RUMPKE

Waste & Recycling Services

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September 16, 2021

OEPA LIQUID FILES

Ms. Erika Jackson
Ohio Environmental Protection Agency, SEDO
Division of Materials and Waste Management
2195 Front Street
Logan, Ohio 43138-9013

RE: Athens-Hocking Landfill
Cell 30 Construction Certification Report

Dear Ms. Jackson:

In accordance with OAC 3745-27-08(H), please find enclosed the Cell 30 Construction Certification report for the Athens-Hocking Reclamation Center Landfill.

Thank you and should you have any questions concerning this submittal, please contact me at david.murphy@rumpke.com or 513-851-0122 ext. 3161.

Sincerely,

RUMPKE WASTE, INC.

David Murphy, P.E.
Rumpke East Area Sr. Site Engineer

Enclosure

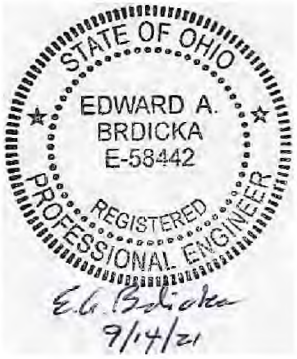
ec: Chris Jaquet, Rumpke Engineering and Landfill Operations Director
Mark Mansfield, Ohio EPA SEDO
Michael Cooper, Athens City-County Health Department
Mark Ruof, The Mark James Corporation
File Solid Waste

CONSTRUCTION CERTIFICATION REPORT

Cell 30 CONSTRUCTION

Athens-Hocking Reclamation Center
Nelsonville, Ohio

for
Rumpke Waste & Recycling Services
Cincinnati, Ohio



The Mark James Corporation
Project No. 1000
September 2021

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1.0 INTRODUCTION

1.1 Project Overview

This construction certification report documents the construction of Cell 30 at the Athens-Hocking Reclamation Center (AHRC) Landfill, located in York Township, Athens County, Ohio. The AHRC landfill is owned by Athens Hocking Landfill, Inc. (AHL) and is operated by Rumpke Waste & Recycling Services (Rumpke). Sheet 1 shows the location of the landfill.

The entire work area, including additional recompacted soil liner (RSL), for later tie-in and the placement of sand rock in the outer edge of Cell 29, is approximately 1.71 acres. The approximate area where at least three feet of RSL was constructed was approximately 1.39 acres. The area for Cell 30 waste placement, where there is three feet of RSL, geosynthetics, and at least one foot of sand or thermal barrier constructed, is 1.39 acres. The certifiable area for Cell 30 is, therefore, 1.39 acres.

This report discusses the construction of the foundation, recompacted soil liner, geosynthetics, leachate collection system, protective sand layer, thermal barrier layer, and the surface water management system for Cell 30. Also discussed are alterations that occurred before or during construction and other changes that affected the record drawings for the facility. The construction drawings are presented for review. Sheet 1 provides a list of the drawings included in the drawing set. This report was prepared in accordance with Rule 3745-27-08 of the Ohio Administrative Code.

A portion of Cell 30 will accept secondary aluminum production wastes and, therefore, a thermal barrier above the composite liner system has been constructed within the northern portion of the cell.

1.2 Description of Drawings

Eleven drawings are included in the Cell 30 construction certification report. Sheet 1 is a title sheet that shows the location of the AHRC Landfill on a USGS map. Sheet 2 depicts the facility at a scale of 1" = 200' and provides a frame of reference to relate the construction drawings to the PTI drawings. The remaining sheets show larger-scale plan views of the various constructed facility components, cross-sections, and construction details.

Sheets 3 through 9 depict the various construction components of the cell, the survey point locations and other pertinent data, and are drawn at a scale of 1" = 50'. Sheet 3 shows the lateral and vertical limits of cell excavation compared to the PTI excavation contours. Sheet 4 shows the constructed bottom of the recompacted soil liner (RSL) contours compared to the PTI top of excavation/bottom RSL contours. Sheet 5 compares the actual constructed top of the RSL contours to the PTI top of RSL contours. This sheet demonstrates that the top of the constructed RSL is not at an elevation that is lower than those approved by the PTI. Sheet 6 compares the actual constructed top of RSL contours to the actual constructed bottom of RSL contours to demonstrate that that the RSL has a minimum thickness of three feet. Sheets 5 and 6 also show the leachate collection piping that was installed on top of the RSL, which in this case, is also the top of the leachate collection geocomposite. A separate sheet for the top of the leachate collection system has not been provided because the thickness of the geocomposite cannot be accurately measured. The geomembrane panel layout, destructive test locations, and geomembrane repair locations are shown on Sheet 7. Sheet 8 shows the contours for the constructed top of the protective sand layer and the top of the constructed soil liner contours to demonstrate that the protective layer is a minimum of one foot thick. The thermal barrier layer contours are compared to the top of the recompacted soil liner contours on Sheet 9. Sheet 10 presents the cross sections of the constructed cell and Sheet 11 shows specific construction details for various components of the cell.

1.3 Survey Control

Survey section lines were established within the limits of the cell to control and certify the elevation and thickness of the various construction components of Cell 30. The survey section lines were established on approximate increments of 50 to 80 feet and in no instances did the distance between survey locations exceed 100 feet. Survey points were located at grade contours, at the lateral limits of the cell, and at grade breaks.

The location and identification number of the survey points used in the construction of Cell 30 are shown on Sheet 2 – Survey Point Locations. Table 1 provides a summary of the survey point identification numbers, their plan coordinates, and the PTI and constructed elevations for the various cell components. The "as-built" thickness of the RSL, protective cover layer, and thermal barrier are tabulated in the table.

1.4 Project Parties

AHL (landfill owner) and Rumpke (landfill operator) directed the construction activities for Cell 30. All required earthwork was completed by Rumpke employees. Chesapeake Containment Systems, Inc. (CCS) was the geosynthetic subcontractor for the project. Geotechnics, Inc. and S&ME Inc. provided laboratory services for the geosynthetics testing and soil analysis, respectively. Quality assurance activities were performed by personnel from The Mark James Corporation. Resumes for the project quality assurance personnel are contained in Appendix E.

2.0 FOUNDATION PREPARATION and RECOMPACTED SOIL LINER INSTALLATION

The area of RSL construction within Cell 30 is approximately 1.35 acres in size and is immediately adjacent to Cells 25, 28 and 29. The entire work area, including additional recompacted soil liner (RSL), for later tie-in and the placement of sand rock in the outer edge of Cell 29 is approximately 1.69 acres in size. The configuration of the cell is shown on Sheet 2 – Survey Point Locations. Construction of the foundation consisted of excavating and grading the cell to the grades shown on Sheet 6C-39 of the PTI. The RSL was constructed once the base of the cell was excavated or filled to grade and the foundation prepared.

2.1 Foundation Preparation

Preparation to bring the foundation of Cell 30 to the permitted grade consisted of excavating or filling portions of the cell to bring the foundation to the required PTI grades.

2.1.1 Structural Rock Fill

A portion of the existing grade within the limits of Cell 30 was below the required PTI excavation grade. One area, as shown on Sheet 3, was below grade because a surface water sump had been constructed in this area. Initial work consisted of pumping out water from the sump and removing any accumulated sediment. Structural rock fill was then placed and compacted in the sump to bring the area into conformance with the PTI RSL bottom limits. Sheet 4 shows the bottom elevations for the RSL once the structural rock fill had been constructed.

Laboratory Testing

The rock fill is to consist of durable rock in a range of rock sizes such that the smaller particles fill the voids between the larger pieces of rock. The maximum rock particle size is

not to exceed 24 inches. Laboratory testing of the rock used in the construction of the structural rock fill is not required.

The rock used in the construction of the structural rock fill was inspected prior to its use. The maximum particle size was found to be less than or equal to 24 inches and there was a range of rock sizes such that the smaller particles filled the voids between the larger pieces of rock.

Placement and Compaction

An articulated dump truck was used to transport the rock from the borrow area to the structural rock fill area shown on Sheet 3. As the material was placed in Cell 30 it was inspected to ensure that it was free of unacceptable material. The rock was spread in lifts that were less than or equal to 2 feet in loose thickness. The lift thickness and final grade of the compacted fill were controlled through the use of visual observations, measurements, grade stakes and/or a total station. The lift was compacted until no additional movement of the fill was observed. Additional lifts were added until the foundation conformed to the contours shown on Sheet 4 – Bottom of Soil Liner.

A total of approximately 30 - 40 cubic yards of rock were placed in the sump area. Table 1 presents the elevations of the actual excavation grade (Column 5), the PTI top of excavation/bottom of soil liner (Column 4), and the bottom of the RSL as constructed in the field (Column 6).

The foundation checklist and field notes for the placement of the rock fill are contained in Appendix B, Section 1, Structural Rock Fill. The checklist presents the observations and tests that were conducted to verify that the structural rock fill was placed in accordance with the PTI requirements.

2.1.2 Bedrock Foundation

The bedrock elevation within Cell 30 was above the PTI excavation contours and had to be excavated prior to the construction of the RSL. To accomplish the grading of the bedrock, a bulldozer with an attached ripper blade was used to loosen the bedrock. An excavator was then used to load the loosened rock into articulated dump trucks for removal. Excavation of the rock continued until Cell 30 approximated the contours shown on the construction certification drawing entitled Sheet 3 – Limits of Excavation. In general, the bedrock was excavated from 0.0' to 1.5' below the PTI excavation grade.

Once the bedrock was brought to grade the bedrock foundation was surveyed for proper grade and the condition of the foundation was inspected. The bedrock foundation was found to be at an acceptable grade. The bedrock was found to be competent with minor jointing and the jointing was in a closed condition with no open jointing observed. There were no significant sized pieces of rock that were loose or detached from the bedrock. The foundation checklist (Appendix B, Section 1) presents the observations and tests that were conducted to verify that the excavated bedrock was in conformance with the PTI requirements. Table 1 presents the PTI elevations for the Cell 30 limits of excavation (Column 4) and the constructed top of excavation (Column 5).

2.1.2 Soil Foundation

The bedrock within Cell 30 was excavated anywhere from approximately 0.0' to 1.5' below grade, as shown on Sheet 3 – Limits of Excavation. Structural fill was placed in this area, therefore, to raise the grades up to the approximate PTI excavation/bottom of recompacted soil liner grade.

Laboratory Testing

Soil used in the soil structural foundation was tested in the laboratory for modified Proctor maximum dry density and optimum moisture content. This data was used to control

compaction of the structural fill in the low lying areas of Cell 30. The structural fill laboratory compaction data is shown in Table 2 and Appendix A, Section 1.

The volume of structural fill used in Cell 30 was approximately 1,325 cubic yards. A single sample was collected and analyzed for maximum dry density and moisture content (modified Proctor) for use in constructing the structural fill. This meets the required testing frequency of 1 test per 10,000 cubic yards of material used in the construction of Cell 30.

Placement and Compaction

The structural fill was placed in the base area of the cell, where the cell is constructed at an approximate grade of 2.5%. Articulated dump trucks were used to transport the soil from the borrow area to the structural fill area. The earthen material was spread in approximate 1 foot thick lifts. The lift thickness and final grade of the compacted fill were controlled through the use of grade stakes and a total station. The lift was compacted with a Caterpillar 826, self-propelled, padfoot compactor. Each lift of the foundation was compacted with a minimum of 4 contacts. The foundation was then graded to conform to the contours shown on Sheet 4 – Bottom of Soil Liner.

Table 1 presents the PTI top of excavation/bottom of soil liner (Column 4), elevations of the actual excavation grade (Column 5), and the bottom of the as constructed RSL (Column 6). Column 7 presents the difference in elevation between the PTI and the actual as constructed bottom of soil liner elevations. A negative value in the difference column represents an as constructed bottom of RSL elevation that is below the PTI bottom of liner elevation. Positive elevation differences are acceptable as long as the positive elevation difference is accounted for in the elevation of the as constructed top of the RSL. The data contained in Table 1 show that the bottom of the RSL was constructed above the required PTI elevation. This is a result of previous cells having been constructed above grade.

Soil Density and Moisture Content Testing

After each lift was compacted, the density and moisture content of the lift was tested according to ASTM D2922 and D3017, respectively. The density of the compacted fill had to exceed 90 percent of the Modified Proctor and the moisture content had to be between plus or minus 3 percent of the optimum moisture content. As seen in Table 3, which presents a summary of the foundation field density and moisture test results, all of the tests passed the PTI density and moisture requirements.

2.2 Recompacted Soil Liner Installation

The installation of the RSL for Cell 30 consisted of the following activities: soil preparation, laboratory testing, placement and compaction, and field verification of the moisture and density of the RSL.

2.2.1 Soil Preparation

The soil for the Cell 30 RSL was excavated from the borrow area and processed through a screen with a square sieve size of 1.25 inches. The screened soil was then placed in a soil stockpile. As the soil was processed and placed in the soil stockpile, it was observed that the soil was on the dry side of the optimum moisture content and that the soil required moisture conditioning. The soil was, therefore, placed in approximate 6-inch thick lifts and water was then added and mixed into the soil. This procedure continued until it appeared that the moisture content of the soil was above the optimum moisture content for the soil. Microwave water contents of the processed soil were conducted periodically to control the moisture content of the soil.

Eleven soil samples (21-1 through 21-11) were collected from the borrow area and sent to the soils laboratory for analysis. Each sample represents 1,500 cubic yards of soil within the stockpile. As will be discussed in the following section, the soil met the PTI requirements.

2.2.2 Soil Laboratory Testing Requirements

Laboratory testing of the Cell 30 composite soil samples was as follows.

- Atterberg Limits (ASTM D4318)
- Mechanical Gradation and Hydrometer (ASTM D421 and D422)
- Standard Proctor (ASTM D698)
- Permeability (ASTM D5084-90) (Tested at a rate of one test per 10,000 cubic yards)

Specifications that the soil had to meet are based on the specifications contained within the Test Pad #3 Report, which was approved by the Ohio EPA on September 13, 2005. The required specifications are listed below:

1) Gradation and Hydrometer:

   (i) 100% of the particles having a dimension not greater than 2.0 inches.

   (ii) Not more than 10% of the particles retained on the ¾ inch sieve.

   (iii) Not more than 17% of the soil fraction retained between #4 and 2 inch sieves.

   (iv) Between 19% and 29% of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters.

2) Permeability

   The soil must have a laboratory permeability of less than or equal to 1×10^{-7} centimeters per second (cm/sec).

S&ME analyzed the soil samples per the PTI requirements. The results are summarized in Table 2 and the laboratory data sheets are contained in Appendix A, Section 1. The results for the eleven soil samples collected for Cell 30 show that:

1) Gradation and Hydrometer:

   All of the soil was finer than 2 inches in diameter. The fraction retained on the ¾" sieve was between 1.0% and 2.5%. The soil fraction retained between the #4 and 2" screen size was between 6.6% and 10.4%. The fraction of the soil passing the .002 mm sieve ranged from 24.6 % to 27.3%. The soil samples,

therefore, passed the PTI gradation and hydrometer requirements and were substantially similar to the soil used in Test Pad #3.

2) Permeability:

Two soil samples (21-1 and 21-7) were tested for permeability and had permeabilities of 3.4×10^{-8} cm/sec and 4.5×10^{-8} cm/sec, respectively. The samples, therefore, passed the PTI maximum soil permeability requirement of 1.0×10^{-7} cm/sec.

3) Atterberg Limits:

The Atterberg limits for the soil samples were within the nominal range of the test pad results. The liquid limit, plastic limit, and plasticity index values ranged from 34 to 36, 18 to 21, and 14 to 18, respectively.

4) Standard Proctor:

The standard Proctor maximum dry density for the Cell 30 borrow area samples varied from 112.8 pcf to 120.3 pcf and the optimum moisture content varied from 11.4% to 13.2%. The average maximum dry density and optimum moisture content were 116.8 pcf and 12.1%, respectively. These values were used as the benchmark values for constructing the RSL.

The Ohio EPA concurred with the use of the soil borrow for the construction of Cell 30 RSL in a letter dated July 1. 2021.

2.2.3 Placement of the Recompacted Soil Liner

The AHRC landfill is required to install a three-foot thick RSL. Construction of the RSL was conducted according to the construction methods described in the following paragraphs.

Articulated dump trucks transported soil for the RSL from the stockpile area to Cell 30. Once deposited at the cell, a bulldozer would then spread the soil into maximum eight-inch thick, loose lifts. Lift thickness was controlled by visual observation, grade stakes, and/or the use of a total station. Once the lift was placed, a dozer graded the lift so that there were no significant depressions or rises. The lifts were inspected for stones in excess of 2.0 inches and other unacceptable materials that were inadvertently incorporated into the RSL. Stones

exceeding 2.0 inches in size and other unacceptable material were handpicked from the soil. The checklist for the placement of the RSL with respect to lift thickness, number of passes, soil quality and overall elevation is contained in Appendix B, Section 2.

Subsequent to the RSL being placed and unacceptable materials removed, an *826 Caterpillar* compactor was used to compact the RSL. It was determined that additional water had to added to the RSL because the moisture content of the RSL was potentially below the optimum moisture content of the soil. The lift was watered and then the compactor made two (2) contacts to mix the water into the RSL. The lift was then watered again and the compactor made the three passes (six contacts) required by the PTI. The lift was then tested for moisture and density. If the lift failed, it was reworked until it passed the moisture and/or density requirements. Once the lift passed the testing requirements, an additional lift would then be placed and compacted. This construction sequence continued until the RSL was constructed to a total thickness of at least three feet. The volume of approved RSL soil material used to construct Cell 30 was approximately 6,300 cubic yards.

Once installed, minor grading was conducted so that the RSL was constructed to the approximate elevations and grades shown on Sheets 5 and 6 - Top of Soil Liner/Leachate Collection System. Sheet 5 compares the as constructed top of RSL contours to the top of the RSL contours required by the PTI. Sheet 6 compares the as constructed top of RSL contours with the as constructed bottom of the RSL contours of the cell. Sheets 5 and 6 can be used to visually determine that the RSL was constructed above the PTI required grade and that the required minimum RSL thickness of three feet was met.

Table 1 presents the elevations of both the PTI top of RSL and the as constructed top of RSL (Columns 8 and 9, respectively). Also presented in Table 1 is Column 10, entitled "Difference of Actual and PTI Top of RSL." The survey locations within the certifiable limits of Cell 30 all had positive values in Column 10, showing that the RSL was constructed above the required PTI elevation. The thickness of the RSL constructed within Cell 30 is shown in the column entitled, "Thickness of Actual RSL" (Column 11). All of the RSL thicknesses meet or exceed the three-foot thickness requirement. The values in Columns 10

and 11 demonstrate that the RSL of Cell 30 was constructed at or above the approved PTI elevations and that the RSL had a thickness of at least three feet. Please note that there are two survey locations (Points 44 and 45) included in Table 1 that do not have an RSL thickness (Column 11) of three feet. These values are acceptable because these points are outside the certifiable limits of Cell 30 and can be brought to grade during subsequent cell construction.

2.2.4 Recompacted Soil Liner Density and Moisture Content Testing

Every lift of the constructed RSL was tested for soil density and moisture content using ASTM methods D2922 and D3017, respectively. Per the PTI, the density and moisture content of the RSL must be tested at a minimum rate of 5 tests per acre per lift. The area of the RSL placement within the working area that achieved the three foot thickness was approximately 1.35 acres and, therefore, a minimum of 7 test locations were required. Table 4 summarizes the RSL field density and moisture content test results. Each lift was tested for soil density and moisture content at least 10 times. The field testing frequency exceeded the required PTI and regulatory testing frequency. The field sheets presenting the field locations and test results are presented in Appendix B, Section 2.

The RSL was required to be compacted to at least 95 percent of the standard Proctor density and to a water content that was at or above the optimum moisture content of the soil. There were three instances where the RSL failed the field density or moisture requirement as discussed below:

Area 5 – Lift 3: The first two field tests for Area 5 – Lift 3 failed the density requirement. The entire lift was compacted with four additional contacts. The lift was then tested and the moisture content and density of the lift passed the compaction and moisture requirements.

Area 4 – Lift 5: Two of three field tests for Area 4 – Lift 5 failed the moisture requirement. The entire lift was watered and compacted with an additional four contacts. The lift was then tested and the moisture content and density of the lift passed the compaction and moisture requirements.

Swale – Lift 2: The field test for Lift 2 of the swale area failed the density requirement. The area was compacted with an additional six contacts. The lift was then tested and the moisture content and density of the lift passed the compaction and moisture requirements.

The field notes in Appendix B, Section 2 discuss the steps taken to remedy the failed points. The checklist for the placement of the recompacted soil liner with respect to the required density and moisture and the elevations of the top and bottom of the recompacted soil liner is contained in Appendix B, Section 2.

2.2.5 Anchor Berm

A soil anchor berm was not used in Cell 30 to anchor the geomembrane and geocomposite. The cell is to be expanded in the next several weeks and anchoring of the materials is, therefore, not necessary. Sand bags and loose sand were placed on top of the geosynthetics to anchor and prevent movement of the geosynthetics and allow for the future expansion of the cell.

2.2.6 Weather Conditions Affecting Recompacted Soil Liner Construction

Construction of the RSL occurred from July 27th through August 5th, 2021. There were several precipitation events during cell construction.

Rain occurred on July 30th and August 1st, 2021. All excess water and saturated RSL were removed after each of rain event and the upper section of the lift was scarified prior to re-initiating the construction of the RSL.

The weather conditions experienced during construction caused additional work but did not impact the overall quality of the RSL construction. Short summaries of the weather conditions encountered during the construction of the RSL are included in the field notes (Appendix B, Section 2).

3.0 GEOMEMBRANE LINER INSTALLATION

The facility's PTI requires that a 60-mil textured (double sided) HDPE geomembrane be installed in direct contact with the three-foot thick RSL. Chesapeake Containment Systems, Inc. (CCS) was contracted by Rumpke to install the 60-mil textured HDPE geomembrane. The HDPE geomembrane used in the construction of Cell 30 was manufactured by Solmax (formerly GSE).

3.1 Prequalification

A total of twelve rolls (144,504 square feet) of geomembrane were ordered for installation in Cell 30. The tests, testing frequencies and general specifications for the 60-mil geomembrane as required by the PTI are presented in Table 5.

The manufacturers' quality control (QC) certifications for the HDPE are contained in Appendix C, Section 1, Manufacturer's Conformance Testing. The laboratory test results for the owner conformance testing conducted on Roll #1001-151225 and #1001-151233 are contained in Appendix C, Section 1, Owner's Conformance Testing. Table 6 documents that the required geomembrane tests were performed at the required frequency by both the manufacturer and the owner. Tables 7 and 8 present the manufacturer's and owner's conformance test results for the geomembrane. The tables demonstrate that the geomembrane met or exceeded the required PTI material specifications. The Ohio EPA, in a letter dated July 14, 2021, concurred with the use of the geomembrane in the construction of Cell 30.

The owner conducted direct shear interface testing between the geomembrane and the RSL. The results of the testing are summarized in Table 9 and the laboratory data sheets are contained in Appendix C, Section 2. As shown in the table, the geomembrane met the required test parameters for the RSL/Geomembrane direct shear interface testing.

3.2 Preparation

Once the material was delivered to the site, the QC certifications were used to inventory and inspect the geomembrane. Each roll was located, inspected for damage, and its QC certification reviewed. All of the individual rolls of HDPE geomembrane had an accompanying QC certification that conformed to the required specifications and no observable damage to the rolls was noted.

The RSL was inspected for protruding stones and pebbles and other deleterious material prior to the installation of the 60-mil geomembrane. Laborers walked the area and handpicked deleterious material from the RSL. The RSL was inspected a final time immediately prior to placement of the 60-mil textured geomembrane. The geomembrane installer inspected the RSL and accepted it as a suitable subbase for the geomembrane without additional preparations being required.

3.3 Geomembrane Deployment

The 60-mil HDPE textured geomembrane was installed in Cell 30 on top of the three-foot thick RSL. The geomembrane was transported to the working face with the use of a skid steer from which the geomembrane was hung with the use of a metal bar and straps. The geomembrane was pulled into position, aligned by hand, cut to length, and then further adjusted for proper overlap with adjacent geomembrane panels. The overlap was typically a minimum of six inches.

Once placed, the geomembrane panels were inspected for rips, holes, or other flaws. Inspection of the geomembrane found it to be in good condition upon placement. No noticeable defects or damages to the geomembrane were noted. Panel Placement Logs are contained in Appendix B, Section 3. The location of the geomembrane panels and the geomembrane rolls used to construct the panels is shown on Sheet 7 – Geomembrane Panel Layout.

3.4 HDPE Geomembrane Seaming

3.4.1 Seaming Preparation

The area of the HDPE geomembrane to be seamed was verified to be clean and free of moisture, dust, dirt, and other foreign material that would impair the seaming process. Prior to seaming, dust and other foreign materials were wiped from the area to be seamed. The geomembrane panels were aligned such that geomembrane panels overlapped a minimum of six inches for hot wedge-fusion welding and three inches for extrusion welding. The panels were also adjusted to minimize the number of wrinkles within the seam.

3.4.2 Trial Seams

Seaming of the geomembrane was accomplished over a two day period. Hot wedge, double seam, fusion welding was conducted on August 6th through August 7th, 2021. Extrusion seaming was conducted on August 7th through August 8th, 2021. Individual operators using an assigned machine had to perform a test weld by seaming together two pieces of geomembrane. The trial seams were conducted on top of the Cell 30 RSL. The test weld/seam was then tested for seam peel strength (ASTM D413). The seaming devices and operators had to pass the peel strength requirements prior to working on the liner system. The trial seam test logs, showing that the operators passed the trial seam welds, are contained in Appendix B, Section 4.

3.4.3 Geomembrane Seaming

Either a hot wedge fusion or extrusion seaming device was used to seam the HDPE geomembrane. The hot wedge, double seam, fusion welding method was used for the majority of the completed seams. It is estimated that 2,630 linear feet of fusion welding was completed in Cell 30. A minimum overlap of six inches for the hot wedge fusion was maintained in all seams. Seam locations are shown on Sheet 7. Seam Test Logs are contained in Appendix B, Section 4. Extrusion seaming was used for patch repairs and beads. It is estimated that approximately 325

linear feet of extrusion welding was conducted. A minimum overlap of three inches for the extrusion seaming was maintained in all seams

3.4.4 Non-Destructive Testing

One hundred percent of the extruded and fused seams were tested for continuity by either the vacuum box or air channel pressure (ACP) test methods. The ACP continuity testing was conducted as the seaming of the geomembrane progressed. Some seams were tested in their entirety whereas some were tested in sections because of various defects along the seam(s). The Seam Test Logs (Appendix B, Section 4) demonstrate that all of the fusion welded seams passed the ACP continuity testing. Repair patches were placed at the ACP test locations.

The vacuum box test method was used to test every linear foot of extrusion welding completed at the site. Extrusion welding was performed to repair destructive test locations, cross seam intersections, miscellaneous damages to the geomembrane, and the ACP test locations. It was also used to construct the seam between P5/P6 and the existing geomembrane. This extrusion seam was approximately 50 feet in length. All of the extrusion welding passed the vacuum box continuity testing.

3.4.5 Destructive Testing

Destructive test samples of the welded seams were cut from the installed geomembrane once the seams passed the non-destructive ACP testing. The destructive test samples were collected and tested to evaluate seam strength and whether or not the welds had integrated the individual panels into a continuous sheet. Destructive testing provides a direct evaluation of seam strength and bonding efficiency, which are indicators of seam durability. According to the PTI, destructive test samples are to be collected and tested at a frequency of 1 sample per every 500 linear feet of constructed weld, per operator, per seaming apparatus.

A representative of Mark James selected the destructive test locations. A CCS representative cut the destructive test samples, measuring approximately 18 inches by 36 inches, out of the seam.

The destructive test samples were labeled for identification purposes. The sample locations were surveyed so that their locations could be recorded on the layout drawing. The destructive test location was then repaired by welding a patch over the hole. All of the destructive test locations were repaired with a patch that had approximate dimensions of 24 inches by 60 inches. Finally, the extrusion welds of the repair patch seams were tested using the vacuum box test. All of the repair patches for the destructive test locations passed the non-destructive vacuum box testing.

