.7 | 71.0 | 102.4 | 136.3 |
| 6. | 221.5 | 282.5 | 63.0 | 67.0 | 101.8 | 137.7 |
| 7. | 210.2 | 276.5 | 68.3 | 67.7 | 101.7 | 110.6 |
| 8. | 276.5 | 282.2 | 62.7 | 72.3 | 103.2 | 141.1 |
| 9. | 311.5 | 254.5 | 66.0 | 71.3 | 120.2 | 145.3 |
| 10. | 415.2 | 254.5 | 53.3 | 81.0 | 137.4 | 158.6 |
| AVG | 281.5 | 262.2 | 62.3 | 71.7 | 113.7 | 136.0 |

**JUNE 2018** **18102853**

# GEOTEXTILE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**ROLL DESIGNATION:** **52930.49**

| | MASS PER UNIT AREA (oz/yd²) | PUNCTURE STRENGTH (pounds) | APPARENT OPENING SIZE (mm) | PERMITTIVITY (sec-1) |
|---|---|---|---|---|
| 1. | 7.42 | 172.1 | 0.098 | 1.55 |
| 2. | 7.50 | 136.4 | 0.085 | 1.38 |
| 3. | 8.00 | 120.9 | 0.089 | 1.74 |
| 4. | 9.68 | 171.5 | 0.089 | 1.55 |
| 5. | 8.09 | 124.1 | 0.079 | |
| AVG | 8.1 | 145.0 | 0.088 | 1.6 |

| EQUIVALENT SIEVE SIZE | PERMEABILITY (cm/sec) | FLOW RATE (gal/min/ft²) |
|---|---|---|
| 170 | 0.45 | 116.5 |

| | GRAB STRENGTH (pounds) | | GRAB ELONGATION (%) | | TRAPEZOIDAL TEAR (pounds) | |
|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD |
| 1. | 322.5 | 262.4 | 54.1 | 70.5 | 107.5 | 114.6 |
| 2. | 247.8 | 190.3 | 61.9 | 71.5 | 120.2 | 145.1 |
| 3. | 226.7 | 314.0 | 67.5 | 63.3 | 110.0 | 137.8 |
| 4. | 270.5 | 342.5 | 67.2 | 67.3 | 119.4 | 170.4 |
| 5. | 310.9 | 332.8 | 69.4 | 64.8 | 114.6 | 134.7 |
| 6. | 226.8 | 332.9 | 62.7 | 69.5 | 91.6 | 169.1 |
| 7. | 226.6 | 293.7 | 56.9 | 65.1 | 118.0 | 105.6 |
| 8. | 244.7 | 266.4 | 62.2 | 71.0 | 108.4 | 132.0 |
| 9. | 259.3 | 238.5 | 59.9 | 72.4 | 116.0 | 134.1 |
| 10. | 312.1 | 256.2 | 55.2 | 66.1 | 113.7 | 121.1 |
| AVG | 264.8 | 283.0 | 61.7 | 68.2 | 111.9 | 136.5 |

**JUNE 2018** **18102853**

# GEOTEXTILE TEST RESULTS

**PROJECT NAME:** **FTN/CCSW-LEGACY LF-CELL 15-2N/AR**
**ROLL DESIGNATION:** **52930.60**

| | MASS PER UNIT AREA (oz/yd²) | PUNCTURE STRENGTH (pounds) | APPARENT OPENING SIZE (mm) | PERMITTIVITY (sec-1) |
|---|---|---|---|---|
| 1. | 9.39 | 163.2 | 0.087 | 1.44 |
| 2. | 9.78 | 155.4 | 0.082 | 1.52 |
| 3. | 8.26 | 135.6 | 0.083 | 1.43 |
| 4. | 7.75 | 136.5 | 0.087 | 1.32 |
| 5. | 8.76 | 108.6 | 0.075 | |
| AVG | 8.8 | 139.9 | 0.083 | 1.4 |

| | EQUIVALENT SIEVE SIZE | PERMEABILITY (cm/sec) | FLOW RATE (gal/min/ft²) |
|---|---|---|---|
| | 170 | 0.39 | 107.0 |

| | GRAB STRENGTH (pounds) | | GRAB ELONGATION (%) | | TRAPEZOIDAL TEAR (pounds) | |
|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD |
| 1. | 236.1 | 230.9 | 53.5 | 74.5 | 124.6 | 131.4 |
| 2. | 272.9 | 224.8 | 52.5 | 68.9 | 106.4 | 126.8 |
| 3. | 223.4 | 282.8 | 57.8 | 71.2 | 133.5 | 156.5 |
| 4. | 246.8 | 224.0 | 66.3 | 70.1 | 93.8 | 124.5 |
| 5. | 233.8 | 317.4 | 57.2 | 67.8 | 120.3 | 143.6 |
| 6. | 223.0 | 271.0 | 60.5 | 65.8 | 96.4 | 133.9 |
| 7. | 272.8 | 285.0 | 66.5 | 64.5 | 112.0 | 165.0 |
| 8. | 266.2 | 260.3 | 62.6 | 65.9 | 113.2 | 136.8 |
| 9. | 262.5 | 276.6 | 63.6 | 66.7 | 142.5 | 146.3 |
| 10. | 229.4 | 291.9 | 59.0 | 66.6 | 93.5 | 173.5 |
| AVG | 246.7 | 266.5 | 59.9 | 68.2 | 113.6 | 143.8 |

SKAPS Industries (Nonwoven Division)
335, Athena Drive
Athens, GA 30601 (U.S.A.)
Phone (706) 354-3700 Fax (706) 354-3737
E-mail: contact@skaps.com

Sales Office:
Engineered Synthetic Product Inc.
Phone: (770)564-1857
Fax: (770)564-1818

**May 31, 2018**
**Plastic Fusion Fabricators, Inc.**
3455 Stanwood Blvd
Huntsville, AL 35811
**PO : P17536**

Dear Sir/Madam:

This is to certify that SKAPS GE180 is a high quality needle-punched nonwoven geotextile made of 100% polypropylene staple fibers, randomly networked to form a high strength dimensionally stable fabric.SKAPS GE180 resists ultraviolet deterioration, rotting, biological degradation. The fabric is inert to commonly encountered soil chemicals. Polypropylene is stable within a pH range of 2 to 13. SKAPS GE180 conforms to the property values listed below:

| PROPERTY | TEST METHOD | UNITS | M.A.R.V. Minimum Average Roll Value |
|---|---|---|---|
| Weight | ASTM D 5261 | oz/sy ($g/m^2$) | 8.00 (271) |
| Thickness* | ASTM D 5199 | mils (mm) | 100 (2.54) |
| Grab Tensile | ASTM D 4632 | lbs (kN) | 225 (1.00) |
| Grab Elongation | ASTM D 4632 | % | 50 |
| Trapezoidal Tear | ASTM D 4533 | lbs (kN) | 90 (0.40) |
| CBR Puncture | ASTM D 6241 | lbs (kN) | 650 (2.89) |
| Permittivity* | ASTM D 4491 | $sec^{-1}$ | 1.26 |
| Permeability* | ASTM D 4491 | cm/sec | 0.30 |
| Water Flow* | ASTM D 4491 | $gpm/ft^2(l/min/m^2)$ | 100 (4074) |
| AOS* | ASTM D 4751 | US Sieve (mm) | 80 (0.18) |
| UV Resistance | ASTM D 4355 | %/hrs | 70/500 |

**Notes:**
* At the time of manufacturing. Handling may change these properties.

**KOUROSH SABZEVARI**
QUALITY CONTROL MANAGER

**Product : GE180-180**

| ROLL # | WEIGHT | THICKNESS | MD TENSILE | MD ELONG | XMD TENSILE | XMD ELONG | MD TRAP | XMD TRAP | CBR PUNCTURE | AOS | WATER FLOW | PERMEABILITY | PERMITTIVITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | D5261 | D5199 | D4632 | D4632 | D4632 | D4632 | D4533 | D4533 | D6241 | D4751 | D4491 | D4491 | D4491 |
| UNITS | oz/sq yd | (mils) | lbs. | % | lbs | % | lbs. | lbs | lbs. | US Sieve | $gpm/ft^2$ | cm/sec | $sec^{-1}$ |
| TARGET | 8.00 | 100 | 225 | 50 | 225 | 50 | 90 | 90 | 650 | 80 | 100 | 0.30 | 1.26 |
| 52930.1 | 8.54 | 123 | 234 | 73 | 243 | 84 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.2 | 8.54 | 123 | 234 | 73 | 243 | 84 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.3 | 8.54 | 123 | 234 | 73 | 243 | 84 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.4 | 8.54 | 123 | 234 | 73 | 243 | 84 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.5 | 8.22 | 120 | 229 | 68 | 232 | 79 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.6 | 8.22 | 120 | 229 | 68 | 232 | 79 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.7 | 8.22 | 120 | 229 | 68 | 232 | 79 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.8 | 8.22 | 120 | 229 | 68 | 232 | 79 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.9 | 8.22 | 120 | 229 | 68 | 232 | 79 | 104 | 119 | 699 | 80 | 103 | 0.43 | 1.38 |
| 52930.10 | 8.37 | 125 | 231 | 71 | 240 | 82 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.11 | 8.37 | 125 | 231 | 71 | 240 | 82 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.12 | 8.37 | 125 | 231 | 71 | 240 | 82 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.13 | 8.37 | 125 | 231 | 71 | 240 | 82 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.14 | 8.37 | 125 | 231 | 71 | 240 | 82 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.15 | 8.10 | 122 | 226 | 66 | 237 | 75 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.16 | 8.10 | 122 | 226 | 66 | 237 | 75 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.17 | 8.10 | 122 | 226 | 66 | 237 | 75 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.18 | 8.10 | 122 | 226 | 66 | 237 | 75 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.19 | 8.10 | 122 | 226 | 66 | 237 | 75 | 98 | 105 | 666 | 80 | 103 | 0.43 | 1.38 |
| 52930.20 | 8.43 | 124 | 233 | 75 | 245 | 85 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.21 | 8.43 | 124 | 233 | 75 | 245 | 85 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.22 | 8.43 | 124 | 233 | 75 | 245 | 85 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.23 | 8.43 | 124 | 233 | 75 | 245 | 85 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.24 | 8.43 | 124 | 233 | 75 | 245 | 85 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.25 | 8.34 | 121 | 228 | 69 | 230 | 77 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.26 | 8.34 | 121 | 228 | 69 | 230 | 77 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.27 | 8.34 | 121 | 228 | 69 | 230 | 77 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.28 | 8.34 | 121 | 228 | 69 | 230 | 77 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.29 | 8.34 | 121 | 228 | 69 | 230 | 77 | 101 | 115 | 677 | 80 | 103 | 0.43 | 1.38 |
| 52930.30 | 8.51 | 123 | 235 | 72 | 242 | 81 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.31 | 8.51 | 123 | 235 | 72 | 242 | 81 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.32 | 8.51 | 123 | 235 | 72 | 242 | 81 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.33 | 8.51 | 123 | 235 | 72 | 242 | 81 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.34 | 8.51 | 123 | 235 | 72 | 242 | 81 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.35 | 8.16 | 125 | 230 | 66 | 232 | 79 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.36 | 8.16 | 125 | 230 | 66 | 232 | 79 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.37 | 8.16 | 125 | 230 | 66 | 232 | 79 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.38 | 8.16 | 125 | 230 | 66 | 232 | 79 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.39 | 8.16 | 125 | 230 | 66 | 232 | 79 | 96 | 102 | 650 | 80 | 103 | 0.43 | 1.38 |
| 52930.40 | 8.49 | 120 | 232 | 74 | 239 | 83 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |

*All Values are MARV.

**Product : GE180-180**

| ROLL # | WEIGHT | THICKNESS | MD TENSILE | MD ELONG | XMD TENSILE | XMD ELONG | MD TRAP | XMD TRAP | CBR PUNCTURE | AOS | WATER FLOW | PERMEABILITY | PERMITTIVITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | D5261 | D5199 | D4632 | D4632 | D4632 | D4632 | D4533 | D4533 | D6241 | D4751 | D4491 | D4491 | D4491 |
| UNITS | oz/sq yd | (mils) | lbs. | % | lbs | % | lbs. | lbs | lbs. | US Sieve | $gpm/ft^2$ | cm/sec | $sec^{-1}$ |
| TARGET | 8.00 | 100 | 225 | 50 | 225 | 50 | 90 | 90 | 650 | 80 | 100 | 0.30 | 1.26 |
| 52930.41 | 8.49 | 120 | 232 | 74 | 239 | 83 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.42 | 8.49 | 120 | 232 | 74 | 239 | 83 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.43 | 8.49 | 120 | 232 | 74 | 239 | 83 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.44 | 8.49 | 120 | 232 | 74 | 239 | 83 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.45 | 8.21 | 124 | 227 | 68 | 234 | 76 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.46 | 8.21 | 124 | 227 | 68 | 234 | 76 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.47 | 8.21 | 124 | 227 | 68 | 234 | 76 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.48 | 8.21 | 124 | 227 | 68 | 234 | 76 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.49 | 8.21 | 124 | 227 | 68 | 234 | 76 | 103 | 117 | 682 | 80 | 103 | 0.43 | 1.38 |
| 52930.50 | 8.36 | 122 | 234 | 71 | 243 | 80 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.51 | 8.36 | 122 | 234 | 71 | 243 | 80 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.52 | 8.36 | 122 | 234 | 71 | 243 | 80 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.53 | 8.36 | 122 | 234 | 71 | 243 | 80 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.54 | 8.36 | 122 | 234 | 71 | 243 | 80 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.55 | 8.13 | 125 | 225 | 65 | 231 | 78 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.56 | 8.13 | 125 | 225 | 65 | 231 | 78 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.57 | 8.13 | 125 | 225 | 65 | 231 | 78 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.58 | 8.13 | 125 | 225 | 65 | 231 | 78 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.59 | 8.13 | 125 | 225 | 65 | 231 | 78 | 99 | 108 | 653 | 80 | 101 | 0.42 | 1.35 |
| 52930.60 | 8.55 | 121 | 231 | 73 | 238 | 82 | 105 | 120 | 691 | 80 | 101 | 0.42 | 1.35 |
| 52930.61 | 8.55 | 121 | 231 | 73 | 238 | 82 | 105 | 120 | 691 | 80 | 101 | 0.42 | 1.35 |
| 52930.62 | 8.55 | 121 | 231 | 73 | 238 | 82 | 105 | 120 | 691 | 80 | 101 | 0.42 | 1.35 |

*All Values are MARV.

# APPENDIX X

**Leachate Collection System**

# Specification

June 2017
*Revised January 2017*

Furnish one AFT Simplex Control Panel to operate a pump motor and auxiliary equipment in manual or automatic mode. This control panel enclosure shall be NEMA type 4x.

The enclosure shall be equipped with a window in the outer door, an inner door, and a tamper resistant latch. The NEMA type 4x enclosure will be white powder coated stainless steel.

The control system will operate from a __230_ Volt, 60 Hertz, single phase power supply. Pump control components will be sized to operate a pump motor of specified horsepower.

UL Listed, UL 508A Industrial Control Panels.

The control panel shall include the following as standard features:

**Main Disconnect Breaker:** The main disconnect breaker shall be __20__ Amp rated.

**"Hand-Off-Auto" Selector Switch:** Allows manual or automatic operation of the pump motor. The selector switch shall be a heavy duty, oil tight, NEMA 4 rated switch mounted on the inner door.

**Variable Frequency Drive:** The variable frequency drive shall be sized to safely operate pumps ranging from __0.25__ to __3__ horsepower.

**Control Transformer:** A transformer shall be installed to provide for easier and safer field wiring of accessories. It shall lower incoming voltage to 24 Volts.

**Identification Strobes:** Three strobe lights will be mounted directly on top of the control panel. Green strobe shall indicate that the pump is running. Red light shall indicate that the liquid level is above point of compliance. Amber light shall indicate a failure of a component in the control panel.

**Level Simulator:** The level simulator shall be mounted on the inner door. The level simulator is a built-in test circuit designed to simulate a 4-20mA load to assist in level meter setup and troubleshooting.

**Surge Arrester:** Shall be grounded, metal-to-metal. When properly grounded, the surge arrestor will protect electrical equipment against all electrical surges. An additional surge arrestor shall be installed for additional protection specifically for the submersible pressure transmitter.

**Terminal Strip:** A labeled and numbered terminal strip provides easy connection of external components.

**Corrosion Inhibitor Emitter:** Inclusion of an industrial corrosion inhibitor emitter shall protect internal components of control panel from corrosion for up to one year and shall be replaceable.

**Other options are available to meet specific needs.**

**System Logic and Function**

The controller is designed to start and stop a pump using a programmable logic controller with a submersible pressure transmitter. The pump starts at the pump start level set point and continues to run until the liquid level decreases to the pump stop level set point as programmed in the logic controller. If the liquid level rises to the high-level alarm set point, the red strobe beacon will begin flashing. If the liquid level rises to the high-high level fail-safe set point, the pump motor will shut off. The pressure transmitter level sensor shall have a range of 0 to 23.1 feet with a 4-20 mA output signal.

| | MFE | DISPLAY |
|---|---|---|
| POINT OF COMPLIANCE = | | |
| PUMP ON SETPOINT = | | |
| BOTTOM OF LINER = | | |
| PUMP OFF SETPOINT = | | |
| LOW LEVEL ALARM = | | |
| BOTTOM OF SUMP = | | |

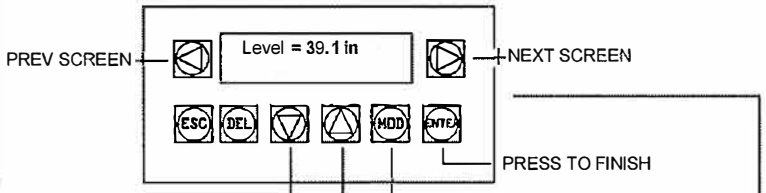
ABOVE POC = FLASHING RED BEACON

ALARMS /FAULT = FLASHING AMBER BEACON

PUMP RUNNING = FLASHING GREEN BEACON

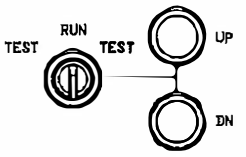
LEVEL is in INCHES

## OPERATOR CONTROL




SCREEN SEQUENCE

1 = LEVEL & FLOW
2 = PUMP ON SETPOINT
3 = PUMP OFF SETPOINT
4 = POC HIGH SETPOINT
5 = POC LOW SETPOINT
6 = SENSOR FAIL
7 = XDUCER SELECT — 1 = 0-5 psi, 2 = 0-10 psi, 3 = 0-15 psi
8 = ETM / DC
10 = ALARMS

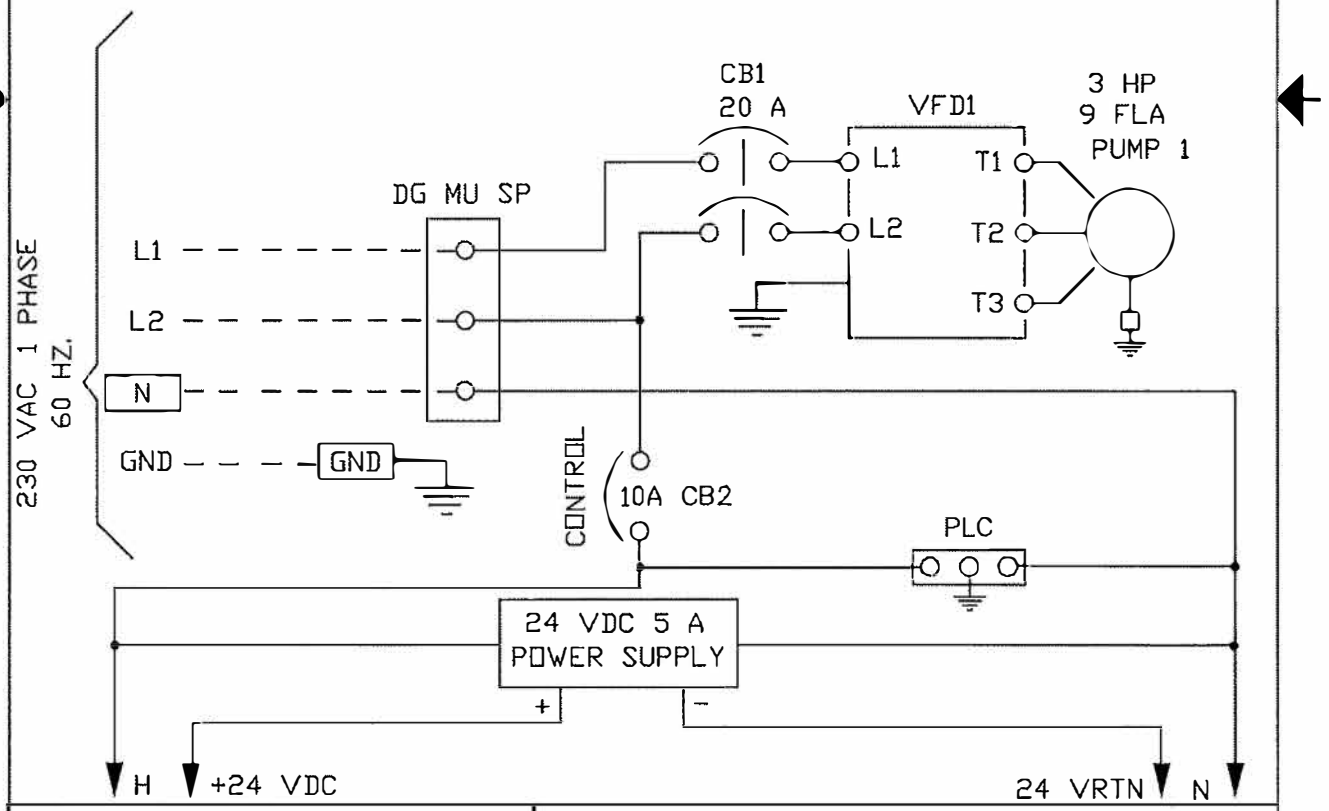



### TO TEST SETPOINTS

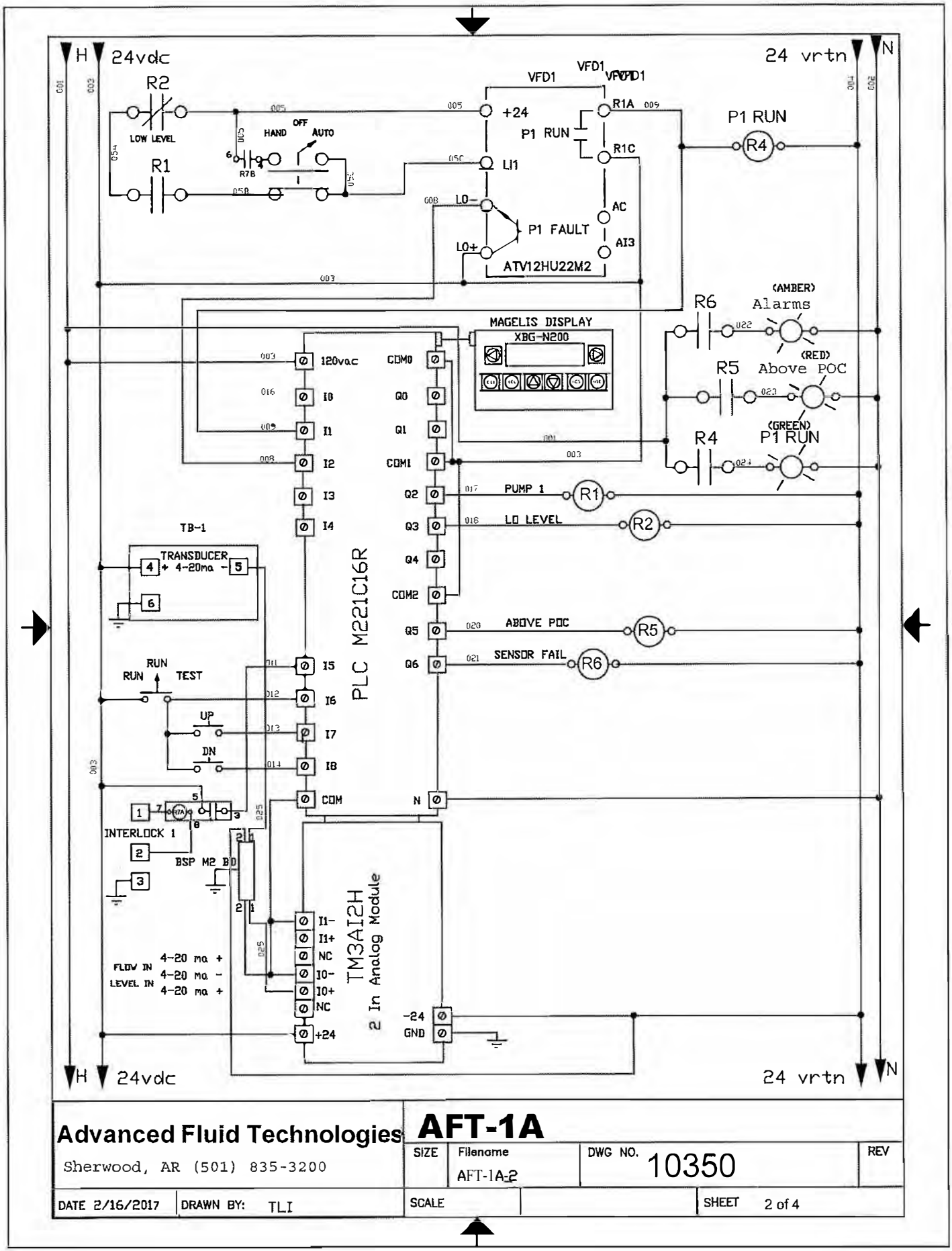
TURN AND HOLD SWITCH IN TEST POS.
PRESS THE UP / DN BUTTONS TO SIMULATE LEVEL CHANGES

### TO CHANGE A SETPOINT

SCROLL TO THE SCREEN YOU WISH TO CHANGE- PRESS THE MOD BUTTON, THEN THE INCREASE OR DECREASE BUTTONS TILL THE DESIRED VALUE IS REACHED - THEN PRESS ENTER TO FINISH




| | | | |
|---|---|---|---|
| **Advanced Fluid Technologies**<br>Sherwood AR. (501) 835-3200 | **AFT-1A** | | |
| | SIZE | Filename: AFT-1A-1 | DWG NO. 10350 REV |
| DATE 2/16/2017 | DRAWN BY: TLI | SCALE | SHEET 1 of 4 |




| | | | |
|---|---|---|---|
| **Advanced Fluid Technologies** Sherwood, AR (501) 835-3200 | **AFT-1A** | | |
| | SIZE | Filename AFT-1A-2 | DWG NO. 10350 REV |
| DATE 2/16/2017 DRAWN BY: TLI | SCALE | | SHEET 2 of 4 |

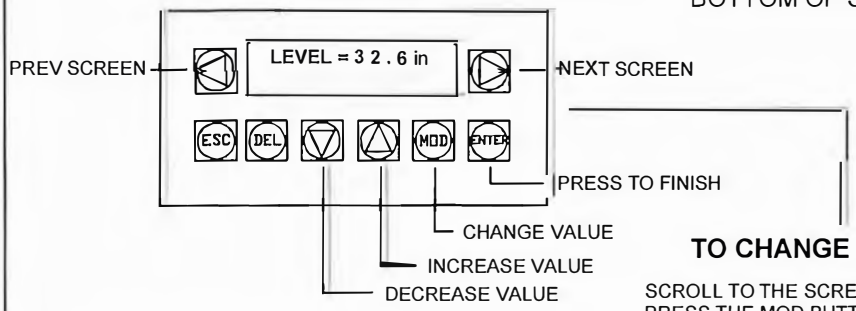
| | MFE | DISPLAY |
|---|---|---|
| POINT OF COMPLIANCE = | | |
| PUMP ON SETPOINT = | | |
| BOTTOM OF LINER = | | |
| PUMP OFF SETPOINT = | | |
| LOW LEVEL ALARM = | | |
| BOTTOM OF SUMP = | | |

ABOVE POC = FLASHING RED BEACON

ALARMS / FAULT = FLASHING AMBER BEACON

PUMP RUNNING = FLASHING GREEN BEACON

## OPERATOR CONTROL

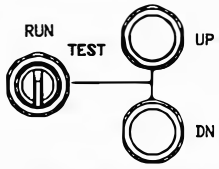



## TO CHANGE A SETPOINT

SCROLL TO THE SCREEN YOU WISH TO CHANGE- PRESS THE MOD BUTTON, THEN THE INCREASE OR DECREASE BUTTONS TILL THE DESIRED VALUE IS REACHED - THEN PRESS ENTER TO FINISH