The total linear footage of double seam fusion welding completed in Cell 30 was approximately 2,630 feet. The double seam fusion welding was divided between two operators/seaming apparatus, designated as AM #1739 and RL #1712. The total constructed seam lengths for AM #1739 and RL #1712 were approximately 1485' and 1145", respectively. To comply with the PTI destructive test frequency requirements, a total of 6 destructive test samples were collected from the fusion welds. Three destructive samples (DS-1, DS-3, and DS-5) were collected for seaming apparatus AM #1739 and three destructive samples (DS-2, DS-4, and DS-6) were collected for seaming apparatus RL #1739. The location of the destructive test locations collected from the fusion welds are shown on Sheet 7.

A total of 325 linear feet of extrusion welds were constructed during the installation of the geomembrane by one operator/extrusion gun (HMR #42). The location of the destructive test location collected from the extrusion weld is shown on Sheet 7.

Destructive test samples DS-1 through DS-7 were tested by Geotechnics. Five test coupons were cut from each destructive test sample and the weld was tested for peel strength (ASTM D413). Four out of five coupons had to meet or exceed the required peel strength requirements. The 5th sample had to have a peel strength that was no less than 80% of the required strength requirement. Regarding the locus of break, the coupons had to exhibit a film tear separation in which the geomembrane sheet tore before the weld. Incursion of the tear into the weld is allowed but the incursion must be less than or equal to 25%. The destructive test sample designation, weld type, seaming apparatus, material type, PTI required test values and the test results for a given sample are summarized in Table 10. The destructive test strength data sheets

are contained in Appendix B, Section 5. All of the fusion and extrusion destructive test samples passed the strength requirements.

3.4.6 Repair Work

Repair work is a part of the normal geomembrane installation process. Standard repair work for Cell 30 consisted of patching the destructive test locations (DS-1 through DS-7), air pressure test locations, wedge burnouts, cross seam intersections, and other damages to the geomembrane.

There were two non-standard repairs of the geomembrane. The first repair was necessary to repair a tear in the geomembrane caused by a boulder rolling down the western adjacent refuse slope. The boulder was released as cover soil was being placed in the adjacent daily working cell. The second repair was the result of a circular hole purposefully being cut out of the geomembrane to release approximately 5 to 10 gallons of water that had become trapped under the geomembrane. The water flowed under the liner during a rainfall event in the early hours of August 18th. Water overflowed the geomembrane located in the southeast corner of the cell and at that time a small amount of water was able to flow under the geomembrane. Repair of these two patches was accomplished by first welding an initial patch to the underside of the geomembrane. The construction of this underlying patch eliminated the possibility of water or soil impacting the final overlying patch. Once the initial patch was completed a final patch was then welded to the top of the geomembrane as would normally occur during patching activities.

The location of the Cell 30 repair patches can be seen on Sheet 7. For additional information on the repairs, the repair patch number shown on Sheet 7 can be compared to the geomembrane repair notes contained in Appendix B, Section 4.

All patches and repair work passed the required vacuum box testing. The remaining areas of the geomembrane were walked and visually inspected for damage or other defects. Any additional defects that were noted during the visual inspection were repaired with a patch or extruded bead.

3.5 Anchoring of the Geomembrane

The geomembrane was anchored so that it would not move during installation and subsequent waste operations. The geomembrane panels located on the gentle base grades are not under significant stress and the geomembrane does not require an anchor trench to hold it in place. Sand and sand bags were placed over the out edge of the geomembrane to hold the geomembrane in place. The southern and western edge of the Cell 30 geomembrane is fused directly to the geomembrane of previous cell constructions and is not located in an anchor system.

3.6 Weather Conditions Affecting Geomembrane Installation

The weather during the installation of the geomembrane was overcast with a slight to moderate breeze. Depending on the time of day, ambient temperatures were in the high 70's to low 80's (degrees Fahrenheit). A minor precipitation event occurred at the end of the first day of installation on August 6th. Installation work was terminated once the rain began. The weather did not have a noticeable effect on the installation of the geomembrane.

The installation of the geomembrane was impacted slightly by a weather event that occurred after the installation of the geomembrane was completed. In the evening of August 17th and the morning of August 18th, 2021 the remnants of Hurricane Ida brought heavy rains into the area. A total of approximately 2.4 inches inundated the site in a relatively short timeframe. A run-on ditch designed to prevent water from the adjacent highwall from entering the work area was damaged and water from the channel flowed to the constructed Cell 30 surface water sump. The 6" pump located in the sump was overwhelmed and surface water flowed over the southeast corner of the cell. As the water flowed over the corner, a small amount of water was able to flow under the geomembrane. A hole was cut in the geomembrane to remove approximately 5 - 10 gallons of water that had accumulated under the geomembrane. The hole was successfully patched, and because the water was removed quickly, the underlying RSL was not impacted. Although the rainfall event did cause additional it did not have an impact on the quality of the geomembrane installation.

4.0 LEACHATE COLLECTION SYSTEM, PROTECTIVE LAYER and THERMAL BARRIER

A leachate collection system, protective layer and thermal barrier were installed on top of the Cell 30 RSL/geomembrane composite liner system. The leachate collection system installed in Cell 30 consists of a double sided geocomposite and a perforated leachate collection pipe system. A granular protective layer with a minimum thickness of 12 inches was installed over the geocomposite to protect the leachate collection and composite liner systems. Per the AHRC PTI, a thermal barrier is to be installed in areas where the disposal of secondary aluminum production (SAP) wastes will occur. A portion of this cell is being constructed for the disposal of SAP wastes and, therefore, a thermal barrier was installed. Specific details for the leachate collection system, protective layer and the thermal barrier are shown on Sheet 11.

4.1 Leachate Collection System

The leachate collection system installed in Cell 30 consists of a geocomposite and 6-inch diameter, perforated, SDR 9 HDPE pipe. The geocomposite used in Cell 30 is an HDPE geonet fused to two non-woven geotextiles. The geocomposite component of the leachate collection system is less than 0.4 inches thick and its thickness is not easily or accurately surveyed. It is assumed, therefore, that the top of the constructed soil liner is the same as the top of the leachate collection system, as shown on Sheets 5 and 6 (Top of Soil Liner/Leachate Collection System).

4.1.1 Prequalification

The geocomposite had to be pre-qualified prior to use in the construction of the Cell 30 leachate collection system. Pre-qualification consisted of quality control testing by the manufacturer and owner conformance testing. Cell 30 utilized both new geocomposite material and geocomposite material remaining from the construction of Cell 27. In a letter dated April 20, 2020, the Ohio EPA concurred with the use of the geocomposites in the construction of Cell 30. A general discussion of the geocomposite material properties, tests, and testing frequency is presented in the following sections.

Material Properties

The material properties discussed in this section are related to the new geocomposite. Discussion of the material properties for the Cell 27 geocomposite can be reviewed in the Cell 27 Construction Certification Report. The PTI specifications and testing frequencies for the geocomposite to be used in the AHRC leachate collection system are presented in Table 11. The geocomposite used in the construction of Cell 30 was manufactured by Skaps and is a product referenced as TN 330-2-8. CCS provided the manufacturers QC certifications for the geomembrane prior to shipping the geocomposite to AHRC.

Table 12 documents that the manufacturer has performed the PTI required quality control tests and has performed them at the required testing frequencies. The table also documents that the owner has performed the PTI required conformance tests and that they were conducted at the required testing frequencies. The QC certifications are contained in Appendix C, Section 3, Manufacturer's Conformance Testing and Owner's Conformance Testing.

Tables 13 and 14 provide a summary of both the manufacturer's quality control test results and owner's conformance test results. The geocomposite met or exceeded the PTI requirements. The owner tested the geocomposite for ply adhesion and the ply adhesion exceeded the required PTI value of 1 ppi. The results of the ply adhesion testing are summarized in Table 13 and the laboratory sheets are contained in Appendix C, Section 3, Owner's Conformance Testing. The ply adhesion was found to be acceptable.

Transmissivity

The 100-hr transmissivity of the geocomposite must be tested at rate of one test per every 50,000 square feet of material to be used in the construction of a cell. A total of 147,900 square feet of new geocomposite was ordered for cell construction. This means that, per the PTI, the geocomposite had to be tested for transmissivity at least three times. The transmissivity of the geocomposite must be tested at the site specific maximum expected load and specific grade. Once fully completed, Cell 30 will be constructed at either a grade of 2.5% with a flow length not to

exceed 200 feet or a grade of 33% with a flow length not to exceed 100 feet. The maximum expected load is approximately 17,800 psf ((219 ft trash x 75 pcf) + 1410 psf for the cap system and barrier layer). Tables 15 and 16 present the required transmissivity calculations and specified 100-hour transmissivity for the 2.5% and 33% grades, respectively.

Geocomposite for the 2.5% Cell Area

Two transmissivity tests were conducted at a normal load of 18,000 psf, a 2.5% grade, and boundary conditions of sand/geocomposite/60 mil HDPE, and a rubber membrane. The rolls tested were #1069110100002 and #1069110100023 (#2 and #23). Roll #2 was also tested at a load of 6,000 psf and Roll #23 was tested at additional loads of 6,000 and 12,000 psf. The combination of the various tests shows that the geocomposite meets the transmissivity requirement for all four stages. The laboratory transmissivity test results are contained Table 13 and 14 and in Attachment C.

Based on the transmissivity test results, roll #2 and #23 and all of the project geocomposite can be prequalified for use in the construction of the cell. The geocomposite material properties and transmissivity results for rolls #2 and #23 meet the PTI requirements.

Geocomposite for the 33% Cell Area

Two transmissivity tests were conducted at a normal load of at least 17,800 psf, a 33% grade, and boundary conditions of sand/geocomposite/60 mil HDPE, and a rubber membrane. The rolls tested were #1069110100001 and #1069110100044 (#1 and #44). Rolls #1 and #44 had transmissivity results of 1.34×10^{-4} m^2/sec and 4.29×10^{-4} m^2/sec respectively, which both exceed the highest required transmissivity for all four stages (2.07×10^{-5} m^2/sec). The laboratory transmissivity test results are contained in Tables 13 and 14 and in Attachment C.

Based on the transmissivity results, rolls #1 and #44 and all of the project geocomposite can be used in the construction of the cell. The geocomposite material properties and transmissivity results for rolls #1 and #44 meet the PTI requirements.

4.1.2 Preparation

Once the material was delivered to the site, the QC Certifications were used to inventory and inspect the geocomposite material. Each roll was located, inspected for damage and its QC certification verified. All of the individual rolls of geocomposite had an accompanying QC certification that conformed to the required specifications and no damage to the rolls was observed.

4.1.3 Geocomposite Installation

The geocomposite, manufactured by Skaps, was installed in Cell 30. The geocomposite was comprised of a minimum 0.25" thick geonet, bonded to two 8-ounce, non-woven polypropylene, needle punched geotextiles. The geocomposite was installed over the geomembrane and stretched as much as possible to remove excess wrinkling. As the geocomposite panels were installed they were inspected for damage, manufacturing flaws, and/or the entrapment of foreign material. Any identified foreign materials were removed and any damaged or flawed areas were repaired. A typical repair was made of the same geotextile used in the geocomposite, was a minimum of 6 inches larger in all directions than the damaged area, and was bonded thermally to the primary geotextile sheet.

Adjacent geocomposite panels were connected with plastic ties and sewing. Plastic ties, spaced approximately every five feet were used to connect the geonet component of the geocomposite. The ties were visually inspected for spacing and tightness. Once the geonets of adjacent panels were connected, the overlying geotextiles were overlapped and sewn together by hand-held sewing machines. Continuous sewing of the geotextile edges bonded the seams of the geocomposite. Every linear foot of seam was visually inspected for proper overlap and seam integrity. Any seam not passing inspection was repaired.

Geocomposite panels that abutted end-to-end were positioned so that at least one foot of overlap existed. The seam was fused together thermally along the entire length of the seam. The exposed butt end of the overlying geocomposite was covered with a strip of geotextile which was

then heat bonded to the underlying geotextile. Strips of geotextile were also used to cover any areas of the geonet that would be exposed to the overlying protective layer.

4.1.4 Leachate Collection Pipe System

In addition to the geocomposite, the leachate collection system for Cell 30 consists of a perforated leachate collection pipe system with a granular protective layer installed around the pipe. Leachate collected within the cell by the geocomposite is directed to and collected by the perforated pipe and then flows through the pipes and out of the cell.

Installation of the Leachate Collection Pipe

The leachate collection pipe system is comprised of leachate collection laterals oriented approximately from east to west. The leachate collection laterals installed in Cell 30 were connected to existing leachate collection laterals with electro-fusion couplers. The location of the leachate collection pipes and electro-fusion couplers are shown on Sheets 5 and 6.

The leachate collection pipes are 6-inch diameter, perforated, HDPE SDR 9 pipe. The leachate collection pipes have 3/8-inch diameter perforations drilled at the orientations shown on Sheet 11 - Perforated Leachate Collection Pipe Detail. The perforations are spaced approximately every four inches along the length of the pipe. The leachate collection pipe was installed on top of the geocomposite in the orientation shown in the detail and as shown in Sheets 5 and 6.

HDPE Pipe Fusion Procedures

Butt fusion welding or electro-fusion welding techniques were used to connect individual HDPE leachate pipes. Welding of the leachate collection pipes took approximately a day and was performed by Rumpke personnel. An inspector observed all of the HDPE pipe fusions. The temperature of the heating element was monitored during the fusion process. A trial weld was completed and approved prior to fusion welding beginning on the leachate collection pipe.

The locations of the electro-fusion couplers are shown on Sheets 5 and 6. The electro-fusion couplers were used to attach the existing leachate collection pipes to the Cell 30 leachate collection pipes. The use of the electro-fusion couplers allows the HDPE pipes to be fused together without having to raise the pipes off of the geocomposite. An inspector observed all of the electrofusion welds.

Gravel Wrap

The HDPE pipe was bedded in a gravel wrap as shown in the detail entitled, "Liner System with Leachate Collection Lateral," located on Sheet 11. The gravel was transported to and placed around the exposed leachate pipe with a wide-track, low ground pressure excavator. The excavator was always located over at least 24 inches of sand. The gravel was transported to the pipe and hand shoveled and tamped under the haunches of the pipe to provide pipe support. Once the gravel was tamped under the haunches of the pipe the excavator would then place additional gravel around the pipe such that there was a minimum of 12 inches of gravel on top of the pipe and from 2 to 3 feet of gravel beside the pipe. A fifteen foot wide, 8-ounce geotextile was placed over the gravel to provide separation between the gravel and the protective sand layer. Personnel from Mark James monitored the placement of the gravel.

The gravel was tested for grain size, permeability, and carbonate content. The gravel used in construction of the leachate collection system had a percent carbonate residue content of 0.56% The gravel had a nominal fines content and the permeability of the gravel was 52.5 cm/sec. The test results for the gravel (19-G1) used in the leachate collection system is contained in Appendix A, Section 3 and summarized in Table 17.

4.2 Protective Layer

A protective layer of sand, at least 12 inches thick, was placed on top of the leachate collection system geocomposite as shown in various details on Sheet 11. The sand acts as a protective layer for the underlying geocomposite and geomembrane and as a filter media to minimize the migration of fines into the leachate collection system. The thickness of the sand along the outer

edge of sand placement was controlled by probing the sand to verify thickness. Survey locations along the outer edge of the sand also verified the sand thickness by comparing the sand elevation to a digital terrain model of the RSL.

Sheet 8 – Top of Protective Layer/Surface Water Management Structures shows the contours of Cell 30 after the protective sand layer was constructed. Table 1 provides elevation and thickness data of the protective layer at the selected survey locations. The sand thickness (Column 13) indicates that all of the sand was placed at a minimum thickness of 1.0 foot. There are locations where the protective sand was not placed and these survey locations are designated with "NS" in Table 1. These locations are located outside the certifiable limits of Cell 30.

The sand was placed with a low ground pressure bulldozer that pushed the sand in a manner that minimized the wrinkling of the geocomposite and/or geomembrane. The bulldozer was always located over at least 12 inches of sand. Personnel from Mark James monitored the placement of the protective layer. The sand and gravel material used for the protective layer must meet the following PTI requirements:

- Less than 5% of the material passing a #200 sieve,
- The carbonate content by weight of the protective layer will be $\leq 5\%$.
- Have a minimum permeability of 2×10^{-4} cm/sec, and
- Be tested for the above physical properties at a rate of 1 test per 3,000 cubic yards.

Approximately 2,750 cubic yards of sand were placed in Cell 30 for the required minimum 1 foot thickness. One sand sample was collected and tested in order to meet the testing requirement of 1 test per 3,000 cubic yards of material used. The test results for the sand sample (21-S1) collected from the sand used in the protective layer are contained in Appendix A, Section 4 and summarized in Table 17. The laboratory test results for the sand sample (21-S1) indicated that the permeability of the sand was 4.15×10^{-2} cm/sec. The sand sample had 1.1% by weight passing the #200 sieve and a percent carbonate residue content of 0.40%. The sand used in Cell 30, therefore, passed the protective layer requirements.

4.3 Thermal Barrier Layer

The northern portion of Cell 30 is to be used for the disposal of SAP wastes. License conditions for the landfill require that a 5-foot thickness of sand or sand rock be placed on top of the geomembrane and geocomposite wherever SAP wastes are to be disposed. The maximum allowable dimension of individual pieces of sand rock specified by the PTI is two feet.

Currently the landfill operator and Ohio EPA have agreed that a 7-foot thick layer will be used to further mitigate elevated temperatures. Seven feet of sand and sand rock were placed within the thermal barrier limits defined on Sheet 9. The thickness of the thermal barrier along the outer edge of the sand/sand rock was verified by comparing the surveyed sand/sand rock elevation to a digital terrain model of the RSL. The comparison verified that the outer edge of the sand/sand rock was at least 7 feet thick. The volume of sand rock used to construct the thermal barrier within Cell 30 has been estimated to be 8,350 cubic yards. To facilitate the expansion of adjacent cells, the thermal barrier was not installed in the outer ten to fifteen feet of Cell 30. No SAP waste will be placed where the thermal barrier is not at least 7 feet thick.

Table 1 presents the elevations for the top of the thermal barrier (Column 14) and the thickness of the thermal barrier (Column 15). The notation of "NTB" in Column 14 of Table 1 means that the thermal barrier was not installed at this location and that the thickness of the thermal barrier is not applicable (NA) as noted in Column 15. Sheet 9 and Table 1 show that the thermal barrier consisting of either sand or sand rock was constructed to a minimum thickness of 7 feet. The Secondary Aluminum Production Waste Thermal Barrier Detail on Sheet 11 illustrates the relationship between the RSL, geomembrane, leachate collection system, protective layer and the thermal barrier.

4.4 Geomembrane Thermocouple Temperature Monitoring Probes

Pursuant to AHRC's PTI, geomembrane temperature monitoring thermocouples are to be installed directly on top of the geomembrane at a rate of one per every acre of constructed liner system. Cell 30 will be expanded in the next several weeks and will ultimately cover

approximately 2.7 acres. A total of three thermocouples were, therefore, installed in Cell 30 to meet the PTI spacing requirement for the full 2.7 acres. The locations of the thermocouples are shown on Sheet 9. Two thermocouples were installed with the proposed SAP waste area and one within the proposed refuse area.

The thermocouples are installed within a solid, 3" diameter, SDR 9, HDPE pipe. The 3" HDPE pipes installed within Cell 30 were connected to previously existing 3" HDPE pipes with the use of electrofusion couples. The thermocouple located within the refuse area is located in a new pipe that is not connected to any previously existing pipe. The location of the 3" electrofusion couplers are shown on Sheet 9. The Liner System Thermocouple detail shown on Sheet 11 illustrates the construction details for the Cell 30 thermocouples.

4.5 Landfill Gas Probe #20

Per the approved SAP waste PTI alteration, a vertical landfill gas probe is to be installed for every five acres of SAP disposal area constructed. Since the SAP waste PTI alteration was approved on June 21, 2016 a total of 6.69 acres of landfill disposal area have been constructed. The 6.69 acres of constructed landfill disposal area is divided between 2.57 acres of municipal solid waste and 4.12 acres of SAP waste. Once Cell 30 is approved for disposal the aggregate constructed SAP waste disposal area will exceed the limit of five acres. A landfill gas probe (LGP #20) will be installed, therefore, within the limits of Cell 30.

The location of the vertical gas probe is shown on Sheet 9. Landfill gas probe #20 is in alignment with landfill gas probes #15 and #16. Landfill gas probe #20 cannot be constructed until waste placement is commenced with Cell 30. The landfill gas probes will be constructed according to Figure 4 of the SAP PTI alteration.

4.6 Weather Conditions Affecting the Leachate Collection System

A weather event that impacted the leachate collection system occurred after the installation of the geocomposite was completed. In the evening of August 17th and the morning of August 18th,

2021 the remnants of Hurricane Ida brought heavy rains into the area. A total of approximately 2.4 inches inundated the site in a relatively short timeframe. A run-on ditch designed to prevent water from the adjacent highwall from entering the work area was damaged and water from the channel flowed to the constructed surface water sump for Cell 30. The 6" pump located in the sump was overwhelmed and surface water flowed over the southeast corner of the cell. The overflowing water placed silt over approximately 2400 square feet of the geocomposite. The silted geocomposite was removed and new geocomposite was installed following the previously discussed installation techniques.

5.0 SURFACE WATER MANAGEMENT SYSTEM

The surface water management system at the site consists of a sedimentation pond with primary and emergency spillways and surface water channels. The sedimentation pond, primary and emergency spillways were constructed and certified during the construction of Cell 1A in 1994.

5.1 Surface Water Channels

Channel 1B was the only existing channel that was modified for the construction of Cell 30. The channel collects run-off from the existing refuse cells and run-on from the adjacent watershed. Channel 1B was abandoned along the eastern side of the existing cells to allow Cell 30 to be constructed. Channel 1B was relocated along the eastern limit of Cell 30 and carries surface water to Sedimentation Pond #1. The location of Channel 1B is shown on Sheet 8 – Top of Protective Layer/Surface Water Management. The channel is located on bedrock and, therefore, riprap or erosion netting did not have to be installed in the channel.

A temporary channel (Temporary Channel A) was added as part of the AHRC Surface Water Pollution and Prevention Plan (SWPPP). This channel collects surface water than cannot flow to Channel 1B and directs it to a retention pond constructed as part of the AHRC SWPPP.

5.2 Surface Water Culverts

No new culverts were placed during the construction of Cell 30.

6.0 OWNER CERTIFICATION, PTI ALTERATIONS and OTHER INFORMATION

This section of the report discusses the owner certification, alterations to the approved PTI, and other changes for Cell 30. Facility closure bonding requirements are also discussed. Section 6.1 discusses the owner's certification of this report. Section 6.2 discusses the alterations to the PTI that occurred before or during the construction of Cell 30 and Section 6.3 lists Other Changes. The bonding requirements for the facility are discussed in Section 6.4.

6.1 Owner Certification

Appendix D contains the notarized statement by the owner/operator of the Athens-Hocking Reclamation Center certifying that the construction certification report for Cell 30 is true, accurate, and contains all information required by Paragraph H of 3745-27-08.

6.2 Alterations

Cell 30 – Size and Configuration

An alteration request to modify the size of Cell 30 was requested by The Mark James Corporation. The size and configuration of Cell 30 was reduced to facilitate the operation of the facility. The alteration request did not propose any changes to AHRC's horizontal or vertical limits of excavation or waste.

6.3 Other Changes

1. Erosion netting was not installed in Channel 1B because the channel was cut directly into competent bedrock.

6.4 Bonding Requirements

The AHRC landfill has a closure bond for 47.21 acres. After the construction of Cell 30 a total of 55.08 acres of the landfill will have been constructed for the disposal of waste and a total of 9.36 acres of the landfill has been capped and certified. The minimum area that has to be bonded for closure in 2021, therefore, is 45.72 acres (55.08 - 9.36). The facility closure bond of 47.21 acres exceeds the required closure bond amount by 1.49 acres.

TABLES

Table 1
Elevation and Thickness Data
Athens-Hockng Reclamation Center Landfill

Point Number	Northing	Easting	PTI Top of Excavation/ Bottom of RSL (Feet)	Actual Top of Excavation (Feet)	Actual Bottom of RSL (Feet)	Difference of Actual and PTI Bottom of RSL (Feet) (6-4)	PTI Top of RSL (Feet)	Actual Top of RSL (Feet)	Difference of Actual and PTI Top of RSL (Feet) (9-8)	Thickness of Actual RSL (Feet) (9-6)	Top of Protective Sand Layer (Feet)	Thickness of Sand (Feet) (12-9)	Top of Thermal Layer (Feet)	Thickness of Thermal Layer (Feet) (14-9)	Pass/ Fail
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
1	534888.17	2031889.83	819.00	819.69	820.34	1.34	822.00	823.37	1.37	3.03	824.46	1.09	NTB	NA	Pass
2	534918.78	2031850.29	819.00	820.30	820.44	1.44	822.00	823.67	1.67	3.23	824.74	1.07	NTB	NA	Pass
4	534930.56	2031895.58	820.00	820.14	821.47	1.47	823.00	824.68	1.68	3.21	NS	NA	NTB	NA	Pass
5	534948.78	2031872.86	820.00	819.19	821.08	1.08	823.00	824.86	1.86	3.78	826.03	1.17	NTB	NA	Pass
6	534979.85	2031833.66	820.00	819.89	821.42	1.42	823.00	824.64	1.64	3.22	825.93	1.28	NTB	NA	Pass
8	535005.33	2031864.45	821.00	822.44	822.44	1.43	824.00	825.79	1.79	3.36	NS	NA	NTB	NA	Pass
9	535040.90	2031817.01	821.00	821.04	822.50	1.50	824.00	825.59	1.59	3.09	826.80	1.22	NTB	NA	Pass
11	535078.93	2031833.81	822.00	823.49	823.49	1.49	825.00	826.70	1.70	3.21	NS	NA	NTB	NA	Pass
12	535103.24	2031801.33	822.00	822.52	823.26	1.26	825.00	826.64	1.64	3.38	827.83	1.19	NTB	NA	Pass
14	535141.69	2031807.69	822.82	824.43	824.25	1.43	825.82	827.32	1.50	3.07	NS	NA	NTB	NA	Pass
15	535168.05	2031787.51	823.00	824.23	824.23	1.23	826.00	827.61	1.61	3.39	828.90	1.28	NTB	NA	Pass
17	535196.95	2031810.34	824.00	825.50	825.60	1.60	827.00	828.78	1.78	3.18	NS	NA	NTB	NA	Pass
18	535228.43	2031770.35	824.00	825.20	825.44	1.44	827.00	828.68	1.68	3.25	829.97	1.29	NTB	NA	Pass
20	535277.98	2031774.92	825.00	826.52	826.50	1.50	828.00	829.59	1.59	3.09	NS	NA	NTB	NA	Pass
21	535323.91	2031717.03	825.00	826.22	826.44	1.44	828.00	829.71	1.71	3.27	830.92	1.21	837.226	7.52	Pass
23	535357.79	2031740.03	826.00	827.47	827.61	1.61	829.00	830.71	1.71	3.11	NS	NA	NTB	NA	Pass
24	535387.41	2031702.23	826.00	827.46	827.46	1.46	829.00	830.68	1.67	3.21	831.78	1.10	NTB	NA	Pass
27	535433.28	2031707.03	827.00	828.48	828.48	1.48	830.00	831.78	1.78	3.30	NS	NA	NTB	NA	Pass
28	535480.46	2031647.08	827.00	828.47	828.40	1.40	830.00	831.67	1.67	3.26	833.77	2.10	838.938	7.27	Pass
31	535504.01	2031676.11	828.00	829.49	829.49	1.49	831.00	832.63	1.63	3.14	NS	NA	NTB	NA	Pass
32	535540.60	2031629.75	828.00	829.49	829.49	1.49	831.00	832.58	1.58	3.09	833.68	1.10	NTB	NA	Pass
36	535588.01	2031639.39	829.00	830.35	830.35	1.35	832.00	833.66	1.66	3.32	NS	NA	NTB	NA	Pass
38	535618.99	2031625.85	829.00	830.52	830.52	1.52	832.00	833.67	1.67	3.15	NS	NA	NTB	NA	Pass
44	535622.96	2031592.92	829.00	830.44	830.53	1.53	832.00	833.27	1.27	2.74	834.41	1.14	NTB	NA	Pass
45	535632.37	2031620.00	829.50	830.95	830.95	1.45	832.50	833.67	1.17	2.71	NS	NA	NTB	NA	Pass

Table 1
Elevation and Thickness Data
Athens-Hockng Reclamation Center Landfill

Point Number	Northing	Easting	PTI Top of Excavation/ Bottom of RSL (Feet)	Actual Top of Excavation (Feet)	Actual Bottom of RSL (Feet)	Difference of Actual and PTI Bottom of RSL (Feet) (6-4)	PTI Top of RSL (Feet)	Actual Top of RSL (Feet)	Difference of Actual and PTI Top of RSL (Feet) (9-8)	Thickness of Actual RSL (Feet) (9-6)	Top of Protective Sand Layer (Feet)	Thickness of Sand (Feet) (12-9)	Top of Thermal Layer (Feet)	Thickness of Thermal Layer (Feet) (14-9)	Pass/ Fail
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
125	535612.48	2031606.85	829.00	830.15	830.04	1.03	832.00	833.55	1.55	3.51	834.64	1.09	NTB	NA	Pass
127	535568.19	2031594.77	828.00	828.11	828.92	0.92	831.00	832.59	1.59	3.67	833.71	1.13	839.76	7.17	Pass
128	535496.89	2031626.21	827.00	827.38	828.29	1.29	830.00	831.67	1.66	3.37	832.76	1.10	838.82	7.16	Pass
129	535420.68	2031659.75	826.00	826.40	827.42	1.42	829.00	830.69	1.68	3.26	831.85	1.16	837.819	7.13	Pass
130	535341.86	2031694.40	825.00	824.76	826.47	1.47	828.00	829.67	1.67	3.20	831.01	1.34	836.979	7.31	Pass
131	535259.60	2031730.75	824.00	823.21	825.41	1.41	827.00	828.69	1.69	3.28	830.04	1.35	836.166	7.48	Pass
132	535187.43	2031762.50	823.00	822.22	823.70	0.70	826.00	827.59	1.59	3.89	828.90	1.31	834.8	7.21	Pass
133	535150.66	2031830.59	823.32	824.85	824.85	1.53	826.32	828.05	1.73	3.20	NS	NA	NTB	NA	Pass
Cell 25 Construction Certification Survey Points															
162 (41)	534885.11	2031829.37	817.50	818.09	818.09	0.59	820.50	821.45	0.95	3.36	823.29	1.84	NTB	NA	Pass
Cell 28 Construction Certification Survey Points															
170 (37)	534858.17	2031864.25	818.35	818.48	818.48	0.13	821.35	821.71	0.36	3.23	824.26	2.56	NTB	NA	Pass
171 (38)	534872.57	2031909.98	819.35	819.54	819.54	0.18	822.35	822.74	0.39	3.20	825.24	2.50	NTB	NA	Pass
Cell 29 Construction Certification Survey Points															
150 (1)	534919.42	2031817.28	818.50	818.55	818.55	0.05	821.50	821.74	0.24	3.19	823.90	2.16	NTB	NA	Pass
151 (4)	534957.16	2031800.71	819.00	819.50	820.07	1.07	822.00	823.40	1.40	3.33	824.78	1.37	NTB	NA	Pass
152 (7)	535014.57	2031788.91	820.00	820.47	820.47	0.47	823.00	824.26	1.26	3.79	825.40	1.14	NTB	NA	Pass
153 (9)	535032.70	2031783.93	820.30	820.75	820.75	0.45	823.30	824.57	1.27	3.82	825.83	1.26	NTB	NA	Pass
154 (10)	535113.98	2031756.62	821.50	822.09	822.09	0.59	824.50	826.06	1.56	3.98	827.25	1.19	NTB	NA	Pass
155 (11)	534937.95	2031825.52	819.00	819.39	819.39	0.39	822.00	822.96	0.96	3.57	824.30	1.34	NTB	NA	Pass
156 (29)	535559.19	2031576.91	827.50	828.15	828.19	0.69	830.50	831.48	0.98	3.29	832.65	1.16	838.69	7.21	Pass
157 (30)	535446.79	2031626.42	826.00	826.48	827.08	1.08	829.00	830.36	1.36	3.28	831.48	1.13	837.65	7.29	Pass
158 (31)	535368.40	2031660.95	825.00	825.57	826.41	1.41	828.00	829.50	1.50	3.09	832.31	2.81	836.63	7.13	Pass
159 (32)	535285.95	2031697.26	824.00	824.54	825.26	1.26	827.00	828.59	1.59	3.33	829.66	1.07	835.70	7.11	Pass
160 (33)	535213.13	2031729.34	823.00	823.61	824.22	1.22	826.00	827.61	1.61	3.39	828.95	1.33	834.80	7.19	Pass

Table 1
Elevation and Thickness Data
Athens-Hockng Reclamation Center Landfill

Point Number	Northing	Easting	PTI Top of Excavation/ Bottom of RSL (Feet)	Actual Top of Excavation (Feet)	Actual Bottom of RSL (Feet)	Difference of Actual and PTI Bottom of RSL (Feet) (6-4)	PTI Top of RSL (Feet)	Actual Top of RSL (Feet)	Difference of Actual and PTI Top of RSL (Feet) (9-8)	Thickness of Actual RSL (Feet) (9-6)	Top of Protective Sand Layer (Feet)	Thickness of Sand (Feet) (12-9)	Top of Thermal Layer (Feet)	Thickness of Thermal Layer (Feet) (14-9)	Pass/ Fail
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
161 (34)	535133.75	2031764.30	822.00	822.54	823.05	1.05	825.00	826.57	1.57	3.52	827.90	1.33	NTB	NA	Pass
162 (41)	534885.11	2031829.37	817.50	818.09	818.09	0.59	820.50	821.45	0.95	3.36	823.29	1.84	NTB	NA	Pass
163 (58)	535592.17	2031562.37	828.00	828.34	828.73	0.73	831.00	831.93	0.93	3.20	832.95	1.02	838.95	7.02	Pass
164 (59)	535484.20	2031609.94	826.50	827.11	827.65	1.15	829.50	830.95	1.45	3.30	832.02	1.07	838.15	7.19	Pass
165 (60)	535407.88	2031643.56	825.50	825.95	826.77	1.27	828.50	829.92	1.42	3.15	831.00	1.07	837.08	7.16	Pass
166 (61)	535326.20	2031679.54	824.50	825.16	825.87	1.37	827.50	829.08	1.58	3.21	830.24	1.16	836.21	7.13	Pass
167 (62)	535249.02	2031713.53	823.50	824.01	824.82	1.32	826.50	828.05	1.55	3.23	829.35	1.30	835.21	7.15	Pass
168 (63)	535172.00	2031747.46	822.50	823.22	823.90	1.40	825.50	827.03	1.53	3.13	829.12	2.08	834.25	7.22	Pass
169 (311)	535523.36	2031592.69	827.00	827.42	828.01	1.01	830.00	831.15	1.15	3.14	832.32	1.17	838.52	7.37	Pass
172 (2)	534993.76	2031784.64	819.50	820.03	820.03	0.53	822.50	823.78	1.28	3.75	825.53	1.75	NTB	NA	Pass
173 (8)	535030.33	2031768.59	820.00	820.47	821.13	1.13	823.00	824.40	1.40	3.27	826.19	1.79	NTB	NA	Pass
174 (13)	535075.77	2031773.45	821.00	821.46	822.13	1.13	824.00	825.40	1.40	3.27	826.50	1.09	NTB	NA	Pass
175 (14)	535106.38	2031733.91	821.00	821.52	822.27	1.27	824.00	825.57	1.57	3.30	826.91	1.33	NTB	NA	Pass
176 (20)	535346.34	2031654.27	824.50	825.05	825.61	1.11	827.50	828.90	1.40	3.29	830.52	1.62	836.17	7.27	Pass
177 (21)	535427.72	2031618.43	825.50	826.08	826.52	1.02	828.50	829.86	1.36	3.34	831.23	1.38	837.03	7.17	Pass
178 (22)	535503.84	2031584.90	826.50	826.94	827.37	0.87	829.50	830.61	1.11	3.24	832.03	1.41	838.08	7.47	Pass
179 (23)	535231.74	2031705.32	823.00	823.57	824.26	1.26	826.00	827.55	1.55	3.29	828.87	1.32	834.69	7.14	Pass
180 (83)	535543.06	2031567.54	827.00	827.58	827.81	0.81	830.00	831.08	1.08	3.27	832.37	1.29	838.65	7.57	Pass
181 (303)	535153.34	2031738.62	822.00	822.50	823.36	1.36	825.00	826.57	1.57	3.21	828.15	1.57	833.59	7.02	Pass
182 (304)	535306.23	2031671.50	824.00	824.43	825.17	1.17	827.00	828.42	1.42	3.25	829.78	1.36	835.62	7.20	Pass
183 (305)	535388.78	2031635.27	825.00	825.59	826.18	1.18	828.00	829.53	1.53	3.35	830.85	1.32	836.59	7.06	Pass
184 (306)	535466.62	2031601.10	826.00	826.56	827.22	1.22	829.00	830.48	1.48	3.26	831.93	1.45	837.65	7.17	Pass
185 (315)	535596.71	2031543.99	827.76	828.19	828.66	0.90	830.76	831.86	1.10	3.20	833.22	1.37	NTB	NA	Pass

Notes:

1. NS: No sand placement. 2. NTB: No thermal barrier placed. 3. NA: Not applicable.

Table 2
Recompacted Soil Liner Borrow Source - Laboratory Test Data
Athens-Hocking Reclamation Center Landfill

Sample Number	standard Proctor (ASTM D698)		Atterberg Limits (D4318)			Percent Finer by Weight (ASTM D421 and D422)					Maximum Permeability (cm/sec) (ASTM D5084)	Pass or Fail
	Maximum Dry Density (PCF)	Optimum Water Content (%)	Liquid Limit	Plastic Limit	Plastic Index	2"	3/4"	#4 (Gravel)	#200	.002 mm		
Test Pad Requirement						**100%**	**≥ 90%**	**83-100%**		**19-29%**	**1.00E-07**	
Test Pad General Comparisons	116.3-119.8	12.7-14.6	32-42	18-21	14-21		95-98%		58.1-67.4%			
Recompacted Soil Liner												
Standard Proctor												
Cell 30												
21-1	116.3	13.2	36	19	17	100.0	99.0	90.8	71.9	24.6	3.40E-08	Pass
21-2	115.4	12.6	35	19	16	100.0	98.0	89.6	72.0	26.0		Pass
21-3	117.3	12.5	35	19	16	100.0	98.0	93.3	74.4	26.6		Pass
21-4	117.7	11.5	36	21	15	100.0	97.5	90.0	71.6	25.5		Pass
21-5	113.1	13.1	36	19	17	100.0	99.0	93.4	76.1	25.9		Pass
21-6	112.8	12.0	36	19	17	100.0	98.0	90.7	72.0	26.9		Pass
21-7	118.8	11.4	35	18	17	100.0	98.0	90.8	71.6	24.8	4.50E-08	Pass
21-8	118.9	11.5	35	21	14	100.0	98.0	90.4	69.7	26.1		Pass
21-9	117.3	12.5	36	18	18	100.0	98.0	90.6	72.4	27.3		Pass
21-10	117.0	11.4	36	18	18	100.0	97.5	91.6	70.4	26.9		Pass
21-11	120.3	11.4	34	18	16	100.0	97.5	89.8	72.5	23.9		Pass
Average	116.8	12.1										
Structural Fill												
Modified Proctor												
SF-1	135.9	6.7										Pass

Note: Required frequency of testing is 1 borrow source sample for every 1500 cubic yards of soil to be used in RSLconstruction. Frequency is 1 for every 10,000 cubic yards for structural fill.

Table 3
Summary of Recompacted Stuctural Fill Field Tests
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	90% Percent of Modified MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	1	1	SF-1	07/22/21	135.9	122.3	127.7	94.0	6.7	5.3	-1.4	Pass
1	1	2	SF-1	07/22/21	135.9	122.3	128.2	94.3	6.7	6.5	-0.2	Pass
1	1	3	SF-1	07/22/21	135.9	122.3	124.3	91.5	6.7	6.1	-0.6	Pass
1	1	4	SF-1	07/23/21	135.9	122.3	125.1	92.1	6.7	7.2	0.5	Pass
1	1	5	SF-1	07/23/21	135.9	122.3	126.9	93.4	6.7	6.3	-0.4	Pass
1	2	1	SF-1	07/24/21	135.9	122.3	126.2	92.9	6.7	6.8	0.1	Pass
1	2	2	SF-1	07/24/21	135.9	122.3	128.1	94.3	6.7	5.9	-0.8	Pass
1	2	3	SF-1	07/24/21	135.9	122.3	129.5	95.3	6.7	6.3	-0.4	Pass

Note: Passing criteria are ≥ 90% of modified Proctor maximum dry density and ≥ 0.0% of the modified Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Lift 1
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	1	1	21-1 to 21-11	07/27/21	116.8	111.0	120.1	102.8	12.1	12.5	0.4	Pass
1	1	2	21-1 to 21-11	07/27/21	116.8	111.0	118.1	101.1	12.1	12.8	0.7	Pass
2	1	1	21-1 to 21-11	07/27/21	116.8	111.0	114.7	98.2	12.1	13.6	1.5	Pass
2	1	2	21-1 to 21-11	07/27/21	116.8	111.0	116.4	99.7	12.1	12.1	0.0	Pass
3	1	1	21-1 to 21-11	07/28/21	116.8	111.0	120.0	102.7	12.1	13.2	1.1	Pass
3	1	2	21-1 to 21-11	07/28/21	116.8	111.0	114.6	98.1	12.1	13.0	0.9	Pass
4	1	1	21-1 to 21-11	07/30/21	116.8	111.0	119.1	101.9	12.1	13.0	0.9	Pass
4	1	2	21-1 to 21-11	07/30/21	116.8	111.0	114.9	98.4	12.1	12.9	0.8	Pass
5	1	1	21-1 to 21-11	08/04/21	116.8	111.0	115.3	98.7	12.1	12.9	0.8	Pass
5	1	2	21-1 to 21-11	08/04/21	116.8	111.0	115.6	99.0	12.1	13.1	1.0	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Lift 2
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	2	1	21-1 to 21-11	07/27/21	116.8	111.0	114.8	98.3	12.1	13.5	1.4	Pass
1	2	2	21-1 to 21-11	07/27/21	116.8	111.0	116.4	99.7	12.1	12.1	0.0	Pass
2	2	1	21-1 to 21-11	07/27/21	116.8	111.0	115.9	99.2	12.1	12.2	0.1	Pass
2	2	2	21-1 to 21-11	07/27/21	116.8	111.0	115.5	98.9	12.1	12.4	0.3	Pass
3	2	1	21-1 to 21-11	07/29/21	116.8	111.0	118.2	101.2	12.1	14.1	2.0	Pass
3	2	2	21-1 to 21-11	07/29/21	116.8	111.0	116.8	100.0	12.1	13.4	1.3	Pass
4	2	1	21-1 to 21-11	07/30/21	116.8	111.0	119.7	102.4	12.1	12.9	0.8	Pass
4	2	2	21-1 to 21-11	07/30/21	116.8	111.0	113.5	97.2	12.1	15.0	2.9	Pass
5	2	1	21-1 to 21-11	08/04/21	116.8	111.0	114.7	98.2	12.1	12.6	0.5	Pass
5	2	2	21-1 to 21-11	08/04/21	116.8	111.0	113.9	97.5	12.1	13.0	0.9	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Lift 3
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	3	1	21-1 to 21-11	07/27/21	116.8	111.0	115.7	99.1	12.1	12.8	0.7	Pass
1	3	2	21-1 to 21-11	07/27/21	116.8	111.0	116.3	99.6	12.1	12.2	0.1	Pass
2	3	1	21-1 to 21-11	07/27/21	116.8	111.0	119.0	101.9	12.1	12.4	0.3	Pass
2	3	2	21-1 to 21-11	07/27/21	116.8	111.0	114.8	98.3	12.1	13.9	1.8	Pass
3	3	1	21-1 to 21-11	07/29/21	116.8	111.0	117.1	100.3	12.1	14.0	1.9	Pass
3	3	2	21-1 to 21-11	07/29/21	116.8	111.0	114.9	98.4	12.1	13.3	1.2	Pass
4	3	1	21-1 to 21-11	07/31/21	116.8	111.0	115.2	98.6	12.1	14.1	2.0	Pass
4	3	2	21-1 to 21-11	07/31/21	116.8	111.0	114.0	97.6	12.1	16.2	4.1	Pass
5	3	1	21-1 to 21-11	08/04/21	116.8	111.0	110.1	94.3	12.1	13.4	1.3	Pass
5	3	2	21-1 to 21-11	08/04/21	116.8	111.0	110.7	94.8	12.1	12.9	0.8	Pass
5	3	1R	21-1 to 21-11	08/04/21	116.8	111.0	111.7	95.6	12.1	13.6	1.5	Pass
5	3	2R	21-1 to 21-11	08/04/21	116.8	111.0	112.1	96.0	12.1	13.3	1.2	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Lift 4
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	4	1	21-1 to 21-11	07/28/21	116.8	111.0	118.6	101.6	12.1	14.3	2.2	Pass
1	4	2	21-1 to 21-11	07/28/21	116.8	111.0	115.7	99.1	12.1	12.5	0.4	Pass
2	4	1	21-1 to 21-11	07/28/21	116.8	111.0	120.0	102.7	12.1	12.4	0.3	Pass
2	4	2	21-1 to 21-11	07/28/21	116.8	111.0	115.5	98.9	12.1	13.6	1.5	Pass
3	4	1	21-1 to 21-11	07/29/21	116.8	111.0	113.3	97.0	12.1	13.1	1.0	Pass
3	4	2	21-1 to 21-11	07/29/21	116.8	111.0	117.0	100.2	12.1	12.8	0.7	Pass
4	4	1	21-1 to 21-11	07/31/21	116.8	111.0	113.1	96.8	12.1	13.2	1.1	Pass
4	4	2	21-1 to 21-11	07/31/21	116.8	111.0	113.9	97.5	12.1	13.5	1.4	Pass
5	4	1	21-1 to 21-11	08/05/21	116.8	111.0	115.2	98.6	12.1	12.9	0.8	Pass
5	4	2	21-1 to 21-11	08/05/21	116.8	111.0	116.0	99.4	12.1	12.8	0.7	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Lift 5
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	5	1	21-1 to 21-11	07/28/21	116.8	111.0	119.9	102.7	12.1	14.2	2.1	Pass
1	5	2	21-1 to 21-11	07/28/21	116.8	111.0	118.8	101.7	12.1	13.2	1.1	Pass
2	5	1	21-1 to 21-11	07/28/21	116.8	111.0	115.7	99.1	12.1	14.4	2.3	Pass
2	5	2	21-1 to 21-11	07/28/21	116.8	111.0	111.4	95.4	12.1	15.4	3.3	Pass
3	5	1	21-1 to 21-11	07/30/21	116.8	111.0	115.6	99.0	12.1	12.5	0.4	Pass
3	5	2	21-1 to 21-11	07/30/21	116.8	111.0	117.7	100.8	12.1	14.2	2.1	Pass
4	5	1	21-1 to 21-11	08/02/21	116.8	111.0	119.0	101.9	12.1	12.3	0.2	Pass
4	5	2	21-1 to 21-11	08/02/21	116.8	111.0	117.7	100.8	12.1	11.4	-0.7	Pass
4	5	3	21-1 to 21-11	08/02/21	116.8	111.0	115.5	98.9	12.1	11.9	-0.2	Pass
4	5	4	21-1 to 21-11	08/02/21	116.8	111.0	113.2	96.9	12.1	15.1	3.0	Pass
4	5	5	21-1 to 21-11	08/02/21	116.8	111.0	116.5	99.7	12.1	12.7	0.6	Pass
5	5	1	21-1 to 21-11	08/05/21	116.8	111.0	117.0	100.2	12.1	12.2	0.1	Pass
5	5	2	21-1 to 21-11	08/05/21	116.8	111.0	115.4	98.8	12.1	13.0	0.9	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Lift 6
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
1	6	1	21-1 to 21-11	08/03/21	116.8	111.0	117.2	100.3	12.1	13.6	1.5	Pass
1	6	2	21-1 to 21-11	08/03/21	116.8	111.0	114.7	98.2	12.1	15.9	3.8	Pass
2	6	1	21-1 to 21-11	08/03/21	116.8	111.0	113.6	97.3	12.1	17.0	4.9	Pass
2	6	2	21-1 to 21-11	08/03/21	116.8	111.0	116.9	100.1	12.1	13.2	1.1	Pass
3	6	1	21-1 to 21-11	08/03/21	116.8	111.0	117.2	100.3	12.1	13.9	1.8	Pass
3	6	2	21-1 to 21-11	08/03/21	116.8	111.0	114.2	97.8	12.1	16.4	4.3	Pass
4	6	1	21-1 to 21-11	08/03/21	116.8	111.0	116.1	99.4	12.1	15.7	3.6	Pass
4	6	2	21-1 to 21-11	08/03/21	116.8	111.0	114.7	98.2	12.1	12.8	0.7	Pass
5	6	1	21-1 to 21-11	08/05/21	116.8	111.0	116.1	99.4	12.1	12.4	0.3	Pass
5	6	2	21-1 to 21-11	08/05/21	116.8	111.0	115.7	99.1	12.1	12.6	0.5	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

Table 4
Summary of Recompacted Soil Liner Field Tests - Swale
Athens-Hocking Reclamation Center Landfill

Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (D698)	95% Percent of MDD (PCF)	Field Density (PCF) (D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (D698)	Field Moisture Content (%) (D3017-01)	Difference in Moisture (%)	Pass or Fail
Swale	1	1	21-1 to 21-11	08/02/21	116.8	111.0	111.9	95.8	12.1	14.1	2.0	Pass
Swale	2	2	21-1 to 21-11	08/02/21	116.8	111.0	110.0	94.2	12.1	16.8	4.7	Pass
Swale	2	2R	21-1 to 21-11	08/02/21	116.8	111.0	111.5	95.5	12.1	14.3	2.2	Pass
Swale	3	3	21-1 to 21-11	08/02/21	116.8	111.0	115.3	98.8	12.1	12.9	0.8	Pass

Note: Passing criteria are ≥ 95% of standard Proctor maximum dry density and ≥ 0.0% of the standard Proctor optimum moisture content.

TABLE 5
Geomembrane Material Testing - Tests and Frequencies
Athens-Hocking Reclamation Center Landfill

Property	Proposed Test Value	Proposed Test Method	Proposed Basis of Test Value	Testing Frequency	
				MQC	Owner's Conformance Note (6)
Thickness	60 mils (-5%) -15%	ASTM D 5994	Minimum average Lowest individual for any of the 10 values	Per Roll	Yes
Asperity Height	18 mil	ASTM D 7466	Minimum Average	Every 2nd Roll	Yes
Density/Specific gravity	0.94 g/cm^3	ASTM D 1505 or D 792	Minimum Average	200,000 lb	Yes
Tensile Properties: Yield Strength Break Strength Yield Elongation (1.3") Break Elongation (2.0")	 126 ppi 90 ppi 12% 100%	ASTM D 6693 Type IV	(Each Direction) Minimum Average Minimum Average Minimum Average Minimum Average	20,000 lb	Yes
Tear Resistance	42 lb	ASTM D 1004	Minimum Average	45,000 lb	Yes
Puncture Resistance	90 lb	ASTM 4833	Minimum Average	45,000 lb	Yes
Carbon Black Content	2.0-3.0%	ASTM D 1603 or D 4218	Range	20,000 lb	Yes
Carbon Black Dispersion	Cat. 1 or 2	ASTM D 5596	Note (1)	45,000 lb	Yes
Oxidative Induction Time (OIT) (a) Standard OIT **or** (b) High Pressure OIT	 100 min 400 min	 ASTM 3895 ASTM 5885	Note (2) Minimum Average Minimum Average	200,000 lb	No
Stress Crack Resistance	300 hr	ASTM D 5397	Minimum Note (3)	Per Formulation	No
Oven Aging at 85^{0}C (a) Standard OIT **or** (b) High Pressure OIT	 55% 80%	ASTM 5721 ASTM 3895 ASTM 5885	 Min. Ave. - % retained after 90 days Min. Ave. - % retained after 90 days	Per Formulation	No
UV Resistance Note (4) (a) Standard OIT **or** (b) High Pressure OIT	 N.R. Note (5) 50%	 ASTM 5885	 Minimum average Min. Ave. - % retained after 1600 hours	Per Formulation	No

Notes:

(1) Carbon black dispersion only applies to near spherical agglomerates: 9 of 10 views shall be Category 1 or 2 with no more than 1 view from Category 3.

(2) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

(3) The SP-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation used for the textured sheets. The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

(4) The condition of the test should 20 hour UV cycle at 75^{0}C followed by 4 hour condensation at 60^{0}C.

(5) Not recommended since the temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

(6) A minimum of 1 sample per construction project or 1 sample per 150,000 square feet of installed geomembrane, whichever results in the greater number of samples.

(7) Please note that the proposed test parameters, test values, test methods, and testing frequency are designed to ensure that the geomembrane meets or exceeds the requirements of GRI GM13 (V11:12/14/12). The required test parameters, test values, test methods, and test frequency will be required to meet either those specified in this table or the version of the GRI GM13 that is the most current.

Table 6
Documentation of Geomembrane Material Test Frequencies
Athens-Hocking Reclamation Center Landfill

Property	Testing Frequency					
	PTI REQUIRED MQC	Number of MQC Tests Required Per 48,334 lbs of Material to be Used	ACTUAL MQC	PTI Required Frequency of Owner's Conformance Tests	Number of Owner's Conformance Tests Required Per Material to be Used	Actual Number of Owner's Conformance Tests
Thickness	Per Roll	Per Roll	Per Roll	1/150,000 sq. ft.	1	2
Asperity Height	Every 2nd Roll	Every 2nd Roll	Every Roll	1/150,000 sq. ft.	1	2
Density/Specific gravity	200,000 lb	1 Test	3 Tests	1/150,000 sq. ft.	1	2
Tensile Properties: Yield Strength Break Strength Yield Elongation (1.3") Break Elongation (2.0")	20,000 lb	3 Tests	7 Tests	1/150,000 sq. ft.	1 1	2
Tear Resistance	45,000 lb	2 Tests	3 Tests	1/150,000 sq. ft.	1	2
Puncture Resistance	45,000 lb	2 Tests	3 Tests	1/150,000 sq. ft.	1	2
Carbon Black Content	20,000 lb	3 Tests	7 Tests	1/150,000 sq. ft.	1	2
Carbon Black Dispersion	45,000 lb	2 Tests	7	1/150,000 sq. ft.	1	2
Oxidative Induction Time (OIT) (a) Standard OIT **or** (b) High Pressure OIT	200,000 lb	1 Test	7 Tests	No	None	None
Oven Aging at 85^{0}C (a) Standard OIT **or** (b) High Pressure OIT	Per Formulation	Per Formulation	Per Formulation	No	None	None
UV Resistance Note (4) (a) Standard OIT **or** (b) High Pressure OIT	Per Formulation	Per Formulation	Per Formulation	No	None	None

Note: 12 rolls totaling 144,504 square feet with a weight of 48,334 pounds are to be used in Cell 30.