SCREEN SEQUENCE

1 = LEVEL & FLOW
2 = PUMP ON SETPOINT
3 = PUMP OFF SETPOINT
4 = POC HIGH SETPOINT
5 = POC LOW SETPOINT
6 = SENSOR FAIL
7 = XDUCER SELECT — 1 = 0-5 psi, 2 = 0-10 psi, 3 = 0-15 psi
8 = ETM / DC
10 = ALARMS



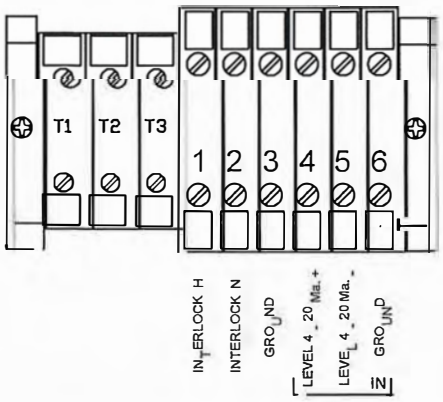

## TO TEST SETPOINTS

TURN AND HOLD SWITCH IN TEST POS. PRESS THE UP / DN BUTTONS TO SIMULATE LEVEL CHANGES

## QUICK TROUBLESHOOTING GUIDE

For the Pump to run you MUST HAVE :
HOA in AUTO or HAND
a Pump Call (Output #2 on the PLC)
No Faults
the Low Level Alarm must be Clear
and the Interlock Input must be Connected

| IF | LOOK FOR |
|---|---|
| NO Pump Call---- | Interlock Missing<br>4-20 ma Level Signal Missing or Bad<br>Pump Fault |
| Pump Fault------- | Fault Line from Drive ( input #2 on PLC )<br>Check wiring from Drive to Motor<br>Check Drive Settings - if correct, Replace Drive |




CONNECTION DETAIL TB-1

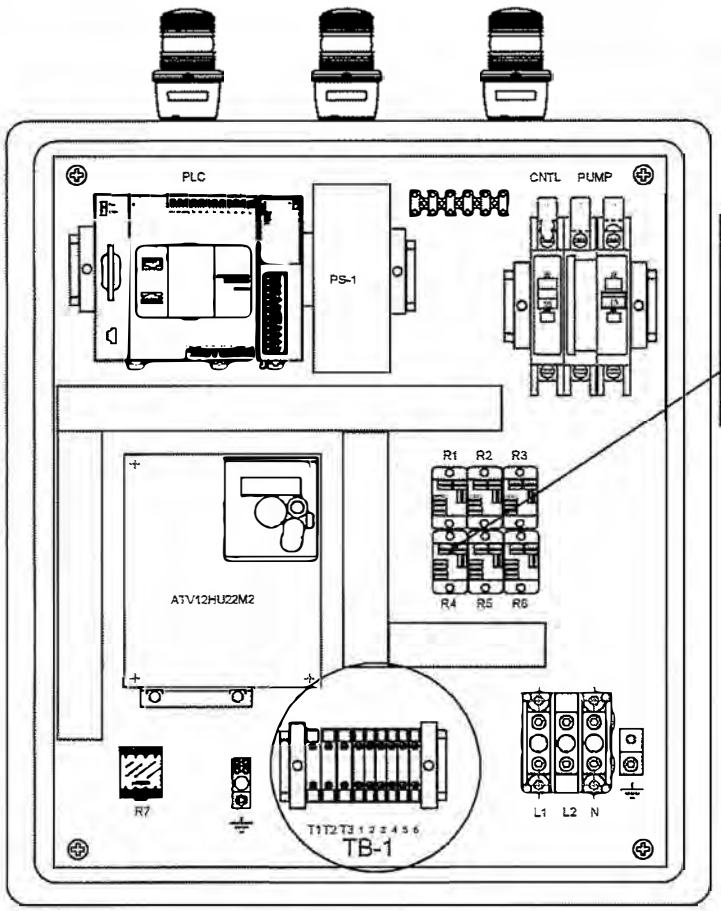
**Advanced Fluid Technologies**
Sherwood AR, (501) 835-3200

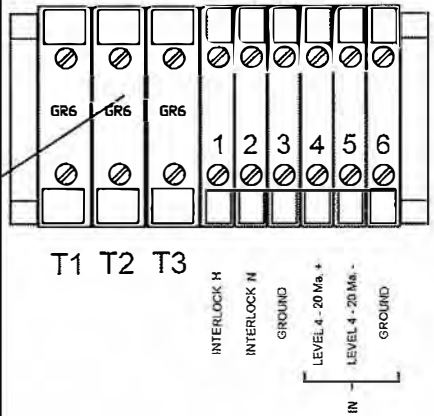
# AFT-1A

| SIZE | DWG NO. | REV |
|---|---|---|
| AFT-1A-3 | 10350 | |

| DATE | DRAWN BY: | SCALE | SHEET |
|---|---|---|---|
| 2/16/2017 | TLI | | 3 OF 4 |

| REVISIONS | | | | |
|---|---|---|---|---|
| ZONE | REV | DESCRIPTION | DATE | APPROVED |




CONNECTION DETAIL TB-1

**Advanced Fluid Technologies**
SHERWOOD, AR. 531-635-3200

# AFT-1A ENCLOSURE LAYOUT

| SIZE | FSCM NO. | DWG NO. | REV |
|---|---|---|---|
| A | WM_1A_4 | 10350 | |
| SCALE | | SHEET 4 of 4 | |

# 4" SUPER STAINLESS SUBMERSIBLE MOTORS

## ⅓ - 1.5 hp, 2 Wire: ⅓ - 3 hp 3 Wire, Single- & Three-Phase

### Application Data:

These motors are built for dependable operation in 4" diameter or larger water wells. Continuous rating in 86 °F (30 °C) water.

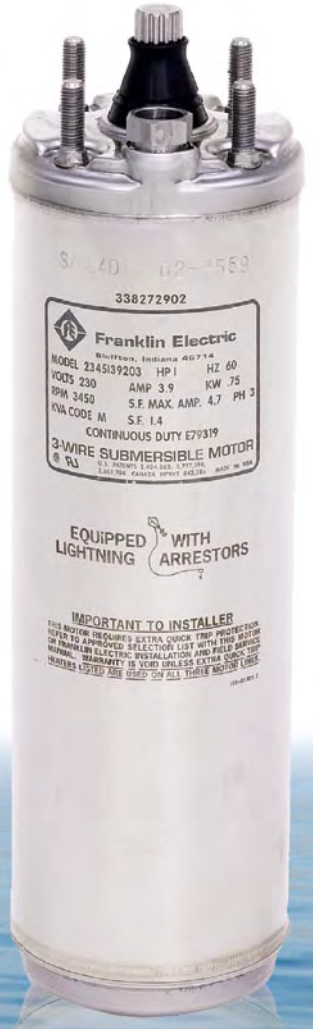
For further information, refer to Franklin Electric's "Submersible Motors: Application, Installation, Maintenance Manual."

### Special Features:

- No flow inducer sleeve required in water up to 86 °F (30 °C) for motors through 2 hp.
- Two-wire motors are split-phase designs with integral starting components and on-winding thermal overload protection, and do not require a control box. They feature Franklin's patented 2-wire BIAC starting switch which provides reverse impact torque to aid starting in adverse environments.
- Three-wire 60 Hz motors 1/3 - 1 hp use Franklin's exclusive 3-wire QD (Quick-Disconnect) Control Box with the patented QD Relay. This relay provides the ultimate in operational life.

### Basic Features:

- Corrosion-Resistant All Stainless Steel Exterior Construction
- Stainless Steel Splined Shaft
- Hermetically-Sealed Windings
- Anti-Track Self-Healing Resin System
- Water Lubrication
- Filter Check Valve
- Kingsbury-Type Thrust Bearing
- Pressure Equalizing Diaphragm
- Built-In Lightning Arrestors (all single-phase; 200 and 230 Volt three-phase)
- Removable "Water-Bloc" lead installed In North American 60 Hz water well motors. Consult factory for additional leads.
- UL 778 Recognized (North American Voltages)
- CSA Certified
- ANSI/NSF 61 Certified
- NEMA Mounting Dimensions
- Rotation: single-phase - CCW; three-phase electrically reversible




**WARNING:** Serious or fatal electrical shock or fire hazard may result from failure to follow the instructions for proper installation and use which accompany this equipment. Do not use motor in swimming areas.

System Solutions

Franklin Electric

# Availability

## Single-Phase

### 2-Wire, Split-Phase, 60 Hz, 3450 rpm

| HP | KW | VOLTS | "L" DIM | SHIPPING WEIGHT | |
|---|---|---|---|---|---|
| | | | INS | LBS | KGS |
| 1/3 | 0.25 | 115 OR 230 | 8.78 | 16 | 7.2 |
| 1/2 | 0.37 | 115 OR 230 | 9.53 | 18 | 8.1 |
| 3/4 | 0.55 | 230 | 10.66 | 21 | 9.5 |
| 1 | 0.75 | 230 | 11.75 | 24 | 10.9 |
| 1.5 | 1.1 | 230 | 15.12 | 31 | 14.1 |

### 2-Wire, Split-Phase, 50 Hz, 2875 rpm

| HP | KW | VOLTS | "L" DIM | SHIPPING WEIGHT | |
|---|---|---|---|---|---|
| | | | INS | LBS | KGS |
| 1/2 | 0.37 | 220 | 9.53 | 18 | 8.1 |
| 3/4 | 0.55 | 220 | 10.66 | 21 | 9.5 |
| 1 | 0.75 | 220 | 11.75 | 24 | 10.9 |
| 1.5 | 1.1 | 220 | 15.12 | 31 | 14.1 |

### 3-Wire, Capacitor Start, 60 Hz, 3450 rpm ①

| HP | KW | VOLTS | "L" DIM | SHIPPING WEIGHT | |
|---|---|---|---|---|---|
| | | | INS | LBS | KGS |
| 1/3 | 0.25 | 115 OR 230 | 8.78 | 17 | 7.7 |
| 1/2 | 0.37 | 115 OR 230 | 9.53 | 19 | 8.6 |
| 3/4 | 0.55 | 230 | 10.66 | 21 | 9.5 |
| 1 | 0.75 | 230 | 11.75 | 24 | 10.9 |
| 1.5 | 1.1 | 230 | 13.62 | 28 | 12.7 |
| 2 | 1.5 | 230 | 15.12 | 33 | 15.0 |
| 3 | 2.2 | 230 | 19.06 | 41 | 18.6 |

### 3-Wire, Capacitor Start, 50 Hz, 2875 rpm ①

| HP | KW | VOLTS | "L" DIM | SHIPPING WEIGHT | |
|---|---|---|---|---|---|
| | | | INS | LBS | KGS |
| 1/3 | 0.25 | 220 | 8.78 | 17 | 7.7 |
| 1/2 | 0.37 | 220 | 9.53 | 19 | 8.6 |
| 3/4 | 0.55 | 220 | 10.66 | 21 | 9.5 |
| 1 | 0.75 | 220 | 11.75 | 24 | 10.9 |
| 1.5 | 1.1 | 220 | 13.62 | 28 | 12.7 |
| 2 | 1.5 | 220 | 15.12 | 33 | 15.0 |
| 3 | 2.2 | 220 | 19.06 | 41 | 18.6 |

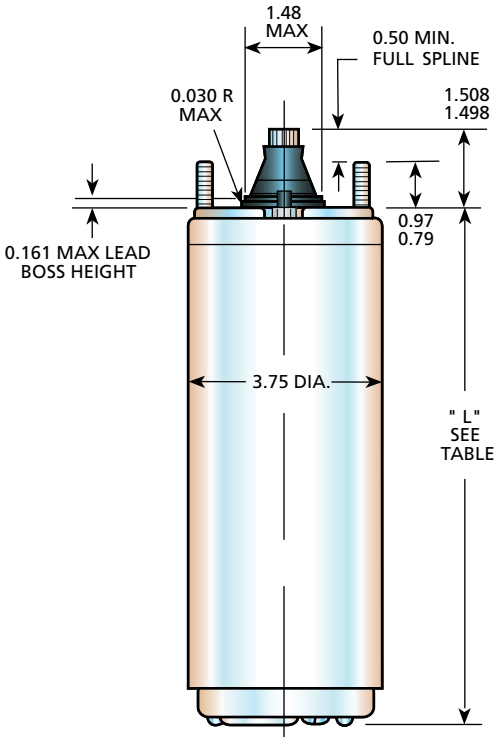
## Three-Phase

### 200, 230, 380, 460, 575 Volt-60 Hz; 220, 380 Volt-50 Hz

Consult factory for dimensional and weight data.

# Construction Materials

| Components | Standard Water Well |
|---|---|
| Casting | 304 SS Over Iron |
| Stator Shell | 301 SS |
| Shaft Extension | 17-4 SS |
| Fasteners | 305 SS or 302 SS |
| Seal Cover | Acetal |
| Seal | Nitrile Rubber Lip |
| Diaphragm | Nitrile Rubber |
| Diaphragm Cover | 301 SS |
| Slinger | Nitrile Rubber |
| Lead Wire (or Cable) | XLPE ② |
| Lead Potting | Epoxy |
| Lead Jam Nut | 303 SS |




① Franklin Electric control box required.

② Removable type installed in North American 60 Hz rated water well motors. Consult factory for additional leads.

Specifications subject to change without notice. Contact Franklin Electric if material types are required for bid specifications.


**Franklin Electric**

400 East Spring Street, Bluffton, Indiana 46714 • Tel: 260.824.2900 Fax: 260.824.2909 • **www.franklin-electric.com**

# 4" SP SERIES SUBMERSIBLE PUMPS
## 3600 RPM • 60 Hz
### 5 • 10 • 18 • 25 • 40 • 70 GPM

**SP Series Submersible Pumps** are manufactured using high quality materials and are designed to deliver years of dependable service. SP Series are comprised of a large selection of pump models ranging from 1/2 HP thru 10 HP with a broad variety of capacities (5 GPM - 70 GPM).

**Recommended for Pumping Clear Water**

## QUALITY FEATURES

STAINLESS STEEL CONSTRUCTION DESIGNED AND BUILT FOR YEARS OF TROUBLE FREE OPERATION

STAINLESS STEEL DISCHARGE HEAD WITH BUILT-IN CHECK VALVE

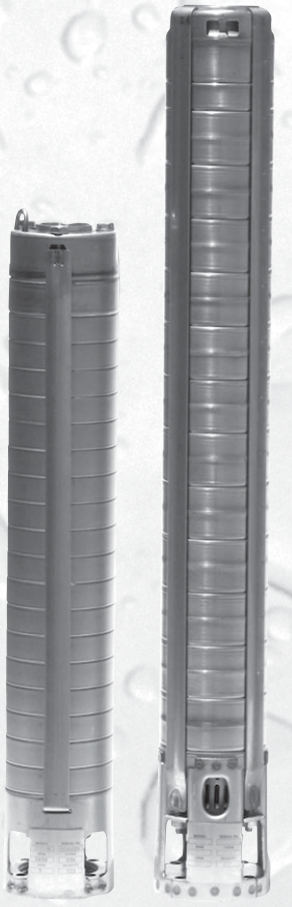
HIGH-EFFICIENCY STAINLESS STEEL IMPELLERS AND DIFFUSERS

STAINLESS STEEL SUCTION SCREEN

STAINLESS STEEL SHAFT AND COUPLING

STAINLESS STEEL NEMA FACED MOUNTING BRACKET

*Specifications subject to change without notice.*



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## DESIGNATION

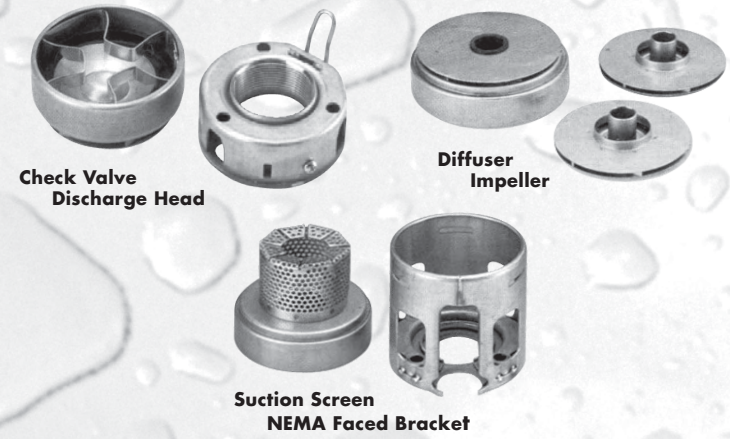
SP 10 21 - 15

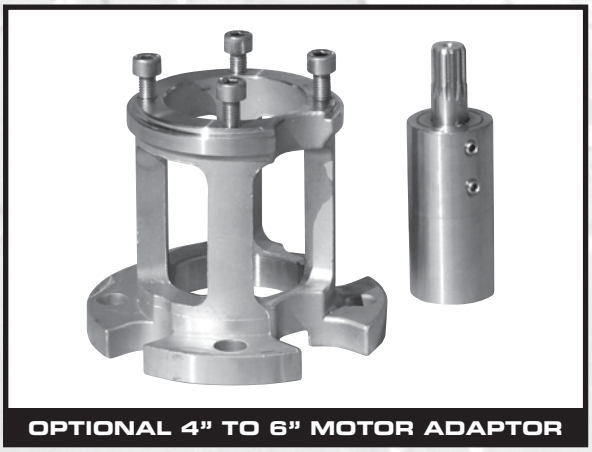
- Series
- Capacity - U.S. GPM
- Number of Stages
- Horsepower

**8" Pumps Feature:**
Cast Stainless Steel 5" Discharge Head & NEMA Mounting Bracket

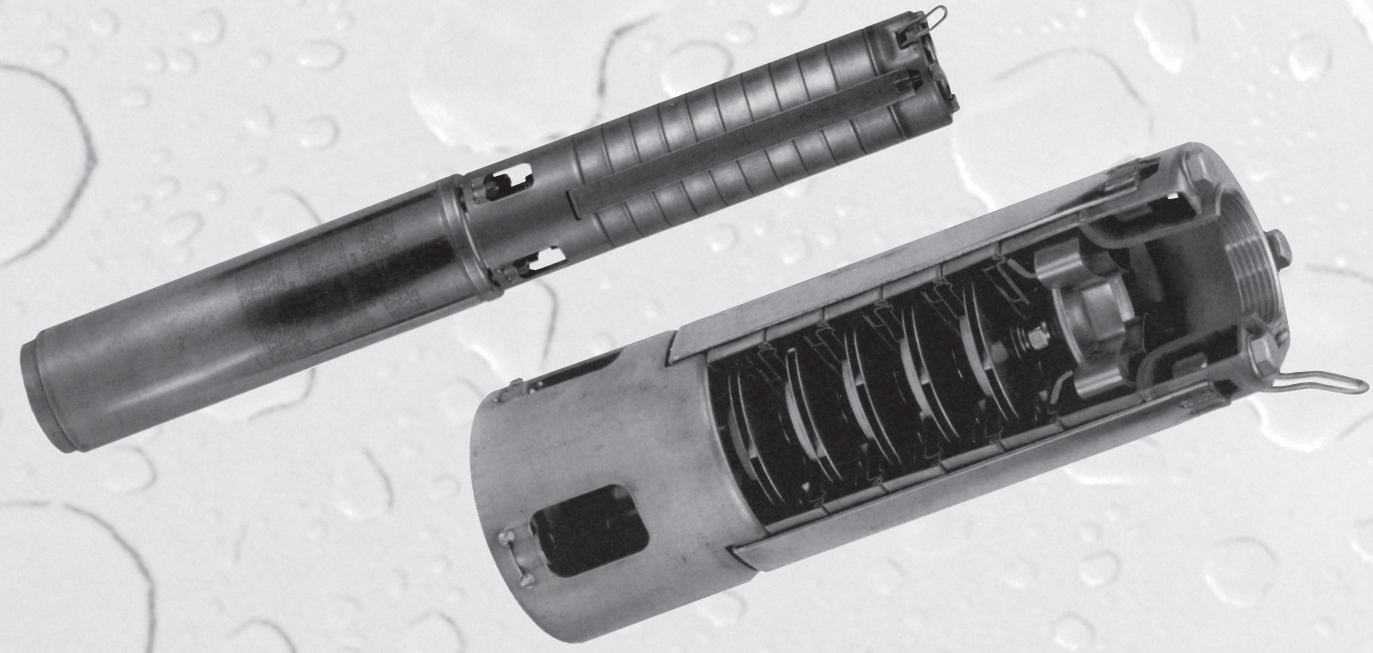
## MATERIALS OF CONSTRUCTION

| COMPONENT | MATERIALS | STANDARD |
|---|---|---|
| Valve Casing | Stainless Steel | 304 |
| Valve Cup | Stainless Steel | 304 |
| Valve Seat | Stainless Steel | 304 |
| Diffuser | Stainless Steel | 304 |
| Neck Ring | NBR | |
| Diffuser Bearing | NBR | |
| Split Cone Nut | Stainless Steel | 304 |
| Split Cone | Stainless Steel | 304 |
| Impeller | Stainless Steel | 304 |
| NEMA Mounting Bracket | Stainless Steel | 304 |
| Strainer | Stainless Steel | 304 |
| Shaft | Stainless Steel | 304 |
| Strap | Stainless Steel | 304 |
| Nut for Strap | Stainless Steel | 304 |
| Coupling | Stainless Steel | 304 |
| Valve Guide | Stainless Steel | 304 |



**OPTIONAL 4" TO 6" MOTOR ADAPTOR**



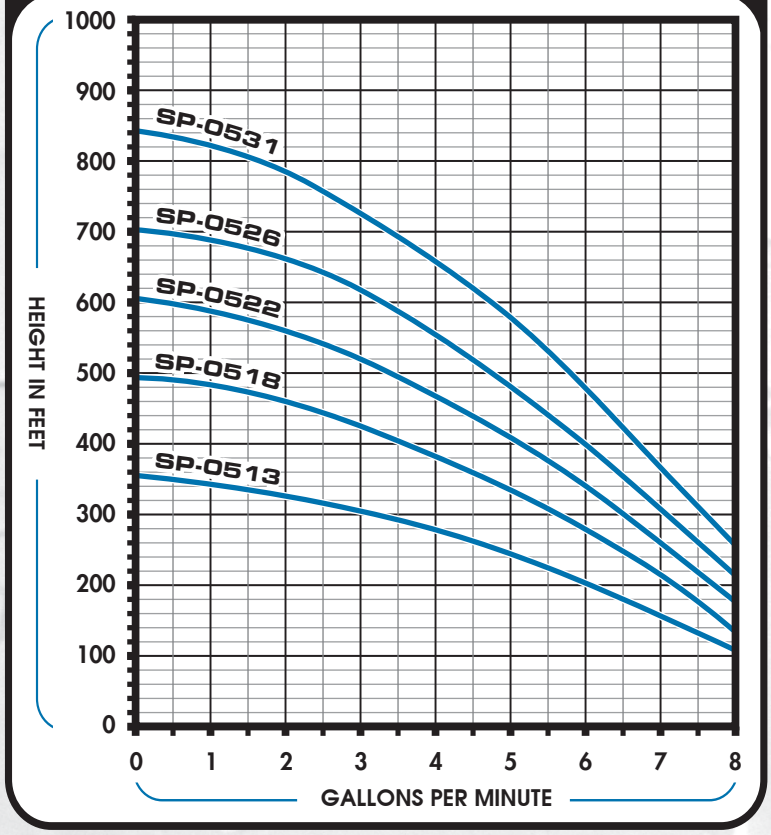
OUR PUMPS ARE POWERED BY
**Franklin Electric**

WWW.AFTGRP.COM • 7801 WARDEN RAOD • Sherwood, AR 72120 • Tel: 501-835-3200 • Fax: 501-835-3251 Email: info@aftgrp.ocm

AFT
ADVANCED FLUID TECHNOLOGIES

# 4" MODEL SP-05
## 60 Hz - 3600 RPM

## SP SERIES PERFORMANCE CURVES
### 5 GPM MAXIMUM EFFICIENCY




**5 GPM ½ - 1½ HP 1¼" Discharge**

| MODEL | HP | STAGES | PHASE | LENGTH (IN) | | WEIGHT (LB) | |
|---|---|---|---|---|---|---|---|
| | | | | PUMP | MOTOR | PUMP | MOTOR |
| SP-0513 | ½ | 13 | 1 | 16.8 | 9.5 | 8.4 | 18 |
| SP-0518 | ¾ | 18 | 1 | 21.0 | 10.7 | 10.6 | 21 |
| SP-0522 | 1 | 22 | 1 | 24.3 | 11.8 | 12.1 | 23 |
| SP-0526 | 1½ | 26 | 1 | 27.5 | 13.6 | 13.7 | 27 |
| | | | 3 | | 11.8 | | 26 |
| SP-0531 | 1½ | 31 | 1 | 31.7 | 13.6 | 15.9 | 27 |
| | | | 3 | | 11.8 | | 26 |