Table 7
Geomembrane Material Testing Results - Sheet Properties
Athens-Hocking Reclamation Center Landfill

Roll #	Thickness		Density	Tensile Properties								Tear Resistance		Puncture Resistance	Carbon Black		Asperity Height	OIT	Pass/ Fail
	Minimum	Average		Yield Strength		Break Strength		Yield Elongation		Break Elongation					Content	Dispersion			
	mil	mil	g/cm^3	ppi		ppi		%		%		ppi		lb	%	# in Cat. 1 or 2	mil	Minutes	
				MD	CD	MD	CD	MD	CD	MD	CD	MD	CD						
60-mil HDPE TEXTURED GEOMEMBRANE																			
PTI Criteria	51	57	0.94	126	126	90	90	12	12	100	100	42	42	90	2.0-3.0	9/10	18	100	
Manufacturers Quality Control																			
1001-151225	57.3	59.5	0.946	158.6	167.4	206	207	16.0	14.4	565	601	57	58	146	2.46	10	19.0/19.4	152	Pass
1001-151226	55.6	59.7	0.946	164.1	167.7	209	194	17.1	17.1	567	568	57	58	146	2.66	10	19.2/19.5	152	Pass
1001-151227	53.9	58.1	0.946	164.1	167.7	209	194	17.1	17.1	567	568	57	58	146	2.66	10	18.5/18.4	152	Pass
1001-151228	55.8	58.1	0.946	159.9	157.6	200	190	13.8	16.4	554	567	57	58	146	2.75	10	18.6/18.9	152	Pass
1001-151229	55.5	58.3	0.947	159.9	157.6	200	190	13.8	16.4	554	567	53	58	136	2.75	10	18.8/19.2	152	Pass
1001-151230	56.7	58.2	0.947	155.8	156.9	194	180	16.3	16.4	551	538	53	58	136	2.81	10	18.8/18.4	152	Pass
1001-151231	55.1	57.9	0.947	155.8	156.9	194	180	16.3	16.4	551	538	53	58	136	2.81	10	19.2/18.5	152	Pass
1001-151233	53.3	57.2	0.947	151.8	156.3	200	186	15.8	15.6	574	571	53	58	136	2.62	10	18.5/18.5	152	Pass
1001-151235	56.6	57.8	0.947	151.8	156.3	200	186	15.8	15.6	574	571	53	58	136	2.62	10	19.3/19.4	152	Pass
1001-151237	55.5	57.4	0.948	154.6	155.0	191	179	14.1	14.3	537	542	53	57	142	2.76	10	18.8/18.8	152	Pass
1001-151238	53.8	57.3	0.948	151.4	161.5	202	177	15.8	15.1	567	526	53	57	142	2.78	10	19.1/18.3	152	Pass
1001-151239	53.9	57.4	0.948	151.4	161.5	202	177	15.8	15.1	567	526	53	57	142	2.78	10	19.2/19.5	152	Pass
Owner's Conformance Testing																			
Conformance (1001-151225)	59	60	0.9477	160	164	197	176	17	16	550	530	55.8	53.8	140.7	2.46	10	27/25	NA	Pass
Conformance (1001-151233)	55	58	0.9471	154	155	194	181	17	16	560	550	55.2	52.3	140.7	2.55	10	25/26	NA	Pass

Table 8
Geomembrane Material Testing Results - Formulation Properties
Athens-Hocking Reclamation Center Landfill

Reference #	Stress Crack Resistance (Hours)	Oven Aging - High Pressure OIT (% Retained)	UV Resistance (% Retained)	Pass/Fail
PTI Criteria	**300 hours**	**80**	**50**	
Formulation	500	80	50	Pass

Table 9
Direct Shear Interface Testing
Peak RSL to Geomembrane (Roll # 1001-151238)
Athens-Hocking Reclamation Center Landfill

Normal Load (psf)	**PTI Requirement (psf)**	Conformance Test	Pass/Fail
0	**0**	0	Pass
1440	**350**	1029	Pass
2880	**850**	1307	Pass
8640	**2500**	2897	Pass
19440	**5500**	5890	Pass

Table 10
Geomembrane Seam Destructive Test Results
Athens-Hocking Reclamation Center Landfill

PTI Criteria																	
	Peel Test Fusion (ppi)				**91**	**91**	**91**	**91**	**91**	**≤ 25**	**≤ 25**	**≤ 25**	**≤ 25**	**≤ 25**		
	Peel Test - Extrusion (ppi)				**78**	**78**	**78**	**78**	**78**	**≤ 25**	**≤ 25**	**≤ 25**	**≤ 25**	**≤ 25**		
Sample	Weld Type	Seaming Apparatus	Material	Track	Replicate - Peak Load (ppi)					Replicate - Peel Incursion (%)					Break Code	Pass/ Fail	Failure Remedy
					1	2	3	4	5	1	2	3	4	5			
DS-1	Fusion	AM #1739	60 Mil Textured	Outside	131.2	130.9	138.0	142.5	129.2	<10	<10	<10	<10	<10	SE1	Pass	NA
				Inside	111.1	114.3	112.6	112.4	112.5	<10	<10	<10	<10	<10	SE1		
DS-2	Fusion	RL #1712	60 Mil Textured	Outside	143.9	129.6	137.1	142.2	123.0	<10	<10	<10	<10	<10	SE1	Pass	NA
				Inside	124.5	149.8	146.2	131.5	139.0	<10	<10	<10	<10	<10	SE1		
DS-3	Fusion	AM #1739	60 Mil Textured	Outside	106.5	113.9	104.8	103.7	107.4	<10	<10	<10	<10	<10	SE1	Pass	NA
				Inside	105.5	118.5	105.7	110.5	114.0	<10	<10	<10	<10	<10	SE1		
DS-4	Fusion	RL #1712	60 Mil Textured	Outside	151.3	157.3	148.2	157.3	148.4	<10	<10	<10	<10	<10	SE1	Pass	NA
				Inside	122.0	130.7	123.1	124.5	121.0	<10	<10	<10	<10	<10	SE1		
DS-5	Fusion	AM #1739	60 Mil Textured	Outside	123.9	129.5	115.8	128.8	120.7	<10	<10	<10	<10	<10	SE1	Pass	NA
				Inside	135.0	127.4	122.4	127.6	126.1	<10	<10	<10	<10	<10	SE1		
DS-6	Fusion	RL #1712	60 Mil Textured	Outside	144.1	160.4	154.4	148.2	147.6	<10	<10	<10	<10	<10	SE1	Pass	NA
				Inside	143.2	144.0	150.7	149.1	164.2	<10	<10	<10	<10	<10	SE1		
DS-7	Extrusion	HMR #42	60 Mil Textured		113.8	92.6	89.1	113.9	93.7	<10	<10	<10	<10	<10	SE3	Pass	NA

Note: See notes at end of table for additional requirements for passing of geomembrane seam destructive test results.

Table 11
Geocomposite Specifications and Testing Frequencies
Athens-Hocking Reclamation Center Landfill

Property	ASTM Test Method	Test Value	Proposed Basis of Test Value (1)	MQC Testing and Frequency	Owner Conformance Testing
Geocomposite (2)					
Transmissivity, m^2/sec	D 4716	Varies (3)	MARV	1/540,000 sq ft	Yes (4)
Ply Adhesion, lb/in	D 7005	1	MARV	1/50,000 sq ft	Yes (5)
Geonet Core					
Thickness, mils	D 5199	250	MARV	1/50,000 sq ft	No
Density, g/cm^3	D 1505	0.94	MARV	1/50,000 sq ft	No
Tensile Strength, lb/in	D 5035/7179	55	MARV	1/50,000 sq ft	No
Carbon Black Content, %	D 1603/4218	2-3	Range	1/50,000 sq ft	No
Transmissivity, m^2/sec	D 4716	Varies (6)	MARV	Per MQC Testing	No
Geotextile					
Mass per Unit Area, oz/yd^2	D 5261	8	MARV	1/100,000 sq. ft.	No
Grab Tensile Strength, lbs	D 4632	200	MARV	1/100,000 sq. ft.	No
Grab Elongation, %	D 4632	50	MARV	1/100,000 sq. ft.	No
Puncture Strength, lbs **or** CBR Puncture Strength, lbs	D 4833 D 6241	110 575	MARV MARV	1/100,000 sq. ft. 1/100,000 sq. ft.	No No
Apparent Opening Size, sieve # (7)	D 4751	80	MARV	1/540,000 sq. ft.	No
UV Resistance, Percent Retained After 500 Hours	D 4355	70	MARV	Per Formulation	No
Permittivity, 1/sec	D 4491	1.2	MARV	1/600,000 sq. ft.	No

NOTES:

(1) MARV: Minimum Average Roll Value

(2) Geocomposite is double sided.

(3) All 100-hour transmissivity tests on the geocomposite must be tested at site specific conditions of slope and maximum expected load. The geocomposite is to be tested at specific boundary conditions defined by protective sand layer/geocomposite/60-mil textured HDPE geomembrane, and rubber mat or RSL. Testing is to be at a rate of one (1) test per 50,000 sq. ft. of geocomposite used.

(4) Owner conformance testing for transmissivity will be conducted at a rate of one (1) per job or one (1) per 150,000 whichever results in a greater number of tests. If the manufacturer does not test the geocomposite per Note #3 at the required rate of one (1) per 50,000 sq. ft., then the owner will do so, but a conformance test will not be performed. The required transmissivity value will be determined per the calculations in Table 14.

(5) Owner conformance testing for ply adhesion will be conducted at a rate of one (1) per job or one (1) per 150,000 whichever results in a greater number of tests.

(6) Reported manufacturer data for the geonet core may or may not reflect site conditions and is not a PTI condition.

(7) AOS in mm is a maximum value.

Table 12
Documentation of Geocomposite Material Test Frequencies
Athens-Hocking Reclamation Center Landfill

Property	PTI Required MQC	Number of MQC Tests Required Per Material to be Used	Actual MQC Testing	PTI Required Frequency of Owner's Conformance Tests	Number of Owner's Conformance Tests Required Per Material to be Used	Actual Number of Owner's Conformance Tests
Geocomposite (2)						
Transmissivity, m^2/sec	1/540,000 sq ft	1	1	1/50,000 sq ft	3	3
Ply Adhesion, lb/in	1/50,000 sq ft	3	4	1/150,000 sq ft	1	1
Geonet Core						
Thickness, mils	1/50,000 sq ft	3	4	None	None	None
Density, g/cm^3	1/50,000 sq ft	3	4	None	None	None
Tensile Strength, lb/in	1/50,000 sq ft	3	4	None	None	None
Carbon Black Content, %	1/50,000 sq ft	3	4	None	None	None
Transmissivity, m^2/sec	Per MQC Testing	1	1	None	None	None
Geotextile						
Mass per Unit Area, oz/yd^2	1/100,000 sq. ft.	2	2	None	None	None
Grab Tensile Strength, lbs	1/100,000 sq. ft.	2	2	None	None	None
Grab Elongation, %	1/100,000 sq. ft.	2	2	None	None	None
Puncture Strength, lbs **or** CBR Puncture Strength, lbs	1/100,000 sq. ft. 1/100,000 sq. ft.	2 2	NA 2	None None	None None	None None
Apparent Opening Size, sieve # (7)	1/540,000 sq. ft.	1	1	None	None	None
UV Resistance, Percent Retained After 500 Hours	Per Formulation	1	1	None	None	None
Permittivity, 1/sec	1/600,000 sq. ft.	1	1	None	None	None

Note: 60 rolls with a square footage of 147,900 square feet are to be used in Cell 30.

Table 13
Geocomposite Testing Results
Athens-Hocking Reclamation Center Landfill

Roll #	GEONET CORE					Geocomposite		
	Transmissivity	Thickness	Density	Tensile Strength	Carbon Black Content	Transmissivity	Ply Adhesion	Pass/ Fail
	m^2/sec	mil	g/cm^3	ppi	%	m^2/sec	ppi	
PTI Criteria	Varies[1]	250	0.94	55	2-3	Varies[2]	1	
Manuafacutrers Quality Control								
1069110100001	NA	328	0.9566	110	2.23	7.83E-04	3.12/2.86	Pass
1069110100001	NA	328	0.9566	110	2.23	1.34E-04	3.12/2.86	Pass
1069110100020	NA	330	0.9522	112	2.38	NA	4.11/2.48	Pass
1069110100040	NA	336	0.9555	114	2.27	NA	3.76/2.89	Pass
1069110100060	NA	331	0.9557	117	2.29	NA	2.11/4.11	Pass
Owner's Conformance Testing								
1069110100002	NA	NA	NA	NA	NA	7.17E-04	9.68/8.96	Pass
1069110100002	NA	NA	NA	NA	NA	1.28E-03	9.68/8.96	Pass
1069110100023	NA	NA	NA	NA	NA	5.17E-04	NA	Pass
1069110100023	NA	NA	NA	NA	NA	1.69E-03	NA	Pass
1069110100023	NA	NA	NA	NA	NA	8.35E-04	NA	Pass
1069110100001	NA	NA	NA	NA	NA	1.34E-04	NA	Pass
1069110100044	NA	NA	NA	NA	NA	4.29E-04	NA	Pass

Notes: (1) Reported manufacturer data for geonet core transmissivity may or not reflect site conditions and is not a PTI condition.

(2) Geocomposite transmissivity is a PTI condition and must be tested at a rate of 1 per 50,000 square feet of geocomposite used. (See Tables 15 and 16 and the notes in Table 15A for specific test conditions).

(3) See Table 11 for a summary of the geocomposite required test parameters, test methods, and testing frequency, and see Table 12 for the frequency documentation.

Table 14
Geocomposite Other Results
Athens-Hocking Reclamation Center Landfill

		PTI Criteria									
Roll #	Fabric Side	Apparent Opening Size[(1)] (U.S. Sieve)	UV Resistance (% Retained after 500 Hours)	Permittivity sec^{-1}	Mass/ Area (oz/sy)	Grab Tensile Strength (lbs)		Grab Elongation (%)		CBR Puncture (lb)	Pass/Fail
						MD	CD	MD	CD		
		80 (0.180 mm)	**70**	**1.2**	**8**	**200**	**200**	**50**	**50**	**575**	Pass
1069110100001	A	80	70	1.39	8.39	232	240	65	85	736	Pass
1069110100001	B	80	70	1.39	8.58	235	243	67	77	663	Pass
1069110100040	A	80	70	1.39	8.52	234	242	68	79	694	Pass
1069110100040	B	80	70	1.39	8.11	227	237	72	81	671	Pass

Transmissivity Results

The 100-hour transmissivity test results reported in this table were tested at site specific conditions of either a 2.5% or 33% slope and varying load conditions. The site specific boundary conditions used were sand protective layer/geocomposite/60-mil textured HDPE geomembrane, and rubber mat.

Stage Passed	Geocomposite Roll #	Required Minimum PTI Transmissivity	Geocomposite Roll Transmissivity	Grade	Load (psf)	Pass/ Fail
1, 3 and 4	1069110100001	7.58E-04	7.83E-04	0.025	17800	Pass
1 and 2	1069110100002	1.20E-03	1.28E-03	0.025	6000	Pass
3 and 4	1069110100002	6.68E-04	7.17E-04	0.025	18000	Pass
1 and 2	1069110100023	1.20E-03	1.69E-03	0.025	6000	Pass
3	1069110100023	6.68E-04	8.35E-04	0.025	12000	Pass
4	1069110100023	1.70E-04	5.17E-04	0.025	18000	Pass
1 - 4	1069110100001	2.07E-05	1.34E-04	0.33	17800	Pass
1 - 4	1069110100044	2.07E-05	4.29E-04	0.33	18000	Pass

Note: (1) AOS in millimeters is a maximum value.

Table 15

2.5% Grade with Flow Length of 200 Feet

Athens-Hocking Reclamation Center Landfill

Input Parameter Values

L =	200	(feet)	Maximum horizontal drainage length of slope
β =	1.4321	(degree), sin β = 0.025	Slope angle
γ_{waste} =	75	lb/cf	Unit weight of solid waste

Notes:

(1) Input parameters of slope and maximum horizontal drainage length of slope may be varied according to site specific conditions.

(2) Peak impingement rates, reduction factors, and factor of safety may not be revised without prior approval of the Ohio EPA.

(3) Specified 100-hour transmissivity is at the maximum projected load.

(4) Required 100-hour transmissivity is maximum of estimated values.

(5) See Notes for Table 14 for test boundary conditions.

Peak Impingement Rates

Stage	Thickness of solid waste, t_{waste}		Peak Impingement rate into the LCRS drainage layer, q_i		Peak Impingement rate into the LCRS drainage layer, q_i	
I - Initial Operation	10	(feet)	3.2600E-06	(cm/sec)	3.2600E-08	(m/sec)
II - Active Operation	80	(feet)	1.4860E-06	(cm/sec)	1.4860E-08	(m/sec)
III - Intermediate Cover	120	(feet)	2.6500E-07	(cm/sec)	2.6500E-09	(m/sec)
IV - Post-Closure	180	(feet)	2.6500E-08	(cm/sec)	2.6500E-10	(m/sec)

Reduction Factors & Factor of Safety

Stage	Chemical Clogging Reduction Factor, RF_{cc}		Biological Clogging Reduction Factor, RF_{bc}		Creep Reduction Factor RF_{cr}		Overall Factor of Safety FS	
I - Initial Operation	1.2	dimensionless	1.1	dimensionless	1.10	dimensionless	2.0	dimensionless
II - Active Operation	2.0	dimensionless	1.2	dimensionless	1.40	dimensionless	3.0	dimensionless
III - Intermediate Cover	3.0	dimensionless	1.5	dimensionless	1.75	dimensionless	4.0	dimensionless
IV - Post-Closure	4.0	dimensionless	2.0	dimensionless	2.00	dimensionless	5.0	dimensionless

Solution:

Stage	Normal Stress		Design required transmissivity of LCRS		Allowable transmissivity of LCRS		Specified 100-hour transmissivity of LCRS	
	$\sigma = \gamma_{waste} * t_{waste}$		$\theta_{req} = (q_i * L) / \sin \beta$		$\theta_{allow} = \theta_{req} * FS$		$\theta_{100} = \theta_{allow} * RF_{cr} * RF_{cc} * RF_{bc}$	
I - Initial Operation	750	(lb/sf)	2.61E-04	(m^2/sec)	5.22E-04	(m^2/sec)	7.58E-04	(m^2/sec)
II - Active Operation	6000	(lb/sf)	1.19E-04	(m^2/sec)	3.57E-04	(m^2/sec)	1.20E-03	(m^2/sec)
III - Intermediate Cover	12000	(lb/sf)	2.12E-05	(m^2/sec)	8.48E-05	(m^2/sec)	6.68E-04	(m^2/sec)
IV - Post-Closure	19260	(lb/sf)	2.12E-06	(m^2/sec)	1.06E-05	(m^2/sec)	1.70E-04	(m^2/sec)

Table 15 A

Notes for Table 15

(1) The geocomposite must be double sided.

(2) All 100-hour transmissivity tests conducted on the geocomposite must be tested at the site specific conditions of slope angle and the maximum expected load. In addition, it must be demonstrated that the geocomposite meets or exceeds the required 100-Hr transmissivities for Stages I through IV. The geocomposite is to be tested at the specific boundary conditions defined by the protective sand layer/geocomposite/60-mil textured HDPE geomembrane, and a rubber mat or the RSL. Testing is to be at a rate of one (1) test per 50,000 sq. ft. of geocomposite used in cell construction.

(3) As shown in Table 15 the transmissivity of the geocomposite is to be determined for four stages. The four stages are defined by differing normal stresses, factors of safety, and reduction factors. The acceptability of the geocomposite for use in landfill construction, with respect to transmissivity, will be determined by the following protocol:

(A) Determine the slope length, slope angle, and maximum anticipated load for a given cell construction. Please note that it possible to have more than one slope length, slope angle, and/or normal load that will need to be tested.

(B) Construct a transmissivity evaluation graph that plots the normal loads versus the calculated required 100-Hr transmissivities for the four stages. The required 100-Hr transmissivities for the stages will be determined using Table 15 using the cell specific slope angle, slope length as well as the specific factor of safety and reduction factors for the four stages. Please see the Example Graph for Table 14 on the following page for illustrative purposes.

(C) Test the geocomposite at the maximum anticipated load for the cell. Compare the transmissivity test result to the transmissivity graph at the maximum load the geocomposite was tested. If the test result meets or exceeds the required value, then the maximum load test requirement will have been met. Then compare the maximum anticipated load transmissivity value to the required 100-HR transmissivity values for Stages I through IV (as appropriate). If the value exceeds (passes) the required transmissivities then no other testing is required and the geocomposite is acceptable for use.

(D) If the maximum load transmissivity test does not pass the required 100-Hr transmissivity for a lower stage, then test the geocomposite at the load required for the given stage. Compare the transmissivity result to the required 100-HR transmissivity for the stage. If it passes, meets or exceed the required transmissivity, then compare the transmissivity result to the lower stages. If it meets or exceeds the required 100-Hr transmissivity for the lower stages then no additional testing is required. Continue to test the geocomposite until it fails a given stage or the tested transmissivity exceeds the required 100-Hr transmissivity for any lower stage.

(4) Owner conformance testing for transmissivity will be conducted at a rate of one (1) per job or one (1) per 150,000 whichever results in a greater number of tests. If the manufacturer does not test the geocomposite per Note #2 at the required rate of one (1) per 50,000 sq. ft., then the owner will do so, but a conformance test will not be performed. The required transmissivity value will be determined per the calculations in Table 15.

Table 16
Calculation of Specified 100-HR Liner System Geocomposite Transmissivity
33% Grade with Flow Length of 100 Feet
Athens-Hocking Reclamation Center Landfill

Input Parameter Values

L =	100	(feet)	Max. horizontal drainage length of slope
β =	18.4	(degree), sin β = 0.3164	Slope angle
γ_{waste} =	75	lb/cf	Unit weight of solid waste

Notes:

(1) Input parameters of slope and maximum horizontal drainage length of slope may be varied according to site specific conditions.

(2) Peak impingement rates, reduction factors, and factor of safety may not be revised without prior approval of the Ohio EPA.

(3) Specified 100-hour transmissivity is at the maximum projected load.

(4) Required 100-hour transmissivity is maximum of estimated values.

(5) See Notes - Table 6-11 & 6-12 for test boundary conditions.

Peak Impingement Rates

Stage	Thickness of solid waste, t_{waste}		Peak Impingement rate into the LCRS drainage layer, q_i		Peak Impingement rate into the LCRS drainage layer, q_i	
I - Initial Operation	10	(feet)	3.2600E-06	(cm/sec)	3.26E-08	(m/sec)
II - Active Operation	80	(feet)	1.4860E-06	(cm/sec)	1.49E-08	(m/sec)
III - Intermediate Cover	120	(feet)	2.6500E-07	(cm/sec)	2.65E-09	(m/sec)
IV - Post-Closure	180	(feet)	2.6500E-08	(cm/sec)	2.65E-10	(m/sec)

Reduction Factors & Factor of Safety

Stage	Chemical Clogging Reduction Factor, RF_{cc}		Biological Clogging Reduction Factor, RF_{bc}		Creep Reduction Factor RF_{cr}		Overall Factor of Safety FS	
I - Initial Operation	1.2	dimensionless	1.1	dimensionless	1.10	dimensionless	2.0	dimensionless
II - Active Operation	2.0	dimensionless	1.2	dimensionless	1.40	dimensionless	3.0	dimensionless
III - Intermediate Cover	3.0	dimensionless	1.5	dimensionless	1.75	dimensionless	4.0	dimensionless
IV - Post-Closure	4.0	dimensionless	2.0	dimensionless	2.00	dimensionless	5.0	dimensionless

Solution:

Stage	Normal Stress		Design required transmissivity of LCRS		Allowable transmissivity of LCRS		Specified 100-hour transmissivity of LCRS	
	$\sigma = \gamma_{waste} * t_{waste}$		$\theta_{req} = (q_i * L) / \sin \beta$		$\theta_{allow} = \theta_{req} * FS$		$\theta_{100} = \theta_{allow} * RF_{cr} * RF_{cc} * RF_{bc}$	
I - Initial Operation	750	(lb/sf)	1.03E-05	(m^2/sec)	2.07E-05	(m^2/sec)	3.00E-05	(m^2/sec)
II - Active Operation	6000	(lb/sf)	4.71E-06	(m^2/sec)	1.41E-05	(m^2/sec)	4.75E-05	(m^2/sec)
III - Intermediate Cover	12000	(lb/sf)	8.40E-07	(m^2/sec)	3.36E-06	(m^2/sec)	2.64E-05	(m^2/sec)
IV - Post-Closure	17000	(lb/sf)	8.40E-08	(m^2/sec)	4.20E-07	(m^2/sec)	6.72E-06	(m^2/sec)

Table 17
Protective Layer Borrow Source - Laboratory Test Data
Athens-Hocking Reclamation Center Landfill

Sample Number	Carbonate Content by Weight	Percent Finer by Weight (ASTM D422)		Permeability (cm/sec) (ASTM D2434)	Pass or Fail
		1"	#200		
PTI Requirement	**≤ 5%**		**≤ 5%**	**≥ 0.0002**	
General Considerations		100%			
Filter Layer (Protective Sand) Samples					
21-S1	0.40	100	1.1	4.15E-02	Pass
19-G1	0.56	94.5	0.0	5.25E+01	Pass

Note: Required frequency of testing is 1 borrow source sample for every 3,000 cubic yards of soil to be used in cell construction.

APPENDIX A
LABORATORY TESTING DATA

APPENDIX A
SECTION 1
STRUCTURAL FILL

LETTER OF TRANSMITTAL

S&ME, Inc.
6190 Enterprise Ct.
Dublin, Ohio 43016
(614) 793-2226 – Phone
(614) 793-2410 – Fax
www.smeinc.com

Date: June 24, 2021
S&ME Project No: 212937 – A
Project Name: AHRC Landfill, 2021
Reference: Laboratory Test Results

To: Kilbarger Construction Co.
450 Gallagher – P.O. Box 946
Logan, Ohio 44830
Attention: Mr. Mark Ruof

With this e-mail, we are sending you the following:

Document	Number of Pages
Laboratory Test Results for Sample SF-1 • 1 Modified Proctor (ASTM D1557) • 1 Summary	4 including cover

These documents are transmitted as checked below:

[ ] For Approval [ ] For Your Use [X] As Requested [ ] For review & comment [ ] _____

Signed: Paula J Manning
Paula J. Manning,
Group Leader/
Project Manager

Distribution: 1 Copy – AHRC Landfill
Mr. Mark Ruof

IF ENCLOSURES ARE NOT AS NOTED, PLEASE NOTIFY US AT ONCE.

SUMMARY OF LABORATORY TEST RESULTS

SPECIMEN ID	PT.ID	MC	LL	PL	PI	% passing #200	% passing .002 mm	opt.	pcf	PERMEABILITY	ASTM Classification
SF-1	**0.00**							**6.7**	**135.9**		
SF-1	**1.00**							**7.9**	**133.2**		

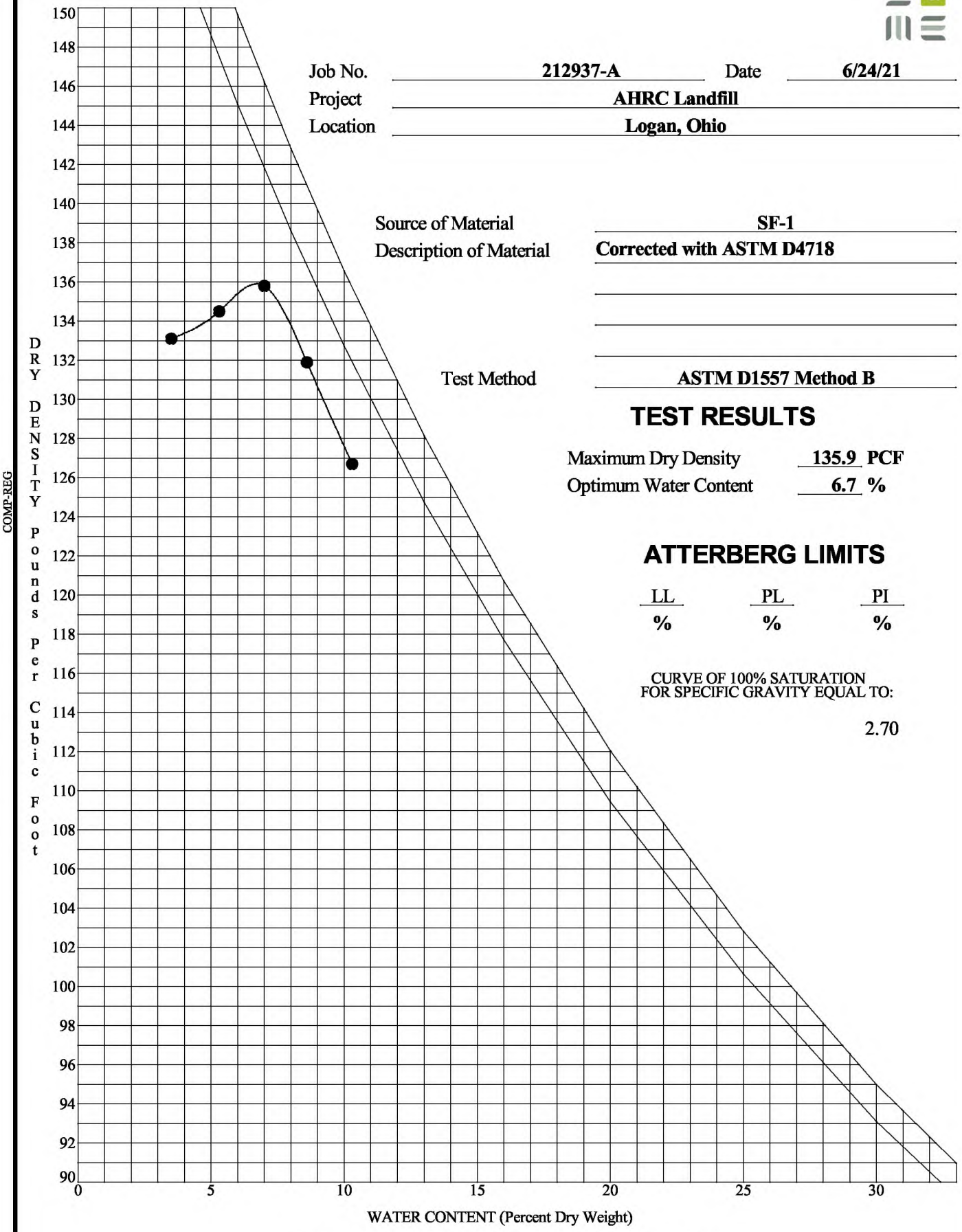
PT. ID. 0 is for corrected sample and PT. ID. 1 is for uncorrected sample.