## SELECTION CHART

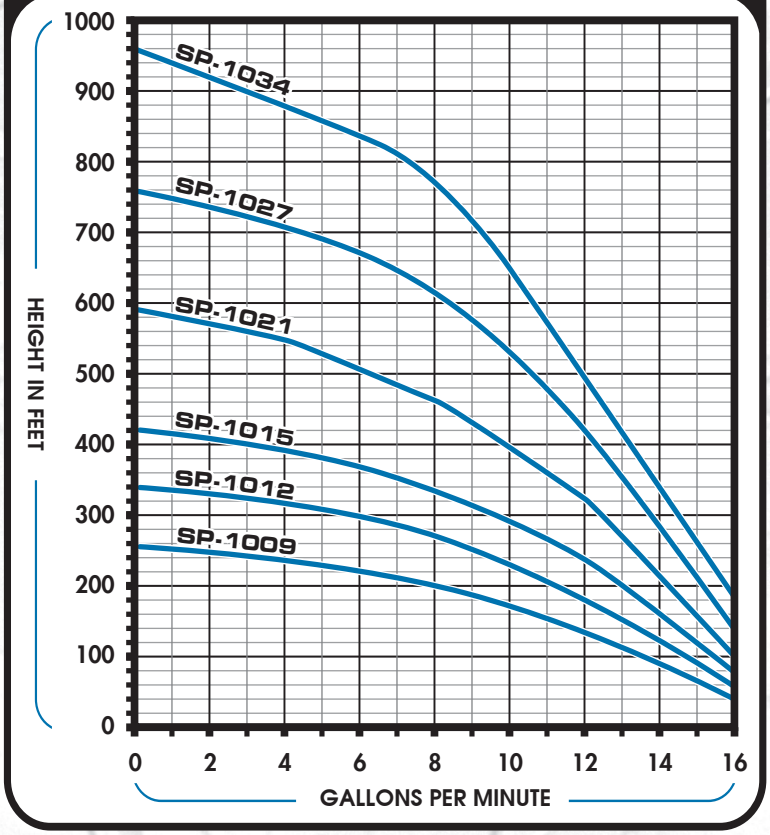
| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 | 460 | 500 | 540 | 580 | 620 | 660 | 700 | 740 | 780 | | |
| SP-0513 | ½ | 0 | | | | | | | 7.4 | 6.9 | 6.5 | 6.0 | 5.5 | 5.1 | 4.6 | 4.1 | 3.4 | | | | | | | | | | | | | | |
| | | 20 | | | | | 7.2 | 6.8 | 6.3 | 5.8 | 5.4 | 4.9 | 4.5 | 3.9 | 3.2 | 2.2 | | | | | | | | | | | | | | | |
| | | 30 | | | | 7.2 | 6.7 | 6.2 | 5.8 | 5.3 | 4.9 | 4.4 | 3.8 | 3.1 | 2.0 | | | | | | | | | | | | | | | | |
| | | 40 | | 7.5 | 7.1 | 6.6 | 6.2 | 5.7 | 5.2 | 4.8 | 4.3 | 3.7 | 2.9 | 1.8 | | | | | | | | | | | | | | | | |
| | | 50 | 7.5 | 7.0 | 6.6 | 6.1 | 5.6 | 5.2 | 4.7 | 4.2 | 3.6 | 2.8 | 1.5 | | | | | | | | | | | | | | | | | |
| | | 60 | 7.0 | 6.5 | 6.0 | 5.6 | 5.1 | 4.6 | 4.1 | 3.5 | 2.6 | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 144 | 135 | 126 | 118 | 109 | 101 | 92 | 83 | 75 | 66 | 57 | 49 | 40 | 31 | 23 | | | | | | | | | | | | | | |
| SP-0518 | ¾ | 0 | | | | | | | | 7.9 | 7.6 | 7.3 | 7.0 | 6.6 | 6.3 | 5.9 | 5.6 | 4.9 | 4.2 | 3.3 | 1.8 | | | | | | | | | | |
| | | 20 | | | | | | 7.8 | 7.5 | 6.8 | 6.5 | 6.2 | 5.8 | 5.5 | 5.2 | 4.8 | 4.1 | 3.1 | 1.4 | | | | | | | | | | | | |
| | | 30 | | | | | 7.8 | 7.5 | 7.1 | 6.8 | 6.5 | 6.1 | 5.8 | 5.4 | 5.1 | 4.8 | 4.4 | 3.6 | 2.3 | | | | | | | | | | | | |
| | | 40 | | | | 7.7 | 7.4 | 7.1 | 6.7 | 6.4 | 6.1 | 5.7 | 5.4 | 5.1 | 4.7 | 4.4 | 4.0 | 2.9 | 1.1 | | | | | | | | | | | | |
| | | 50 | | | 7.7 | 7.4 | 7.0 | 6.7 | 6.3 | 6.0 | 5.7 | 5.3 | 5.0 | 4.7 | 4.3 | 3.9 | 3.4 | 2.0 | | | | | | | | | | | | | |
| | | 60 | | 7.6 | 7.3 | 7.0 | 6.6 | 6.3 | 6.0 | 5.6 | 5.3 | 5.0 | 4.6 | 4.3 | 3.9 | 3.4 | 2.7 | | | | | | | | | | | | | | |
| Shut-off PSI | | | 202 | 193 | 185 | 176 | 167 | 159 | 150 | 141 | 133 | 124 | 116 | 107 | 98 | 90 | 81 | 64 | 46 | 29 | 12 | | | | | | | | | | |
| SP-0522 | 1 | 0 | | | | | | | | | | | 7.6 | 7.3 | 7.1 | 6.8 | 6.5 | 6.0 | 5.4 | 4.9 | 4.3 | 3.6 | 2.6 | | | | | | | | |
| | | 20 | | | | | | | | | 7.5 | 7.3 | 7.0 | 6.7 | 6.4 | 6.2 | 5.9 | 5.3 | 4.8 | 4.2 | 3.5 | 2.4 | | | | | | | | | |
| | | 30 | | | | | | | | 7.5 | 7.2 | 6.9 | 6.7 | 6.4 | 6.1 | 5.8 | 5.6 | 5.0 | 4.5 | 3.8 | 2.9 | 1.5 | | | | | | | | | |
| | | 40 | | | | | | | 7.4 | 7.2 | 6.9 | 6.6 | 6.3 | 6.1 | 5.8 | 5.5 | 5.2 | 4.7 | 4.1 | 3.3 | 2.2 | | | | | | | | | | |
| | | 50 | | | | | | 7.4 | 7.1 | 6.9 | 6.6 | 6.3 | 6.0 | 5.7 | 5.5 | 5.2 | 4.9 | 4.4 | 3.7 | 2.7 | 1.2 | | | | | | | | | | |
| | | 60 | | | | | 7.4 | 7.1 | 6.8 | 6.5 | 6.3 | 6.0 | 5.7 | 5.4 | 5.2 | 4.9 | 4.0 | 3.2 | 1.9 | | | | | | | | | | | | |
| Shut-off PSI | | | | | | | 215 | 206 | 197 | 189 | 180 | 171 | 163 | 154 | 145 | 137 | 128 | 111 | 94 | 76 | 59 | 42 | 24 | | | | | | | | |
| SP-0526 | 1½ | 0 | | | | | | | | | | | | 7.8 | 7.6 | 7.4 | 7.2 | 6.7 | 6.2 | 5.7 | 5.3 | 4.8 | 4.4 | 3.8 | 3.0 | 1.9 | | | | |
| | | 20 | | | | | | | | | | | 7.5 | 7.3 | 7.1 | 6.9 | 6.6 | 6.1 | 5.7 | 5.2 | 4.8 | 4.3 | 3.7 | 2.9 | 1.7 | | | | | |
| | | 30 | | | | | | | | | | 7.5 | 7.3 | 7.1 | 6.8 | 6.6 | 6.3 | 5.9 | 5.4 | 5.0 | 4.5 | 4.0 | 3.3 | 2.3 | | | | | | |
| | | 40 | | | | | | | | | 7.5 | 7.2 | 7.0 | 6.8 | 6.5 | 6.3 | 6.1 | 5.6 | 5.2 | 4.7 | 4.2 | 3.6 | 2.7 | 1.5 | | | | | | |
| | | 50 | | | | | | | | 7.4 | 7.2 | 7.0 | 6.7 | 6.5 | 6.3 | 6.0 | 5.8 | 5.3 | 4.9 | 4.4 | 3.9 | 3.1 | 2.1 | | | | | | | |
| | | 60 | | | | | | | 7.4 | 7.2 | 6.9 | 6.7 | 6.5 | 6.2 | 6.0 | 5.8 | 5.5 | 5.1 | 4.6 | 4.1 | 3.5 | 2.6 | | | | | | | | |
| Shut-off PSI | | | | | | | | | 244 | 235 | 226 | 218 | 209 | 201 | 192 | 183 | 175 | 157 | 140 | 123 | 105 | 88 | 71 | 53 | 36 | 19 | | | | | |
| SP-0531 | 1½ | 0 | | | | | | | | | | | | | | | 7.7 | 7.3 | 6.9 | 6.5 | 6.2 | 5.8 | 5.4 | 5.0 | 4.6 | 4.2 | 3.7 | 3.0 | 2.1 | | |
| | | 20 | | | | | | | | | | | | | | 7.4 | 7.3 | 6.9 | 6.5 | 6.1 | 5.7 | 5.3 | 4.9 | 4.5 | 4.1 | 3.6 | 2.9 | 1.9 | | | |
| | | 30 | | | | | | | | | | | | | 7.4 | 7.2 | 7.0 | 6.7 | 6.3 | 5.9 | 5.5 | 5.1 | 4.7 | 4.3 | 3.8 | 3.2 | 2.4 | 1.2 | | | |
| | | 40 | | | | | | | | | | | | 7.4 | 7.2 | 7.0 | 6.8 | 6.4 | 6.0 | 5.6 | 5.3 | 4.9 | 4.5 | 4.0 | 3.5 | 2.8 | 1.8 | | | | |
| | | 50 | | | | | | | | | | 7.5 | 7.4 | 7.2 | 7.0 | 6.8 | 6.6 | 6.2 | 5.8 | 5.4 | 5.0 | 4.7 | 4.2 | 3.7 | 3.1 | 2.2 | | | | | |
| | | 60 | | | | | | | | | 7.5 | 7.3 | 7.1 | 7.0 | 6.8 | 6.6 | 6.4 | 6.0 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.4 | 2.6 | 1.6 | | | | | |
| Shut-off PSI | | | | | | | | | | | 285 | 276 | 268 | 259 | 250 | 242 | 233 | 216 | 198 | 181 | 164 | 146 | 129 | 112 | 95 | 77 | 60 | 43 | 25 | | |

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AFT
ADVANCED FLUID TECHNOLOGIES

# 4" MODEL SP-10
## 60 Hz - 3600 RPM

## SP SERIES PERFORMANCE CURVES
### 10 GPM MAXIMUM EFFICIENCY




**10 GPM ½ - 3 HP 1¼" Discharge**

| MODEL | HP | STAGES | PHASE | LENGTH (IN) | | WEIGHT (LB) | |
|---|---|---|---|---|---|---|---|
| | | | | PUMP | MOTOR | PUMP | MOTOR |
| SP-1009 | ½ | 9 | 1 | 13.5 | 9.5 | 6.9 | 18 |
| SP-1012 | ¾ | 12 | 1 | 16.0 | 10.7 | 8.0 | 21 |
| SP-1015 | 1 | 15 | 1 | 18.5 | 11.8 | 9.3 | 23 |
| SP-1021 | 1½ | 21 | 1 | 23.5 | 13.6 | 12.6 | 27 |
| | | | 3 | | 11.8 | | 26 |
| SP-1027 | 2 | 27 | 1 | 28.4 | 15.1 | 15.0 | 30 |
| | | | 3 | | 13.6 | | 28 |
| SP-1034 | 3 | 34 | 1 | 34.2 | 23.5 | 19.0 | 54 |
| | | | 3 | | 20.6 | | 44 |

## SELECTION CHART

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 | 460 | 500 | 540 | 580 | 620 | 660 | 700 | 740 | 780 | 820 | 860 | 900 |
| SP-1009 | ½ | 0 | | 16.2 | 15.5 | 14.8 | 14.0 | 13.1 | 12.1 | 11.0 | 9.8 | 8.3 | 6.3 | 3.1 | | | | | | | | | | | | | | | | | | |
| | | 20 | 15.3 | 14.6 | 13.7 | 12.8 | 11.7 | 10.6 | 9.4 | 7.8 | 5.4 | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | 14.4 | 13.6 | 12.6 | 11.6 | 10.4 | 9.1 | 7.5 | 5.0 | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | 13.4 | 12.4 | 11.4 | 10.3 | 8.9 | 7.1 | 4.5 | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | 12.3 | 11.2 | 10.1 | 8.7 | 6.8 | 4.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 11.1 | 9.9 | 8.4 | 6.4 | 3.4 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 101 | 92 | 84 | 75 | 66 | 58 | 49 | 41 | 32 | 23 | 15 | 6 | | | | | | | | | | | | | | | | | | |
| SP-1012 | ¾ | 0 | | | 16.0 | 15.5 | 15.0 | 14.4 | 13.8 | 13.1 | 12.3 | 11.5 | 10.7 | 9.8 | 8.7 | 7.4 | 5.6 | | | | | | | | | | | | | | | |
| | | 20 | 15.9 | 15.4 | 14.8 | 14.2 | 13.5 | 12.8 | 12.1 | 11.3 | 10.4 | 9.5 | 8.3 | 6.9 | 4.9 | 2.2 | | | | | | | | | | | | | | | | |
| | | 30 | 15.3 | 14.7 | 14.1 | 13.4 | 12.7 | 12.0 | 11.1 | 10.3 | 9.3 | 8.1 | 6.6 | 4.6 | | | | | | | | | | | | | | | | | | |
| | | 40 | 14.6 | 14.0 | 13.3 | 12.6 | 11.8 | 11.0 | 10.1 | 9.1 | 7.9 | 6.3 | 4.2 | | | | | | | | | | | | | | | | | | | |
| | | 50 | 13.9 | 13.2 | 12.5 | 11.7 | 10.9 | 10.0 | 9.0 | 7.7 | 6.0 | 3.8 | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 13.1 | 12.4 | 11.6 | 10.8 | 9.8 | 8.8 | 7.5 | 5.7 | 3.3 | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 138 | 129 | 120 | 112 | 103 | 94 | 86 | 77 | 68 | 60 | 51 | 42 | 34 | 25 | 16 | | | | | | | | | | | | | | | |
| SP-1015 | 1 | 0 | | | | 16.0 | 15.8 | 15.5 | 15.0 | 14.5 | 13.9 | 13.2 | 12.5 | 11.8 | 11.2 | 10.5 | 9.8 | 8.0 | 5.2 | | | | | | | | | | | | | | |
| | | 20 | | 15.9 | 15.7 | 15.3 | 14.9 | 14.3 | 13.7 | 13.0 | 12.3 | 11.6 | 10.9 | 10.3 | 9.5 | 8.7 | 7.6 | 4.6 | | | | | | | | | | | | | | | |
| | | 30 | 15.9 | 15.6 | 15.3 | 14.8 | 14.2 | 13.6 | 12.9 | 12.2 | 11.5 | 10.8 | 10.1 | 9.4 | 8.5 | 7.4 | 6.1 | | | | | | | | | | | | | | | | |
| | | 40 | 15.6 | 15.2 | 14.7 | 14.1 | 13.5 | 12.8 | 12.1 | 11.4 | 10.7 | 10.0 | 9.3 | 8.4 | 7.3 | 5.8 | 4.0 | | | | | | | | | | | | | | | | |
| | | 50 | 15.1 | 14.6 | 14.0 | 13.4 | 12.7 | 12.0 | 11.3 | 10.6 | 9.9 | 9.1 | 8.2 | 7.1 | 5.6 | 3.6 | | | | | | | | | | | | | | | | |
| | | 60 | 14.5 | 13.9 | 13.2 | 12.6 | 11.9 | 11.2 | 10.5 | 9.8 | 9.0 | 8.1 | 6.9 | 5.3 | 3.3 | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 174 | 166 | 157 | 148 | 140 | 131 | 122 | 114 | 105 | 96 | 88 | 79 | 70 | 62 | 53 | 36 | 18 | | | | | | | | | | | | | |
| SP-1021 | 1½ | 0 | | | | | | 15.8 | 15.5 | 15.2 | 14.9 | 14.6 | 14.2 | 13.9 | 13.5 | 13.1 | 12.6 | 11.8 | 10.8 | 9.8 | 8.5 | 6.9 | 4.6 | | | | | | | | | | |
| | | 20 | | | 16.0 | 15.7 | 15.4 | 15.1 | 14.8 | 14.5 | 14.1 | 13.7 | 13.3 | 12.9 | 12.5 | 12.1 | 11.6 | 10.7 | 9.6 | 8.3 | 6.6 | 4.2 | | | | | | | | | | |
| | | 30 | | 16.0 | 15.7 | 15.4 | 15.1 | 14.8 | 14.4 | 14.1 | 13.7 | 13.3 | 12.9 | 12.4 | 12.0 | 11.5 | 11.1 | 10.1 | 8.9 | 7.4 | 5.3 | 2.3 | | | | | | | | | | |
| | | 40 | 15.9 | 15.6 | 15.4 | 15.0 | 14.7 | 14.4 | 14.0 | 13.6 | 13.2 | 12.8 | 12.4 | 11.9 | 11.5 | 11.0 | 10.5 | 9.4 | 8.1 | 6.3 | 3.7 | | | | | | | | | | | |
| | | 50 | 15.6 | 15.3 | 15.0 | 14.7 | 14.3 | 13.9 | 13.6 | 13.2 | 12.7 | 12.3 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 8.7 | 7.1 | 4.9 | | | | | | | | | | | | |
| | | 60 | 15.3 | 14.9 | 14.6 | 14.3 | 13.9 | 13.5 | 13.1 | 12.7 | 12.2 | 11.8 | 11.3 | 10.9 | 10.4 | 9.8 | 9.2 | 7.9 | 6.0 | 3.2 | | | | | | | | | | | | |
| Shut-off PSI | | | 247 | 239 | 230 | 222 | 213 | 204 | 196 | 187 | 178 | 170 | 161 | 152 | 144 | 135 | 126 | 109 | 92 | 74 | 57 | 40 | 22 | | | | | | | | | |
| SP-1027 | 2 | 0 | | | | | 16.4 | 16.2 | 16.0 | 15.8 | 15.5 | 15.3 | 15.1 | 14.8 | 14.6 | 14.3 | 14.0 | 13.4 | 12.7 | 12.1 | 11.3 | 10.6 | 9.8 | 8.8 | 7.7 | 6.3 | 4.3 | | | | | |
| | | 20 | | | | | 15.9 | 15.7 | 15.5 | 15.2 | 15.0 | 14.7 | 14.5 | 14.2 | 13.9 | 13.6 | 13.3 | 12.6 | 11.9 | 11.2 | 10.5 | 9.6 | 8.7 | 7.5 | 6.0 | 4.0 | | | | | | |
| | | 30 | | | | 15.9 | 15.7 | 15.2 | 15.0 | 14.7 | 14.4 | 14.1 | 13.8 | 13.5 | 13.2 | 12.9 | 12.2 | 11.5 | 10.8 | 10.0 | 9.1 | 8.0 | 6.7 | 4.9 | 2.5 | | | | | | | |
| | | 40 | | 16.0 | 15.8 | 15.6 | 15.2 | 14.9 | 14.7 | 14.4 | 14.1 | 13.8 | 13.5 | 13.2 | 12.9 | 12.5 | 11.8 | 11.1 | 10.4 | 9.5 | 8.5 | 7.3 | 5.7 | 3.6 | | | | | | | | |
| | | 50 | 16.0 | 15.8 | 15.6 | 15.4 | 15.1 | 14.9 | 14.6 | 14.3 | 14.1 | 13.8 | 13.4 | 13.1 | 12.8 | 12.4 | 12.1 | 11.4 | 10.7 | 9.9 | 9.0 | 7.8 | 6.4 | 4.6 | 2.1 | | | | | | | |
| | | 60 | 15.8 | 15.6 | 15.3 | 15.1 | 14.8 | 14.6 | 14.3 | 14.0 | 13.7 | 13.4 | 13.1 | 12.8 | 12.4 | 12.1 | 11.7 | 11.0 | 10.2 | 9.4 | 8.3 | 7.1 | 5.4 | 3.2 | | | | | | | | |
| Shut-off PSI | | | 321 | 312 | 303 | 295 | 286 | 277 | 269 | 260 | 251 | 243 | 234 | 225 | 217 | 208 | 199 | 182 | 165 | 148 | 130 | 113 | 96 | 78 | 61 | 44 | 26 | | | | | |
| SP-1034 | 3 | 0 | | | | | | | | | 15.9 | 15.8 | 15.6 | 15.4 | 15.2 | 15.0 | 14.8 | 14.4 | 14.0 | 13.5 | 13.0 | 12.4 | 11.9 | 11.3 | 10.2 | 10.1 | 9.4 | 8.6 | 7.7 | 6.6 | 5.2 | 3.5 |
| | | 20 | | | | | | | 16.0 | 15.9 | 15.7 | 15.5 | 15.4 | 15.2 | 15.0 | 14.8 | 14.6 | 14.3 | 13.9 | 13.4 | 12.9 | 12.4 | 11.8 | 11.2 | 10.7 | 10.0 | 9.3 | 8.5 | 7.6 | 6.4 | 5.0 | 3.1 |
| | | 30 | | | | | 16.0 | 15.9 | 15.7 | 15.5 | 15.3 | 15.1 | 14.9 | 14.7 | 14.5 | 14.3 | 14.1 | 13.6 | 13.1 | 12.6 | 12.0 | 11.5 | 10.9 | 10.3 | 9.6 | 8.9 | 8.0 | 6.9 | 5.6 | 4.0 | | |
| | | 40 | | | | 16.0 | 16.8 | 15.7 | 15.5 | 15.3 | 15.1 | 14.9 | 14.7 | 14.5 | 14.3 | 14.0 | 13.8 | 13.3 | 12.8 | 12.3 | 11.7 | 11.2 | 10.6 | 9.9 | 9.2 | 8.4 | 7.4 | 6.2 | 4.7 | 2.8 | |
| | | 50 | | | 16.0 | 15.8 | 15.6 | 15.5 | 15.3 | 15.1 | 14.9 | 14.7 | 14.5 | 14.2 | 14.0 | 13.8 | 13.5 | 13.0 | 12.5 | 12.0 | 11.4 | 10.8 | 10.2 | 9.5 | 8.7 | 7.8 | 6.7 | 5.4 | 3.7 | | | |
| | | 60 | | 15.9 | 15.8 | 15.6 | 15.4 | 15.2 | 15.1 | 14.9 | 14.6 | 14.4 | 14.2 | 14.0 | 13.7 | 13.5 | 13.2 | 12.7 | 12.2 | 11.6 | 11.1 | 10.5 | 9.8 | 9.1 | 8.2 | 7.2 | 6.0 | 4.5 | 2.5 | | | |
| Shut-off PSI | | | 406 | 397 | 389 | 380 | 371 | 363 | 354 | 345 | 337 | 328 | 319 | 311 | 302 | 293 | 285 | 268 | 250 | 233 | 216 | 198 | 181 | 164 | 146 | 129 | 112 | 94 | 77 | 60 | 42 | 25 |

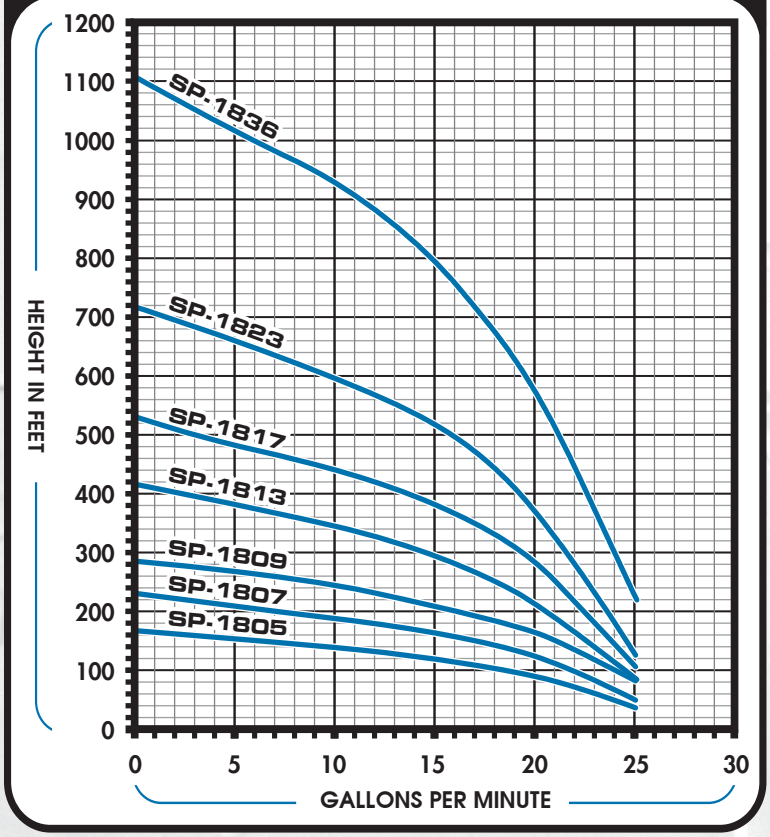
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# 4" MODEL SP-18
## 60 Hz - 3600 RPM

**18 GPM ½ - 5 HP 1¼" Discharge**

| MODEL | HP | STAGES | PHASE | LENGTH (IN) | | WEIGHT (LB) | |
|---|---|---|---|---|---|---|---|
| | | | | PUMP | MOTOR | PUMP | MOTOR |
| SP-1805 | ½ | 5 | 1 | 10.3 | 9.5 | 5.1 | 18 |
| SP-1807 | ¾ | 7 | 1 | 11.7 | 10.7 | 6.0 | 21 |
| SP-1809 | 1 | 9 | 1 | 13.4 | 11.8 | 6.9 | 23 |
| SP-1813 | 1½ | 13 | 1 | 16.9 | 13.6 | 8.6 | 27 |
| | | | 3 | | 11.8 | | 26 |
| SP-1817 | 2 | 17 | 1 | 20.2 | 15.1 | 10.4 | 30 |
| | | | 3 | | 13.6 | | 28 |
| SP-1823 | 3 | 23 | 1 | 25.1 | 23.5 | 13.0 | 54 |
| | | | 3 | | 20.6 | | 44 |
| SP-1836 | 5 | 36 | 1 | 35.9 | 29.5 | 18.7 | 65 |
| | | | 3 | | 23.5 | | 50 |

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 |
| SP-1805 | ½ | 0 | | 23.7 | 22.4 | 20.1 | 17.1 | 13.1 | 6.2 | | | | |
| | | 20 | 21.8 | 19.2 | 16.1 | 11.3 | | | | | | | |
| | | 30 | 18.7 | 15.5 | 10.3 | | | | | | | | |
| | | 40 | 14.9 | 9.2 | | | | | | | | | |
| | | 50 | 8.0 | | | | | | | | | | |
| Shut-off PSI | | | 59 | 50 | 42 | 33 | 24 | 16 | 7 | | | | |




## SELECTION CHART

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 | 460 | 500 | 540 | 580 | 620 | 660 | 700 | 740 | 780 | 820 | 860 | 900 | 940 | 980 |
| SP-1807 | ¾ | 0 | | 25.4 | 23.6 | 22.7 | 21.2 | 19.3 | 17.1 | 14.5 | 10.5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20 | 23.4 | 22.3 | 20.7 | 18.6 | 16.4 | 13.4 | 9.0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | 22.1 | 20.4 | 18.3 | 16.0 | 12.9 | 8.1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | 20.0 | 18.0 | 15.6 | 12.2 | 7.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | 17.6 | 15.1 | 11.6 | 6.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 14.7 | 10.9 | 5.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 86 | 77 | 69 | 60 | 51 | 43 | 34 | 25 | 17 | | | | | | | | | | | | | | | | | | | | | | | |
| SP-1809 | 1 | 0 | | | 27.7 | 24.4 | 23.4 | 22.6 | 21.3 | 19.6 | 17.7 | 15.6 | 12.8 | 9.1 | | | | | | | | | | | | | | | | | | | | |
| | | 20 | 26.2 | 24.0 | 23.2 | 22.3 | 20.8 | 19.1 | 17.1 | 14.8 | 11.8 | 7.7 | | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | 23.8 | 23.1 | 22.1 | 20.6 | 18.8 | 16.8 | 14.4 | 11.2 | 7.0 | | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | 23.0 | 21.9 | 20.3 | 18.5 | 16.4 | 13.9 | 10.6 | 6.3 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | 21.7 | 20.0 | 18.2 | 16.1 | 13.5 | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 19.8 | 17.9 | 15.7 | 13.0 | 9.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 113 | 104 | 95 | 87 | 78 | 69 | 61 | 52 | 43 | 35 | 26 | 17 | | | | | | | | | | | | | | | | | | | | |
| SP-1813 | 1½ | 0 | | | 27.7 | 24.9 | 23.7 | 23.2 | 22.8 | 22.3 | 21.5 | 20.5 | 19.4 | 18.3 | 17.1 | 15.8 | 14.2 | 9.8 | | | | | | | | | | | | | | | | |
| | | 20 | 26.5 | 24.4 | 23.5 | 23.1 | 22.7 | 22.0 | 21.2 | 20.2 | 19.1 | 17.9 | 16.7 | 15.3 | 13.7 | 11.5 | 8.9 | | | | | | | | | | | | | | | | | |
| | | 30 | 24.2 | 23.5 | 23.1 | 22.6 | 21.9 | 21.0 | 20.0 | 18.9 | 17.8 | 16.5 | 15.1 | 13.4 | 11.2 | 8.5 | | | | | | | | | | | | | | | | | | |
| | | 40 | 23.4 | 23.0 | 22.5 | 21.8 | 20.9 | 19.8 | 18.7 | 17.6 | 16.3 | 14.9 | 13.1 | 10.8 | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | 50 | 22.9 | 22.4 | 21.7 | 20.7 | 19.7 | 18.6 | 17.4 | 16.1 | 14.6 | 12.7 | 10.4 | 7.5 | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 22.3 | 21.5 | 20.6 | 19.5 | 18.4 | 17.2 | 15.9 | 14.3 | 12.4 | 10.0 | 7.1 | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 167 | 158 | 150 | 141 | 132 | 124 | 115 | 106 | 98 | 89 | 80 | 72 | 63 | 54 | 46 | 28 | | | | | | | | | | | | | | | | |
| SP-1817 | 2 | 0 | | | | 27.4 | 25.2 | 24.1 | 23.6 | 23.2 | 22.9 | 22.5 | 22.0 | 21.3 | 20.6 | 19.8 | 18.9 | 17.1 | 15.0 | 12.1 | 8.1 | | | | | | | | | | | | | |
| | | 20 | | 26.5 | 24.8 | 23.9 | 23.4 | 23.1 | 22.8 | 22.4 | 21.8 | 21.1 | 20.3 | 19.5 | 18.6 | 17.8 | 16.8 | 14.6 | 11.6 | 7.4 | | | | | | | | | | | | | | |
| | | 30 | 26.2 | 24.6 | 23.8 | 23.4 | 23.1 | 22.7 | 22.3 | 21.7 | 21.0 | 20.2 | 19.4 | 18.5 | 17.6 | 16.7 | 15.6 | 13.0 | 9.3 | | | | | | | | | | | | | | | |
| | | 40 | 24.4 | 23.7 | 23.3 | 23.0 | 22.7 | 22.2 | 21.6 | 20.9 | 20.1 | 19.2 | 18.4 | 17.5 | 16.5 | 15.4 | 14.2 | 11.0 | 6.6 | | | | | | | | | | | | | | | |
| | | 50 | 23.6 | 23.3 | 23.0 | 22.6 | 22.1 | 21.5 | 20.7 | 19.9 | 19.1 | 18.2 | 17.3 | 16.4 | 15.3 | 14.0 | 12.5 | 8.6 | | | | | | | | | | | | | | | | |
| | | 60 | 23.3 | 22.9 | 22.5 | 22.0 | 21.4 | 20.6 | 19.8 | 19.0 | 18.1 | 17.2 | 16.2 | 15.1 | 13.8 | 12.2 | 10.4 | 5.9 | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 221 | 212 | 204 | 195 | 186 | 178 | 169 | 160 | 152 | 143 | 134 | 126 | 117 | 108 | 100 | 82 | 65 | 48 | 30 | | | | | | | | | | | | | |
| SP-1823 | 3 | 0 | | | | | 28.3 | 26.2 | 24.9 | 24.2 | 23.7 | 23.4 | 23.2 | 23.0 | 22.7 | 22.3 | 21.9 | 20.9 | 19.7 | 18.5 | 17.1 | 15.6 | 13.8 | 11.4 | 8.3 | | | | | | | | | |
| | | 20 | | | 27.6 | 25.8 | 24.7 | 24.0 | 23.6 | 23.3 | 23.1 | 22.9 | 22.6 | 22.2 | 21.8 | 21.3 | 20.7 | 19.5 | 18.2 | 16.9 | 15.3 | 13.4 | 10.9 | 7.8 | | | | | | | | | | |
| | | 30 | | 27.2 | 25.6 | 24.5 | 23.9 | 23.6 | 23.3 | 23.1 | 22.8 | 22.5 | 22.2 | 21.7 | 21.2 | 20.6 | 20.0 | 18.8 | 17.5 | 16.0 | 14.3 | 12.1 | 9.2 | | | | | | | | | | | |
| | | 40 | 26.9 | 25.4 | 24.4 | 23.8 | 23.5 | 23.3 | 23.1 | 22.8 | 22.5 | 22.1 | 21.6 | 21.1 | 20.5 | 19.9 | 19.3 | 18.0 | 16.7 | 15.1 | 13.1 | 10.5 | 7.2 | | | | | | | | | | | |
| | | 50 | 25.2 | 24.3 | 23.8 | 23.5 | 23.2 | 23.0 | 22.8 | 22.4 | 22.0 | 21.6 | 21.0 | 20.5 | 19.9 | 19.2 | 18.6 | 17.3 | 15.8 | 14.0 | 11.7 | 8.7 | | | | | | | | | | | | |
| | | 60 | 24.2 | 23.7 | 23.4 | 23.2 | 23.0 | 22.7 | 22.4 | 22.0 | 21.5 | 20.9 | 20.4 | 19.8 | 19.1 | 18.5 | 17.8 | 16.4 | 14.8 | 12.7 | 10.0 | 6.7 | | | | | | | | | | | | |
| Shut-off PSI | | | 302 | 293 | 285 | 276 | 267 | 259 | 250 | 241 | 233 | 224 | 215 | 207 | 198 | 189 | 181 | 163 | 146 | 129 | 111 | 94 | 77 | 59 | 42 | | | | | | | | | |
| SP-1836 | 5 | 0 | | | | | | | | 28.1 | 26.7 | 25.7 | 24.9 | 24.4 | 24.0 | 23.7 | 23.5 | 23.2 | 22.9 | 22.6 | 22.1 | 21.5 | 20.8 | 20.0 | 19.2 | 18.4 | 17.6 | 16.7 | 15.7 | 14.6 | 13.2 | 11.7 | 9.9 | 7.8 |
| | | 20 | | | | | | | 27.6 | 26.3 | 25.4 | 24.7 | 24.2 | 23.9 | 23.7 | 23.5 | 23.3 | 23.2 | 22.9 | 22.5 | 22.0 | 21.4 | 20.6 | 19.9 | 19.1 | 18.3 | 17.4 | 16.5 | 15.5 | 14.4 | 13.0 | 11.4 | 9.6 | 7.4 |
| | | 30 | | | | | 27.4 | 26.2 | 25.3 | 24.6 | 24.2 | 23.9 | 23.6 | 23.4 | 23.3 | 23.2 | 23.0 | 22.7 | 22.2 | 21.6 | 21.0 | 20.2 | 19.4 | 18.6 | 17.8 | 16.9 | 16.0 | 14.9 | 13.6 | 12.1 | 10.4 | 8.4 | 6.1 | |
| | | 40 | | | 28.7 | 27.2 | 26.0 | 25.2 | 24.6 | 24.1 | 23.8 | 23.6 | 23.4 | 23.3 | 23.1 | 23.0 | 22.8 | 22.4 | 21.9 | 21.2 | 20.5 | 19.8 | 19.0 | 18.1 | 17.3 | 16.4 | 15.3 | 14.3 | 12.8 | 11.2 | 9.2 | 7.1 | | |
| | | 50 | | 28.4 | 27.0 | 25.9 | 25.1 | 24.5 | 24.1 | 23.8 | 23.6 | 23.4 | 23.3 | 23.1 | 23.0 | 22.8 | 22.6 | 22.1 | 21.5 | 20.8 | 20.1 | 19.3 | 18.5 | 17.6 | 16.8 | 15.8 | 14.7 | 13.4 | 11.9 | 10.1 | 8.0 | | | |
| | | 60 | 28.2 | 26.8 | 25.7 | 25.0 | 24.4 | 24.0 | 23.7 | 23.5 | 23.4 | 23.2 | 23.1 | 22.9 | 22.8 | 22.6 | 22.3 | 21.8 | 21.1 | 20.4 | 19.6 | 18.8 | 18.0 | 17.1 | 16.2 | 15.2 | 14.0 | 12.6 | 10.9 | 8.9 | 6.7 | | | |
| Shut-off PSI | | | 477 | 469 | 460 | 451 | 443 | 434 | 425 | 417 | 408 | 399 | 391 | 382 | 373 | 365 | 356 | 339 | 321 | 304 | 287 | 270 | 252 | 235 | 218 | 200 | 183 | 166 | 148 | 131 | 114 | 96 | 79 | 62 |