SUM.EPA

PLATE 1

BULK SAMPLES

PROJECT AHRC Landfill
LOCATION Logan, Ohio
JOB NO. 212937-A **DATE** 6/24/21



COMP-REG

Job No. 212937-A Date 6/24/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material SF-1

Description of Material Corrected with ASTM D4718

Test Method ASTM D1557 Method B

TEST RESULTS

Maximum Dry Density 135.9 PCF

Optimum Water Content 6.7 %

ATTERBERG LIMITS

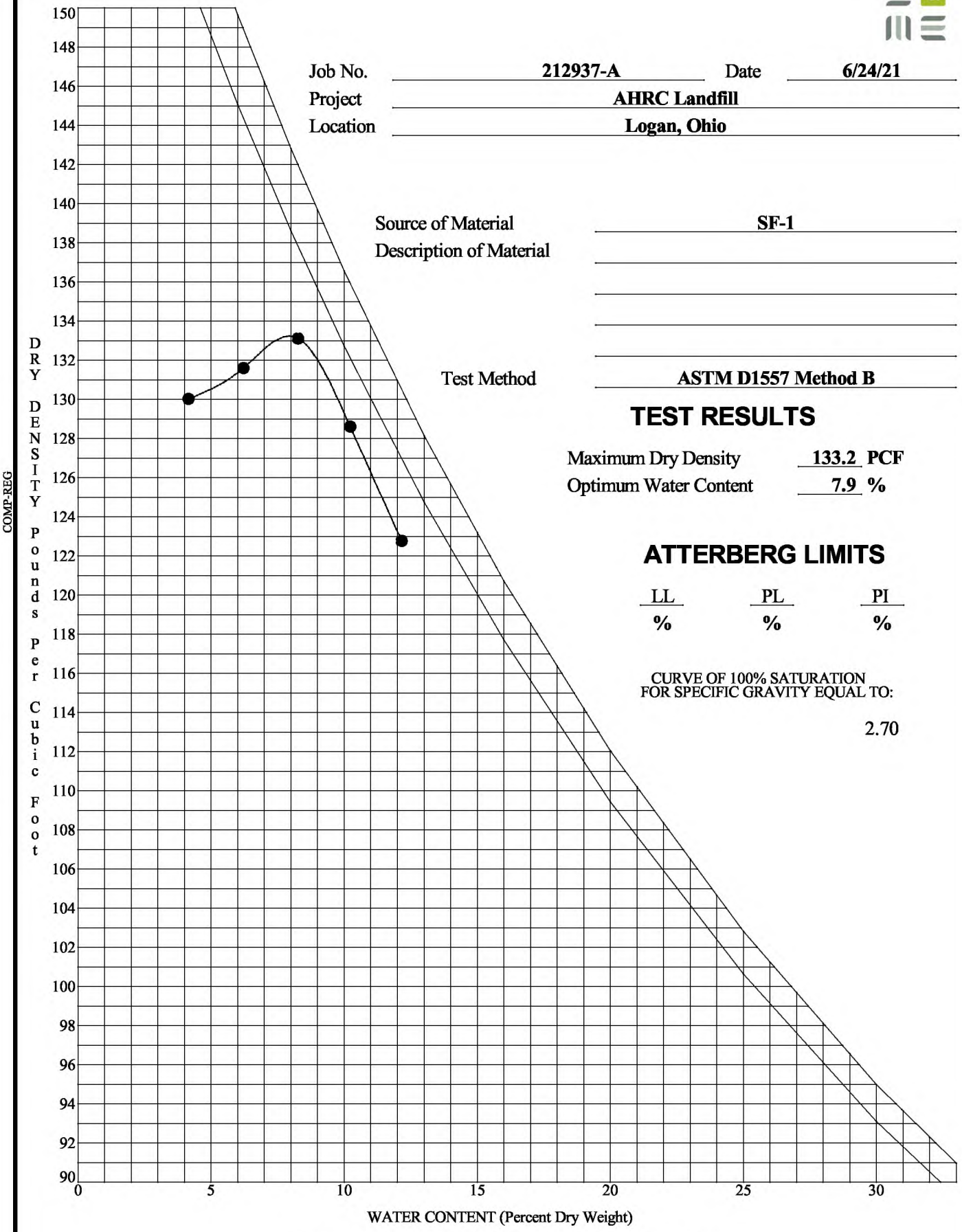
LL	PL	PI
%	%	%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

2.70

MOISTURE-DENSITY RELATIONSHIP

PLATE 1



COMP-REG

Job No. 212937-A Date 6/24/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material SF-1

Description of Material

Test Method ASTM D1557 Method B

TEST RESULTS

Maximum Dry Density 133.2 PCF

Optimum Water Content 7.9 %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

2.70

MOISTURE-DENSITY RELATIONSHIP

PLATE 2

APPENDIX A
SECTION 2
RECOMPACTED SOIL LINER

LETTER OF TRANSMITTAL

S&ME, Inc.
6190 Enterprise Ct.
Dublin, Ohio 43016
(614) 793-2226 – Phone
(614) 793-2410 – Fax
www.smeinc.com

Date: June 2, 2021
S&ME Project No: 212937 – A
Project Name: AHRC Landfill, 2021
Reference: Laboratory Test Results

To: Kilbarger Construction Co.
450 Gallagher – P.O. Box 946
Logan, Ohio 44830
Attention: Mr. Mark Ruof

With this e-mail, we are sending you the following:

Document	Number of Pages
Laboratory Test Results for Samples • 11 Sieve/Long hydros (ASTM D422) • 11 Atterberg Limits (ASTM D4318) • 11 Standard Compactions (ASTM D698) with 10 Specific Gravity Corrections (ASTM D4718) • 1 Summary	25 including cover

These documents are transmitted as checked below:

[ ] For Approval [ ] For Your Use [X] As Requested [ ] For review & comment [ ] _____

Signed: Paula J Manning
Paula J. Manning,
Group Leader/
Project Manager

Distribution: 1 Copy – AHRC Landfill
Mr. Mark Ruof

IF ENCLOSURES ARE NOT AS NOTED, PLEASE NOTIFY US AT ONCE.

SUMMARY OF LABORATORY TEST RESULTS

SPECIMEN ID	PT.ID	MC	LL	PL	PI	% passing #200	% passing .002 mm	opt.	pcf	PERMEABILITY	ASTM Classification
21-1	0.00		36	19	17	71.9	24.6	13.2	116.3		LEAN CLAY with SAND CL
21-2	0.00		35	19	16	72.0	26.0	12.6	115.4		LEAN CLAY with SAND CL
21-3	0.00		35	19	16	74.4	26.6	12.5	117.3		LEAN CLAY with SAND CL
21-4	0.00		36	21	15	71.6	25.5	11.5	117.7		LEAN CLAY with SAND CL
21-5	0.00		36	19	17	76.1	25.9	13.1	113.1		LEAN CLAY with SAND CL
21-6	0.00		36	19	17	72.0	26.9	12.0	112.8		LEAN CLAY with SAND CL
21-7	0.00		35	18	17	71.7	24.8	11.4	118.8		LEAN CLAY with SAND CL
21-8	0.00		35	21	14	69.7	26.1	11.5	118.9		SANDY LEAN CLAY CL
21-9	0.00		36	18	18	72.3	27.3	12.5	117.3		LEAN CLAY with SAND CL
21-10	0.00		36	18	18	70.3	26.9	11.4	117.0		LEAN CLAY with SAND CL
21-11	0.00		34	18	16	72.4	23.9	11.4	120.3		LEAN CLAY with SAND CL

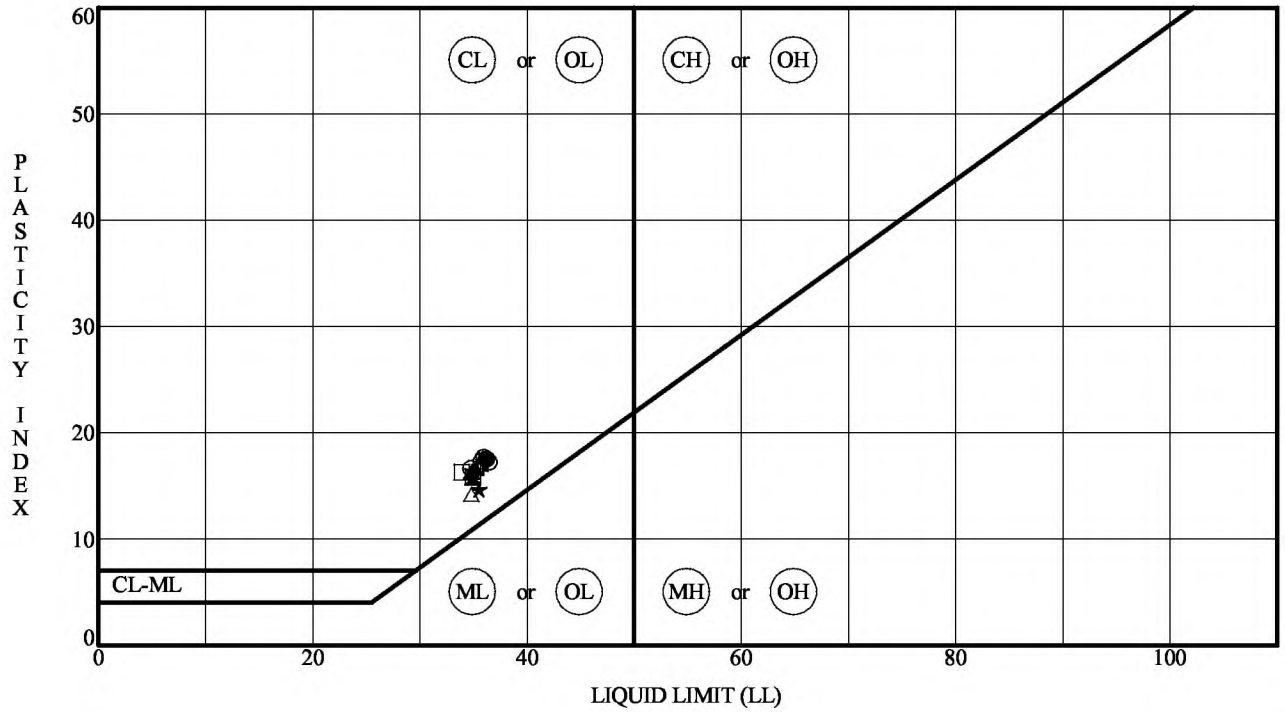
BULK SAMPLES

PROJECT AHRC Landfill
LOCATION Logan, Ohio
JOB NO. 212937-A
DATE 6/2/21

SUMEPA

PLATE 1

ATTERBERG LIMITS' RESULTS - ASTM D4318

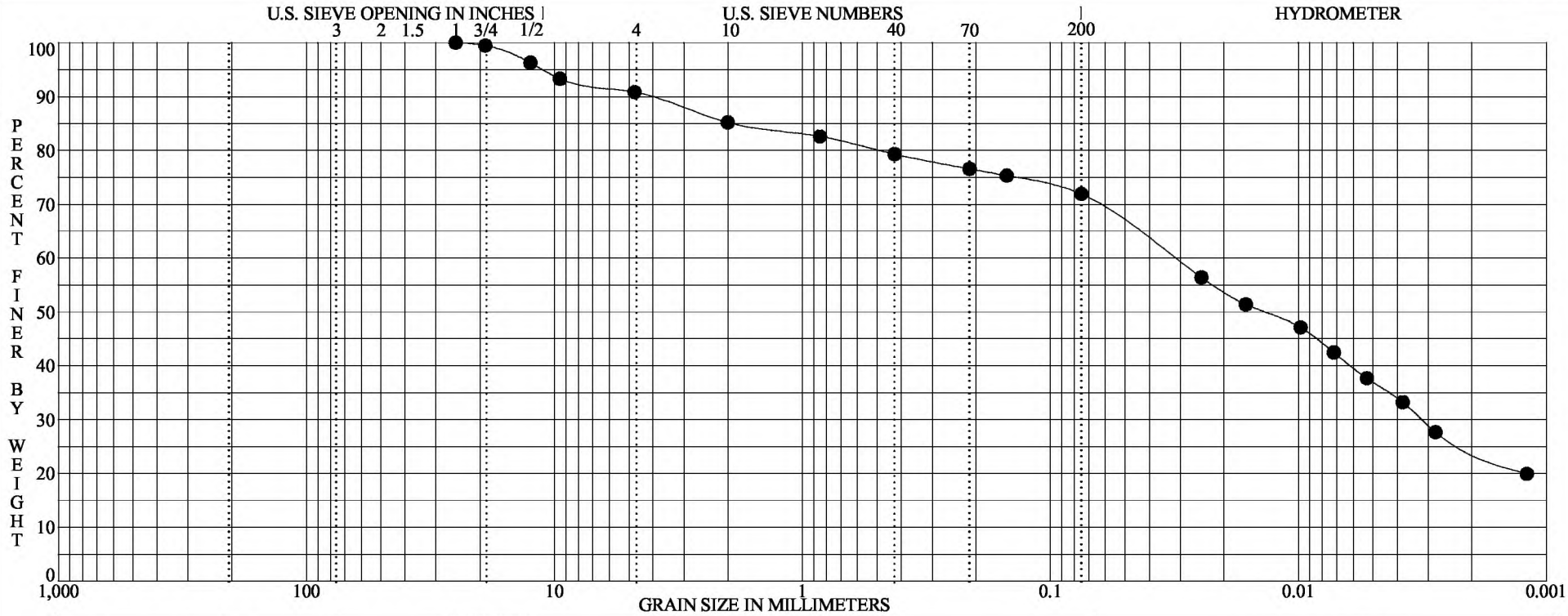


	Specimen Id.	Pt. ID	MC	LL	PL	PI	.002mm	ASTM Classification
●	21-1	0.00		36	19	17	24.6	LEAN CLAY with SAND CL
⧓	21-2	0.00		35	19	16	26.0	LEAN CLAY with SAND CL
▲	21-3	0.00		35	19	16	26.6	LEAN CLAY with SAND CL
★	21-4	0.00		36	21	15	25.5	LEAN CLAY with SAND CL
⊙	21-5	0.00		36	19	17	25.9	LEAN CLAY with SAND CL
✿	21-6	0.00		36	19	17	26.9	LEAN CLAY with SAND CL
○	21-7	0.00		35	18	17	24.8	LEAN CLAY with SAND CL
△	21-8	0.00		35	21	14	26.1	SANDY LEAN CLAY CL
⊗	21-9	0.00		36	18	18	27.3	LEAN CLAY with SAND CL
⊕	21-10	0.00		36	18	18	26.9	LEAN CLAY with SAND CL
□	21-11	0.00		34	18	16	23.9	LEAN CLAY with SAND CL

PROJECT AHRC Landfill
LOCATION Logan, Ohio
JOB NO. 212937-A **DATE** 6/2/21

ALPIEPA

GRN-EPA



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-1	LEAN CLAY with SAND CL		36	19	17	13.2	116.3

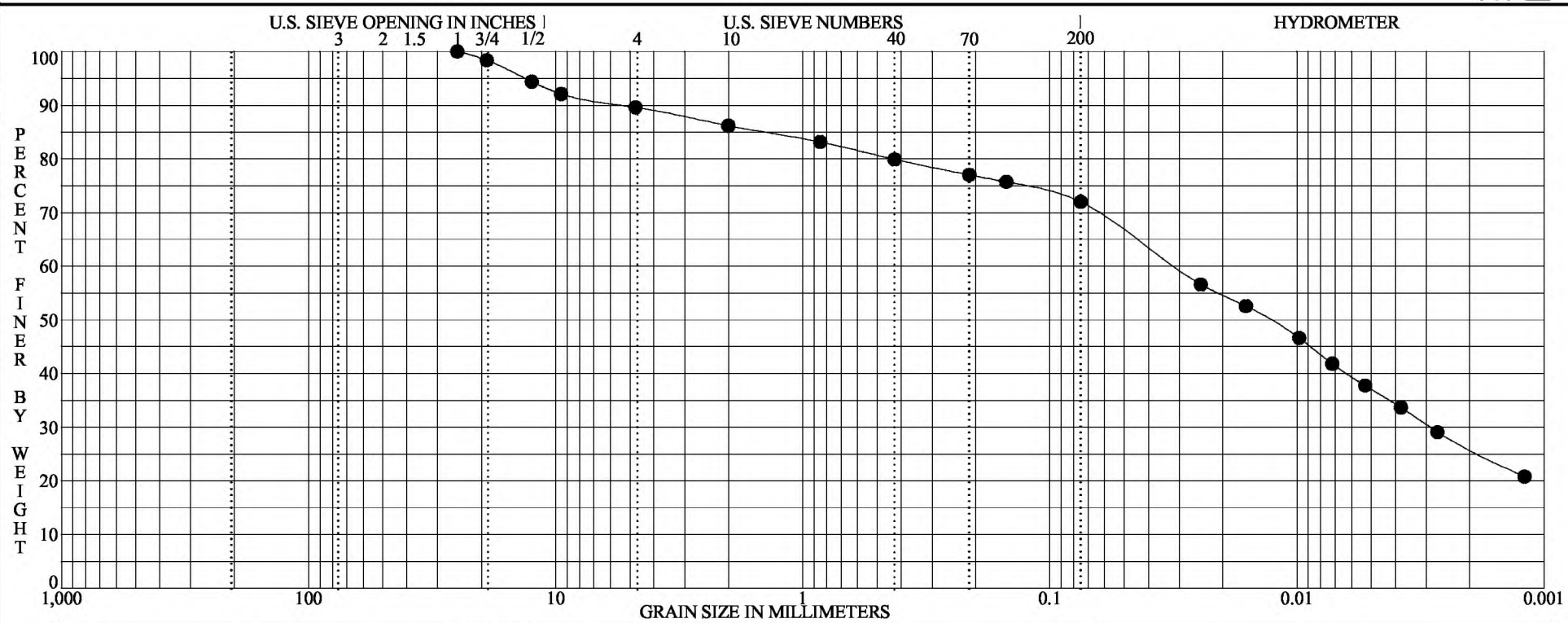
	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-1	25.0000	11.0942	0.0318	0.0138		9.2	18.9	47.3	24.6

ASTM D422

GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

PLATE 1



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-2	LEAN CLAY with SAND CL		35	19	16	12.6	115.4

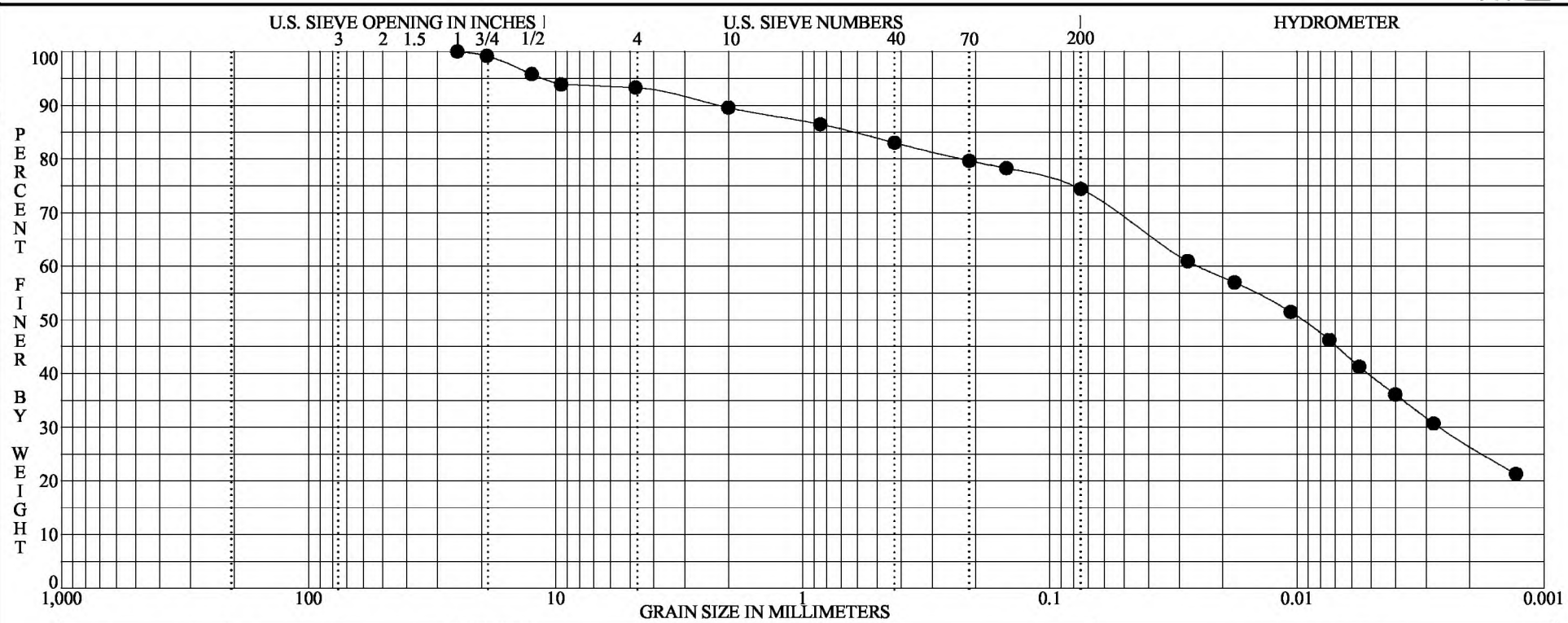
	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-2	25.0000	13.3095	0.0314	0.0130		10.4	17.6	46.0	26.0

ASTM D422 | **GRADATION CURVE**

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 2



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-3	LEAN CLAY with SAND CL		35	19	16	12.5	117.3

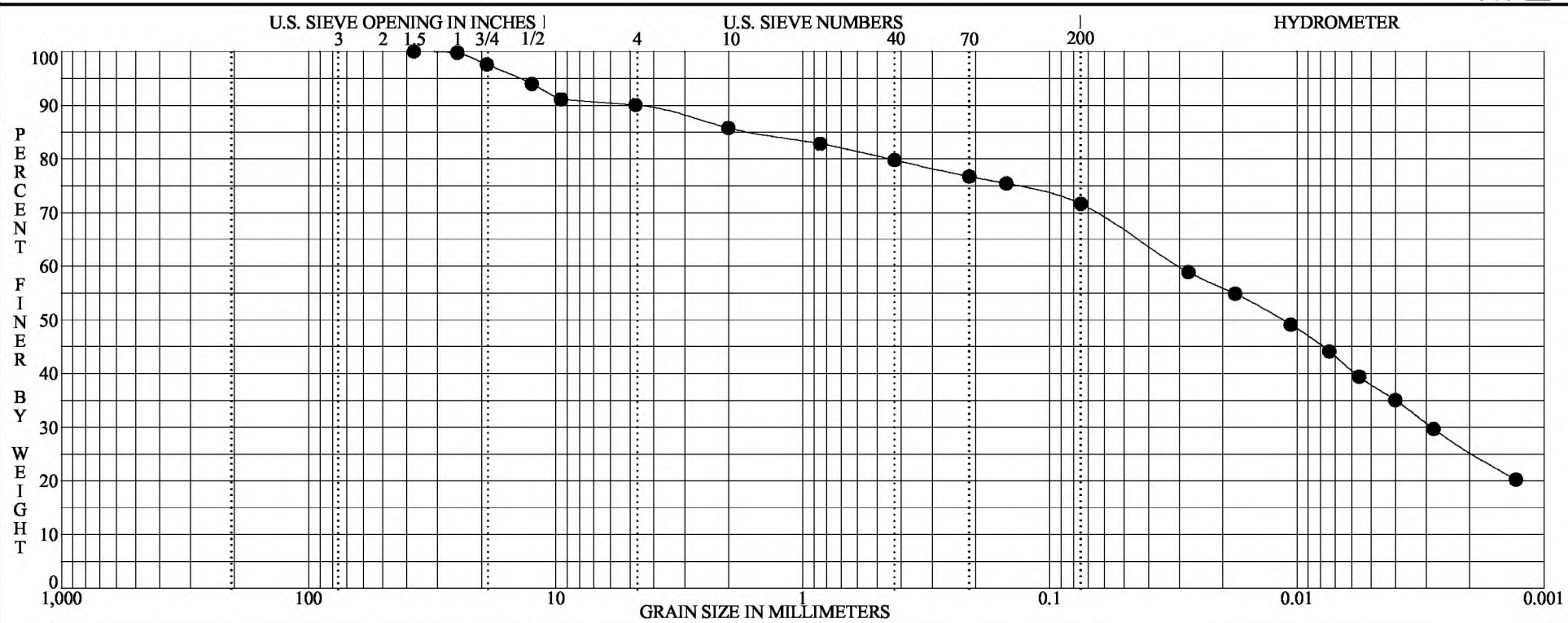
	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-3	25.0000	11.1370	0.0249	0.0096		6.7	18.9	47.8	26.6

ASTM D422 | **GRADATION CURVE**

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 3



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-4	LEAN CLAY with SAND CL		36	21	15	11.5	117.7

	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-4	37.5000	14.0429	0.0300	0.0115		10.0	18.4	46.1	25.5

ASTM D422

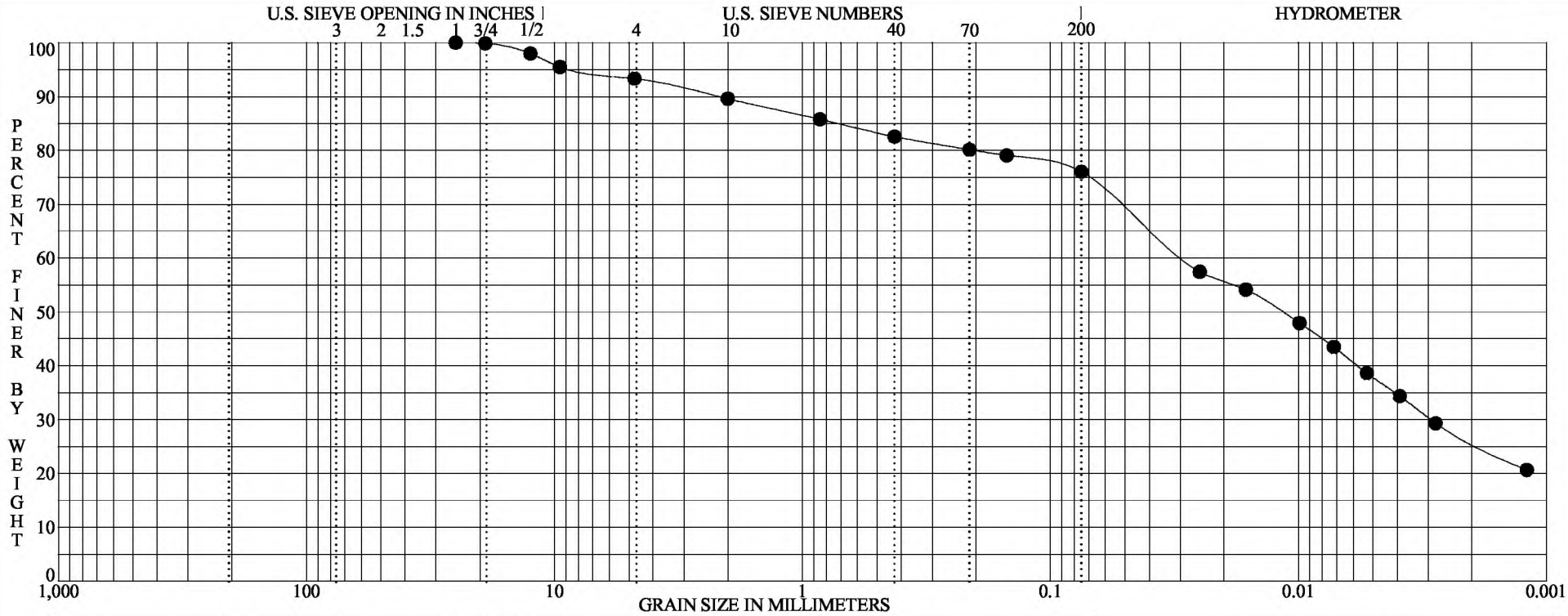
GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 4