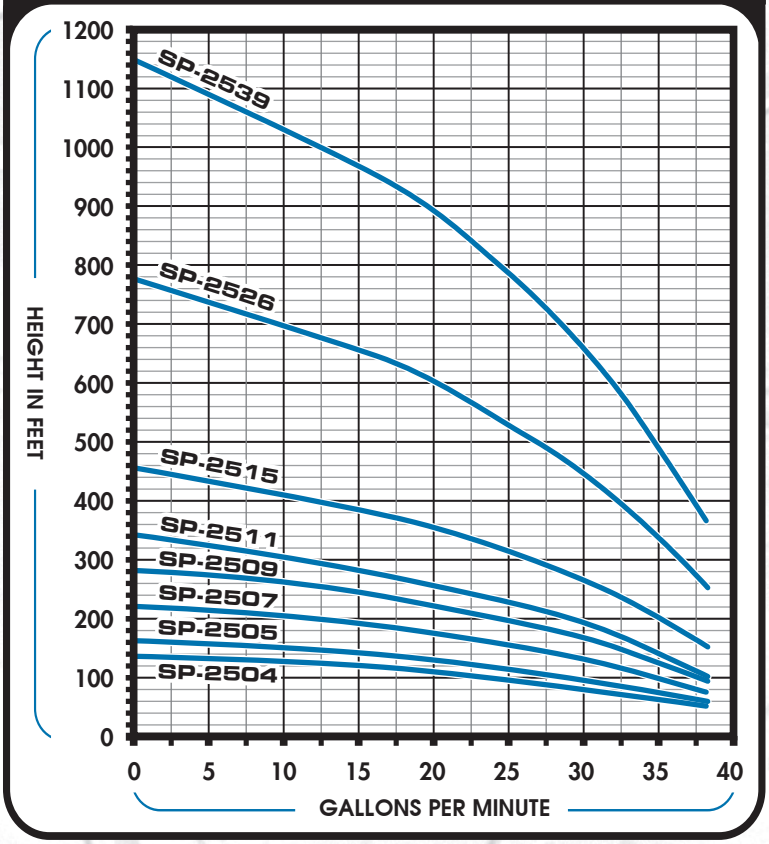
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# 4" MODEL SP-25
## 60 Hz - 3600 RPM

### 25 GPM ½ - 7½ HP 1½" Discharge

| MODEL | HP | STAGES | PHASE | LENGTH (IN) | | WEIGHT (LB) | |
|---|---|---|---|---|---|---|---|
| | | | | PUMP | MOTOR | PUMP | MOTOR |
| SP-2504 | ½ | 4 | 1 | 9.4 | 9.5 | 5.1 | 18 |
| SP-2505 | ¾ | 5 | 1 | 10.3 | 10.7 | 5.3 | 21 |
| SP-2507 | 1 | 7 | 1 | 11.9 | 11.8 | 5.9 | 23 |
| SP-2509 | 1½ | 9 | 1 | 13.5 | 13.6 | 6.8 | 27 |
| | | | 3 | | 11.8 | | 26 |
| SP-2511 | 2 | 11 | 1 | 15.2 | 15.1 | 8.1 | 30 |
| | | | 3 | | 13.6 | | 28 |
| SP-2515 | 3 | 15 | 1 | 18.5 | 23.5 | 9.2 | 54 |
| | | | 3 | | 20.6 | | 44 |
| SP-2526 | 5 | 26 | 1 | 27.6 | 29.5 | 14.3 | 65 |
| | | | 3 | | 23.5 | | 50 |
| SP-2539 | 7½ | 39 | 3 | 39.3 | 29.5 | 20.2 | 66 |

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 |
| SP-2504 | 1 | 0 | 39.5 | 37.5 | 32.5 | 26 | 15.4 | | | | | | | |
| | | 20 | 30.6 | 23.4 | 10.5 | | | | | | | | | |
| | | 30 | 21.9 | 7.9 | | | | | | | | | | |
| Shut-off PSI | | | 43 | 35 | 26 | 17 | 9 | | | | | | | |
| SP-2505 | 1½ | 0 | | 38.3 | 35.9 | 31.3 | 26.0 | | | | | | | |
| | | 20 | | 29.7 | 24.0 | 14.7 | | | | | | | | |
| | | 30 | 28.9 | 22.9 | 12.8 | | | | | | | | | |
| | | 40 | 21.6 | 10.7 | | | | | | | | | | |
| | | 50 | 8.7 | | | | | | | | | | | |
| Shut-off PSI | | | 56 | 47 | 39 | 30 | 21 | | | | | | | |




## SELECTION CHART

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 | 460 | 500 | 540 | 580 | 620 | 660 | 700 | 740 | 780 | 820 | 860 | 900 | 940 | 980 | 1020 | 1060 | 1100 |
| SP-2507 | 1 | 0 | | | | | 33.4 | 29.8 | 26.0 | 20.8 | 13.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20 | | | 32.2 | 28.7 | 24.6 | 18.8 | 10.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | | 31.8 | 28.1 | 23.8 | 17.6 | 8.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | 31.2 | 27.5 | 23.0 | 16.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | 25.9 | 22.2 | 15.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 21.3 | 13.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 82 | 73 | 64 | 56 | 47 | 38 | 30 | 21 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SP-2509 | 1½ | 0 | | | | | | | 31.8 | 29.0 | 26.0 | 22.1 | 16.9 | 10.1 | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20 | | | | 33.7 | 31.0 | 28.1 | 24.9 | 20.7 | 15.0 | 7.8 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | | | 33.3 | 30.6 | 27.7 | 24.3 | 19.9 | 13.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | | 32.9 | 30.1 | 27.2 | 23.7 | 19.1 | 12.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | 32.5 | 29.7 | 26.7 | 23.1 | 18.3 | 11.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 29.2 | 26.2 | 22.5 | 17.4 | 10.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 107 | 99 | 90 | 81 | 73 | 64 | 55 | 47 | 38 | 30 | 21 | 12 | | | | | | | | | | | | | | | | | | | | | | | |
| SP-2511 | 2 | 0 | | | | | | | | 32.3 | 29.9 | 27.3 | 24.5 | 21.2 | 17.3 | 12.5 | | | | | | | | | | | | | | | | | | | | | |
| | | 20 | | | | | 33.7 | 31.6 | 29.1 | 26.5 | 23.5 | 20.0 | 15.9 | 10.9 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | | | | 33.4 | 31.2 | 28.7 | 26.0 | 23.0 | 19.5 | 15.2 | 10.1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | | | 33.1 | 30.8 | 28.3 | 25.6 | 22.5 | 18.8 | 14.4 | 9.2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | | 32.8 | 30.5 | 27.9 | 25.1 | 22.0 | 18.2 | 13.7 | 8.4 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 32.4 | 30.1 | 27.5 | 24.7 | 21.4 | 17.6 | 12.9 | 7.5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 132 | 124 | 115 | 106 | 98 | 89 | 80 | 72 | 63 | 54 | 46 | 37 | 29 | 20 | | | | | | | | | | | | | | | | | | | | | |
| SP-2515 | 3 | 0 | | | | | | | | | | | 32.9 | 31.3 | 29.6 | 27.9 | 26.0 | 21.2 | 14.4 | | | | | | | | | | | | | | | | | | |
| | | 20 | | | | | | | | | 32.4 | 30.8 | 29.1 | 27.3 | 25.3 | 23.1 | 20.3 | 13.1 | | | | | | | | | | | | | | | | | | | |
| | | 30 | | | | | | | 33.8 | 32.2 | 30.5 | 28.8 | 27.0 | 25.0 | 22.7 | 19.9 | 16.5 | 8.0 | | | | | | | | | | | | | | | | | | | |
| | | 40 | | | | | | 33.5 | 31.9 | 30.2 | 28.5 | 26.7 | 24.7 | 22.3 | 19.4 | 15.9 | 11.8 | | | | | | | | | | | | | | | | | | | | | |
| | | 50 | | | | | 33.3 | 31.7 | 30.0 | 28.3 | 26.4 | 24.3 | 21.9 | 18.9 | 15.3 | 11.1 | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | | | | 33.0 | 31.4 | 29.7 | 28.0 | 26.1 | 24.0 | 21.4 | 18.4 | 14.7 | 10.4 | | | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | | | | 159 | 150 | 142 | 133 | 124 | 116 | 107 | 98 | 90 | 81 | 72 | 64 | 46 | 29 | 12 | | | | | | | | | | | | | | | | | |
| SP-2526 | 5 | 0 | | | | | | | | | | | | | | | | | 33.0 | 31.1 | 29.1 | 27.1 | 24.8 | 22.0 | 18.5 | 14.2 | 9.3 | | | | | | | | | | |
| | | 20 | | | | | | | | | | | | | | | | 32.7 | 30.8 | 28.8 | 26.7 | 24.4 | 21.5 | 17.9 | 13.5 | 8.5 | | | | | | | | | | |
| | | 30 | | | | | | | | | | | | | | | 33.5 | 31.6 | 29.7 | 27.6 | 25.4 | 22.8 | 19.5 | 15.5 | 10.6 | | | | | | | | | | |
| | | 40 | | | | | | | | | | | | | | 33.3 | 32.4 | 30.5 | 28.5 | 26.4 | 24.0 | 21.0 | 17.3 | 12.8 | | | | | | | | | | |
| | | 50 | | | | | | | | | | | | | 33.2 | 32.3 | 31.3 | 29.4 | 27.3 | 25.0 | 22.3 | 18.9 | 14.8 | 9.8 | | | | | | | | | | |
| | | 60 | | | | | | | | | | | | 33.1 | 32.1 | 30.2 | 28.2 | 26.0 | 23.5 | 20.5 | 16.6 | 12.0 | 6.8 | | | | | | | | | | | |
| Shut-off PSI | | | | | | | | | | | | | | 231 | 223 | 214 | 205 | 188 | 171 | 154 | 136 | 119 | 102 | 84 | 67 | 50 | 32 | | | | | | | | | |
| SP-2539 | 7½ | 0 | | | | | | | | | | | | | | | | | | | | | 33.9 | 32.7 | 31.4 | 30.1 | 28.8 | 27.4 | 26.0 | 24.3 | 22.5 | 20.3 | 17.9 | 15.0 | 11.8 | 8.4 |
| | | 20 | | | | | | | | | | | | | | | | | | | | 33.7 | 32.5 | 31.2 | 29.9 | 28.6 | 27.2 | 25.7 | 24.1 | 22.2 | 20.0 | 17.4 | 14.5 | 11.3 | 7.9 | |
| | | 30 | | | | | | | | | | | | | | | | | | | | 33.0 | 31.8 | 30.5 | 29.2 | 27.8 | 26.4 | 24.8 | 23.0 | 20.9 | 18.6 | 15.8 | 12.7 | 9.3 | | |
| | | 40 | | | | | | | | | | | | | | | | | | | 33.5 | 32.3 | 31.0 | 29.7 | 28.4 | 27.0 | 25.5 | 23.8 | 21.9 | 19.6 | 17.0 | 14.0 | 10.8 | | | |
| | | 50 | | | | | | | | | | | | | | | | | | | 32.8 | 31.6 | 30.3 | 29.0 | 27.6 | 26.1 | 24.5 | 22.7 | 20.6 | 18.1 | 15.3 | 12.2 | 8.8 | | | |
| | | 60 | | | | | | | | | | | | | | | | | | 33.3 | 32.1 | 30.8 | 29.5 | 28.2 | 26.8 | 25.2 | 23.5 | 21.5 | 19.2 | 16.6 | 13.6 | 10.2 | | | | |
| Shut-off PSI | | | | | | | | | | | | | | | | | | | | 321 | 304 | 287 | 269 | 252 | 235 | 217 | 200 | 183 | 165 | 148 | 131 | 113 | 96 | 79 | 61 | 44 |

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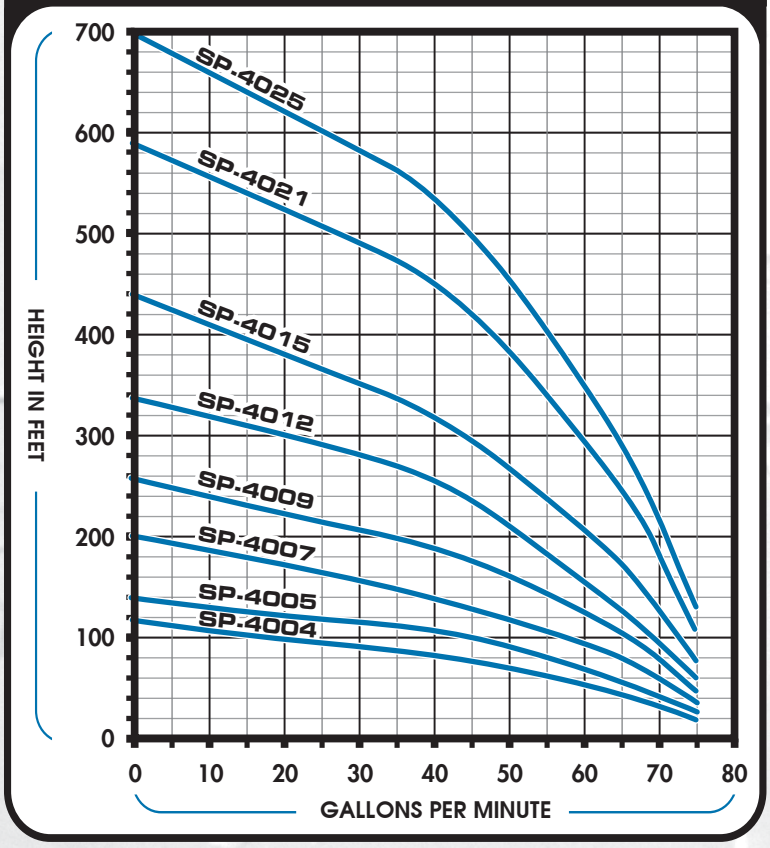
AFT
ADVANCED FLUID TECHNOLOGIES

# 4" MODEL SP-40
## 60 Hz - 3600 RPM

**40 GPM  1 - 7½ HP  2" Discharge**

| MODEL | HP | STAGES | PHASE | LENGTH (IN) | | WEIGHT (LB) | |
|---|---|---|---|---|---|---|---|
| | | | | PUMP | MOTOR | PUMP | MOTOR |
| SP-4004 | 1 | 4 | 1 | 14.4 | 11.8 | 8.2 | 23 |
| SP-4005 | 1½ | 5 | 1 | 16.1 | 13.6 | 9.3 | 27 |
| | | | 3 | | 11.8 | | 26 |
| SP-4007 | 2 | 7 | 1 | 19.4 | 15.1 | 11.5 | 30 |
| | | | 3 | | 13.6 | | 28 |
| SP-4009 | 3 | 9 | 1 | 22.7 | 23.5 | 13.7 | 54 |
| | | | 3 | | 20.6 | | 44 |
| SP-4012 | 5 | 12 | 1 | 27.7 | 29.5 | 17.0 | 65 |
| | | | 3 | | 23.5 | | 50 |
| SP-4015 | 5 | 15 | 1 | 32.6 | 29.5 | 20.2 | 65 |
| | | | 3 | | 23.5 | | 50 |
| SP-4021 | 7½ | 21 | 3 | 42.5 | 29.5 | 26.7 | 66 |
| SP-4025 | 7½ | 25 | 3 | 49.1 | 29.5 | 31.0 | 66 |

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 |
| SP-4004 | 1 | 0 | | 63.5 | 55.7 | 43.2 | | | |
| | | 20 | 53.0 | 36.5 | | | | | |
| | | 30 | 32.7 | | | | | | |
| Shut-off PSI | | | 40 | 32 | 23 | 14 | | | |
| SP-4005 | 1½ | 0 | | | 60.1 | 54.0 | 43.2 | 23.4 | |
| | | 20 | 58.2 | 51.5 | 38.0 | | | | |
| | | 30 | 50.0 | 35.0 | | | | | |
| | | 40 | 31.9 | | | | | | |
| Shut-off PSI | | | 52 | 44 | 35 | 27 | 18 | 9 | |



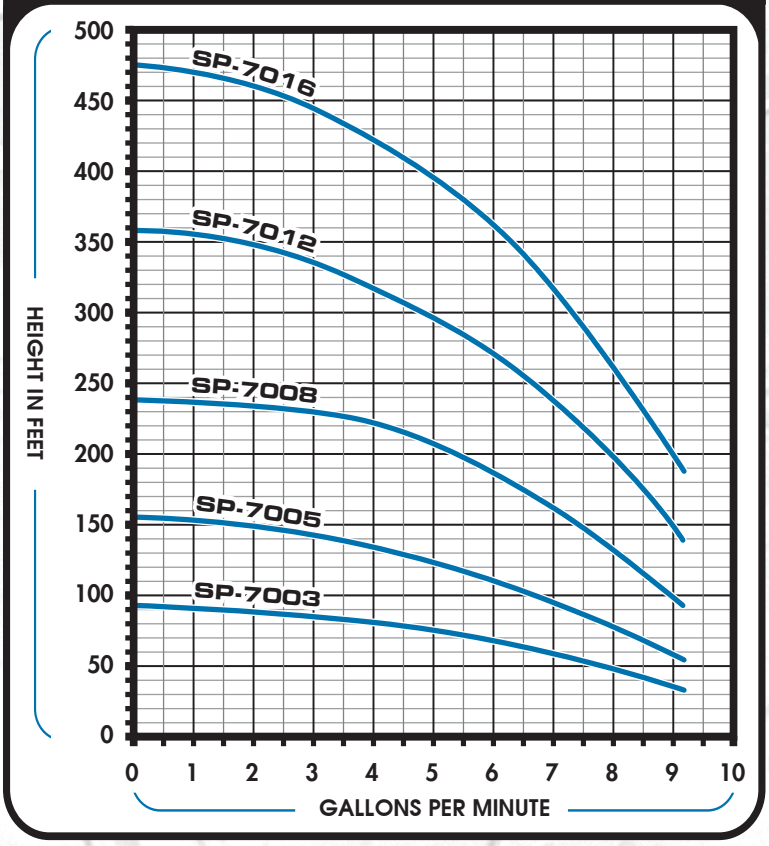

## SELECTION CHART

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 | 460 | 500 | 540 | 580 |
| SP-4007 | 2 | 0 | | | | 61.0 | 56.7 | 51.7 | 43.2 | 29.9 | | | | | | | | | | | | | | |
| | | 20 | 64.5 | 59.6 | 55.4 | 49.6 | 39.6 | 24.9 | | | | | | | | | | | | | | | | |
| | | 30 | 58.9 | 54.7 | 48.3 | 37.6 | 22.3 | | | | | | | | | | | | | | | | | |
| | | 40 | 53.9 | 47.0 | 35.5 | | | | | | | | | | | | | | | | | | | |
| | | 50 | 45.5 | 33.2 | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 30.9 | | | | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 77 | 68 | 60 | 51 | 42 | 34 | 25 | 16 | | | | | | | | | | | | | | |
| SP-4009 | 3 | 0 | | | | 65.6 | 61.5 | 58.1 | 54.8 | 50.2 | 43.2 | 33.2 | 20.8 | | | | | | | | | | | |
| | | 20 | | 64.3 | 60.4 | 57.1 | 53.6 | 48.4 | 40.4 | 29.6 | | | | | | | | | | | | | | |
| | | 30 | 63.6 | 59.8 | 56.6 | 52.9 | 47.3 | 38.9 | 27.7 | | | | | | | | | | | | | | | |
| | | 40 | 59.3 | 56.1 | 52.2 | 46.2 | 37.4 | 25.7 | | | | | | | | | | | | | | | | |
| | | 50 | 55.6 | 51.4 | 45.0 | 35.7 | 23.7 | | | | | | | | | | | | | | | | | |
| | | 60 | 50.6 | 43.8 | 34.0 | 21.7 | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 101 | 93 | 84 | 75 | 67 | 58 | 49 | 41 | 32 | 23 | 15 | | | | | | | | | | | |
| SP-4012 | 5 | 0 | | | | | | 63.2 | 60.6 | 58.3 | 55.8 | 52.6 | 48.2 | 42.2 | 34.6 | 25.6 | | | | | | | | |
| | | 20 | | | 65.2 | 62.4 | 59.9 | 57.5 | 54.9 | 51.4 | 46.5 | 40.0 | 32.0 | 22.7 | | | | | | | | | | |
| | | 30 | | 64.8 | 62.0 | 59.5 | 57.2 | 54.4 | 50.7 | 45.6 | 38.9 | 30.6 | 21.2 | | | | | | | | | | | |
| | | 40 | 64.3 | 61.5 | 59.1 | 56.8 | 53.9 | 50.0 | 44.7 | 37.7 | 29.2 | | | | | | | | | | | | | |
| | | 50 | 61.2 | 58.8 | 56.4 | 53.4 | 49.3 | 43.7 | 36.5 | 27.8 | | | | | | | | | | | | | | |
| | | 60 | 58.4 | 56.0 | 52.9 | 48.6 | 42.7 | 35.2 | 26.3 | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 137 | 128 | 119 | 111 | 102 | 93 | 85 | 76 | 67 | 59 | 50 | 41 | 33 | 24 | | | | | | | | |
| SP-4015 | 5 | 0 | | | | | | | 64.4 | 62.1 | 60.1 | 58.3 | 56.3 | 54.0 | 51.0 | 47.1 | 42.2 | 29.4 | | | | | | |
| | | 20 | | | | | 63.6 | 61.5 | 59.5 | 57.7 | 55.7 | 53.2 | 49.9 | 45.7 | 40.5 | 34.2 | 27.1 | | | | | | | |
| | | 30 | | | | 63.3 | 61.2 | 59.3 | 57.4 | 55.3 | 52.7 | 49.3 | 45.0 | 39.6 | 33.2 | 26.9 | | | | | | | | |
| | | 40 | | | 62.9 | 60.9 | 59.0 | 57.1 | 54.9 | 52.2 | 48.7 | 44.2 | 38.6 | 32.1 | 24.7 | | | | | | | | | |
| | | 50 | 64.9 | 62.6 | 60.6 | 58.7 | 56.8 | 54.6 | 51.8 | 48.1 | 43.4 | 37.7 | 31.0 | 23.5 | | | | | | | | | | |
| | | 60 | 62.3 | 60.3 | 58.4 | 56.5 | 54.2 | 51.3 | 47.4 | 42.6 | 36.7 | 29.9 | 22.4 | | | | | | | | | | | |
| Shut-off PSI | | | 173 | 164 | 156 | 147 | 138 | 130 | 121 | 112 | 104 | 95 | 86 | 78 | 69 | 60 | 52 | 34 | | | | | | |
| SP-4021 | 7½ | 0 | | | | | | | | | | 64.0 | 62.4 | 61.0 | 59.6 | 58.3 | 56.9 | 53.6 | 48.9 | 42.2 | 33.4 | 22.9 | | |
| | | 20 | | | | | | | | 63.5 | 62.0 | 60.5 | 59.2 | 57.9 | 56.5 | 54.9 | 53.0 | 48.0 | 41.0 | 31.9 | 21.2 | | | |
| | | 30 | | | | | | 64.9 | 63.3 | 61.7 | 60.3 | 59.0 | 57.7 | 56.2 | 54.6 | 52.7 | 50.4 | 44.2 | 36.0 | 25.8 | | | | |
| | | 40 | | | | | 64.7 | 63.0 | 61.5 | 60.1 | 58.8 | 57.4 | 56.0 | 54.3 | 52.3 | 50.0 | 47.1 | 39.7 | 30.3 | | | | | |
| | | 50 | | | | 64.4 | 62.8 | 61.3 | 59.9 | 58.6 | 57.2 | 55.8 | 54.0 | 52.0 | 49.5 | 46.6 | 43.1 | 34.5 | 24.2 | | | | | |
| | | 60 | | 65.9 | 64.1 | 62.5 | 61.1 | 59.7 | 58.4 | 57.0 | 55.5 | 53.8 | 51.7 | 49.1 | 46.1 | 42.5 | 38.4 | 28.7 | | | | | | |
| Shut-off PSI | | | | 237 | 228 | 219 | 211 | 202 | 193 | 185 | 176 | 167 | 159 | 150 | 142 | 133 | 124 | 107 | 90 | 72 | 55 | 38 | | |
| SP-4025 | 7½ | 0 | | | | | | | | | | | 65.3 | 63.9 | 62.5 | 61.3 | 60.1 | 57.9 | 55.5 | 52.3 | 48.0 | 42.2 | 34.9 | 26.4 |
| | | 20 | | | | | | | | | 64.9 | 63.5 | 62.2 | 60.9 | 59.8 | 58.7 | 57.5 | 55.0 | 51.7 | 47.2 | 41.2 | 33.7 | 25.0 | |
| | | 30 | | | | | | | | 64.7 | 63.3 | 62.0 | 60.7 | 59.6 | 58.5 | 57.4 | 56.2 | 53.2 | 49.3 | 43.9 | 37.0 | 28.8 | | |
| | | 40 | | | | | | | 64.4 | 63.1 | 61.8 | 60.6 | 59.4 | 58.3 | 57.2 | 56.0 | 54.6 | 51.1 | 46.4 | 40.1 | 32.4 | 23.6 | | |
| | | 50 | | | | | 65.6 | 64.2 | 62.8 | 61.6 | 60.4 | 59.3 | 58.2 | 57.0 | 55.8 | 54.3 | 52.7 | 48.5 | 42.9 | 35.8 | 27.4 | | | |
| | | 60 | | | | 65.4 | 64.0 | 62.6 | 61.4 | 60.2 | 59.1 | 58.0 | 56.8 | 55.6 | 54.1 | 52.4 | 50.5 | 45.5 | 39.0 | 31.1 | 22.1 | | | |
| Shut-off PSI | | | | | | 288 | 259 | 251 | 242 | 233 | 225 | 216 | 207 | 199 | 190 | 181 | 173 | 155 | 138 | 121 | 103 | 86 | 69 | 51 |

WWW.AFTGRP.COM • 7801 WARDEN RAOD • Sherwood, AR 72120 • Tel: 501-835-3200 • Fax: 501-835-3251 Email: info@aftgrp.ocm

# 4" MODEL SP-70
## 60 Hz - 3600 RPM

## SP SERIES PERFORMANCE CURVES
### 70 GPM MAXIMUM EFFICIENCY




**70 GPM 2 - 10 HP 2" Discharge**

| MODEL | HP | STAGES | PHASE | LENGTH (IN) | | WEIGHT (LB) | |
|---|---|---|---|---|---|---|---|
| | | | | PUMP | MOTOR | PUMP | MOTOR |
| SP-7003 | 2 | 3 | 1 | 14.9 | 15.1 | 8.2 | 30 |
| | | | 3 | | 13.6 | | 28 |
| SP-7005 | 3 | 5 | 1 | 20.0 | 23.5 | 10.4 | 54 |
| | | | 3 | | 20.6 | | 44 |
| SP-7008 | 5 | 8 | 1 | 27.7 | 29.5 | 13.7 | 65 |
| | | | 3 | | 23.5 | | 50 |
| SP-7012 | 7½ | 12 | 3 | 37.9 | 29.5 | 18.0 | 66 |
| SP-7016 | 10 | 16 | 3 | 53 | 44 | 29 | 120 |

## SELECTION CHART

| MODEL | HP | PSI | Depth to Water in Feet | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 |
| SP-7003 | 2 | 0 | | 89.1 | 68.9 | 38.8 | | | | | | | | | | | | | | |
| | | 20 | 60.8 | | | | | | | | | | | | | | | | | |
| | | 30 | | | | | | | | | | | | | | | | | | |
| | | 40 | | | | | | | | | | | | | | | | | | |
| | | 50 | | | | | | | | | | | | | | | | | | |
| | | 60 | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 31 | 23 | 14 | 5 | | | | | | | | | | | | | | |
| SP-7005 | 3 | 0 | | | 91.1 | 78.8 | 68.9 | 51.0 | | | | | | | | | | | | |
| | | 20 | 89.4 | 75.5 | 64.4 | 44.9 | | | | | | | | | | | | | | |
| | | 30 | 74.1 | 61.8 | 42.1 | | | | | | | | | | | | | | | |
| | | 40 | 58.8 | 39.6 | | | | | | | | | | | | | | | | |
| | | 50 | 37.1 | | | | | | | | | | | | | | | | | |
| | | 60 | | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 58 | 49 | 40 | 32 | 23 | 14 | | | | | | | | | | | | |
| SP-7008 | 5 | 0 | | | | | 88.9 | 84.8 | 78.5 | 69.4 | 59.4 | 49.7 | | | | | | | | |
| | | 20 | | | 87.8 | 83.2 | 75.9 | 66.3 | 65.4 | 46.3 | | | | | | | | | | |
| | | 30 | 91.0 | 87.2 | 82.3 | 74.6 | 64.7 | 54.9 | 44.4 | | | | | | | | | | | |
| | | 40 | 86.5 | 81.3 | 73.1 | 63.2 | 53.4 | 42.2 | | | | | | | | | | | | |
| | | 50 | 80.2 | 71.6 | 61.6 | 51.9 | 39.8 | | | | | | | | | | | | | |
| | | 60 | 70.1 | 60.1 | 50.4 | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 94 | 86 | 77 | 68 | 60 | 51 | 42 | 34 | 25 | 16 | | | | | | | | |
| SP-7012 | 7½ | 0 | | | | | | | 90.2 | 87.7 | 84.8 | 81.0 | 75.7 | 69.4 | 62.7 | 56.1 | 49.7 | | | |
| | | 20 | | | | | 89.4 | 86.9 | 83.8 | 79.5 | 73.9 | 67.4 | 60.6 | 54.2 | 47.5 | | | | | |
| | | 30 | | | | 89.0 | 86.4 | 83.2 | 78.7 | 72.9 | 66.3 | 59.6 | 53.2 | 46.3 | | | | | | |
| | | 40 | | | 88.6 | 86.0 | 82.6 | 77.9 | 71.9 | 65.3 | 58.6 | 52.2 | 45.0 | 33.0 | 11.3 | | | | | |
| | | 50 | | 88.2 | 85.5 | 81.9 | 77.0 | 70.9 | 64.2 | 57.6 | 51.2 | 43.7 | | | | | | | | |
| | | 60 | 87.8 | 85.1 | 82.3 | 76.1 | 69.9 | 63.2 | 56.6 | 50.2 | 42.2 | | | | | | | | | |
| Shut-off PSI | | | 146 | 137 | 128 | 120 | 111 | 102 | 94 | 85 | 76 | 68 | 59 | 50 | 42 | 33 | 24 | | | |
| SP-7016 | 10 | 0 | | | | | | | | 88.5 | 86.4 | 85.2 | 84.3 | 83.2 | 81.3 | 78.4 | 74.5 | 64.5 | 54.2 | 43.8 |
| | | 20 | | | | | 90.7 | 87.7 | 85.9 | 84.0 | 82.7 | 80.5 | 77.3 | 73.1 | 68.2 | 62.9 | 52.7 | 41.7 | | |
| | | 30 | | | | 90.1 | 87.4 | 85.7 | 84.7 | 83.8 | 82.4 | 80.1 | 76.7 | 72.4 | 67.4 | 62.1 | 56.9 | 47.0 | | |
| | | 40 | | | 89.6 | 87.1 | 85.6 | 84.6 | 83.6 | 82.1 | 79.7 | 76.1 | 71.6 | 66.5 | 61.2 | 56.1 | 51.2 | | | |
| | | 50 | | 89.2 | 86.8 | 85.4 | 83.5 | 81.8 | 79.2 | 75.5 | 70.9 | 65.7 | 60.4 | 55.4 | 50.5 | 45.2 | | | | |
| | | 60 | 88.7 | 86.5 | 85.2 | 84.3 | 83.3 | 81.5 | 78.7 | 74.8 | 70.0 | 64.9 | 59.6 | 54.6 | 49.7 | 44.3 | | | | |
| Shut-off PSI | | | 197 | 188 | 180 | 171 | 162 | 154 | 145 | 136 | 128 | 119 | 110 | 102 | 93 | 84 | 76 | 59 | 41 | 24 |

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# High Accuracy Submersible Level Transmitter — Acculevel

Thermally-compensated, custom ranges, dual output submersible




The Acculevel by Keller America provides standard features that far exceed those of comparably priced transmitters, including standard ±0.25% FS or optional ±0.1% Total Error Band $(TEB)_3$ accuracy.

The ability of the Acculevel to provide this level of sustained performance over a wide range of operating conditions makes it ideally suited to environmental monitoring applications such as surface water, streams, and reservoirs.

Keller America's guaranteed lightning protection makes this transmitter ideal for installation in areas prone to chronic damage due to transients caused by lightning.

For more information on the Acculevel, or any other Keller product, please contact Keller America, or view the entire Keller catalog at http://www.kelleramerica.com/datasheets.html.

FEATURES

4...20mA models include guaranteed lightning protection at no additional cost.

16-bit internal digital error correction for cost-effective low Total Error Band $(TEB)_3$

316L stainless construction standard - Optional Titanium for severe applications.

2-year warranty covers defects in materials and workmanship.

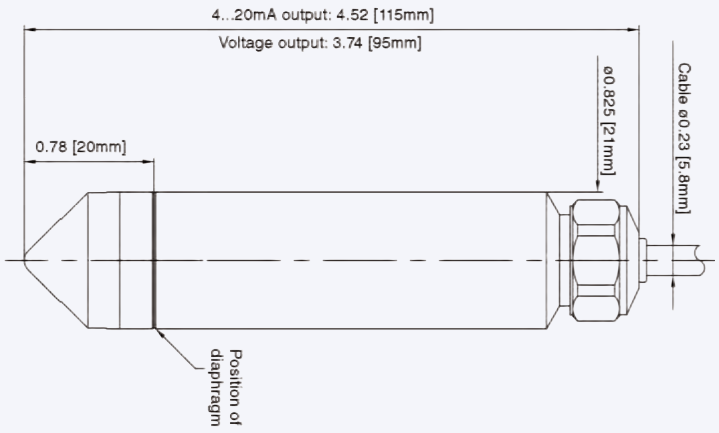
User-rangeable analog output ensures compatibility as requirements change.

RS485 modified-MODBUS compatible interface allows up to 128 transmitters on a single bus.

Standard dual (analog & RS485) outputs simplify interface to controls, data collection, and telemetry systems.

Built in the U.S.A. ARRA Section 1605 Compliant.

Standard 3-day lead time




| Output | White | Black | Red | Blue | Yellow |
|---|---|---|---|---|---|
| 2-wire (mA) | OUT / GND | +Vcc | N/A | RS485A | RS485B |
| 3-wire (VDC) | GND | +VCC | +OUT | RS485A | RS485B |
| Braided shield wire connected to transmitter housing | | | | | |

**KELLER America Inc.**
Newport News, Virginia
www.kelleramerica.com
sales@kelleramerica.com

**Edition 01/2017**
Subject to alterations
877-253-5537
757-596-6659

## Pressure Ranges[1,2]

| | |
|---|---|
| Relative | Infinite between 0...3 thru 0...900 ft W.C. |
| Absolute | Infinite between 0...2 thru 0...11 bar |

1.The Acculevel can be provided with custom calibration at no extra cost. For fluids other than water, the specific gravity must be given at the time the order is placed.

2. Intermediate ranges are realized by deranging the analog output from the next highest basic range: 1, 3, 10, and 30 bar (relative) 2, 4, and 11 bar (absolute). Level range may be specified in units of lb/in2(psi), inches WC or feet WC. Keller America uses the International Standard conversion of 2.3067 feet WC/psi.

## Accuracy[3]

| | |
|---|---|
| Static | Standard ±0.1% FS, Optional ±0.05% FS |
| Total Error Band | Standard ±0.25% BR, Optional ±0.1% BR |

3. Static accuracy includes the combined effects of non-linearity, hysteresis, and non-repeatability at room temperature (25°C). Total Error Band (TEB) includes the combined effects of non-linearity, hysteresis, and non-repeatability as well as thermal dependencies, over the compensated temperature range, expressed as a percentage of the basic range (BR).

The calculation for maximum TEB on intermediate ranges (IR) is: $TEB_{IR} = (BR/IR) \times TEB_{BR}$

## Output

| | |
|---|---|
| Current | 4...20mA + RS485 |
| Voltage[4] | 0...5, 0-10VDC + RS485 |
| Resolution[5] | 0.002% |

4. Other voltage output options available on request.

5. Resolution applies to digital output only. Analog resolution is continuous and limited by the process meter and not the instrument.

## Certifications

| | |
|---|---|
| CE | EN50081-1, EN50082-2 |

## Electrical[6]

| | |
|---|---|
| Supply (4-20mA) | 11-28 VDC |
| Supply (0-5VDC) | 8...28 VDC |
| Supply (0-10VDC) | 13...28 VDC |
| Load Resistance (mA) | <(Supply-11V)/0.022A |
| Load Resistance (VDC) | >4k ohm |

6. Nominal values may be higher depending upon cable length. Internal lightning protection increases the minimum-required supply voltage from 8VDC to 11VDC, due to internal resistance of the surge protectors. In addition, cable resistance (~70Ω / 1000ft) adds to the supply requirement. In order to insure proper system operation, calculate the minimum required supply voltage (at the source) as follows:

For two-part (internal+external) system (recommended):
MINIMUM SUPPLY VOLTAGE = 11.6 + 0.022 (CABLE LENGTH x 0.07) VDC

For internal only protector (standard with 4-20mA output):
MINIMUM SUPPLY VOLTAGE = 11 + 0.022 (CABLE LENGTH x 0.07) VDC

## Environmental

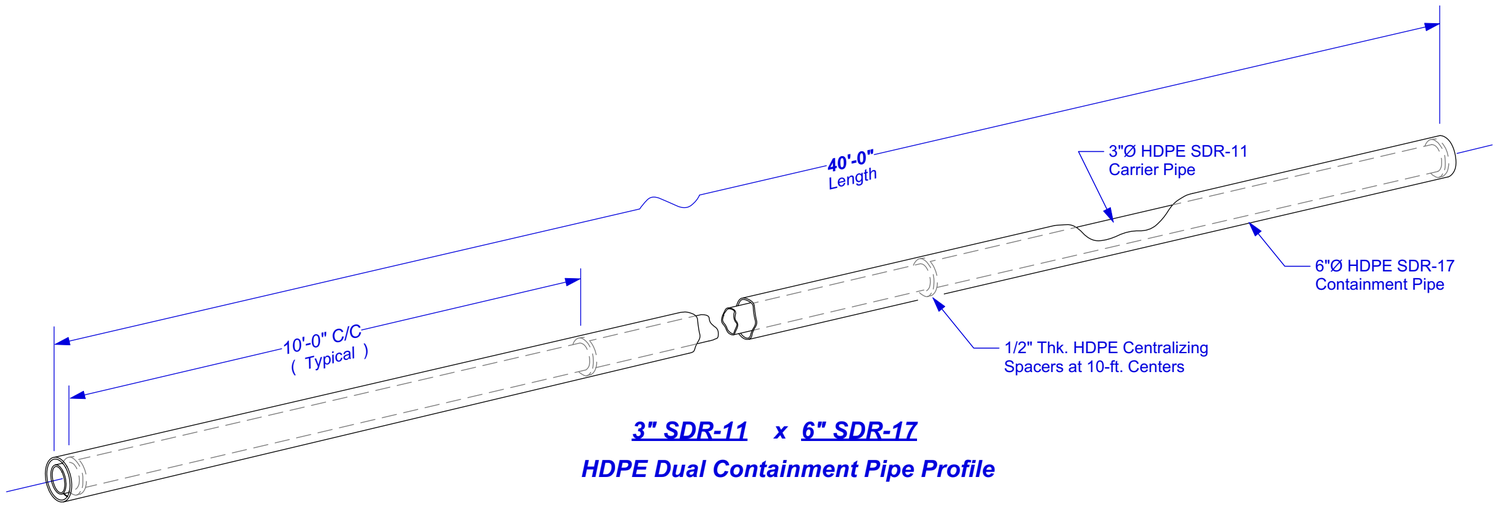
| | |
|---|---|
| Protection Rating | IP68 |
| Operating Temp. | -10...60° C |
| Compensated Temp. | -10...80° C |
| Wetted Materials | 316 L Stainless Steel |
| | Titanium Optional |
| | Polyamide |
| | Fluorocarbon |
| Cable Options | Polyethylene for general purpose |
| | Hytrel for hydrocarbon |
| | Tefzel for chemical interaction |

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Newport News, Virginia
www.kelleramerica.com
sales@kelleramerica.com

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877-253-5537
757-596-6659

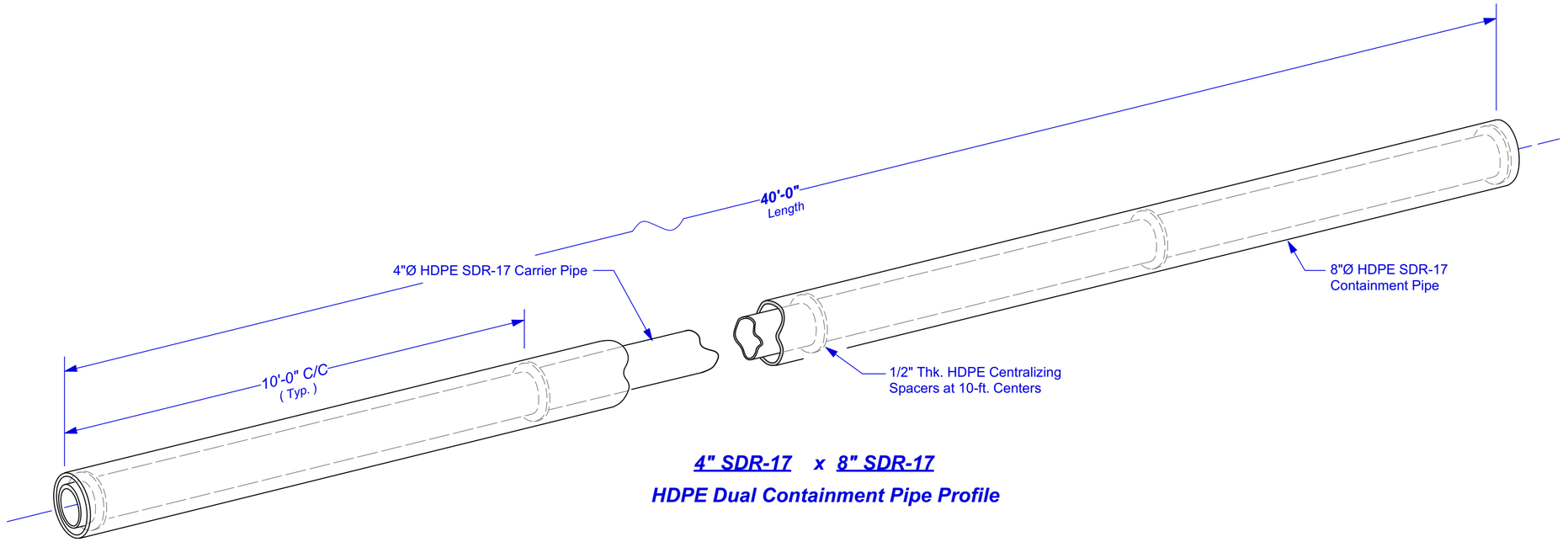
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# Dual Containment Piping




**3" SDR-11 x 6" SDR-17**

**HDPE Dual Containment Pipe Profile**




**4" SDR-17 x 8" SDR-17**

**HDPE Dual Containment Pipe Profile**

| NO. | DATE | BY |
|---|---|---|
| | | |

**REVISIONS**

| | |
|---|---|
| Drawn By: J. Yoder ( Draftsman / Designer ) | Date: 6-11-2018 |
| Technician: | Date: |
| PFF Estimator: | Date: |
| Q/C: | Date: |
| Customer Approval: | Date: |

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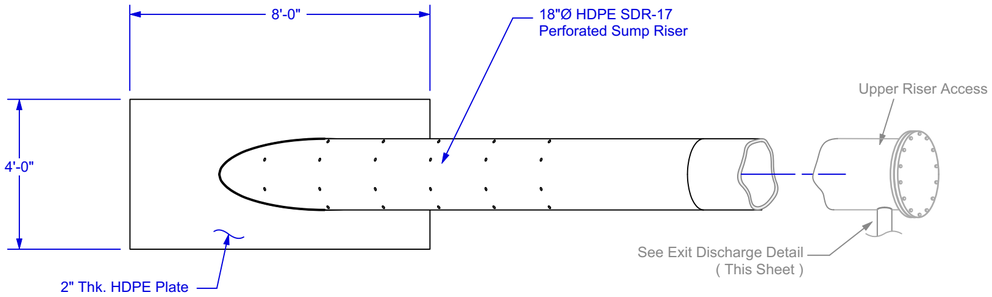
Dumey Contracting, Inc. - Craighead Co. Solid Waste Disposal
Legacy Landfill, Cell 1 South / Cell 2 North - Jonesboro, AR
HDPE Dual-Containment ForceMain Piping Layout Details

| | | |
|---|---|---|
| PFF Drawing No: **03370-096 a** | Scale: N. T. S. | Rev. **0** |
| PFF Job No: F-18096 | Sheet: 1 of 3 | |

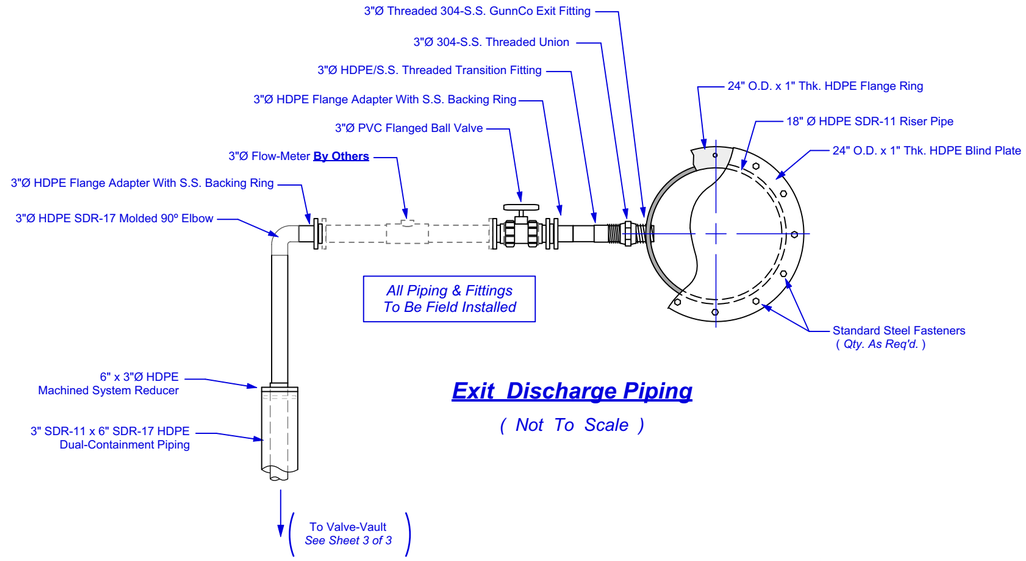
PFF Drawing Form C ( 17 x 22 )

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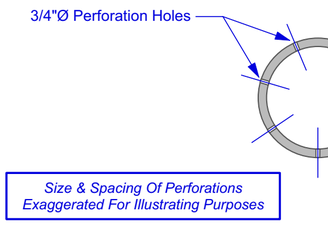
# Leachate Collection Sump Riser



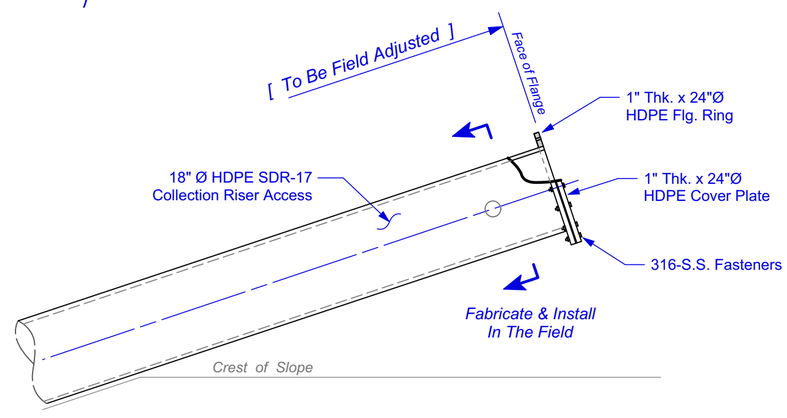

## Plan View
*( Reduced Scale )*



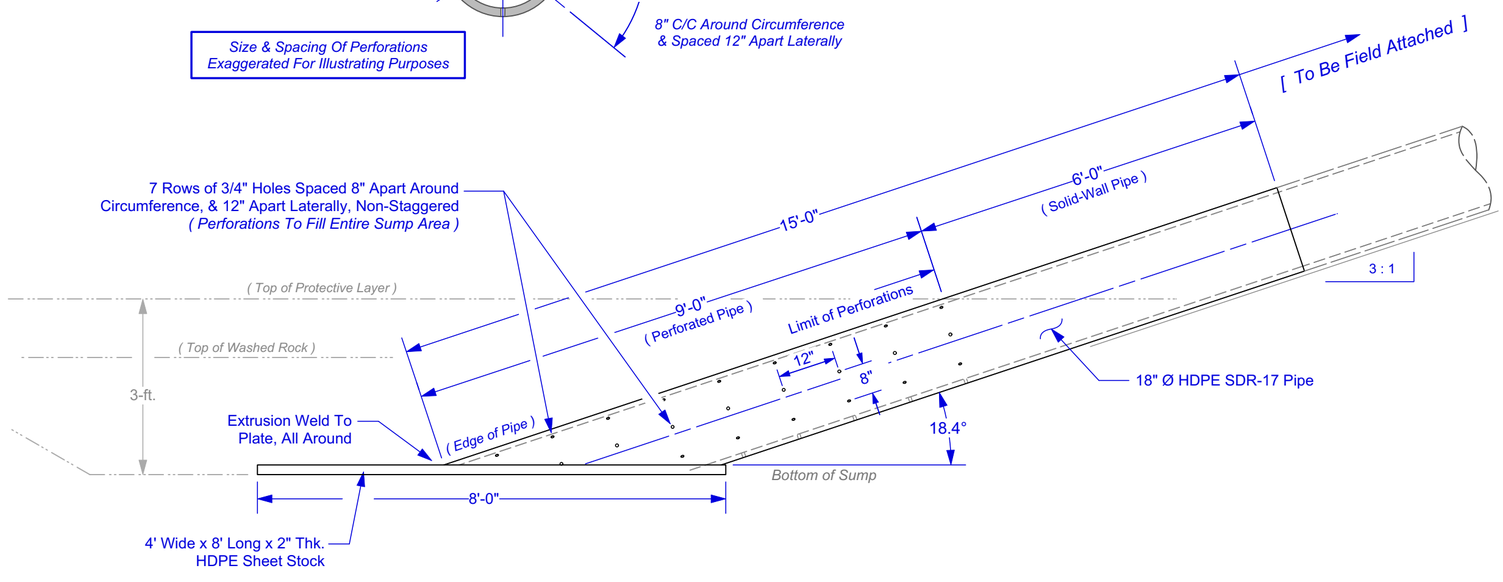

## Exit Discharge Piping
*( Not To Scale )*




*Size & Spacing Of Perforations Exaggerated For Illustrating Purposes*




## Upper Riser Access




## Lower Collection Sump Riser
*( Scale 1/2" = 1'-0" )*

**Qty. - 1 Sump Req'd.**
*( See Plan View Inset )*

| NO. | DATE | REVISIONS | BY |
|---|---|---|---|
| | | | |

| | |
|---|---|
| Drawn By: J. Yoder *( Draftsman / Designer )* | Date: 6-11-2018 |
| Technician: | Date: |
| PFF Estimator: | Date: |
| Q/C: | Date: |
| Customer Approval: | Date: |