GRN-EPA



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-5	LEAN CLAY with SAND CL		36	19	17	13.1	113.1

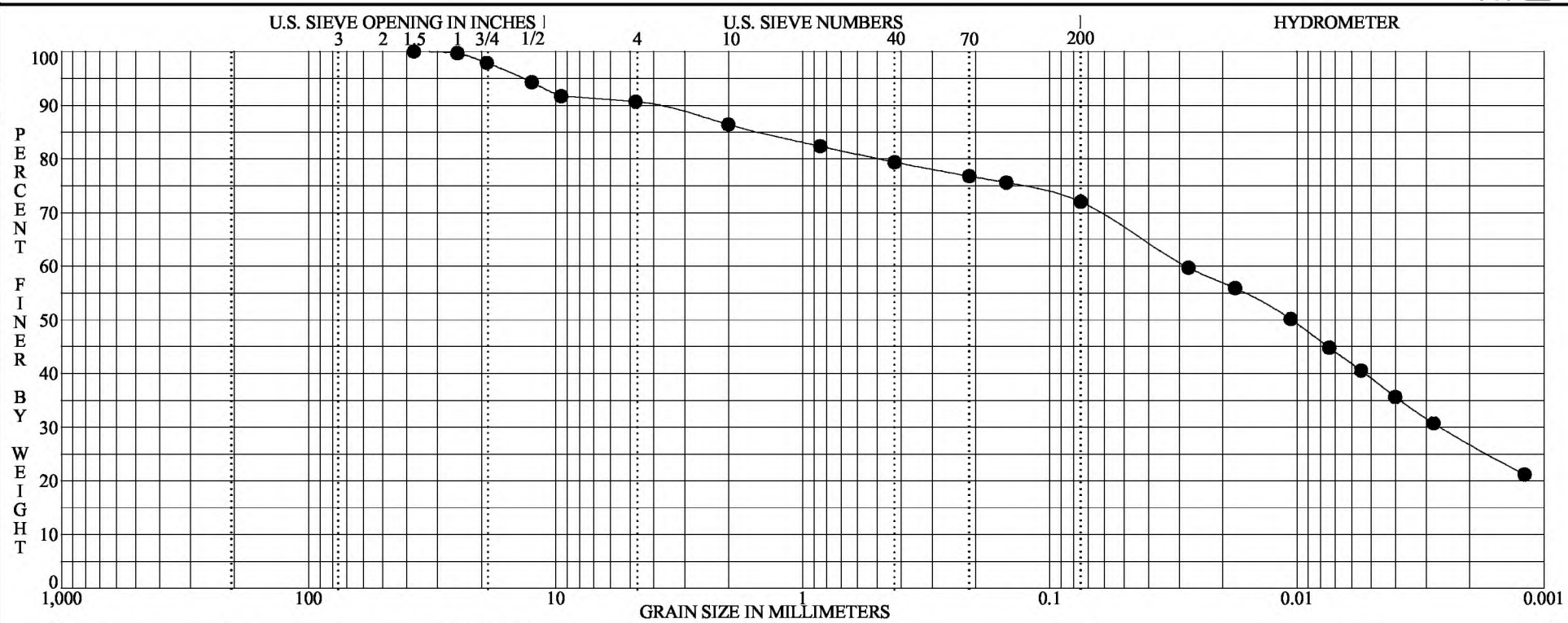
	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-5	25.0000	8.0839	0.0291	0.0117		6.6	17.3	50.2	25.9

ASTM D422

GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

PLATE 5



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-6	LEAN CLAY with SAND CL		36	19	17	12.0	112.8

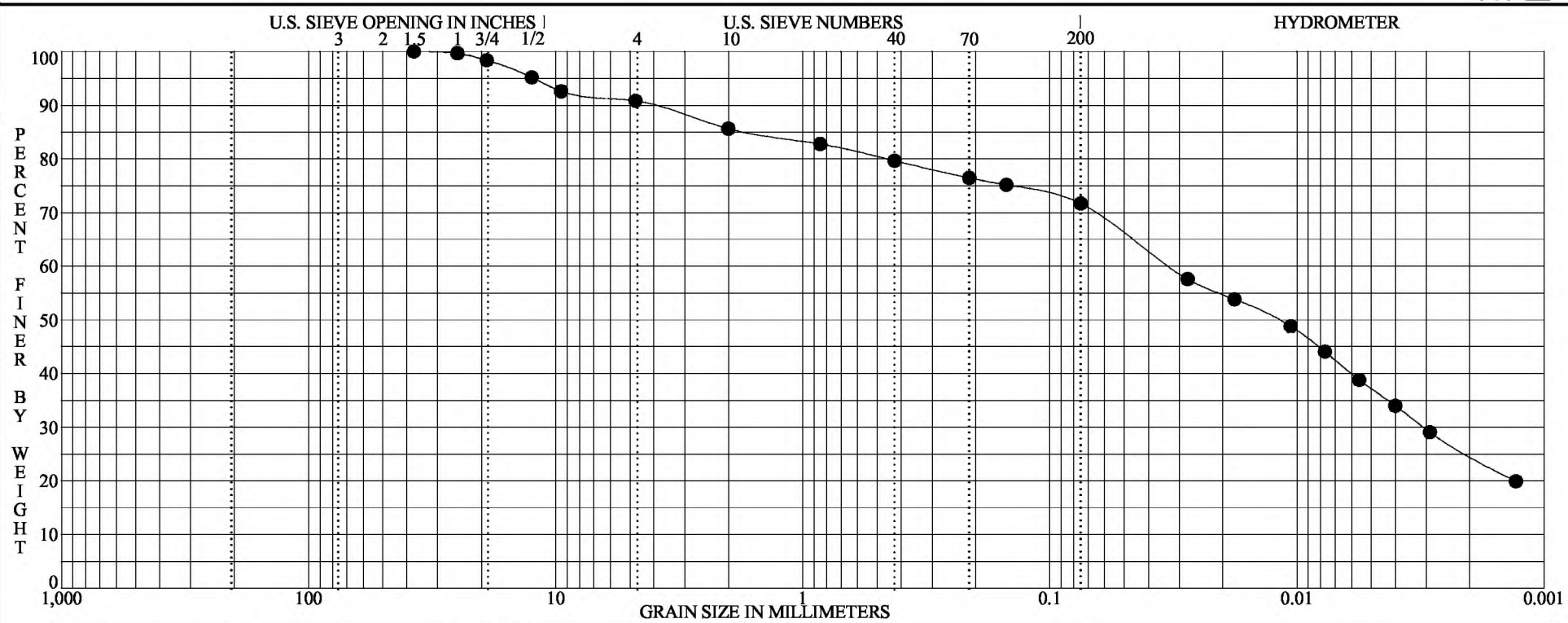
	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-6	37.5000	13.5603	0.0281	0.0105		9.3	18.7	45.1	26.9

ASTM D422 | **GRADATION CURVE**

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 6



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-7	LEAN CLAY with SAND CL		35	18	17	11.4	118.8

	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-7	37.5000	12.2377	0.0328	0.0120		9.2	19.1	46.8	24.8

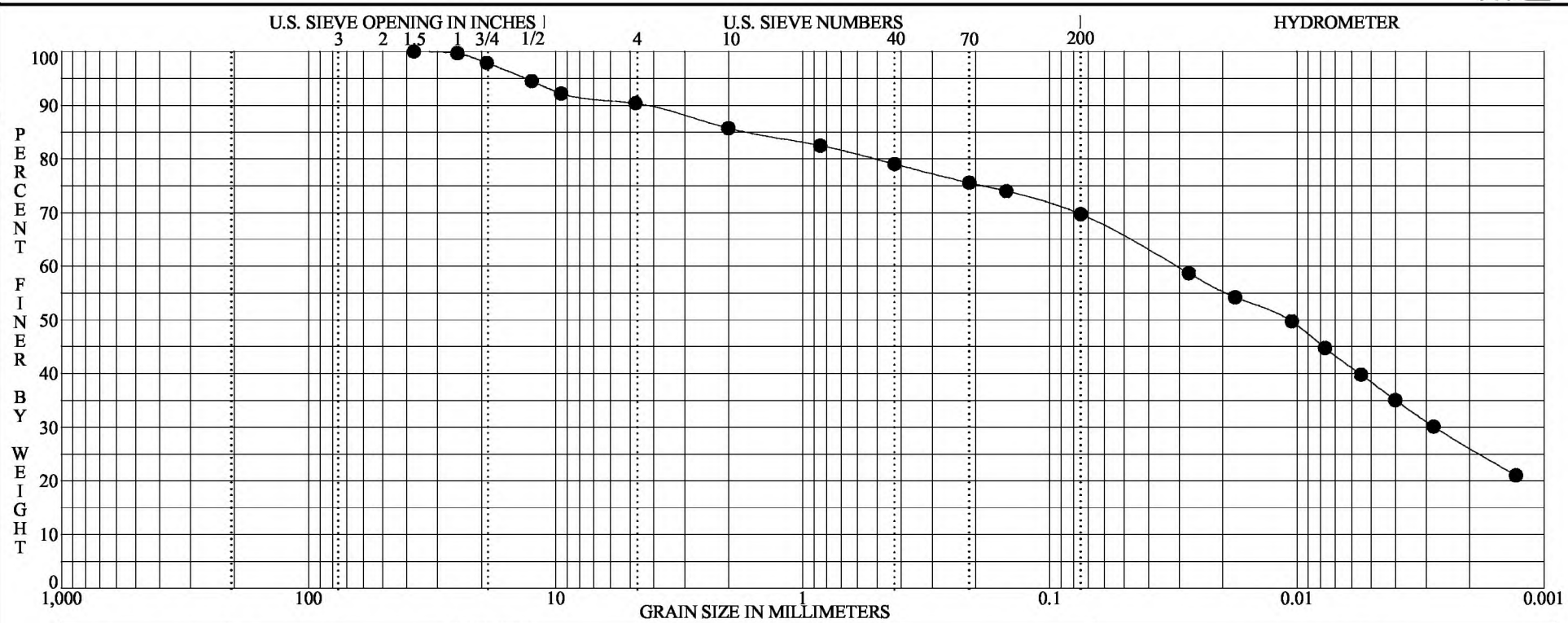
ASTM D422

GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 7



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-8	SANDY LEAN CLAY CL		35	21	14	11.5	118.9

	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-8	37.5000	13.2943	0.0309	0.0108		9.6	20.7	43.6	26.1

ASTM D422

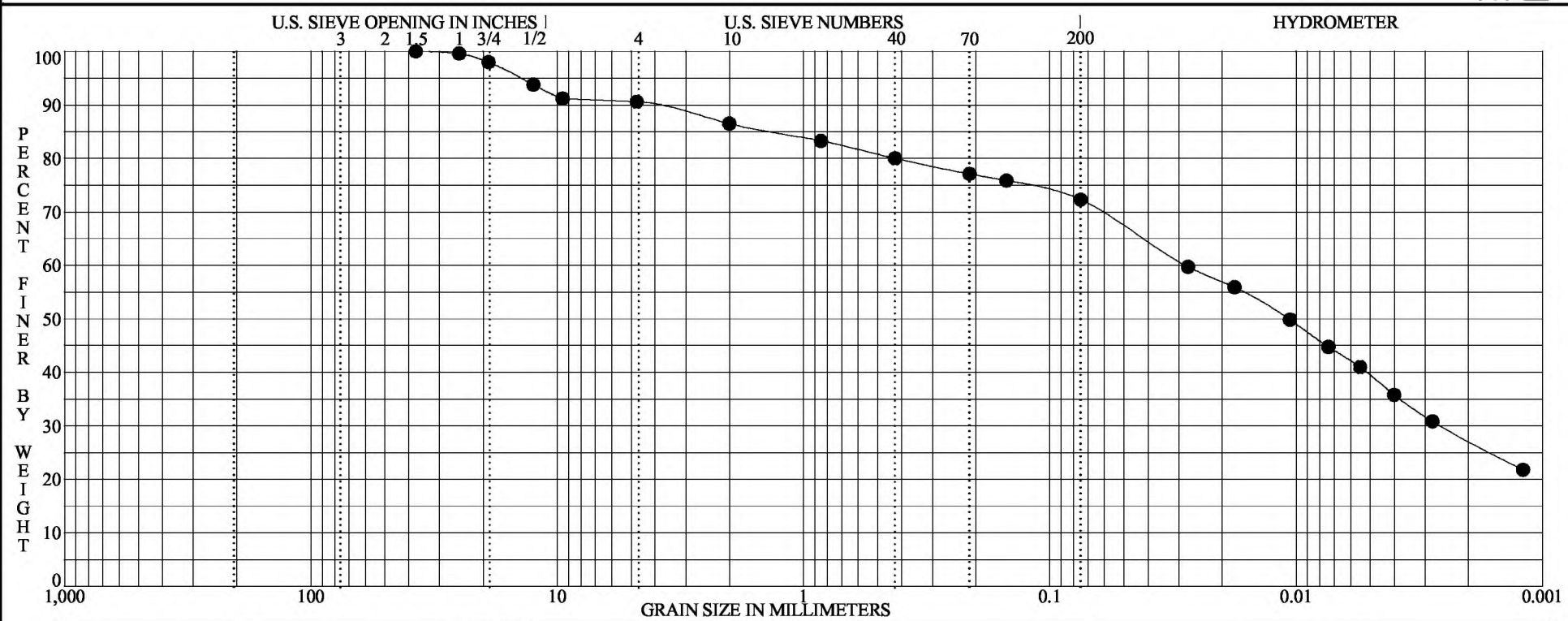
GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 8

GRN-EPA



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

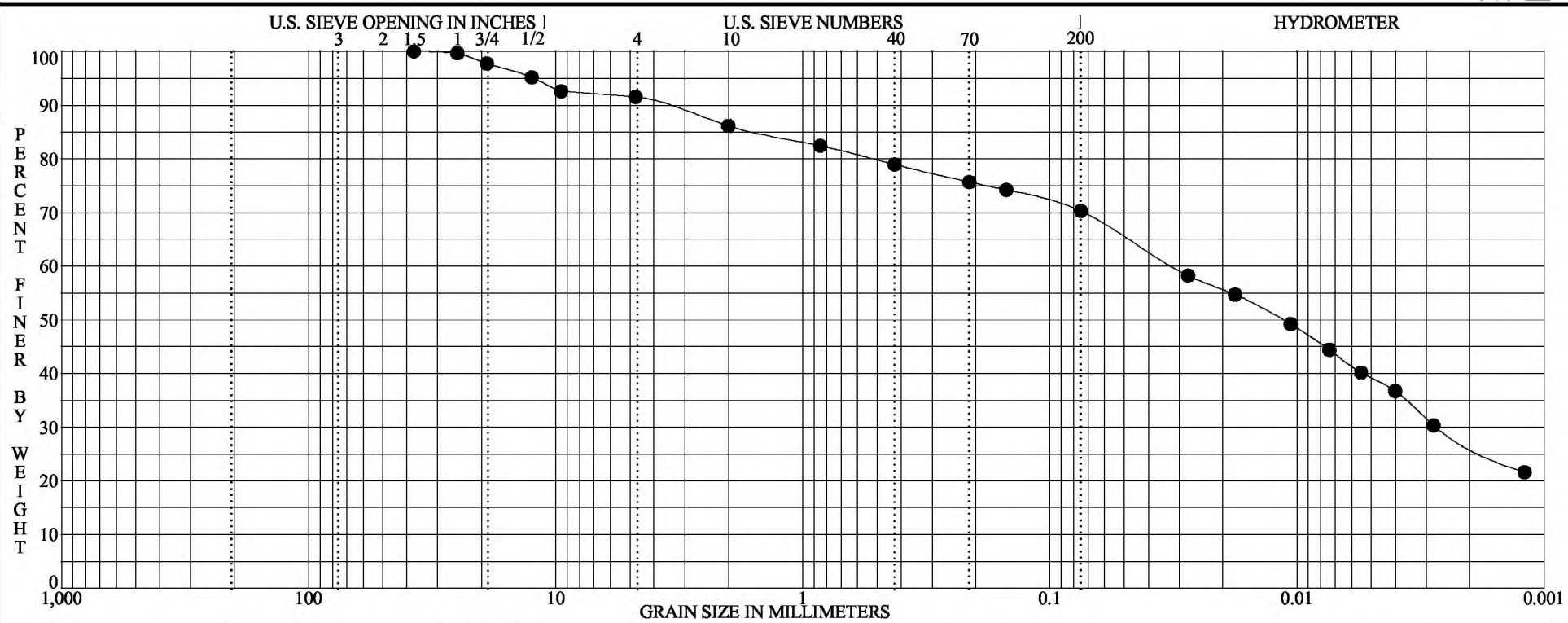
	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-9	LEAN CLAY with SAND CL		36	18	18	12.5	117.3

	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-9	37.5000	14.0885	0.0281	0.0107		9.4	18.3	45.1	27.3

PLATE 9

ASTM D422 | **GRADATION CURVE**

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-10	LEAN CLAY with SAND CL		36	18	18	11.4	117.0

	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-10	37.5000	12.2387	0.0319	0.0114		8.4	21.2	43.5	26.9

ASTM D422

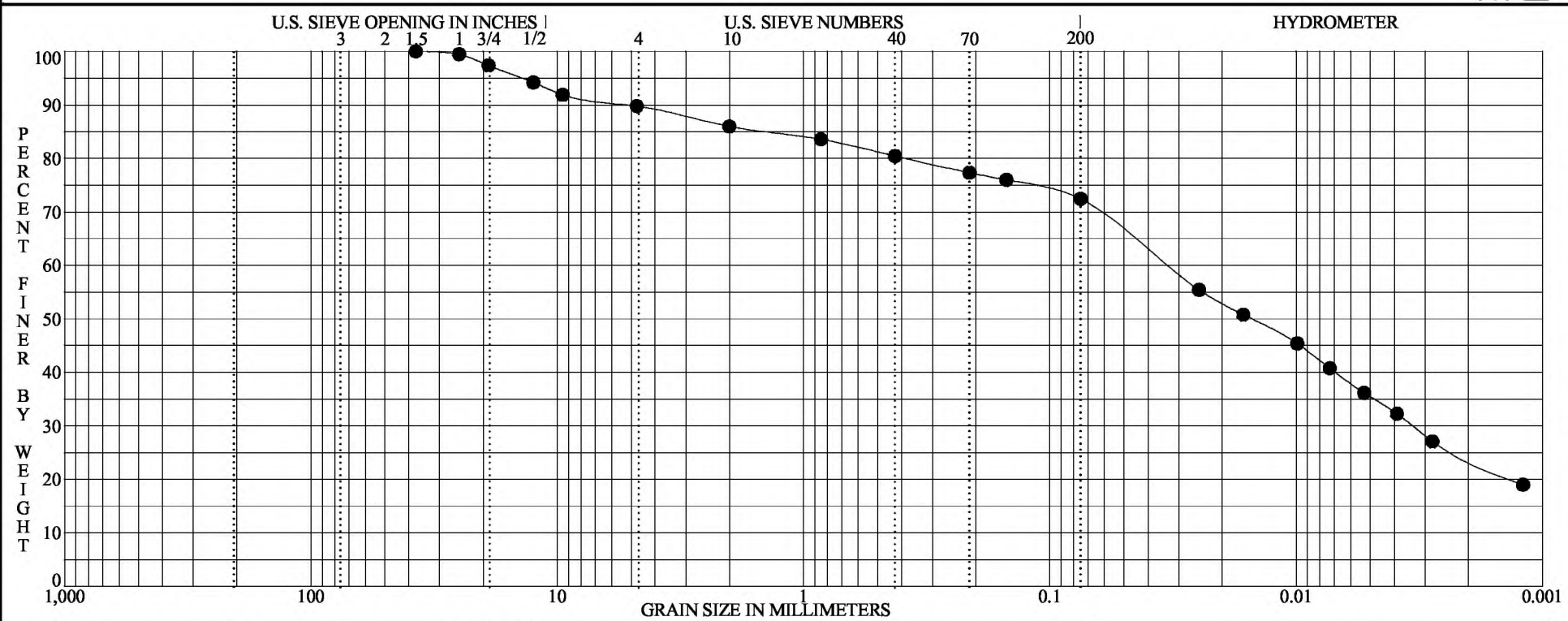
GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

GRN-EPA

PLATE 10

GRN-EPA



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	MC%	LL	PL	PI	opt mc%	max pcf
●	21-11	LEAN CLAY with SAND CL		34	18	16	11.4	120.3

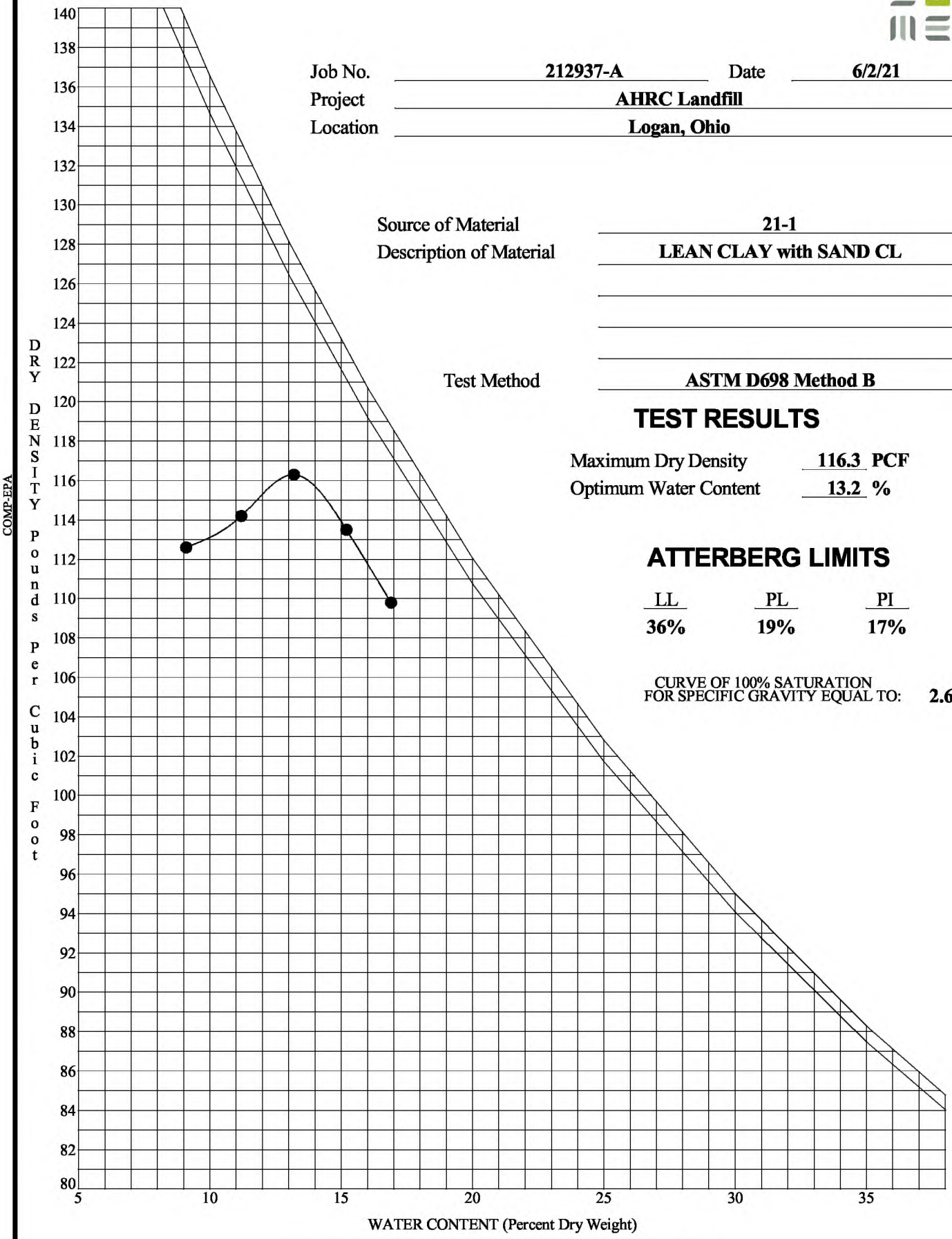
	Specimen Identification	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	21-11	37.5000	13.8796	0.0334	0.0152		10.2	17.3	48.6	23.9