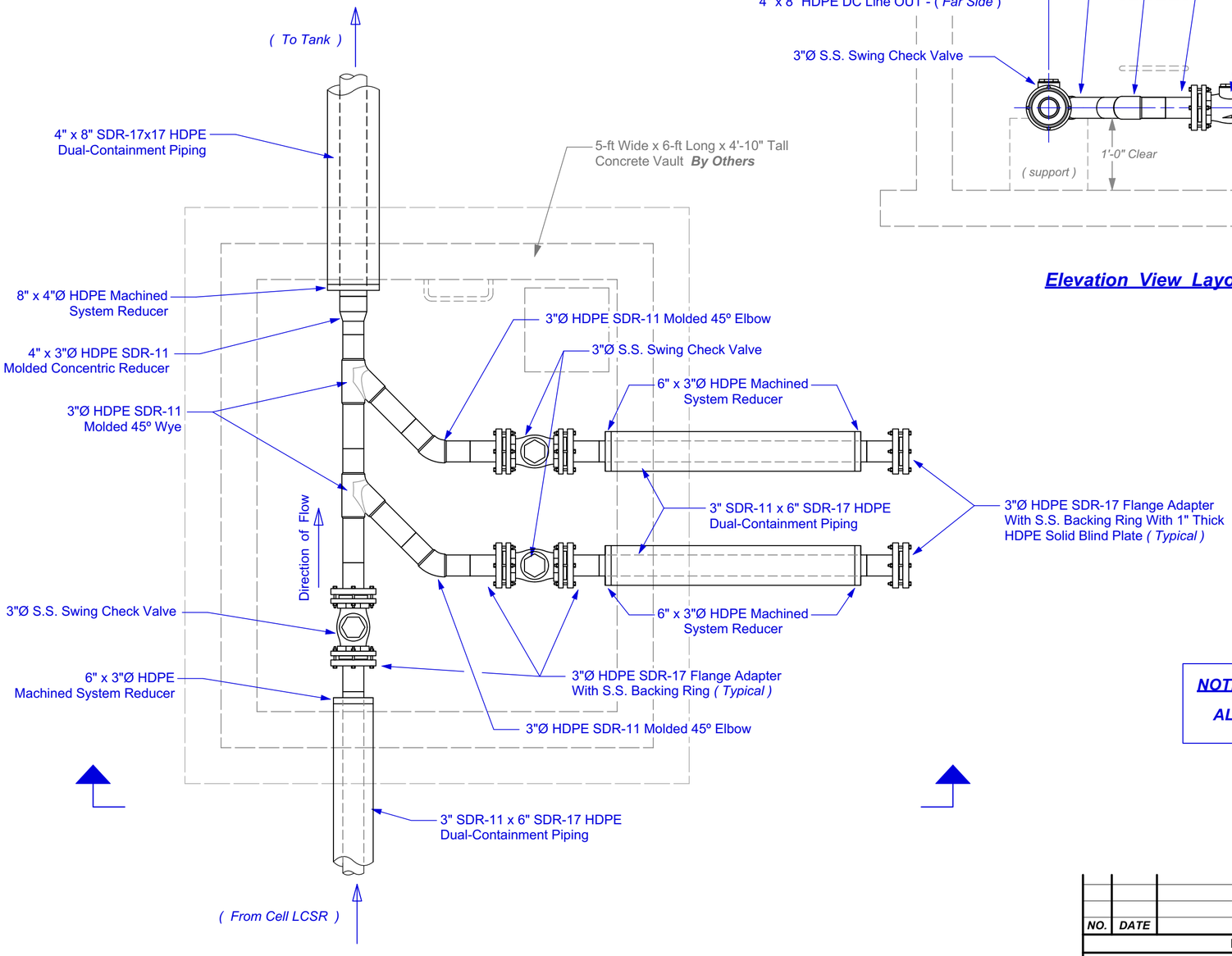
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Dumey Contracting, Inc. - Craighead Co. Solid Waste Disposal
Legacy Landfill, Cell 1 South / Cell 2 North - Jonesboro, AR
18"Ø HDPE Leachate Collection Sump & Riser Access Details

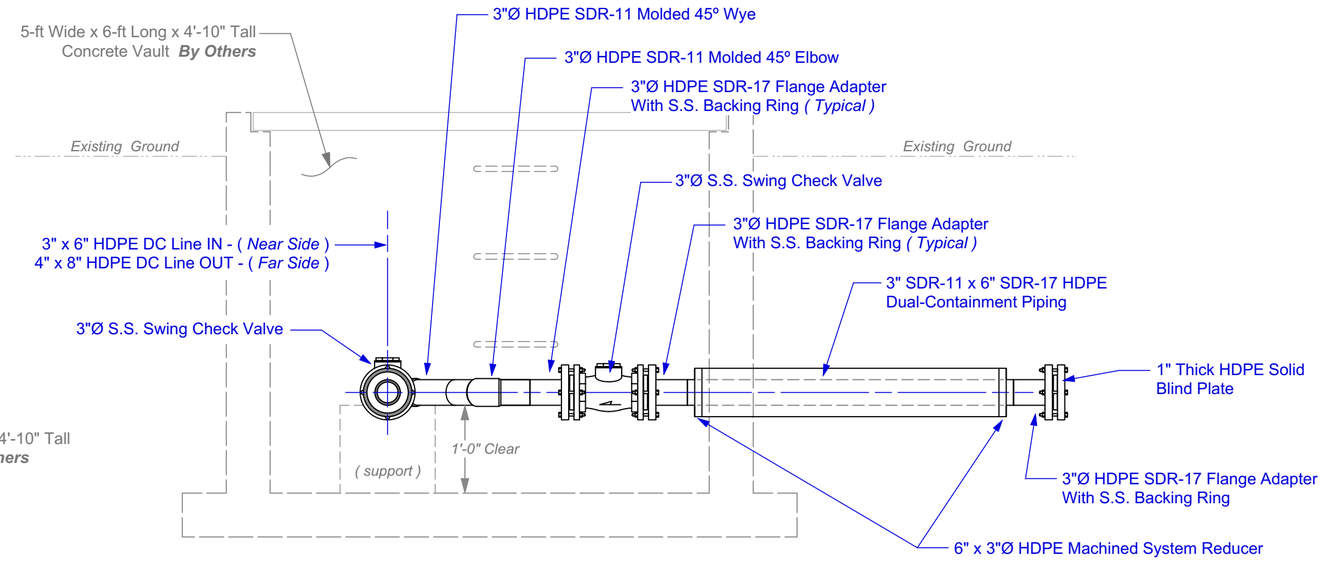
| | | |
|---|---|---|
| PFF Drawing No: **03370-096 b** | Scale: *As Shown* | Rev. **0** |
| PFF Job No: F-18096 | Sheet: 2 of 3 | |

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# Valve Vault Piping




## Plan View Layout




## Elevation View Layout

**NOTE :**

***ALL Piping Shown Inside Valve-Vaulit Will Be Field installed***

| NO. | DATE | BY |
|---|---|---|
| | | |

**REVISIONS**

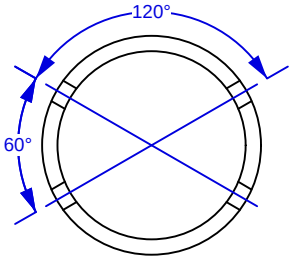
| | |
|---|---|
| Drawn By: J. Yoder ( Draftsman / Designer ) | Date: 6-11-2018 |
| Technician: | Date: |
| PFF Estimator: | Date: |
| Q/C: | Date: |
| Customer Approval: | Date: |

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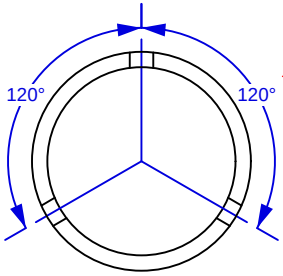
Dumey Contracting, Inc. - Craighead Co. Solid Waste Disposal
Legacy Landfill, Cell 1 South / Cell 2 North - Jonesboro, AR
HDPE Piping System Layout for Valve-Vault Details

| | | |
|---|---|---|
| PFF Drawing No: **03370-096 c** | Scale: 3/4" = 1'-0" | Rev. **0** |
| PFF Job No: F-18096 | Sheet: 3 of 3 | |

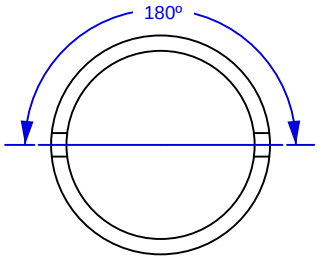
PFF Drawing Form C ( 17 x 22 )



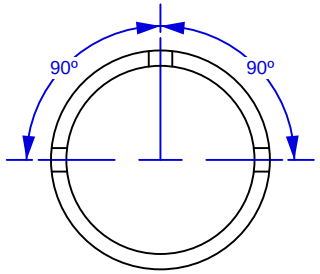

**Style "A"**
(4 - Holes)



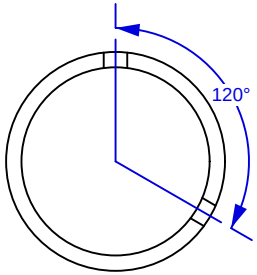

**Style "B"**
(3 - Holes)



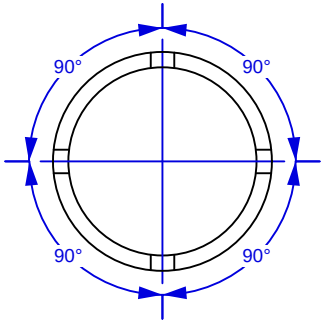

**Style "C"**
(2 - Holes)
Co.Spc'd.



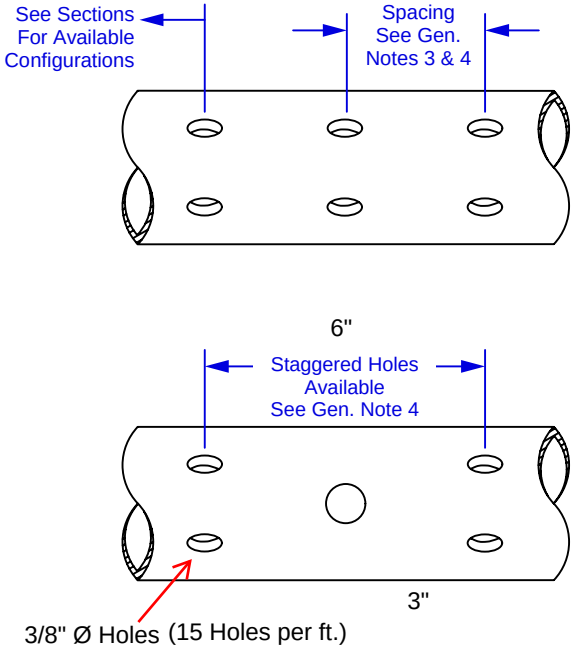

**Style "D"**
(3 - Holes)




**Style "E"**
(2 - Holes)




**Style "F"**
(4 - Holes)




Holes Per Foot

| *Ctr. Dist.* | Style "A" | "B" | "C" | "D" | "E" | "F" |
|---|---|---|---|---|---|---|
| *3* | 16 | 12 | 8 | 12 | 8 | 16 |
| *4* | 12 | 9 | 6 | 9 | 6 | 12 |
| *6* | 8 | 6 | 4 | 6 | 4 | 8 |
| *8* | 6 | 4.5 | 3 | 4.5 | 3 | 6 |
| *9* | 5.3 | 4 | 2.6 | 4 | 2.6 | 5.3 |
| *12* | 4 | 3 | 2 | 3 | 2 | 4 |
| *18* | 2.6 | 2 | 1.3 | 2 | 1.3 | 2.6 |
| *24* | 2 | 1.5 | 1 | 1.5 | 1 | 2 |

General Notes:

1. Perforations Available On 3" Thru 12" IPS.
2. Size Of Perforations May Be ½" to ¾" Dia. Holes.
3. Spacing Of Perforations May Be 3", 4", 6", 8", 9", 12", 18" or 24" On Center. (Note: 6" Centers on 4"Ø Pipe Is The Minimum)
4. Holes Can Be Staggered Upon Request.

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Standard Perforated Pipe Layout Detail

REV. 0

# DRISCOPLEX® 4000/4100 Series Municipal and Industrial HDPE Pipe



DRISCOPLEX® HDPE Pipe is available to meet your needs in compliance with ASTM D3035/AWWA C901 or ASTM F714/AWWA C906 and NSF/ANSI 61 product standards. Factory Mutual FM1613 product standard is also available.

Produced from only the highest rated HDPE pipe material, DRISCOPLEX® 4000/4100 Series Pipe is manufactured from PE4710 resin as listed in PPI-TR4.

## DRISCOPLEX® HDPE Pipe Advantages:

- ✓ Durable
- ✓ Leak Tight
- ✓ Excellent Flow
- ✓ Low Surge
- ✓ Fatigue Free
- ✓ Impact Resistant
- ✓ Trenchless Install
- ✓ Bend Radius
- ✓ Chemical Resistant
- ✓ UV Protection
- ✓ Flexibility
- ✓ Environmental

| Optional Color Stripes to Identify the Application | |
|---|---|
| **Color** | **Application** |
| Blue | Potable Water |
| Green | Wastewater |
| Purple | Treated Effluent, Reclaimed Water |
| Red | Factory Mutual, Underground Fire Main |
| White – Gray – Brown | Customer Specified |

Standard product is solid black with no stripes. IPS – 4 single stripes / DIPS – 3 sets of dual stripes.


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Performance Pipe, a division of Chevron Phillips Chemical Company LP | 5085 W. Park Blvd | Suite 500 | Plano, TX 75093 | Phone: 800-527-0662 | Fax: 972-599-7329

PERFORMANCE PIPE
A Division of Chevron Phillips Chemical Company LP

# DRISCOPLEX® 4000/4100 Series PE Piping

| DriscoPlex® Series Pipe Material Physical Properties | | |
|---|---|---|
| **Property** | **Standard** | **Typical Value†** |
| Material Designation | | PE4710 |
| Cell Classification | ASTM D3350 | 445574C (black) |
| Density [4] | ASTM D1505 | 0.960 g/cc (black) |
| Melt Index [4] | ASTM D1238 | 0.08 g/10 min |
| Flexural Modulus [5] | ASTM D790 | >120,000 psi |
| Tensile Strength [5] | ASTM D638 Type IV | >3500 psi |
| SCG (PENT) [7] | ASTM F1473 | >500 hours |
| HDB at 73°F (23°C) [4] | ASTM D2837 | 1600 psi |
| Color; UV stabilizer [C] | ASTM D3350 | Black |

This is not a product specification and does not guarantee or establish specific minimum or maximum values or manufacturing tolerance for material or piping products to be supplied. Values obtained from tests of specimens taken from piping product may vary from these typical values.

***Additional Sizes and DR available. Contact Performance Pipe or visit www.performancepipe.com***

**Selected Dimension Ratios for DriscoPlex® 4000 DIPS Pipe (Additional Sizes and DR's available. Contact Performance Pipe)**

| DIPS | | DR 17 PC = 125 psi | | | DR 11 PC = 200 psi | | |
|---|---|---|---|---|---|---|---|
| Pipe Size, in. | OD, in. | Min Wall in. | Avg. ID in. | Wgt. lbs/ft | Min Wall in. | Avg. ID in. | Wgt. lbs/ft |
| 4 | 4.80 | 0.282 | 4.201 | 1.76 | 0.436 | 3.876 | 2.62 |
| 6 | 6.90 | 0.406 | 6.040 | 3.64 | 0.627 | 5.571 | 5.42 |
| 8 | 9.05 | 0.532 | 7.921 | 6.26 | 0.823 | 7.305 | 9.33 |
| 10 | 11.10 | 0.653 | 9.716 | 9.42 | 1.009 | 8.961 | 14.03 |
| 12 | 13.20 | 0.776 | 11.554 | 13.32 | 1.200 | 10.656 | 19.84 |
| 14 | 15.30 | 0.900 | 13.392 | 17.89 | 1.391 | 12.351 | 26.65 |
| 16 | 17.40 | 1.024 | 15.230 | 23.14 | 1.582 | 14.046 | 34.47 |
| 18 | 19.50 | 1.147 | 17.068 | 29.07 | 1.773 | 15.741 | 43.30 |
| 20 | 21.60 | 1.271 | 18.906 | 35.66 | 1.964 | 17.436 | 53.13 |
| 24 | 25.80 | 1.518 | 22.583 | 50.88 | 2.345 | 20.829 | 75.77 |
| 30 | 32.00 | 1.882 | 28.009 | 78.28 | 2.909 | 25.833 | 116.58 |
| 36 | 38.30 | 2.253 | 33.524 | 112.13 | 3.482 | 30.918 | 167.02 |
| 42 | 44.50 | 2.618 | 38.951 | 151.37 | | | |

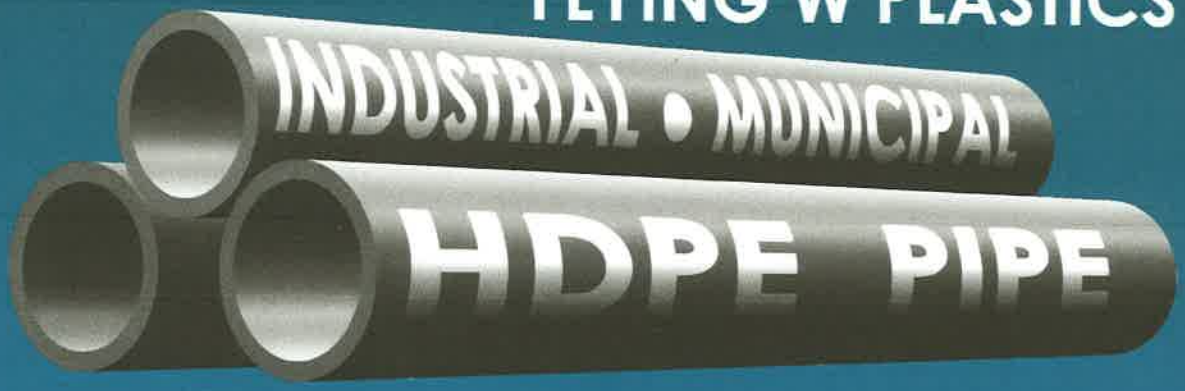
**Selected Dimension Ratios for DriscoPlex® 4100 IPS Pipe (Additional Sizes and DR's available. Contact Performance Pipe)**

| IPS | | DR 17 PC = 125 psi | | | DR 11 PC = 200 psi | | |
|---|---|---|---|---|---|---|---|
| Pipe Size, in. | OD, in. | Min Wall in. | Avg. ID in. | Wgt. lbs/ft | Min Wall in. | Avg. ID in. | Wgt. lbs/ft |
| 2 | 2.375 | 0.140 | 2.078 | 0.43 | 0.216 | 1.917 | 0.64 |
| 3 | 3.50 | 0.206 | 3.063 | 0.94 | 0.318 | 2.826 | 1.39 |
| 4 | 4.50 | 0.265 | 3.938 | 1.55 | 0.409 | 3.633 | 2.31 |
| 6 | 6.63 | 0.390 | 5.798 | 3.36 | 0.602 | 5.349 | 5.00 |
| 8 | 8.63 | 0.507 | 7.550 | 5.69 | 0.784 | 6.963 | 8.47 |
| 10 | 10.75 | 0.632 | 9.410 | 8.83 | 0.977 | 8.679 | 13.16 |
| 12 | 12.75 | 0.750 | 11.160 | 12.43 | 1.159 | 10.293 | 18.51 |
| 14 | 14.00 | 0.824 | 12.253 | 14.98 | 1.273 | 11.301 | 22.32 |
| 16 | 16.00 | 0.941 | 14.005 | 19.57 | 1.455 | 12.915 | 29.15 |
| 18 | 18.00 | 1.059 | 15.755 | 24.77 | 1.636 | 14.532 | 36.89 |
| 20 | 20.00 | 1.176 | 17.507 | 30.58 | 1.818 | 16.146 | 45.54 |
| 22 | 22.00 | 1.294 | 19.257 | 37.00 | 2.000 | 17.760 | 55.10 |
| 24 | 24.00 | 1.412 | 21.007 | 44.03 | 2.182 | 19.374 | 65.58 |
| 26 | 26.00 | 1.529 | 22.759 | 51.67 | 2.364 | 20.988 | 76.96 |
| 28 | 28.00 | 1.647 | 24.508 | 59.93 | 2.545 | 22.605 | 89.26 |
| 30 | 30.00 | 1.765 | 26.258 | 68.80 | 2.727 | 24.219 | 102.47 |
| 32 | 32.00 | 1.882 | 28.010 | 78.28 | 2.909 | 25.833 | 116.58 |
| 34 | 34.00 | 2.000 | 29.760 | 88.37 | 3.091 | 27.447 | 131.61 |
| 36 | 36.00 | 2.118 | 31.510 | 99.07 | 3.273 | 29.061 | 147.55 |
| 42 | 42.00 | 2.471 | 36.761 | 134.84 | 3.818 | 33.905 | 200.84 |
| 48 | 48.00 | 2.824 | 42.013 | 176.12 | | | |
| 54 | 54.00 | 3.176 | 47.266 | 222.90 | | | |

This product flyer is intended for reference purposes. It should not be used in place of the advice from a licensed Professional Engineer. Pressure Ratings and Pressure Class are based on operating temperature up to 80°F. Average inside diameter is calculated using Nominal OD and Minimum Wall plus 6% for use in estimating fluid flow. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in the applicable pipe manufacturing specification. Additional information available at www.performancepipe.com


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# FLYING W PLASTICS




# Municipal & Industrial High-Density Polyethylene Pipe

## PRODUCT SPECIFICATIONS



FLYING W
PLASTICS, INC.

www.flyingwplastics.com
Flying W Plastics, Inc. | 487 Vanhorn Dr. • PO Box 759 | Glenville, WV 26351
304.462.5779 ph • 800.327.4735 sales • 304.462.7657 fx




## OVERVIEW

Flying W Plastics' high-density polyethylene municipal and industrial pipe can be manufactured to meet several industry standards including ASTM, AWWA, NSF, and other custom standards upon request. Different applications can require the pipe to be manufactured and labeled differently. Since Flying W Plastics manufactures pipes for a wide variety of applications, and since some standards may not be suitable for all applications, it is imperative that the customer review all standards prior to purchase and request quotations for pipe manufactured to meet their specific requirement.

Flying W Plastics manufactures the following products:

**Spec I & Spec II** - These HDPE pipes are manufactured from select PE4710 materials designed to give outstanding performance and longevity specifically for municipal water, sewer, and various industrial applications. These pipes are available in sizes 1/2"-18" in both IPS and DIPS (where applicable) and are available as black pipe or with color-coded stripes. These pipes comply with AWWA C901 (3" and smaller sizes), AWWA C906 (4" and larger sizes), and are NSF-PW listed for potable water. They are manufactured in compliance with the requirements of ASTM F714 (3" and larger), ASTM D3035 (2.5" and smaller), and meet the cell classification of PE445574C as specified in ASTM D3350.

**Pioneer Industrial** - These HDPE pipes are manufactured from select PE4710 resins and meet the cell classification of PE445574C as per ASTM D3350. These pipes are designed to provide excellent performance in applications such as mining, landfills (both solid and perforated pipes available), hydraulic fracturing, process fluids, and a wide variety of industrial applications. They are manufactured to meet the requirements of ASTM F714 (3" and larger) and ASTM D3035 (2.5" and smaller). Available in sizes 1/2"-18".

**Earth Source Geothermal** - Manufactured to meet the demanding needs of the geothermal heating and air conditioning industry. These are PE4710 materials meeting the cell classification of PE445574C and manufactured to the requirements of ASTM D3035, F714, and D3350. See Flying W Plastics' Earth Source Geothermal literature for specifications.

**Titan & Spartan Gas** - These pipes are specifically manufactured for the gas gathering and distribution industries and meet the requirements of ASTM D2513. See Flying W Plastics' Titan and Spartan Gas literature for complete details.

**Utility Service Conduit** - These pipes are designed specifically for conduit and are not for pressure applications. They are HDPE pipes that are manufactured to meet the requirements of ASTM F2160 and are used primarily in telecommunications, electrical/power, or telephone applications. See Flying W Plastics' Utility Service Conduit literature for complete details.

FLYING W PLASTICS

INDUSTRIAL • MUNICIPAL

HDPE PIPE

## OVERVIEW

Unless otherwise requested at the time of sale, all municipal and industrial pipe is manufactured from select PE4710 resins. These resins meet or exceed the pressure ratings and physical properties of PE3608 and PE3408 resins.

I.P.S. and D.I.P.S. pipe can be easily connected by fusion processes. Flying W Plastics recommends either butt fusion, socket fusion, or electrofusion, and can provide the recommended guidelines and procedures for connecting municipal and industrial pipe utilizing these methods.

## PE 4710 Pressure Chart

| PE 4710 - 3" to 18" ASTM F714 SPEC I, SPEC II, & Pioneer Industrial | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DR 32.5 | DR 26 | DR 21 | DR 17 | DR 13.5 | DR 11 | DR 9 | DR 7.3 | DR 7 |
| 63 PSI | 80 PSI | 100 PSI | 125 PSI | 160 PSI | 200 PSI | 250 PSI | 317 PSI | 333 PSI |
| **PE 4710 - 1/2" to 18" ASTM D3035 SPEC I, SPEC II, & Pioneer Industrial** | | | | | | | | |
| DR 32.5 | DR 26 | DR 21 | DR 17 | DR 13.5 | DR 11 | DR 9 | DR 7.3 | DR 7 |
| 63 PSI | 80 PSI | 100 PSI | 125 PSI | 160 PSI | 200 PSI | 250 PSI | 317 PSI | 333 PSI |

## Custom Perforation

Flying W Plastic also offers its 4"-18" Pioneer Industrial, Spartan Gas, and Spec II piping custom perforated. We can do a wide variety of patterns and hole sizes done in line as a cost and labor saving alternative to shipping pipe to a perforation facility, making the perforations, re-bundling the pipe, and shipping onto a job site. Our inline perforation capabilities are wide ranging, but there are some limits, as follows:

- Perforations must be round holes ¼" to 1" in diameter.
- A limit of 6 perforated rows to complete pattern.
- Spacing can be 3" to 24"
- Holes can be lined up or staggered (off-set).
- The angles between rows of holes are infinitely adjustable so long as no two rows are closer than 20 degrees apart.
- Any staggering profiles must repeat in 24" or less.






## MATERIAL PROPERTIES

# Material Properties PE4710

The PE4710 materials offer higher working pressures in most applications than PE3608. Flying W certifies that its PE4710 Industrial Pipes are manufactured from high-quality HDPE copolymers having the typical properties listed. These high-density copolymers meet the specifications set forth in ASTM D3035, ASTM F714, and ASTM D3350. These products are designed and manufactured specifically for use in municipal, industrial, mining, water transfer, slurries, irrigation, and landfill applications. For potable water applications, Flying W Plastics' Spec I & Spec II pipes have NSF-PW, AWWA C901, and AWWA C906 certifications and comply with ANSI/NSF Standard 61 health effects requirement.

| Typical Properties [1] | English | SI Units | ASTM Method |
|---|---|---|---|
| Density Black | - | .959 g/cc | D 4883 |
| Melt Index[2] | - | 8.0 g/10 min | D 1238 |
| Tensile Strength | | | |
| @ Yield (2 in/min) | 3625 psi | 25.0 MPa | D 638 |
| @ Break (2 in/min) | 5500 psi | 38.0 MPa | D 638 |
| Elongation @ Break (2 in/min) | >600% | >600% | D 638 |
| Flexural Modulus[3] | 150,000 psi | 1.035 MPa | D 790 |
| Notched Izod Impact Strength | 9 ft-lbf/in | 0.49 kj/m | D 256 |
| Hardness (Shore D) | 66 | 66 | D 2240 |
| Vicat Softening Point | 259 °F | 126 °C | D1525 |
| Brittleness Temperature | <-180 °F | <-118 °C | D 746 |
| Hydrostatic Design Basis | | | |
| @ 23 °C | 1600 psi | 11.0 MPa | D 2837 |
| @ 60 °C | 1000 ps1 | 6.9 MPa | D 2837 |
| Minimum Required Strength | - | 100 MPa | ISO 9080 |
| Environmental Stress Crack Resistance[4] | >1000 hrs | >1000 hrs | D 1693 |
| Notch Tensile (PENT) | >5000 hrs | >5000 hrs | F 1473 |
| Carbon Black Concentration | 2.3% | 2.3% | D 1603 |
| Cell Classification | 445574C | 445574C | D 3350 |

*(1) Typical properties will vary within specification limits;*
*(2) 190 °C / 21,100g;*
*(3) 2% Secant-Method 1*
*(4) Condition C*



FLYING W PLASTICS




## PRODUCT SPECS

# IRON PIPE SIZES - OUTSIDE DIAMETER / DR 7, 7.3, 9, 11, 13.5, 15.5

Pipe weights are calculated in accordance with PPI TR-7. Average ID is calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual inside diameter will vary. Pipe dimensions are in accordance with applicable ASTM standards.

I.P.S. Data
- ASTM F714 Sizes 3" to 18"
- ASTM D3035 Sizes 1/2" to 2-1/2"

All pipe is manufactured from select PE4710 resins unless requested otherwise at the time of quote. While PE4710 resins are used, these resins meet or exceed the pressure ratings and physical properties of PE3608/3408 resins.

| | | *IPS DR - 7 333 psi* | | | *IPS DR - 7.3 317 psi* | | | *IPS DR - 9 250 psi* | | | *IPS DR - 11 200 psi* | | | *IPS DR - 13.5 160 psi* | | | *IPS DR - 15.5 138 psi* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe Size | Nom. OD | Min. Wall | Ave. ID | Weight (lbs/ft.) | Min. Wall | Ave. ID | Weight (lbs/ft.) | Min. Wall | Ave. ID | Weight (lbs/ft.) | Min. Wall | Ave. ID | Weight (lbs/ft.) | Min. Wall | Ave. ID | Weight (lbs/ft.) | Min. Wall | Ave. ID | Weight (lbs/ft.) |
| 1/2" | 0.840 | 0.120 | 0.58 | 0.118 | 0.115 | 0.59 | 0.114 | 0.093 | 0.64 | 0.096 | 0.076 | 0.67 | 0.08 | 0.062 | 0.70 | 0.071 | | | |
| 3/4" | 1.050 | 0.150 | 0.73 | 0.185 | 0.144 | 0.74 | 0.18 | 0.117 | 0.80 | 0.15 | 0.095 | 0.84 | 0.125 | 0.078 | 0.88 | 0.104 | | | |
| 1" | 1.315 | 0.188 | 0.91 | 0.29 | 0.180 | 0.93 | 0.28 | 0.146 | 1.00 | 0.235 | 0.120 | 1.06 | 0.197 | 0.097 | 1.10 | 0.163 | 0.085 | 1.13 | 0.144 |
| 1-1/4" | 1.660 | 0.237 | 1.15 | 0.462 | 0.227 | 1.17 | 0.447 | 0.184 | 1.26 | 0.374 | 0.151 | 1.34 | 0.313 | 0.123 | 1.39 | 0.26 | 0.107 | 1.43 | 0.229 |
| 1-1/2" | 1.900 | 0.271 | 1.32 | 0.606 | 0.260 | 1.34 | 0.585 | 0.211 | 1.45 | 0.49 | 0.173 | 1.53 | 0.411 | 0.141 | 1.60 | 0.341 | 0.123 | 1.64 | 0.30 |
| 2" | 2.375 | 0.339 | 1.65 | 0.947 | 0.325 | 1.68 | 0.914 | 0.264 | 1.81 | 0.766 | 0.216 | 1.91 | 0.642 | 0.176 | 2.00 | 0.533 | 0.153 | 2.05 | 0.469 |
| 2-1/2" | 2.875 | 0.411 | 2.00 | 1.39 | 0.389 | 2.05 | 1.34 | 0.319 | 2.19 | 1.12 | 0.261 | 2.32 | 0.94 | 0.213 | 2.42 | 0.781 | 0.185 | 2.48 | 0.69 |
| 3" | 3.500 | 0.500 | 2.44 | 2.06 | 0.479 | 2.48 | 1.99 | 0.389 | 2.67 | 1.66 | 0.318 | 2.82 | 1.39 | 0.259 | 2.95 | 1.16 | 0.226 | 3.02 | 1.02 |
| 4" | 4.500 | 0.643 | 3.13 | 3.40 | 0.616 | 3.19 | 3.28 | 0.500 | 3.44 | 2.75 | 0.409 | 3.63 | 2.30 | 0.333 | 3.79 | 1.91 | 0.290 | 3.88 | 1.69 |
| 5" | 5.563 | 0.795 | 3.87 | 5.19 | 0.762 | 3.94 | 5.02 | 0.618 | 4.25 | 4.20 | 0.506 | 4.49 | 3.52 | 0.412 | 4.68 | 2.93 | 0.359 | 4.80 | 2.58 |
| 6" | 6.625 | 0.946 | 4.61 | 7.37 | 0.908 | 4.70 | 7.12 | 0.736 | 5.06 | 5.96 | 0.602 | 5.34 | 4.99 | 0.491 | 5.58 | 4.15 | 0.427 | 5.71 | 3.65 |
| 8" | 8.625 | 1.232 | 6.01 | 12.49 | 1.182 | 6.12 | 12.06 | 0.958 | 6.59 | 10.10 | 0.784 | 6.96 | 8.46 | 0.639 | 7.27 | 7.03 | 0.556 | 7.44 | 6.19 |
| 10" | 10.750 | 1.536 | 7.49 | 19.40 | 1.473 | 7.62 | 18.74 | 1.194 | 8.21 | 15.68 | 0.977 | 8.67 | 13.14 | 0.796 | 9.06 | 10.92 | 0.694 | 9.27 | 9.62 |
| 12" | 12.750 | 1.821 | 8.88 | 27.28 | 1.747 | 9.04 | 26.36 | 1.417 | 9.74 | 22.06 | 1.159 | 10.29 | 18.49 | 0.944 | 10.74 | 15.36 | 0.823 | 11.00 | 13.53 |
| 14" | 14.000 | | | | | | | 1.556 | 10.70 | 26.60 | 1.273 | 11.30 | 22.29 | 1.037 | 11.80 | 18.52 | 0.903 | 12.08 | 16.31 |
| 16" | 16.000 | | | | | | | 1.778 | 12.23 | 34.74 | 1.455 | 12.91 | 29.12 | 1.185 | 13.48 | 24.19 | 1.032 | 13.81 | 21.30 |
| 18" | 18.000 | | | | | | | 2.000 | 13.76 | 43.97 | 1.636 | 14.53 | 36.85 | 1.333 | 15.17 | 30.62 | 1.161 | 15.53 | 26.96 |

O.D. controlled water/fluids pipe
Recommended for municipal, industrial, and government applications
Easily connects by fusing, eliminating the need for common connections




## PRODUCT SPECS

# IRON PIPE SIZES - OUTSIDE DIAMETER / DR 17, 21, 26, 32.5

Pipe weights are calculated in accordance with PPI TR-7. Average ID is calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual inside diameter will vary. Pipe dimensions are in accordance with applicable ASTM standards.

I.P.S. Data
- ASTM F714 Sizes 3" to 18"
- ASTM D3035 Sizes 1/2" to 2-1/2"

All pipe is manufactured from select PE4710 resins unless requested otherwise at the time of quote. While PE4710 resins are used, these resins meet or exceed the pressure ratings and physical properties of PE3608/3408 resins.

| | | *IPS DR - 17 125 psi* | | | *IPS DR - 21 100 psi* | | | *IPS DR - 26 80 psi* | | | *IPS DR - 32.5 63 psi* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pipe Size** | **Nom. OD** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** |
| 1/2" | 0.840 | | | | | | | | | | | | |
| 3/4" | 1.050 | | | | | | | | | | | | |
| 1" | 1.315 | 0.077 | 1.15 | 0.132 | | | | | | | | | |
| 1-1/4" | 1.660 | 0.098 | 1.45 | 0.21 | | | | | | | | | |
| 1-1/2" | 1.900 | 0.112 | 1.66 | 0.276 | | | | | | | | | |
| 2" | 2.375 | 0.140 | 2.07 | 0.431 | 0.113 | 2.13 | 0.35 | | | | | | |
| 2-1/2" | 2.875 | 0.169 | 2.51 | 0.631 | 0.137 | 2.58 | 0.52 | | | | | | |
| 3" | 3.500 | 0.206 | 3.06 | 0.935 | 0.167 | 3.14 | 0.767 | 0.135 | 3.21 | 0.63 | 0.108 | 3.27 | 0.50 |
| 4" | 4.500 | 0.265 | 3.93 | 1.55 | 0.214 | 4.04 | 1.27 | 0.173 | 4.13 | 1.03 | 0.138 | 4.20 | 0.835 |
| 5" | 5.563 | 0.327 | 4.86 | 2.36 | 0.265 | 5.00 | 1.94 | 0.214 | 5.10 | 1.58 | 0.171 | 5.20 | 1.28 |
| → 6" | 6.625 | 0.390 | 5.79 | 3.35 | 0.315 | 5.95 | 2.75 | 0.255 | 6.08 | 2.24 | 0.204 | 6.19 | 1.81 |
| → 8" | 8.625 | 0.507 | 7.54 | 5.68 | 0.411 | 7.75 | 4.66 | 0.332 | 7.92 | 3.80 | 0.265 | 8.06 | 3.07 |
| 10" | 10.750 | 0.632 | 9.40 | 8.83 | 0.512 | 9.66 | 7.23 | 0.413 | 9.87 | 5.90 | 0.331 | 10.04 | 4.76 |
| 12" | 12.750 | 0.750 | 11.16 | 12.41 | 0.607 | 11.46 | 10.18 | 0.490 | 11.71 | 8.30 | 0.392 | 11.91 | 6.70 |
| 14" | 14.000 | 0.824 | 12.25 | 14.97 | 0.667 | 12.58 | 12.27 | 0.538 | 12.85 | 10.01 | 0.431 | 13.08 | 8.08 |
| 16" | 16.000 | 0.941 | 14.00 | 19.55 | 0.762 | 14.38 | 16.03 | 0.615 | 14.69 | 13.08 | 0.492 | 14.95 | 10.55 |
| → 18" | 18.000 | 1.059 | 15.75 | 24.74 | 0.857 | 16.18 | 20.28 | 0.692 | 16.53 | 16.55 | 0.554 | 16.82 | 13.35 |

O.D. controlled water/fluids pipe
Recommended for municipal, industrial, and government applications
Easily connects by fusing, eliminating the need for common connections






## DUCTILE IRON PIPE SIZE - OUTSIDE DIAMETER

Pipe weights are calculated in accordance with PPI TR-7. Average ID is calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual inside diameter will vary. Pipe dimensions are in accordance with applicable ASTM standards.

D.I.P.S. Data
- ASTM F-714

All pipe is manufactured from select PE4710 resins unless requested otherwise at the time of quote. While PE4710 resins are used, these resins meet or exceed the pressure ratings and physical properties of PE3608/3408 resins.

| | | *DIPS DR - 7 333 psi* | | | *DIPS DR - 7.3 317 psi* | | | *DIPS DR - 9 250 psi* | | | *DIPS DR - 11 200 psi* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pipe Size** | **Nom. OD** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** |
| 3" | 3.96 | | | | | | | 0.44 | 3.02 | 2.13 | 0.36 | 3.19 | 1.78 |
| 4" | 4.800 | 0.686 | 3.34 | 3.87 | 0.658 | 3.40 | 3.74 | 0.533 | 3.66 | 3.13 | 0.436 | 3.87 | 2.62 |
| 6" | 6.900 | 0.986 | 4.81 | 7.99 | 0.945 | 4.89 | 7.72 | 0.767 | 5.27 | 6.46 | 0.627 | 5.57 | 5.42 |
| 8" | 9.050 | 1.293 | 6.30 | 13.75 | 1.240 | 6.42 | 13.28 | 1.006 | 6.91 | 11.12 | 0.823 | 7.30 | 9.32 |
| 10" | 11.100 | | | | | | | 1.233 | 8.48 | 16.72 | 1.009 | 8.96 | 14.01 |
| 12" | 13.200 | | | | | | | 1.467 | 10.09 | 23.65 | 1.200 | 10.65 | 19.82 |
| 14" | 15.300 | | | | | | | | | | 1.391 | 12.35 | 26.63 |
| 16" | 17.400 | | | | | | | | | | 1.582 | 14.04 | 34.44 |

| | | *DIPS DR - 13.5 160 psi* | | | *DIPS DR - 17 125 psi* | | | *DIPS DR - 21 100 psi* | | | *DIPS DR - 26 80 psi* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pipe Size** | **Nom. OD** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** | **Min. Wall** | **Ave. ID** | **Weight (lbs/ft.)** |
| 3" | 3.96 | 0.293 | 3.33 | 1.48 | 0.233 | 3.46 | 1.20 | 0.189 | 3.55 | 0.982 | | | |
| 4" | 4.800 | 0.356 | 4.04 | 2.18 | 0.282 | 4.20 | 1.76 | 0.229 | 4.31 | 1.44 | 0.185 | 4.40 | 1.18 |
| 6" | 6.900 | 0.511 | 5.81 | 4.50 | 0.406 | 6.03 | 3.64 | 0.329 | 6.20 | 2.98 | 0.265 | 6.33 | 2.43 |
| 8" | 9.050 | 0.670 | 7.62 | 7.74 | 0.532 | 7.92 | 6.25 | 0.431 | 8.13 | 5.13 | 0.348 | 8.31 | 4.18 |
| 10" | 11.100 | 0.822 | 9.35 | 11.64 | 0.653 | 9.71 | 9.41 | 0.529 | 9.97 | 7.71 | 0.427 | 10.19 | 6.29 |
| 12" | 13.200 | 0.978 | 11.12 | 16.47 | 0.776 | 11.55 | 13.31 | 0.629 | 11.86 | 10.91 | 0.508 | 12.12 | 8.90 |
| 14" | 15.300 | 1.133 | 12.89 | 22.12 | 0.900 | 13.39 | 17.88 | 0.729 | 13.75 | 14.66 | 0.588 | 14.05 | 11.96 |
| 16" | 17.400 | 1.289 | 14.66 | 28.61 | 1.024 | 15.23 | 23.12 | 0.829 | 15.64 | 18.95 | 0.669 | 15.98 | 15.46 |

O.D. controlled water/fluids pipe
Recommended for municipal, industrial, and government applications
Easily connects by fusing, eliminating the need for common connections

## Flying W Plastics & PPI




Flying W Plastics, Inc. is a member in good standing with the Plastics Pipe Institute (PPI). PPI is the major trade association representing all segments of the plastics piping industry. As an association, PPI focuses collaborative efforts to accumulate data, concentrate facts, and target resources toward advancements in plastics piping application and usage. PPI promotes contemporary use of plastics piping for water and gas distribution, sewer and wastewater, oil and gas production, industrial and mining uses, power and communications, and ducting and irrigation.

PPI's vision and leadership have resulted in the establishment of uniform testing and design criteria that has become the foundation for all current applications of plastics piping. As PPI members, Flying W Plastics recommends PPI's *Handbook of Polyethylene Pipe, Second Edition* for testing and design criteria of all HDPE pipe manufactured by Flying W Plastics. This handbook is available for purchase online (**www.plasticpipe.org**). The individual chapters can be downloaded free of charge (**www.plasticpipe.org/publications/pe_handbook.html**). Many case studies, technical bulletins, and pipe calculations can also be found at the PPI web site.

FLYING W

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www.flyingwplastics.com

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304.462.5779 ph • 800.327.4735 sales • 304.462.7657 fx

SMITH-COOPER® INTERNATIONAL

SHARPE®
Valves, Automation & Controls

# Series 25116
# 150# Flanged Stainless Steel Check Valve

## Design Features

- Bolted Cover
- Swing Type
- Integral Seat

## Applicable Standards

| | |
|---|---|
| • Steel valves | ANSI B16.34 |
| • Face to face | ANSI B16.10 |
| • End flanges | ANSI B16.5 |
| • Butt-weld ends | ANSI B16.25 |
| • Inspection and test | API 598 |

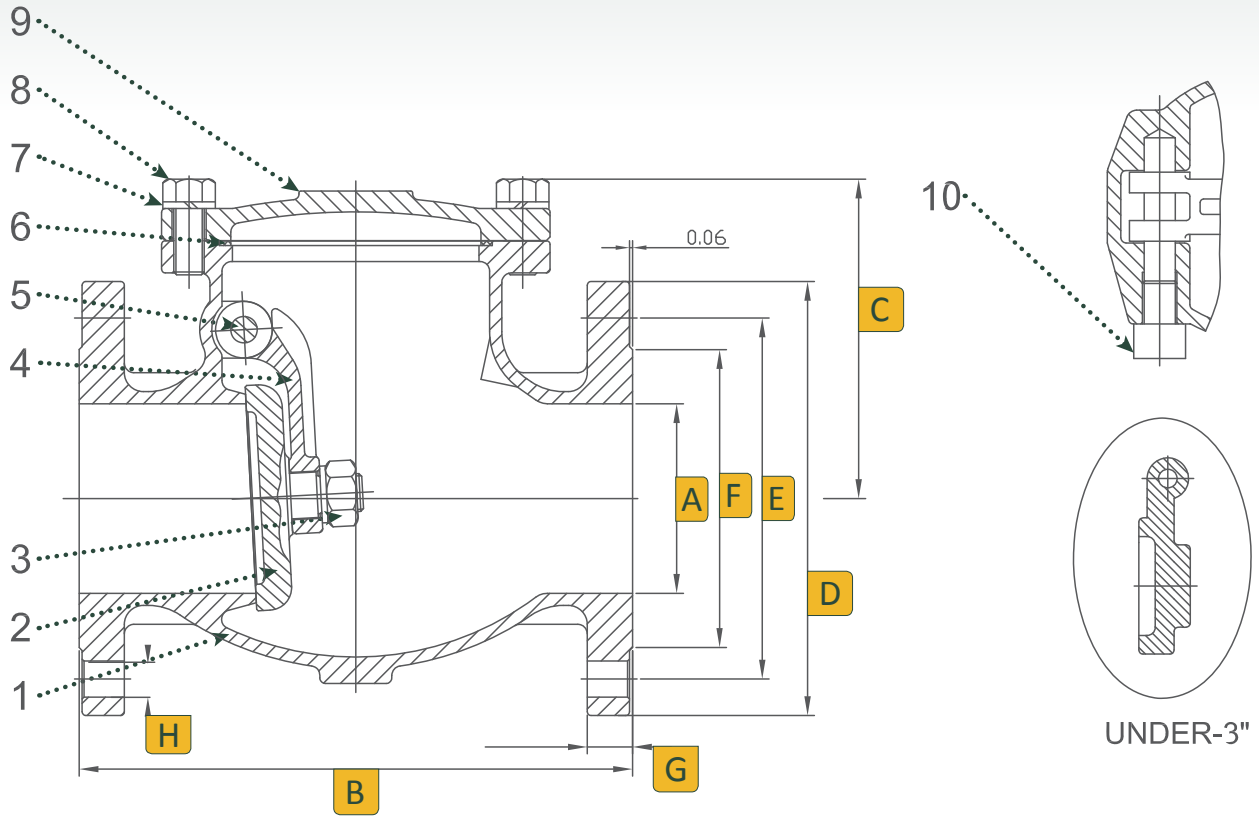


USA 800-766-0076
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# Series 25116
# 150# Flanged Stainless Steel Check Valve

## ½" - 14" Dimensions, Parts & Materials




Dimensions (Inches)

| Size | A | B | C | D | E | F | G | H | Num of Bolt Holes |
|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 0.59 | 4.25 | 2.00 | 3.50 | 2.38 | 1.38 | 0.43 | 0.625 | 4 |
| 3/4 | 0.79 | 4.62 | 2.13 | 3.88 | 2.75 | 1.69 | 0.43 | 0.625 | 4 |
| 1 | 0.98 | 5.00 | 2.52 | 4.25 | 3.12 | 2.00 | 0.43 | 0.625 | 4 |
| 1-1/2 | 1.57 | 6.50 | 2.95 | 5.00 | 3.88 | 2.88 | 0.56 | 0.625 | 4 |
| 2 | 1.97 | 7.99 | 3.82 | 6.00 | 4.75 | 3.62 | 0.62 | 0.75 | 4 |
| 2-1/2 | 2.56 | 8.50 | 4.37 | 7.00 | 5.50 | 4.12 | 0.69 | 0.75 | 4 |
| 3 | 3.15 | 9.49 | 4.72 | 7.50 | 6.00 | 5.00 | 0.75 | 0.75 | 4 |
| 4 | 3.94 | 11.50 | 6.38 | 9.00 | 7.50 | 6.19 | 0.94 | 0.75 | 8 |
| 5 | 4.92 | 13.00 | 7.05 | 10.00 | 8.50 | 7.31 | 0.94 | 0.88 | 8 |
| 6 | 5.90 | 14.02 | 7.99 | 11.00 | 9.50 | 8.50 | 1.00 | 0.88 | 8 |
| 8 | 7.87 | 19.49 | 9.29 | 13.50 | 11.75 | 10.62 | 1.12 | 0.88 | 8 |
| 10 | 9.84 | 24.49 | 11.90 | 16.00 | 14.25 | 12.75 | 1.19 | 1.00 | 12 |
| 12 | 11.81 | 27.48 | 13.40 | 19.00 | 17.00 | 15.00 | 1.25 | 1.00 | 12 |
| 14 | 13.27 | 30.98 | 15.16 | 21.00 | 18.75 | 16.26 | 1.38 | 1.125 | 12 |

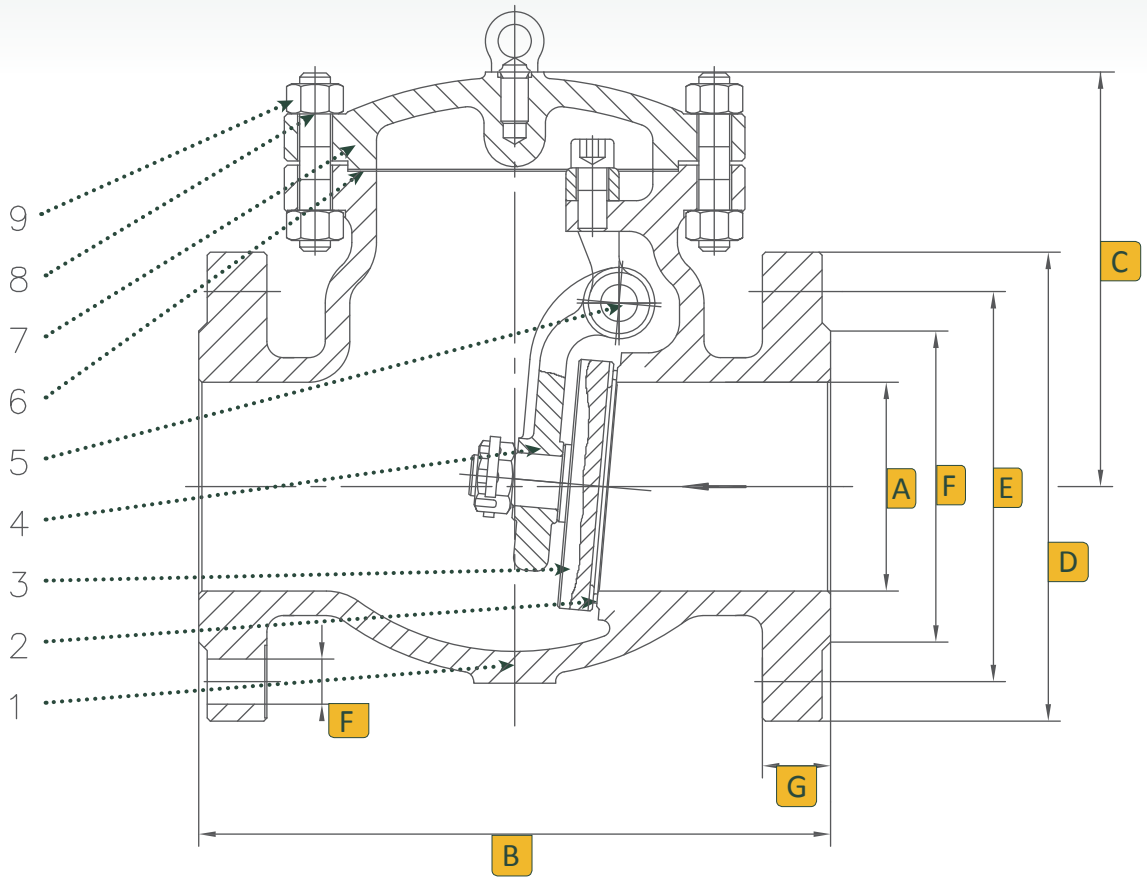
| No. | Part Name | Material |
|---|---|---|
| 1 | Body | 316 Stainless Steel - CF8M |
| 2 | Disc | 316 Stainless Steel - CF8M |
| 3 | Nut | 304 Stainless Steel |
| 4 | Arm Hinge | 316 Stainless Steel |
| 5 | Hinge Pin | 316 Stainless Steel |
| 6 | Gasket | RTFE (Grafoil + 316 Sheet*) |
| 7 | Washer | 304 Stainless Steel |
| 8 | Bolt | 304 Stainless Steel |
| 9 | Cover | 316 Stainless Steel - CF8M |
| 10 | Bolt | 304 Stainless Steel |

*Optional


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# Series 25116
# 150# Flanged Stainless Steel Check Valve

## 16" - 24" Dimensions, Parts & Materials




Dimensions (Inches)

| Size | A | B | C | D | E | F | G | H | Num of Bolt Holes |
|---|---|---|---|---|---|---|---|---|---|
| 16 | 15.24 | 34.00 | 1.44 | 23.50 | 21.25 | 18.25 | 1.44 | 1.125 | 24 |
| 18 | 17.24 | 38.50 | 1.56 | 25.00 | 22.75 | 21.00 | 1.56 | 1.25 | 24 |
| 20 | 19.25 | 38.50 | 1.69 | 27.50 | 25.00 | 23.00 | 1.69 | 1.25 | 24 |
| 24 | 23.27 | 51.00 | 1.88 | 32.00 | 29.50 | 27.25 | 1.88 | 1.25 | 24 |

| No. | Part Name | Material |
|---|---|---|
| 1 | Body | 316 Stainless Steel - CF8M |
| 2 | Seal Facing | 316 Stainless Steel - CF8M |
| 3 | Disc | 316 Stainless Steel - CF8M |
| 4 | Hinge | 316 Stainless Steel |
| 5 | Hinge Pin | 316 Stainless Steel |
| 6 | Gasket | RTFE (Grafoil + 316 Sheet*) |
| 7 | Cover | 316 Stainless Steel - CF8M |
| 8 | Cover Bolt | B8 Stainless Steel |
| 9 | Cover Nut | Grade 8 Nut |

*Optional



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# Series 25116
# 150# Flanged Stainless Steel Check Valve

## Technical Information

| Temperature °F | Working Pressure psi |
|---|---|
| -20 to 100 | 275 |
| 200 | 235 |
| 300 | 215 |
| 400 | 195 |
| 500 | 170 |
| 600 | 140 |
| 650 | 125 |
| 700 | 110 |
| 750 | 95 |
| 800 | 80 |
| 850 | 65 |
| 900 | 50 |
| 950 | 35 |
| 1000 | 20 |

*Standard PTFE seals limiited to 450°F, over 450°F use graphite.

| Size (in) | Weight* (Lbs) | Cracking Pressure* (PSI) |
|---|---|---|
| ½ | 4 | 0.02 |
| ¾ | 4 | 0.02 |
| 1 | 6 | 0.02 |
| 1½ | 10 | 0.02 |
| 2 | 17 | 0.02 |
| 2½ | 26 | 0.03 |
| 3 | 32 | 0.02 |
| 4 | 62 | 0.03 |
| 5 | 83 | 0.03 |
| 6 | 104 | 0.03 |
| 8 | 168 | 0.03 |
| 10 | 296 | 0.04 |
| 12 | 431 | 0.06 |
| 14 | 859 | 0.06 |
| 16 | 1257 | 0.04 |
| 18 | 1466 | 0.05 |
| 20 | 1984 | 0.05 |
| 24 | 2996 | 0.06 |

* For Reference Only

## How to Order

| Size | | Series | Class | | Ends | | Body Material | | Options | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 6 | 25 | 1 | 150 | 1 | Flange | 6 | 316 Stainless Steel | G | Graphite Bonnet Seal* |
| 3/4 | 8 | | | | 2 | Butt-weld* | | | | |
| 1 | 10 | | | | | | | | | |
| 1-1/2 | 12 | | | | | | | | | |
| 2 | 14* | | | | | | | | | |
| 2-1/2 | 16* | | | | | | | | | |
| 3 | 18* | | | | | | | | | |
| 4 | 20* | | | | | | | | | |
| 5 | 24* | | | | | | | | | |

*POA

Example: 3 - 25 - 1 - 1 - 6 = 3-25-1-1-6



Due to continuous development of our product range, we reserve the right to change the dimensions and information for this product as required.