ASTM D422

GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-A
DATE: 6/2/21

PLATE 11



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-1

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 116.3 PCF

Optimum Water Content 13.2 %

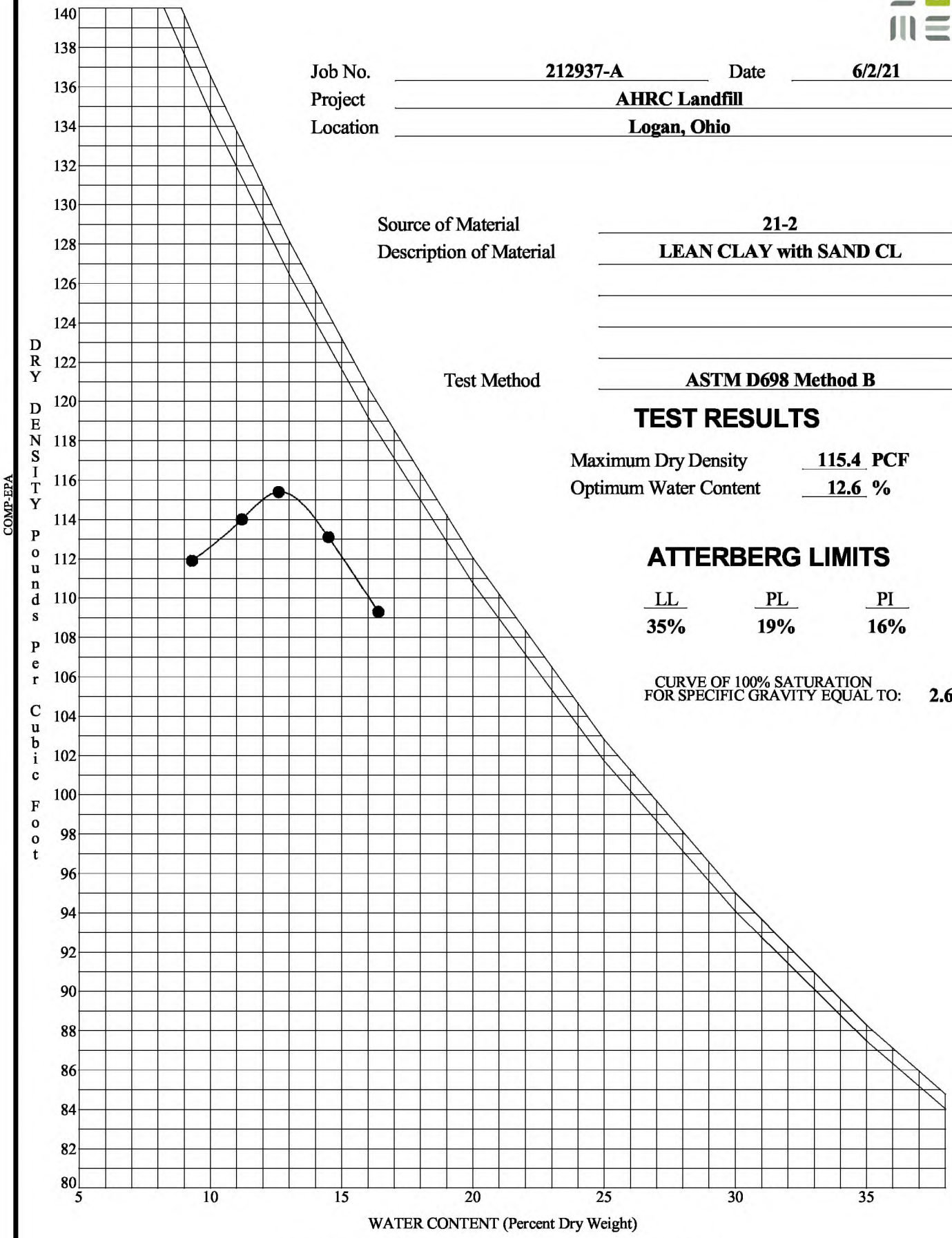
ATTERBERG LIMITS

LL	PL	PI
36%	19%	17%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 1



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-2

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 115.4 PCF

Optimum Water Content 12.6 %

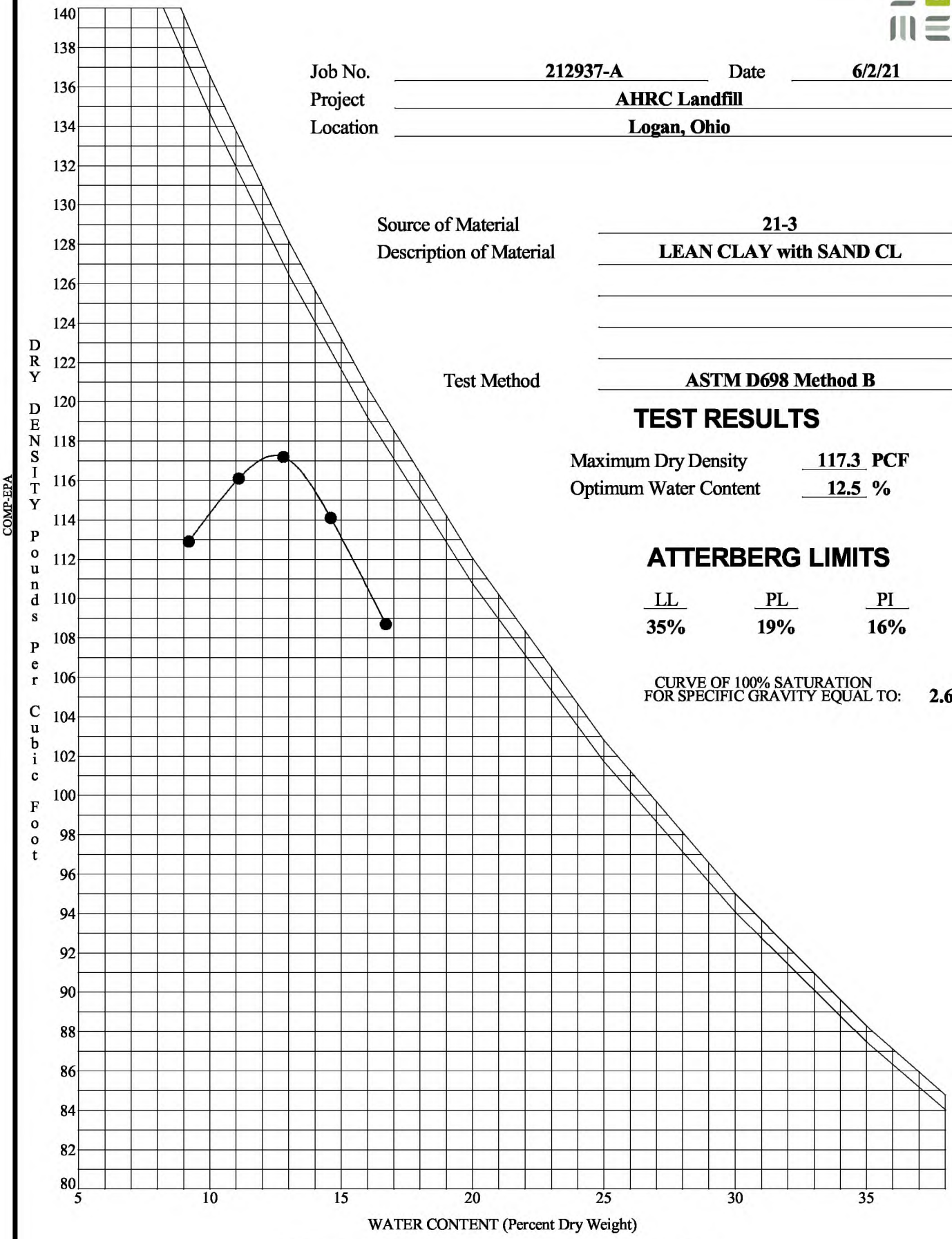
ATTERBERG LIMITS

LL	PL	PI
35%	19%	16%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 2



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-3

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 117.3 PCF

Optimum Water Content 12.5 %

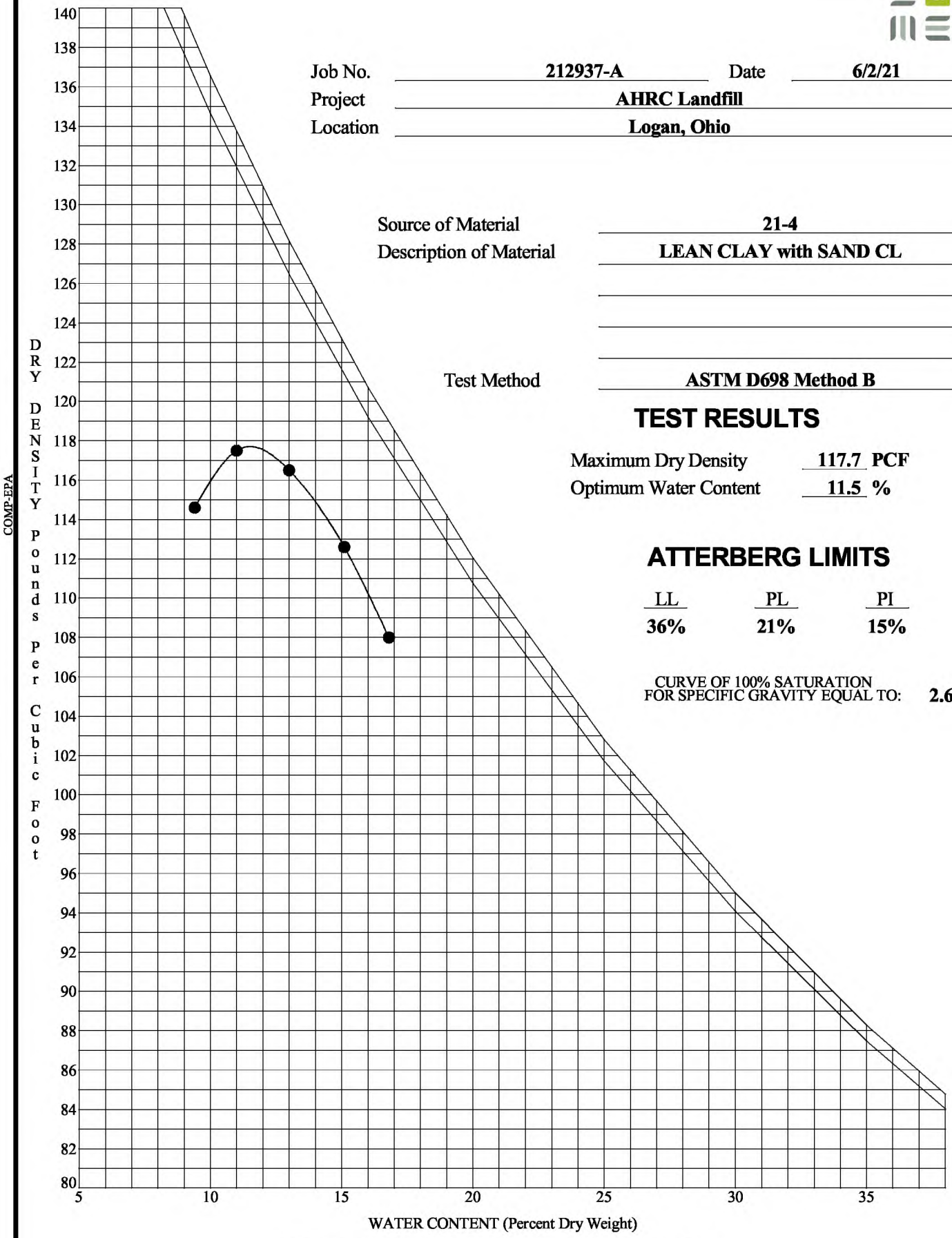
ATTERBERG LIMITS

LL	PL	PI
35%	19%	16%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 3



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-4

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 117.7 PCF

Optimum Water Content 11.5 %

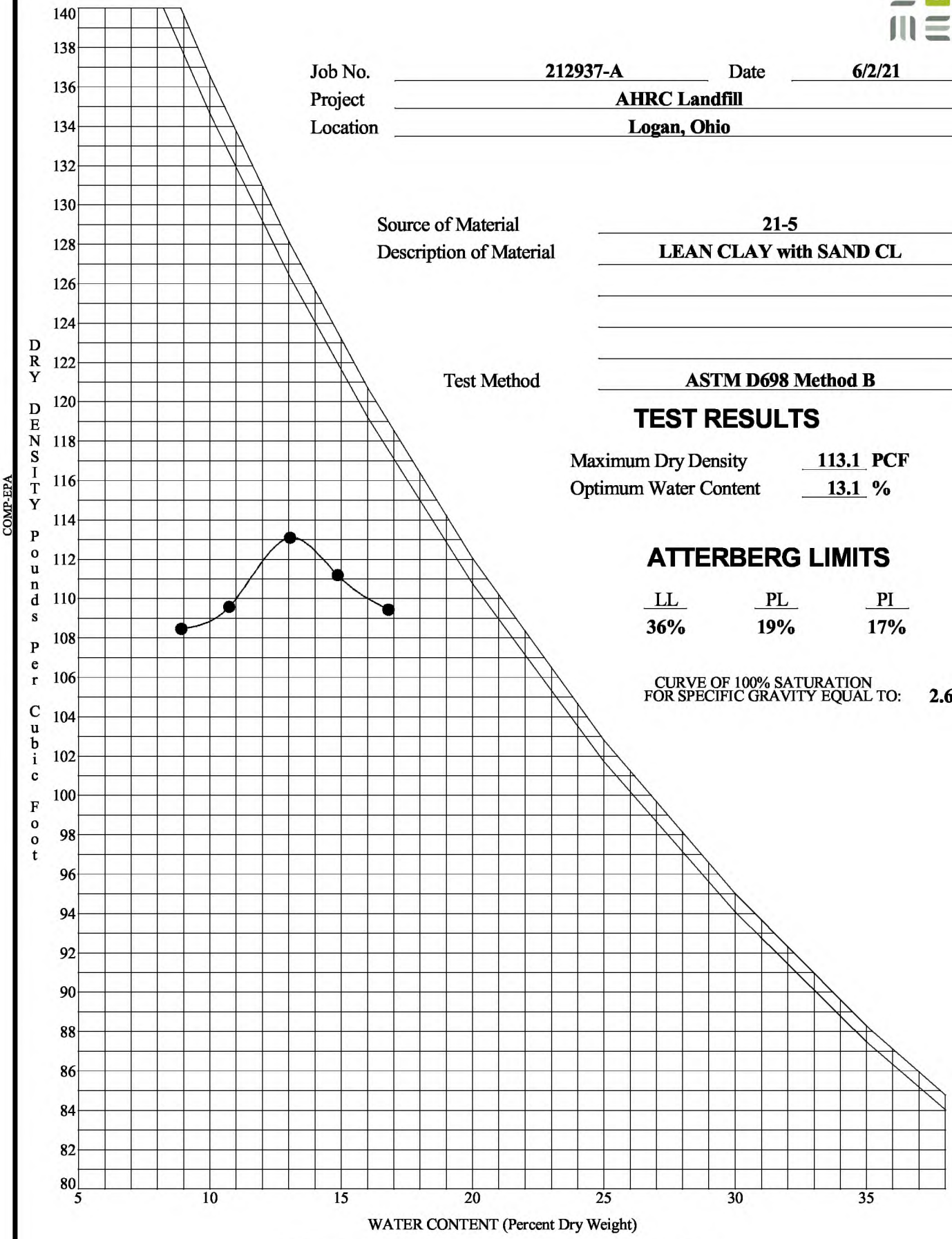
ATTERBERG LIMITS

LL	PL	PI
36%	21%	15%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 4



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-5

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 113.1 PCF

Optimum Water Content 13.1 %

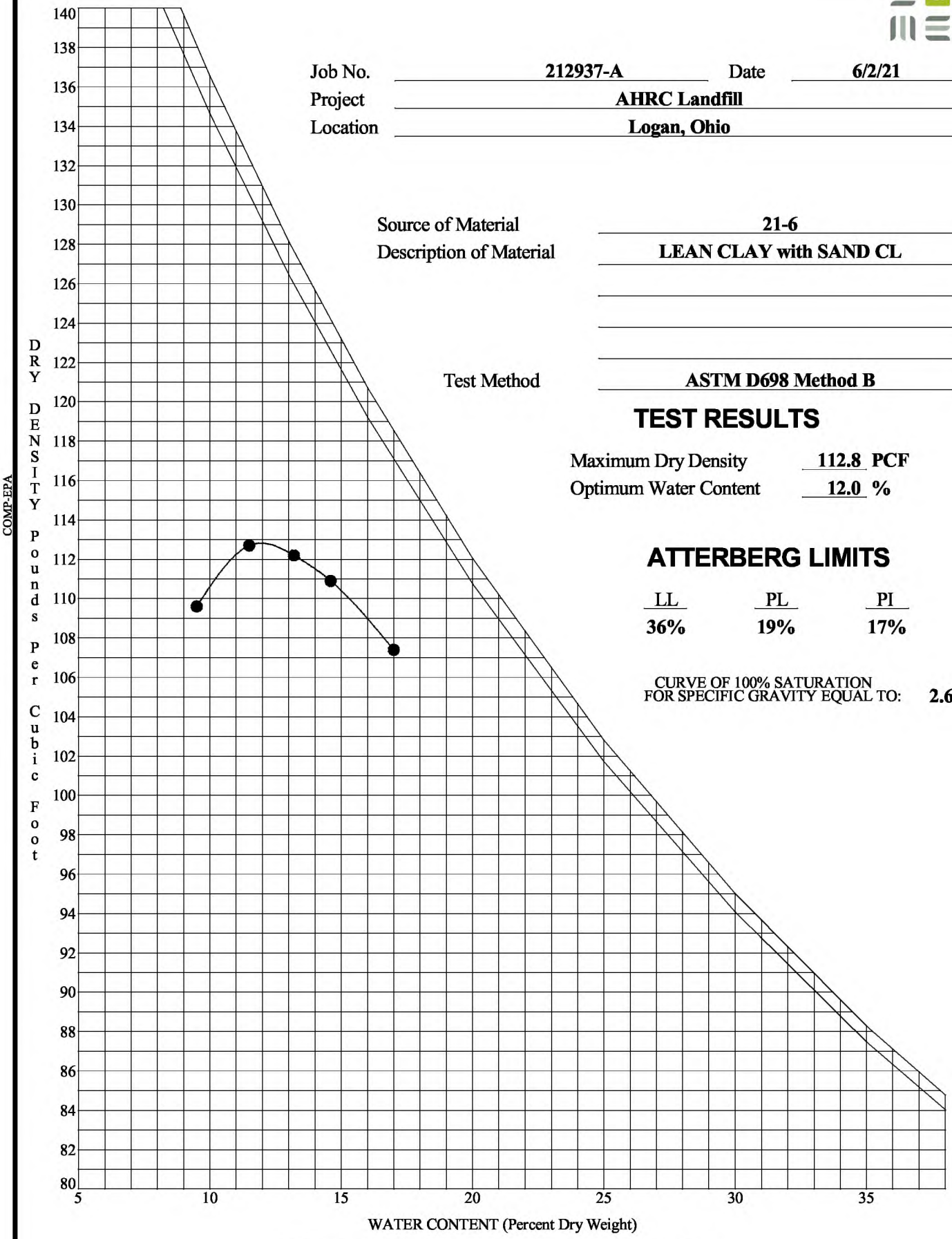
ATTERBERG LIMITS

LL	PL	PI
36%	19%	17%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 5



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-6

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 112.8 PCF

Optimum Water Content 12.0 %

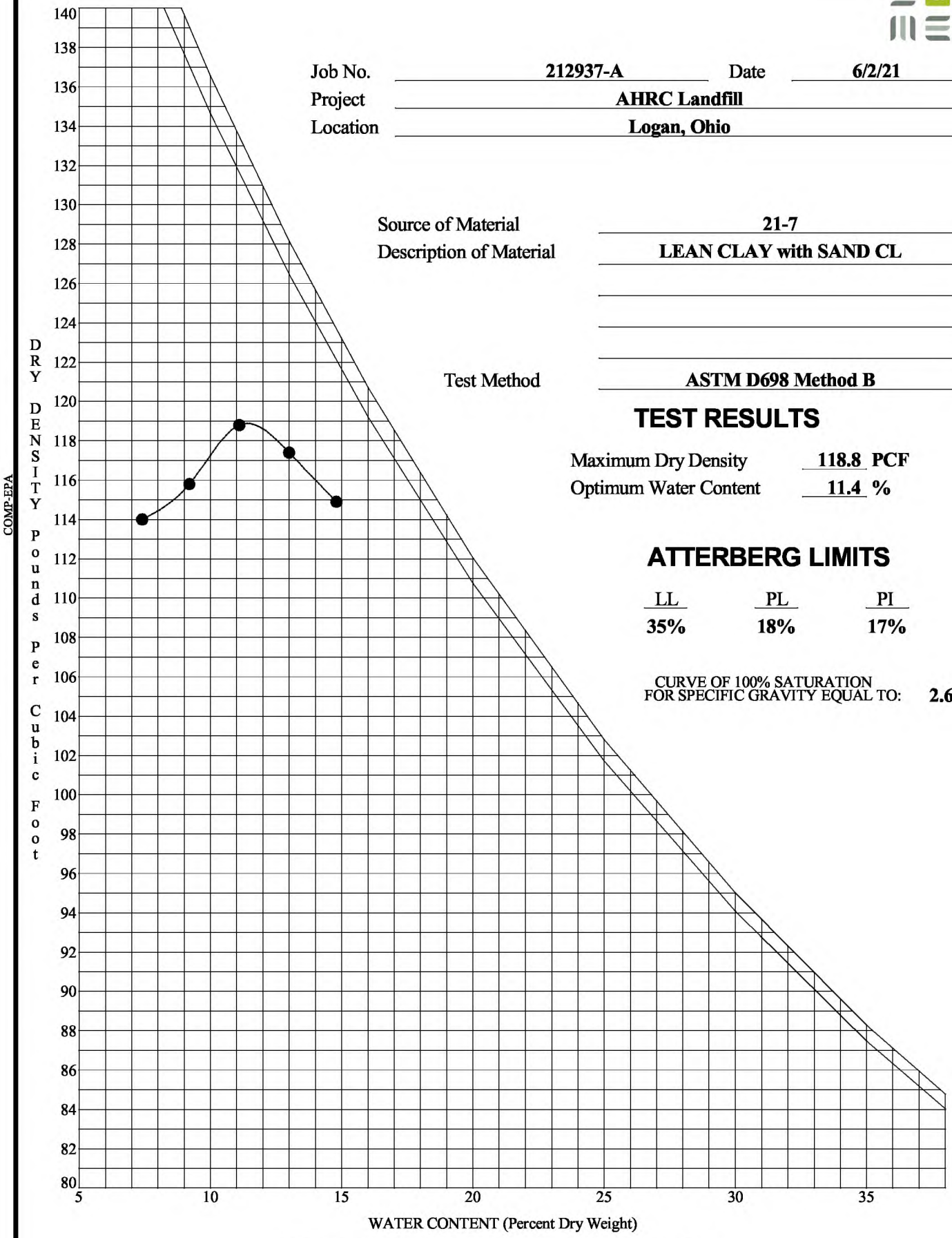
ATTERBERG LIMITS

LL	PL	PI
36%	19%	17%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 6



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-7

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 118.8 PCF

Optimum Water Content 11.4 %

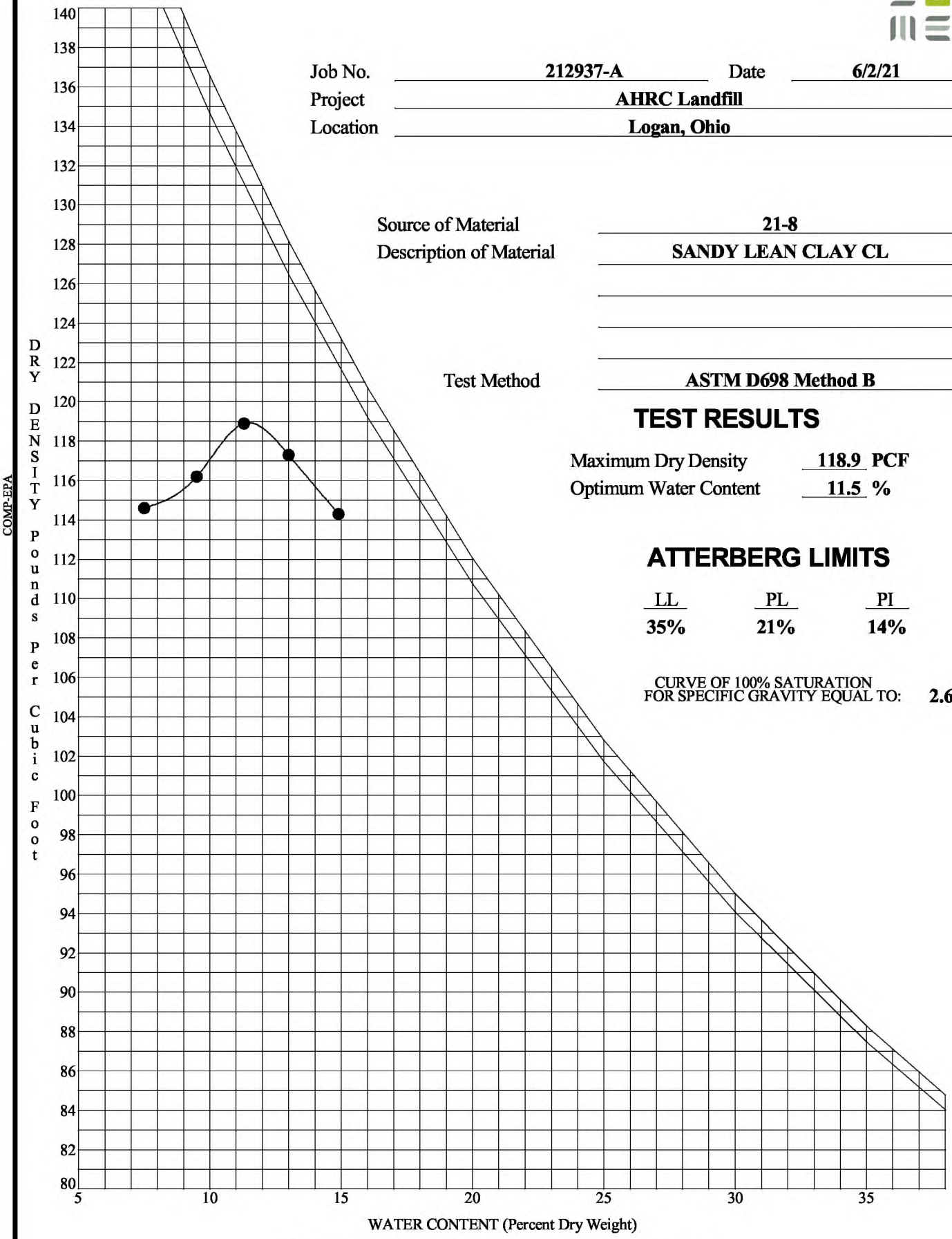
ATTERBERG LIMITS

LL	PL	PI
35%	18%	17%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 7



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-8

Description of Material SANDY LEAN CLAY CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 118.9 PCF