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SHARPE®
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# Series 50
# Full Port Flanged Ball Valves

## Design Features

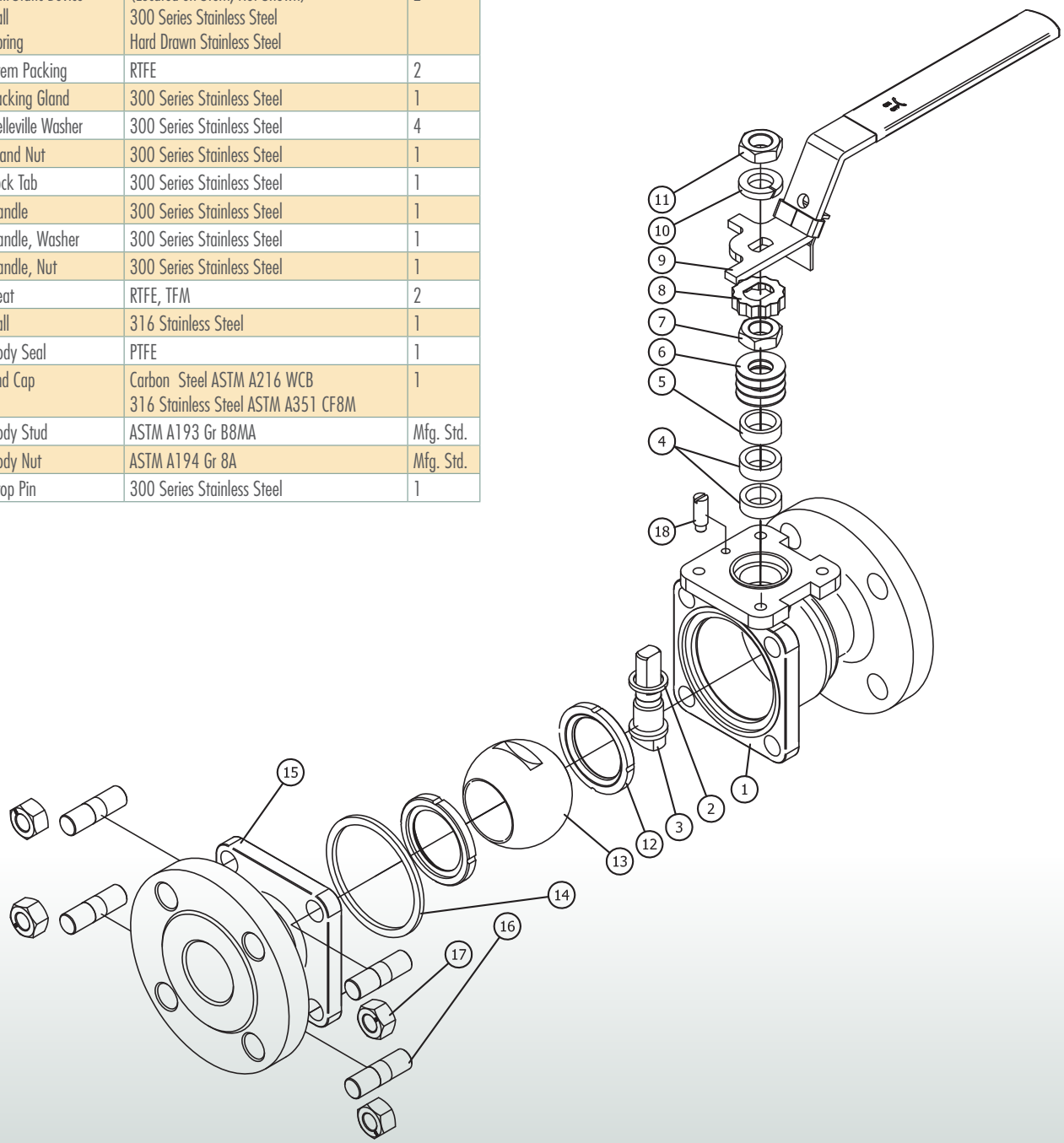
- **ASME B16.34 Design**
  Full port, split body design meets all the requirements of ASME B16.34 for Class 150 ball valves.
- **Blow-Out Proof Stem**
  The internal entry stem is machined with a heavy shoulder to prevent blowout.
- **Anti-Static Configuration**
  Anti-static devices are included at two points on the valve stem to provide continuous ball-to-stem and stem-to-body grounding, to prevent build-up of static charge in the valve.
- **Live-Loaded Stem Seals**
  Stem seals are live-loaded using Belleville washers to provide consistent sealing forces, reducing or eliminating the need for frequent seal adjustment.
- **Fully Encapsulated Body Seals**
  Provides consistent and controlled loading of the body seal compression through a full metal-to-metal contact joint design, eliminating seal extrusion and potential body joint leakage.
- **Integral Mounting Pad**
  Ideal for actuation, ISO 5211 mounting dimensions simplify fit and alignment between valve, bracketry, and actuator. Permits easy field conversion from manual operation to actuation.
- **Lockable Handle**
  Sharpe Series 50 ball valves are supplied with lever handles designed to permit locking the valve in either the open or closed position. Sizes through 2" are supplied with a latch engaged at open and closed positions to prevent inadvertent operation. Larger sizes have a lockable pipe handle.
- **Slotted Seat Design**
  Relief slots are provided at the perimeter of the seats to equalize pressure in the body cavity with the upstream line when the valve is closed, preventing upstream seat extrusion and enhancing downstream seating performance.




- **Seats and Seals**
  Seat materials are offered in RTFE or TFM. Stem packing is RTFE and body seals are PTFE.
- **Floating Ball Design**
  Precision engineered and machined solid stainless steel ball with relief hole in the stem slot prevents build-up of cavity pressure while the valve is in the open position.
- **Material Traceability**
  Body and end piece casting are marked with the heat codes providing traceability to the chemical analysis and material test reports performed at the foundry. CMTR's (Certified Material Test Reports) are available upon request.
- **NACE**
  NACE MR-0175

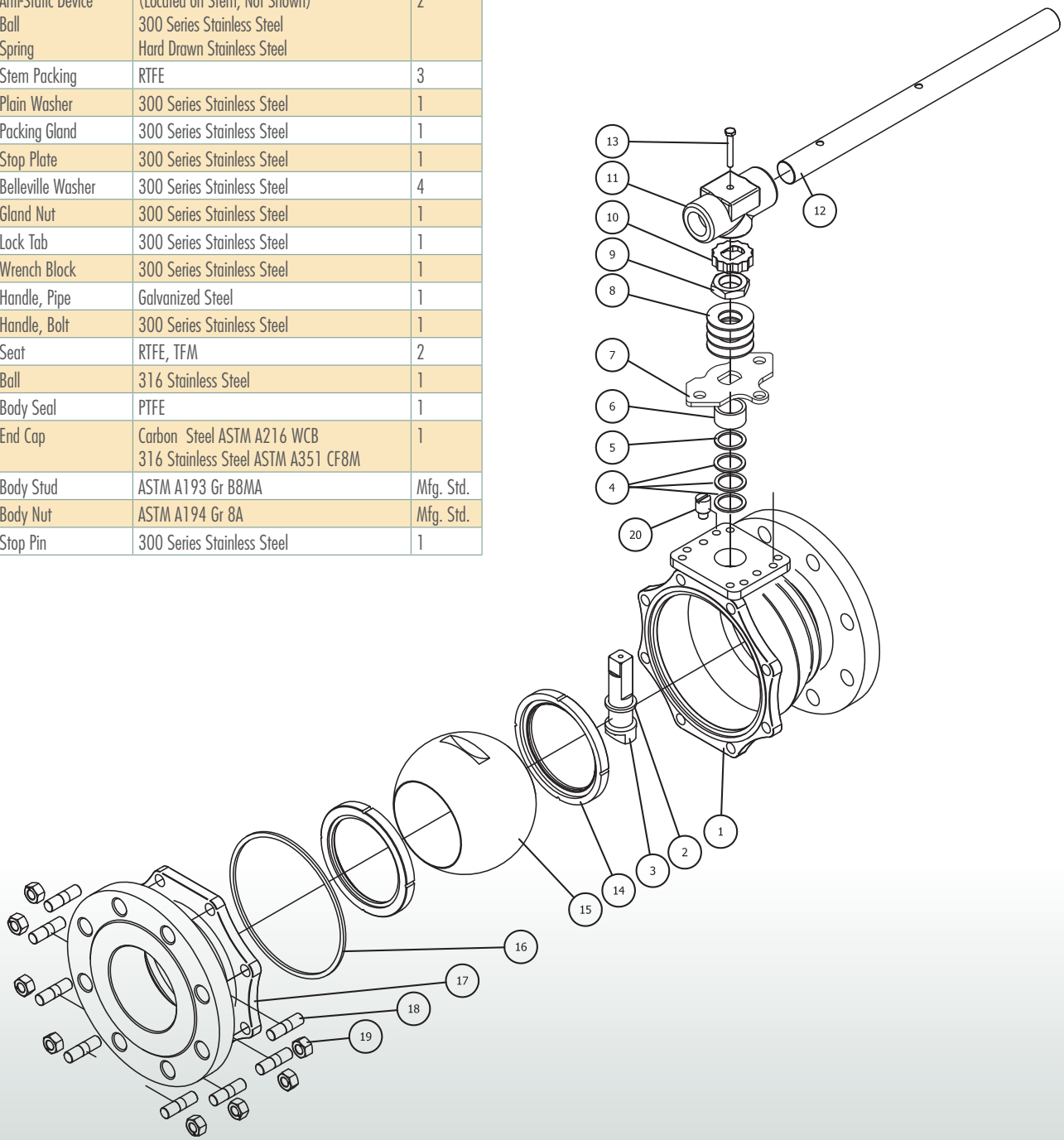
## Parts & Materials
## ½" - 2" Class 150

| No. | Part Name | Material | Qty |
|---|---|---|---|
| 1 | Body | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 2 | Thrust Bearing | RTFE | 1 |
| 3 | Stem | 316 Series Stainless Steel | 1 |
| 3A | Anti-Static Device<br>Ball<br>Spring | (Located on Stem, Not Shown)<br>300 Series Stainless Steel<br>Hard Drawn Stainless Steel | 2 |
| 4 | Stem Packing | RTFE | 2 |
| 5 | Packing Gland | 300 Series Stainless Steel | 1 |
| 6 | Belleville Washer | 300 Series Stainless Steel | 4 |
| 7 | Gland Nut | 300 Series Stainless Steel | 1 |
| 8 | Lock Tab | 300 Series Stainless Steel | 1 |
| 9 | Handle | 300 Series Stainless Steel | 1 |
| 10 | Handle, Washer | 300 Series Stainless Steel | 1 |
| 11 | Handle, Nut | 300 Series Stainless Steel | 1 |
| 12 | Seat | RTFE, TFM | 2 |
| 13 | Ball | 316 Stainless Steel | 1 |
| 14 | Body Seal | PTFE | 1 |
| 15 | End Cap | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 16 | Body Stud | ASTM A193 Gr B8MA | Mfg. Std. |
| 17 | Body Nut | ASTM A194 Gr 8A | Mfg. Std. |
| 18 | Stop Pin | 300 Series Stainless Steel | 1 |



## Parts & Materials
## 2½" - 4" Class 150

| No. | Part Name | Material | Qty |
|---|---|---|---|
| 1 | Body | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 2 | Thrust Bearing | RTFE | 1 |
| 3 | Stem | 316 Stainless Steel | 1 |
| 3A | Anti-Static Device<br>Ball<br>Spring | (Located on Stem, Not Shown)<br>300 Series Stainless Steel<br>Hard Drawn Stainless Steel | 2 |
| 4 | Stem Packing | RTFE | 3 |
| 5 | Plain Washer | 300 Series Stainless Steel | 1 |
| 6 | Packing Gland | 300 Series Stainless Steel | 1 |
| 7 | Stop Plate | 300 Series Stainless Steel | 1 |
| 8 | Belleville Washer | 300 Series Stainless Steel | 4 |
| 9 | Gland Nut | 300 Series Stainless Steel | 1 |
| 10 | Lock Tab | 300 Series Stainless Steel | 1 |
| 11 | Wrench Block | 300 Series Stainless Steel | 1 |
| 12 | Handle, Pipe | Galvanized Steel | 1 |
| 13 | Handle, Bolt | 300 Series Stainless Steel | 1 |
| 14 | Seat | RTFE, TFM | 2 |
| 15 | Ball | 316 Stainless Steel | 1 |
| 16 | Body Seal | PTFE | 1 |
| 17 | End Cap | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 18 | Body Stud | ASTM A193 Gr B8MA | Mfg. Std. |
| 19 | Body Nut | ASTM A194 Gr 8A | Mfg. Std. |
| 20 | Stop Pin | 300 Series Stainless Steel | 1 |

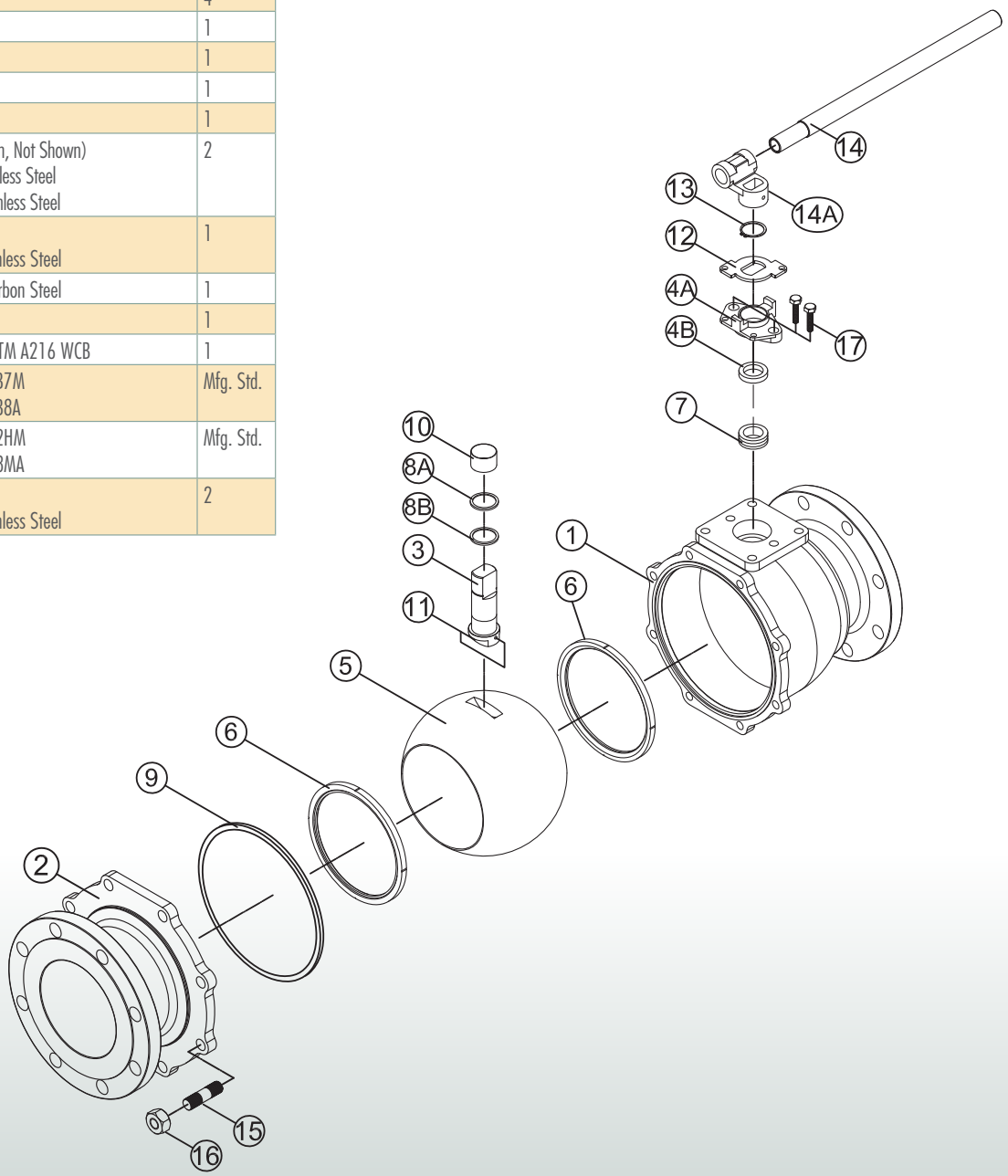




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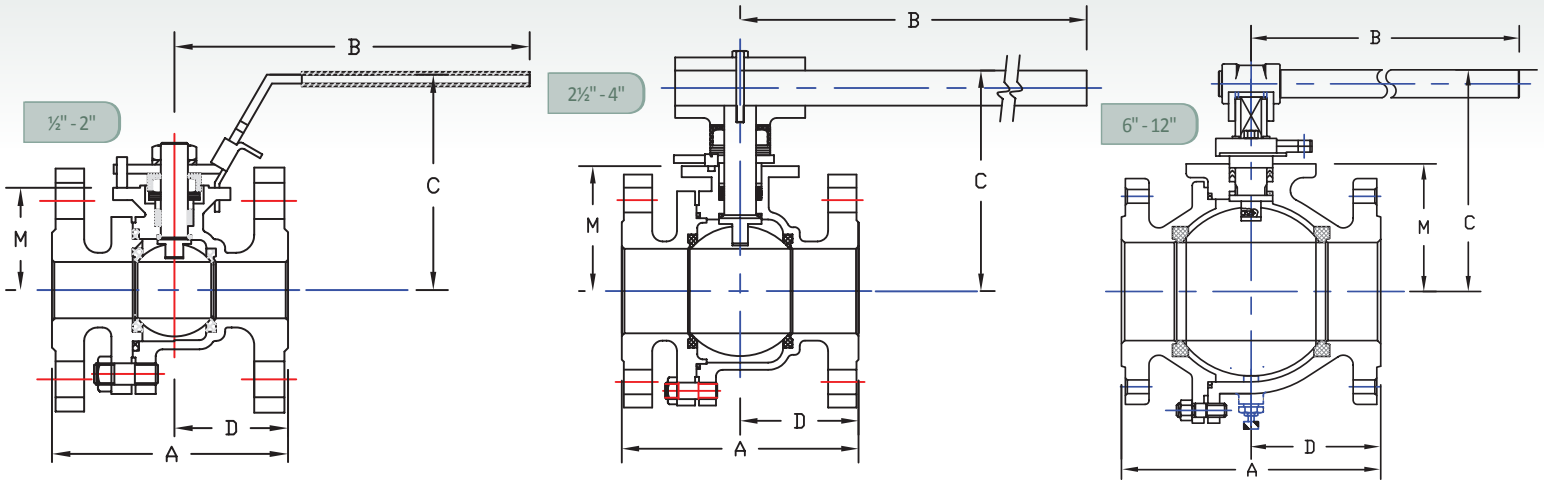
## Parts & Materials
## 6" - 8" Class 150

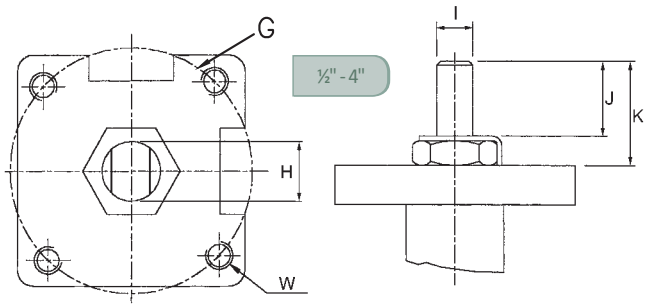
| No. | Part Name | Material | Qty |
|---|---|---|---|
| 1 | Body | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 2 | End Cap | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 3 | Stem | 316 Stainless Steel | 1 |
| 4A | Gland | Carbon Steel ASTM A216 WCB<br>316 Stainless Steel ASTM A351 CF8M | 1 |
| 4B | Sleeve | Steel<br>300 Series Stainless Steel | 1 |
| 5 | Ball | 316 Stainless Steel | 1 |
| 6 | Seat | RTFE | 2 |
| 7 | Stem Packing | PTFE | 4 |
| 8A | Thrust Bearing | PTFE | 1 |
| 8B | Thrust Bearing | PTFE | 1 |
| 9 | Body Seal | PTFE | 1 |
| 10 | Stem Bearing | RTFE | 1 |
| 11 | Anti-Static Device<br>Ball<br>Spring | (Located on Stem, Not Shown)<br>300 Series Stainless Steel<br>Hard Drawn Stainless Steel | 2 |
| 12 | Travel Stop | Zinc Plated Steel<br>300 Series Stainless Steel | 1 |
| 13 | Snap Ring | Nickel Plated Carbon Steel | 1 |
| 14 | Handle, Pipe | Ductile Iron | 1 |
| 14a | Wrench Block | Carbon Steel ASTM A216 WCB | 1 |
| 15 | Stud | ASTM A193 Gr B7M<br>ASTM A193 Gr B8A | Mfg. Std. |
| 16 | Nut | ASTM A194 Gr 2HM<br>ASTM A194 Gr 8MA | Mfg. Std. |
| 17 | Gland Bolt | Steel<br>300 Series Stainless Steel | 2 |

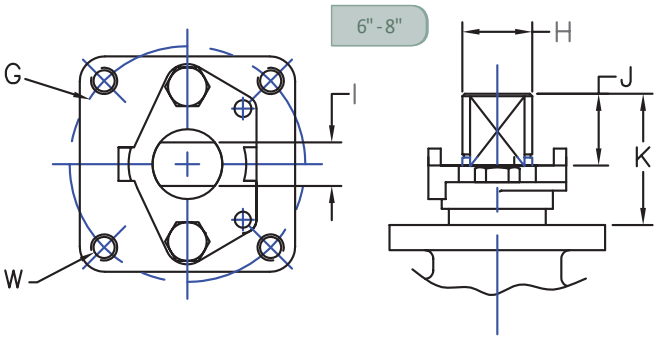


# Series 50
# Full Port Flanged Ball Valves

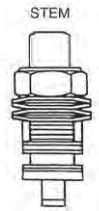
## ½" - 8" Dimensions




½" - 4"
Stem Arrangement for Actuators

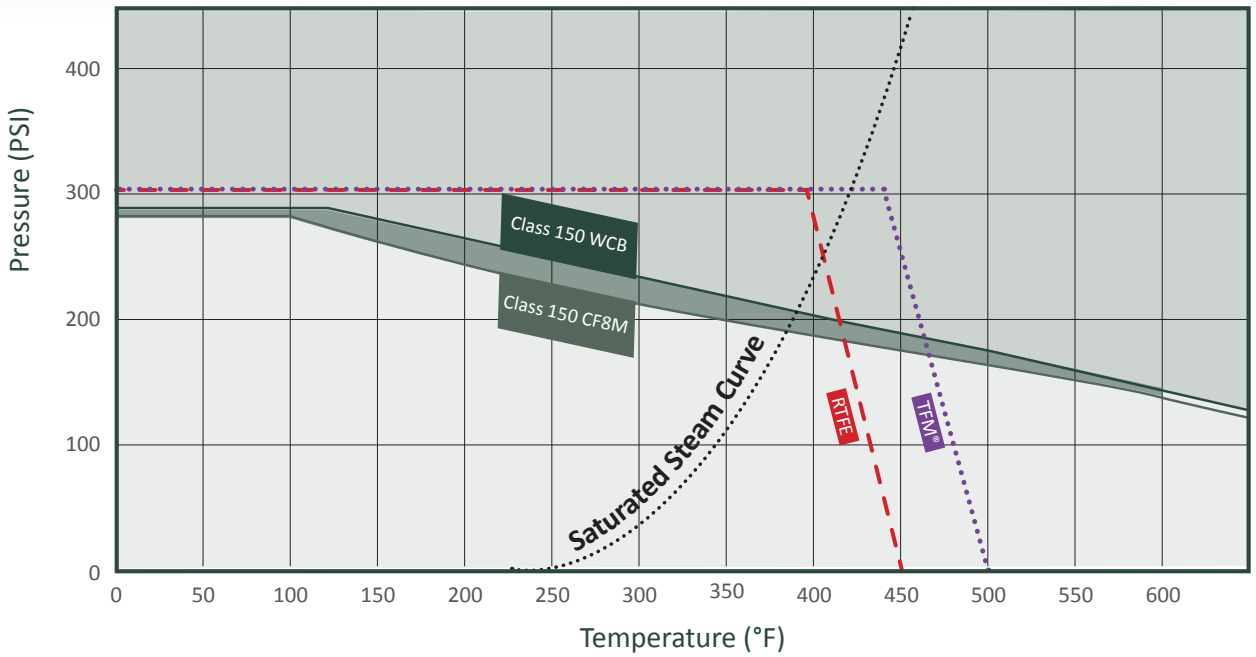



Class 150 Dimensions (Inches)

| Size | Port | A | B | C | D | M | G | H | I** | J | K | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/2" | 0.59 | 4.25 | 4.78 | 3.58 | 1.97 | 1.36 | F03 | 3/8-24 UNF | 0.220 | 0.39 | 0.73 | M5 X 0.8P |
| 3/4" | 0.79 | 4.62 | 4.78 | 3.72 | 2.24 | 1.50 | F03 | 3/8-24 UNF | 0.220 | 0.34 | 0.70 | M5 X 0.8P |
| 1" | 0.98 | 5.00 | 6.25 | 3.80 | 2.20 | 0.77 | F04 | 7/16-20 UNF | 0.291 | 0.60 | 0.85 | M5 X 0.8P |
| 1 1/2" | 1.50 | 6.50 | 9.03 | 4.45 | 3.01 | 2.24 | F05 | 9/16-18 UNF | 0.340 | 0.68 | 1.17 | M6 X 1.0P |
| 2" | 2.00 | 7.00 | 9.03 | 4.82 | 3.47 | 2.61 | F05 | 9/16-18 UNF | 0.340 | 0.61 | 1.15 | M6 X 1.0P |
| 2 1/2" | 2.56 | 7.50 | 13.75 | 6.70 | 3.54 | 3.76 | F10 | 1-14 UNF | 0.748 | 0.61 | 1.87 | M10 X 1.5P |
| 3" | 3.00 | 8.00 | 13.75 | 7.07 | 3.64 | 4.15 | F10 | 1-14 UNF | 0.748 | 0.61 | 1.87 | M10 X 1.5P |
| 4" | 3.94 | 9.00 | 13.75 | 7.70 | 4.42 | 4.74 | F10 | 1-14 UNF | 0.748 | 0.65 | 1.91 | M10 X 1.5P |
| 6" | 6.00 | 15.50 | 37.40 | 11.22 | 7.64 | 7.17 | F14 | 1.72 | 1.018* | 1.65 | 3.58 | M12 X 1.75 |
| 8" | 7.88 | 18.00 | 37.40 | 11.57 | 8.66 | 7.72 | F12 | 1.72 | 1.018* | 1.65 | 3.58 | M12 X 1.75 |

The dimensions above are for informational purposes only. Please contact Sharpe Valves if you need dimensions for construction
** +0.000/ -0.002 * +.000 / -.003

## Seat Pressure -Temperature Rating




Note:
The maximum pressure/temperature ratings of the valve assemblies are limited to lowest of the body or seat material fitted.
The valve body ratings are based on ASME B16.34 rating for materials.
The graphs are based on laboratory testing and our experience in field.
The seat ratings depend on the material, design, application and function.

### Sharpe Seat Materials

**TFM**

**M** - TFM® PTFE
Dyneon® TFM PTFE is a second generation PTFE with improved chemical and heat resistant properties and stress recovery. Its temperature range is -100°F to 500°F (-73°C to 260°C) Color - white.

**RTFE**

**R** - Reinforced Polytetrafluoroethylene (RTFE).
PTFE's mechanical properties are enhanced by adding 15% filler material to provide improved strength, stability and wear resistance. Its temperature range is from -320°F to 450°F (-196°C to 232°C). Color-off-white.

## Technical Information

| Size | $C_V$ | Weight (lbs.) |
|---|---|---|
| 1/2 | 26 | 4 |
| 3/4 | 50 | 6 |
| 1 | 94 | 8 |
| 1-1/2 | 260 | 15 |
| 2 | 480 | 20 |
| 2-1/2 | 750 | 36 |
| 3 | 1150 | 45 |
| 4 | 2110 | 75 |
| 6 | 5070 | 168 |
| 8 | 9330 | 292 |

## Applicable Standards

| | |
|---|---|
| **Wall Thickness** | ASME B16.34 |
| **Face to Face Dimensions** | ASME B16.10 |
| **Flange Dimensions** | ASME B16.5 |
| **NACE** | MR-0175 |
| **Pressure Test** | ASME B16.34, API 598 (optional) |
| **Basic Design** | ASME B16.34 |

## How to Order

| Size | Series | Class | | Body | | Seat | | Options | |
|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 50 | 11 | 150 | 4 | Carbon Steel | M | TFM™ | OH | Oval Handle, Non-locking up to 2" |
| 3/4 | | | | 6 | Stainless Steel | R | RTFE | L | Lockable Stem Extension, 316SS |
| 1 | | | | | | | | | |
| 1-1/2 | | | | | | | | | |
| 2 | | | | | | | | | |
| 2-1/2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 6 | | | | | | | | | |
| 8 | | | | | | | | | |

3/4" - 50 - 11 - 4 - R - = 3/4" 50114-R

Example: 3/4" 50114-R,
3/4" Series 50 Full Port, Split Body Flanged, Raised Face, Class 150 Ball Valve,
Cast Carbon Steel Body with 316 Stainless Ball and Stem, RTFE Seats, PTFE Body Seal and RTFE Stem Packing.


Due to continuous development of our product range, we reserve the right to change the dimensions and information for this product as required.

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