Optimum Water Content 11.5 %

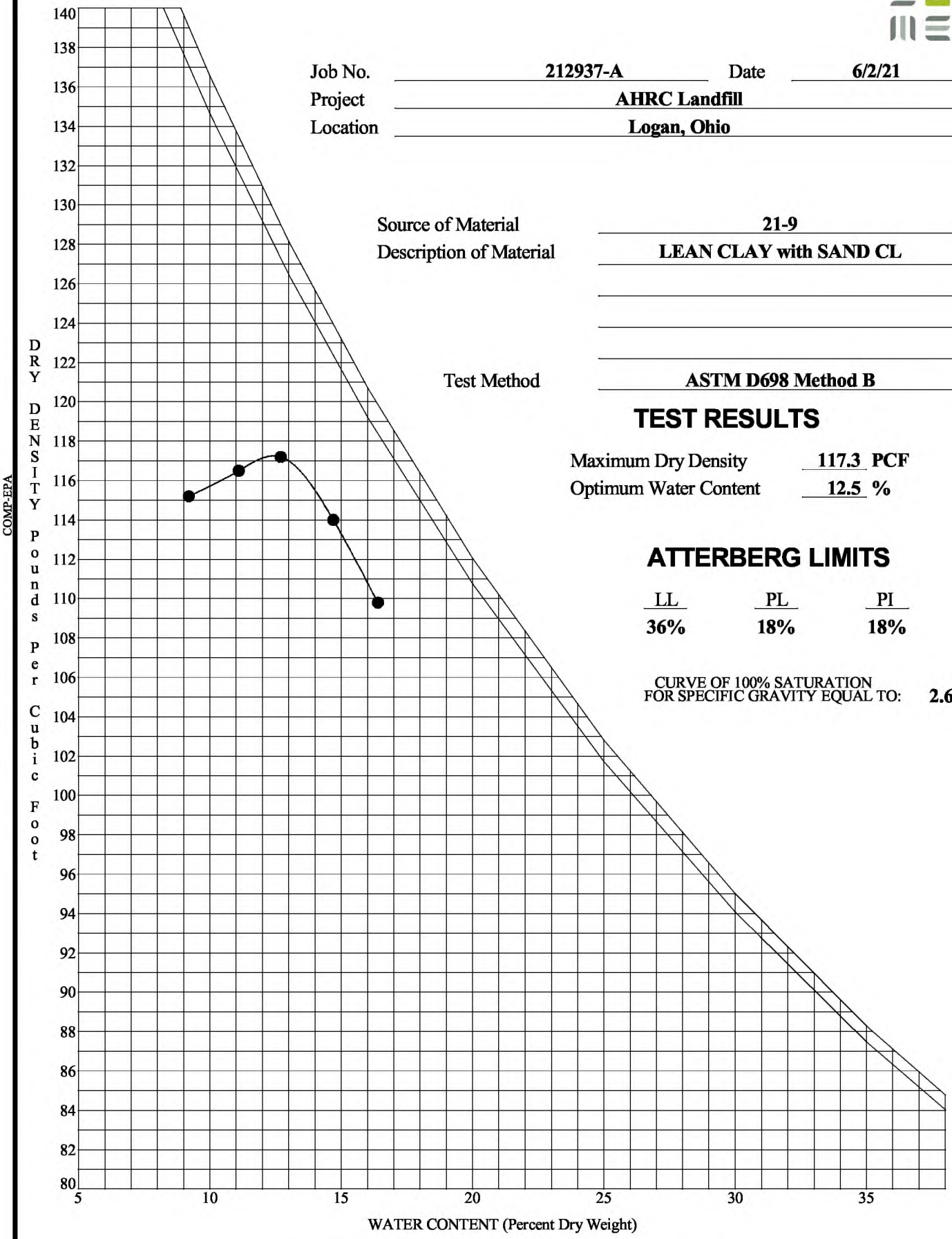
ATTERBERG LIMITS

LL	PL	PI
35%	21%	14%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 8



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-9

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 117.3 PCF

Optimum Water Content 12.5 %

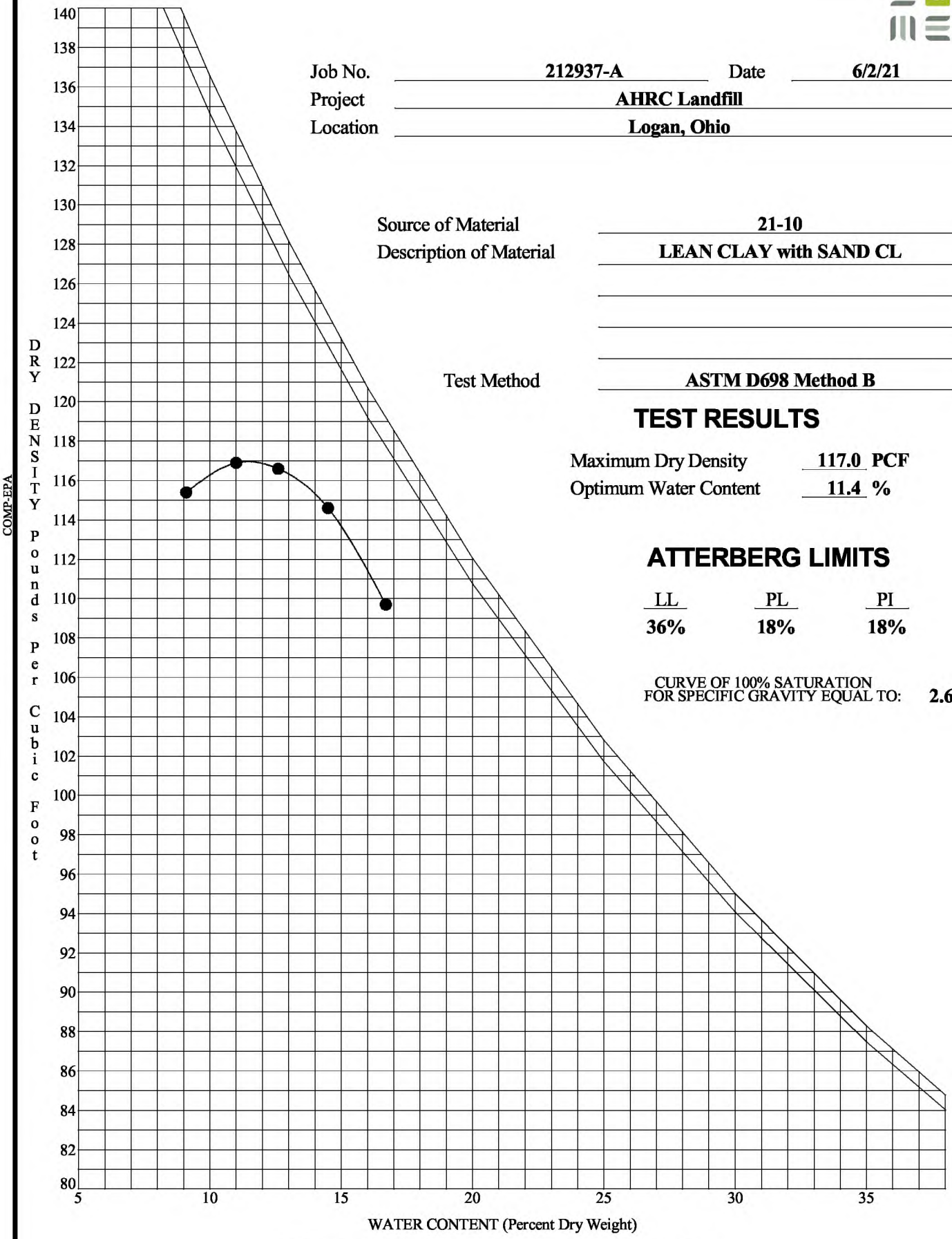
ATTERBERG LIMITS

LL	PL	PI
36%	18%	18%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 9



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-10

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 117.0 PCF

Optimum Water Content 11.4 %

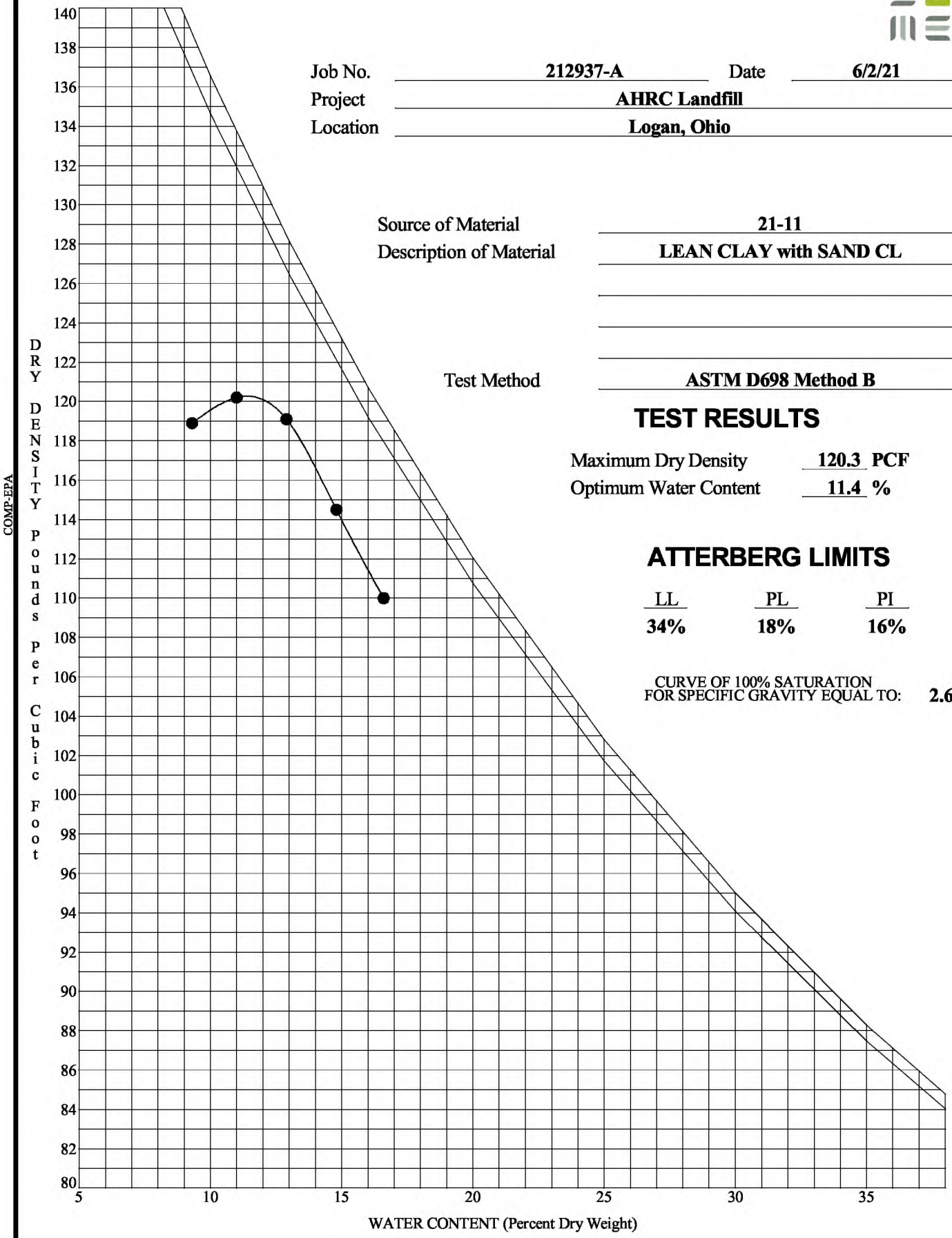
ATTERBERG LIMITS

LL	PL	PI
36%	18%	18%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 10



COMP-EPA

Job No. 212937-A Date 6/2/21

Project AHRC Landfill

Location Logan, Ohio

Source of Material 21-11

Description of Material LEAN CLAY with SAND CL

Test Method ASTM D698 Method B

TEST RESULTS

Maximum Dry Density 120.3 PCF

Optimum Water Content 11.4 %

ATTERBERG LIMITS

LL	PL	PI
34%	18%	16%

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO: 2.68

MOISTURE-DENSITY RELATIONSHIP

PLATE 11

LETTER OF TRANSMITTAL

S&ME, Inc.
6190 Enterprise Ct.
Dublin, Ohio 43016
(614) 793-2226 – Phone
(614) 793-2410 – Fax
www.smeinc.com

Date: June 22, 2021
S&ME Project No: 212937 – A
Project Name: AHRC Landfill, 2021
Reference: Laboratory Test Results

To: Kilbarger Construction Co.
450 Gallagher – P.O. Box 946
Logan, Ohio 44830
Attention: Mr. Mark Ruof

With this e-mail, we are sending you the following:

Document	Number of Pages
Laboratory Test Results for Samples • 2 Hydraulic Conductivity (ASTM D5084) • 1 Summary	4 including cover

These documents are transmitted as checked below:

[ ] For Approval [ ] For Your Use [X] As Requested [ ] For review & comment [ ] _____

Signed: Paula J Manning
Paula J. Manning,
Group Leader/
Project Manager

Distribution: 1 Copy – AHRC Landfill
Mr. Mark Ruof

IF ENCLOSURES ARE NOT AS NOTED, PLEASE NOTIFY US AT ONCE.

SUMMARY OF LABORATORY TEST RESULTS

SPECIMEN ID	PT.ID	MC	LL	PL	PI	% passing #200	% passing .002 mm	opt.	pcf	PERMEABILITY	ASTM Classification
21-1	0.00		36	19	17	71.9	24.6	13.2	116.3	3.4E-08 cm/sec	LEAN CLAY with SAND CL
21-1	1.00							14.0	114.7		
21-2	0.00		35	19	16	72.0	26.0	12.6	115.4		LEAN CLAY with SAND CL
21-2	1.00							13.7	113.7		
21-3	0.00		35	19	16	74.4	26.6	12.5	117.3		LEAN CLAY with SAND CL
21-3	1.00							13.3	115.8		
21-4	0.00		36	21	15	71.6	25.5	11.5	117.7		LEAN CLAY with SAND CL
21-4	1.00							11.5	115.6		
21-5	1.00		36	19	17	76.1	25.9	13.1	113.1		LEAN CLAY with SAND CL
21-6	0.00		36	19	17	72.0	26.9	12.0	112.8		LEAN CLAY with SAND CL
21-6	1.00							13.0	110.8		
21-7	0.00		35	18	17	71.7	24.8	11.4	118.8	4.5E-08 cm/sec	LEAN CLAY with SAND CL
21-7	1.00							12.2	117.1		
21-8	0.00		35	21	14	69.7	26.1	11.5	118.9		SANDY LEAN CLAY CL
21-8	1.00							12.3	117.2		
21-9	0.00		36	18	18	72.3	27.3	12.5	117.3		LEAN CLAY with SAND CL
21-9	1.00							13.8	115.2		
21-10	0.00		36	18	18	70.3	26.9	11.4	117.0		LEAN CLAY with SAND CL
21-10	1.00							12.6	115.1		
21-11	0.00		34	18	16	72.4	23.9	11.4	120.3		LEAN CLAY with SAND CL
21-11	1.00							12.3	118.5		
					PT. ID. 0 is for corrected samples and PT. ID. 1 is for uncorrected samples.						

BULK SAMPLES

PROJECT AHRC Landfill
LOCATION Logan, Ohio
JOB NO. 212937-A
DATE 6/22/21

SUM.EPA

PLATE 1

Form No. WS-D5084-1
Revision No. : 0
Revision Date: 03/11/15

ASTM D5084 Flex Wall Perm Method C

Test Data

S&ME, Inc. Columbus Branch, 6190 Enterprise Ct., Dublin, Ohio 43016

Project No:	212937-A	Report Date:	6/22/2021
Project Name:	AHRC Landfill	Test Date:	6/17-18/2021
Client Name:	Kilbarger Construction Co.	Sample Date:	5/7/2021
Client Address:	Logan, Ohio	Log No:	17-052-21
Sample ID:	21-1	Sample Type:	Intact
Description:	LEAN CLAY with SAND (CL)		

Sample Info:	Assumed SG:	2.70	Percentage Passing 200:	71.9	Maximum Particle Size:	**1.0"**
	Liquid Limit:	36	Plastic Limit:	19	Plastic Index:	17

				Final Specimen Conditions			
Length (cm):	**10.15**	Wet Density (PCF):	**129.3**	Length (cm):	**10.15**	Wet Density (PCF):	**132.5**
Diameter (cm):	**7.27**	Dry Density (PCF):	**111.3**	Diameter (cm):	**7.27**	Dry Density (PCF):	**111.2**
Area (cm^2)	**41.49**	Percent Saturation:	**84.9%**	Area (cm^2)	**41.50**	Percent Saturation:	**100.0%**
Volume (cm^3)	**421.06**			Volume (cm^3)	**421.41**	B-Parameter:	**0.99**
Wet weight (grams)	**872.1**	Void Ratio:	**0.5147**	Wet weight (grams)	**894.3**	Void Ratio:	**0.5159**
Dry Weight (grams)	**750.6**	Porosity:	**0.3398**	Dry Weight (grams)	**750.6**	Porosity:	**0.3403**
Percent Moisture:	**16.2%**			Percent Moisture:	**19.1%**		
Test Parameters:	Effective Consolidation Stress (psi):		**4.0**	Permeant Liquid Used:		Deaired Water	
Burette Area (cm^2):	**0.874**	Cell Pressure (psi):	**62.0**	Influent Pressure (psi):	**60.0**	Effluent Pressure (psi):	**58.0**

Time (24-hr)			**Temperature (°C)**				**Measurements**						**Initial Gradient**	**Final Gradient**	**K-Value (cm/sec)**	
Start	**End**	**Time (sec)**	**Initial**	**Final**	**Avg.**	**Factor**	$h_{out}1$	$h_{in}1$	$h_{out}2$	$h_{in}2$	**h1**	**h2**			**Uncorrected K-Value**	**Corrected K-Value**
10:43:00	12:45:49	7369	22.0	21.0	21.5	0.9647	47.25	1.65	47.05	1.90	192.6	192.1	18.97	18.92	3.87E-08	3.73E-08
12:45:49	15:24:00	9491	21.0	22.0	21.5	0.9647	47.05	1.90	46.80	2.20	192.1	191.4	18.92	18.86	3.68E-08	3.55E-08
15:24:00	16:29:00	3900	22.0	22.0	22.0	0.9533	46.80	2.20	46.70	2.30	191.4	191.2	18.86	18.83	3.27E-08	3.11E-08
16:29:00	17:32:00	3780	22.0	22.0	22.0	0.9533	46.70	2.30	46.60	2.40	191.2	191.0	18.83	18.81	3.37E-08	3.22E-08
17:32:00	18:34:14	3734	22.0	22.0	22.0	0.9533	46.60	2.40	46.50	2.50	191.0	190.8	18.81	18.79	3.42E-08	3.26E-08
Notes:												***Averages:***	***18.88***	***18.84***	***3.52E-08***	***3.4E-08***

Technician: Paula J. Manning
Technical Responsibility: Erica Goodyear

Erica Goodyear
signature

Position: T3

Form No. WS-D5084-1
Revision No. : 0
Revision Date: 03/11/15

ASTM D5084 Flex Wall Perm Method C

Test Data

S&ME, Inc. Columbus Branch, 6190 Enterprise Ct., Dublin, Ohio 43016

Project No:	212937-A	Report Date:	6/22/2021
Project Name:	AHRC Landfill	Test Date:	6/17-18/2021
Client Name:	Kilbarger Construction Co.	Sample Date:	5/7/2021
Client Address:	Logan, Ohio	Log No:	17-052-21
Sample ID:	21-7	Sample Type:	Intact
Description:	LEAN CLAY with SAND (CL)		

Sample Info:	Assumed SG:	2.70	Percentage Passing 200:	71.7	Maximum Particle Size:	**1.5"**
	Liquid Limit:	35	Plastic Limit:	18	Plastic Index:	17

				Final Specimen Conditions			
Length (cm):	**10.17**	Wet Density (PCF):	**129.8**	Length (cm):	**10.27**	Wet Density (PCF):	**132.5**
Diameter (cm):	**7.27**	Dry Density (PCF):	**113.4**	Diameter (cm):	**7.27**	Dry Density (PCF):	**112.2**
Area (cm^2)	**41.51**	Percent Saturation:	**80.4%**	Area (cm^2)	**41.51**	Percent Saturation:	**97.4%**
Volume (cm^3)	**422.07**			Volume (cm^3)	**426.50**	B-Parameter:	**0.95**
Wet weight (grams)	**877.9**	Void Ratio:	**0.4859**	Wet weight (grams)	**905.6**	Void Ratio:	**0.5015**
Dry Weight (grams)	**766.9**	Porosity:	**0.3270**	Dry Weight (grams)	**766.9**	Porosity:	**0.3340**
Percent Moisture:	**14.5%**			Percent Moisture:	**18.1%**		
Test Parameters:	Effective Consolidation Stress (psi):		**4.0**	Permeant Liquid Used:		Deaired Water	
Burette Area (cm^2):	**0.874**	Cell Pressure (psi):	**62.0**	Influent Pressure (psi):	**60.0**	Effluent Pressure (psi):	**58.0**

Time (24-hr)			**Temperature (°C)**				**Measurements**						**Initial Gradient**	**Final Gradient**	**K-Value (cm/sec)**	
Start	**End**	**Time (sec)**	**Initial**	**Final**	**Avg.**	**Factor**	$h_{out}1$	$h_{in}1$	$h_{out}2$	$h_{in}2$	**h1**	**h2**			**Uncorrected K-Value**	**Corrected K-Value**
15:23:30	17:33:00	7770	22.0	22.0	22.0	0.9533	48.65	3.00	48.35	3.25	192.6	192.0	18.75	18.69	4.54E-08	4.33E-08
17:33:00	18:34:30	3690	22.0	22.0	22.0	0.9533	48.35	3.25	48.20	3.40	192.0	191.7	18.69	18.66	5.22E-08	4.98E-08
18:34:30	9:41:34	227224	22.0	22.5	22.3	0.9477	48.20	3.40	40.00	12.00	191.7	172.5	18.66	16.79	5.01E-08	4.75E-08
9:41:34	16:08:15	23201	22.5	22.0	22.3	0.9477	40.00	12.00	39.20	12.70	172.5	170.8	16.79	16.63	4.64E-08	4.40E-08
16:08:15	17:02:16	3241	22.0	22.0	22.0	0.9533	39.20	12.70	39.10	12.80	170.8	170.6	16.63	16.60	4.46E-08	4.25E-08
Notes:												***Averages:***	***17.90***	***17.47***	***4.77E-08***	***4.5E-08***

Technician: Paula J. Manning
Technical Responsibility: Erica Goodyear

Erica Goodyear
signature

Position: T3

APPENDIX A
SECTION 3
GRANULAR DRAINAGE MATERIAL

PERMEABILITY TEST (ASTM D-2434) DATA AND COMPUTATION SHEET

Project: AHRC Landfill Job No.: 3117-19-011 Date: **9/13/2019**

Boring: 19-G1 Sample: Depth:

Max. Dry Density: Opt. MC: % Comp.: Opt. +/- Natural: Remolded: **X**

Material: **POORLY GRADED GRAVEL GP**

Height: 8.99 in / 22.84 cm Circ.: 17.21 in / 43.71 cm Area: 23.57 in^2 / 152.06 cm^2

Dia.: 5.48 in / 13.91 cm

Volume: 3472.70 cm^3

Wet Wt. of Sample: 5199.70 grams Void Ratio: 0.803236595

Unit Wet Weight: 93.48 pcf

Unit Dry Weight: 93.33 pcf Water Type: Filtered Tap Water

Assumed Specific Gravity: 2.7

(L) Adjusted length: 15.293 cm

Moisture Content:

	Before Test	After Test
Pan No.	DL-4	DB-3
Wet Wt. + Pan	162.10	6306.80
Dry Wt. + Pan	162.00	6099.80
Wt. of Pan	98.40	923.80
Wt. of Dry Soil	63.60	5176.00
Wt. of Water	0.10	207.00
% Moisture	0.16	4.00

RUN NUMBER	TEST DATE	Time READINGS INITIAL	Time READINGS FINAL	Accumulated Time (T) Seconds	MANOMETER TOP CM	MANOMETER BOTTOM CM	HYDRAULIC HEAD CM	WATER VOLUME CC	WATER TEMP. C	Permeability CM/SEC K"
1	9/13/2019	4:12:00 PM	4:13:08 PM	68	26.70	26.80	0.10	3500	22.5	5.18E+01
2	9/13/2019	4:13:08 PM	4:14:15 PM	67	27.30	27.20	0.10	3500	22.5	5.25E+01
3	9/13/2019	4:14:15 PM	4:15:24 PM	69	26.90	27.00	0.10	3500	22.5	5.10E+01
4	9/13/2019	4:15:24 PM	4:16:32 PM	68	27.10	27.00	0.10	3500	22.5	5.18E+01
5	9/13/2019	4:16:32 PM	4:17:40 PM	68	26.00	26.10	0.10	3500	22.5	5.18E+01
6	9/13/2019	4:17:40 PM	4:18:47 PM	67	26.80	26.70	0.10	3500	22.5	5.25E+01

$K = \frac{VL}{THA}$

Where ;

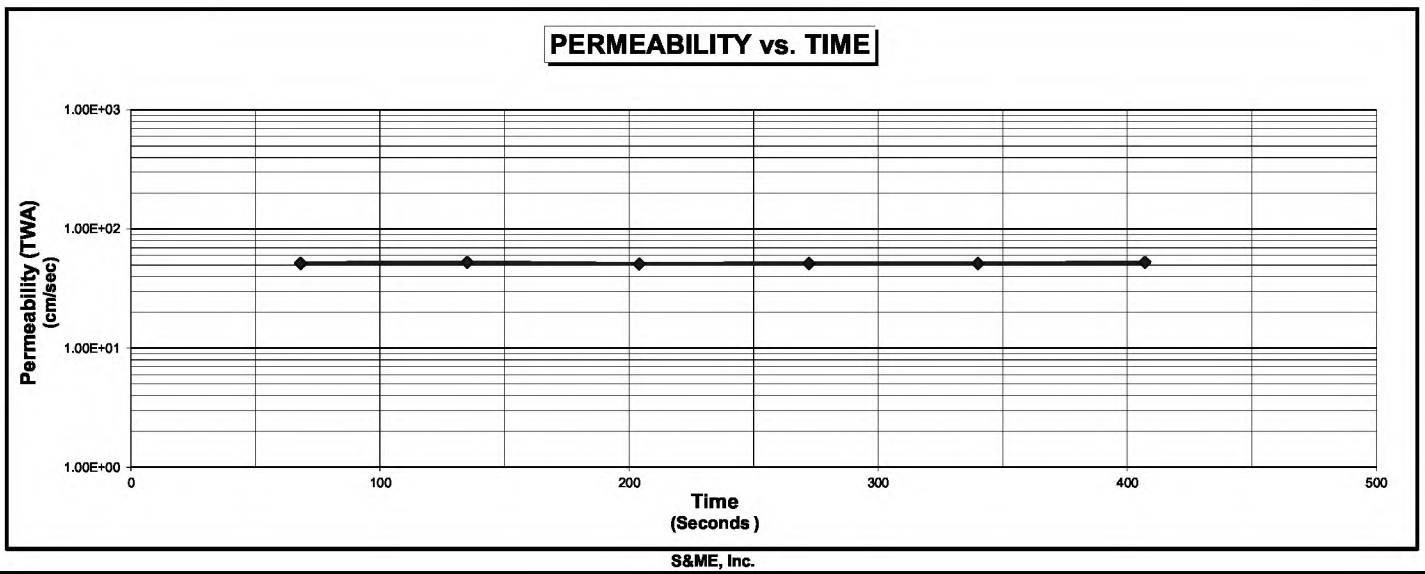
V = Volume of Water
T = Time Interval
L = Sample Length
H = Hydraulic Head
A = Cross-Sectional Area

Average K = 5.19E+01 cm/sec

Temperature Corrected K = 4.89E+01 cm/sec

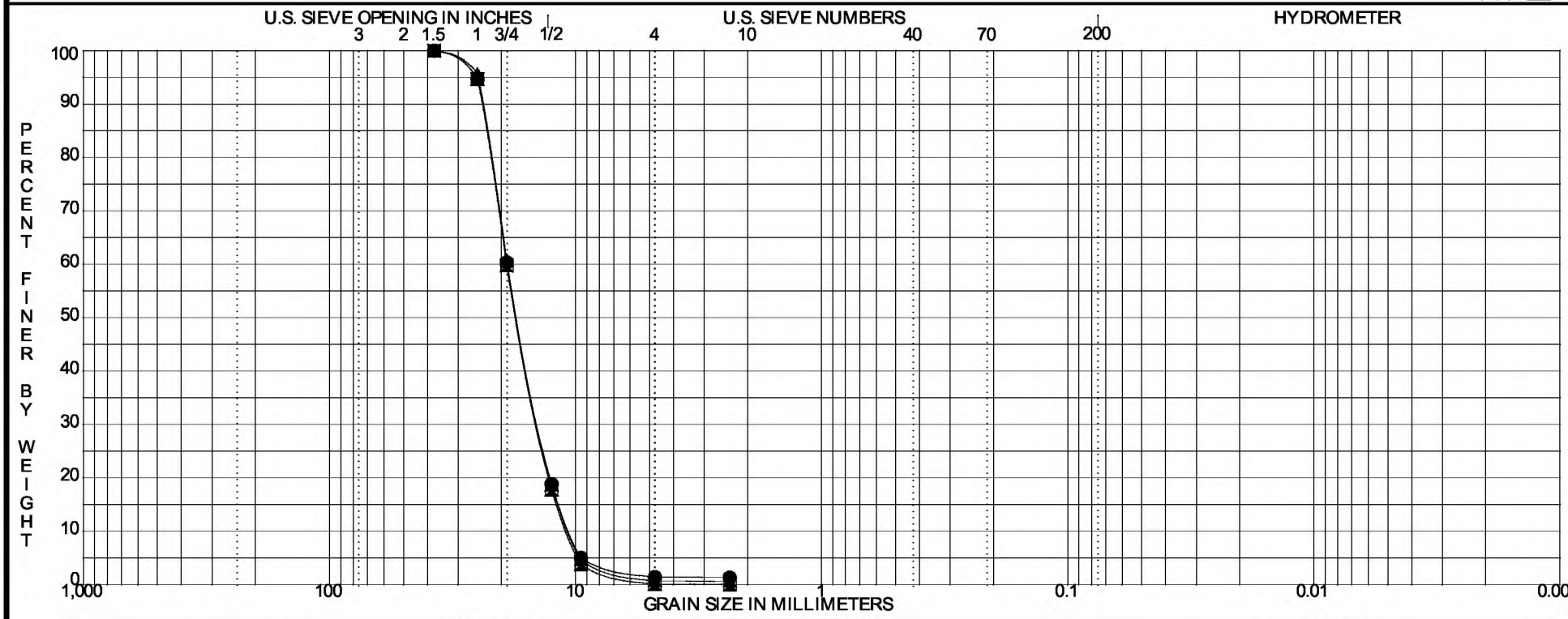
Tested By: EG

Remarks:



S&ME, Inc.

GRN-CARB



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification - Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	19-G1 As received	POORLY GRADED GRAVEL GP					0.986	1.806
⊠	19-G1 Before pH 4						0.976	1.773
▲	19-G1 After pH 4	%-CARBONATE RESIDUE CONTENT = 0.56 PERMEABILITY @ 20C = 4.89E+01 cm/sec					0.985	1.783

	Specimen Identification - Depth	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	19-G1 As received	37.5000	25.4663	18.9382	17.1193	10.4848	98.59			
⊠	19-G1 Before pH 4	37.5000	25.5968	19.0312	17.2339	10.7352	99.91			
▲	19-G1 After pH 4	37.5000	24.8653	18.8396	17.0650	10.5688	99.33			

ASTM D422

GRADATION CURVE

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 3117-19-011
DATE: 9/26/19

PLATE 1

APPENDIX A
SECTION 4
PROTECTIVE MATERIAL

LETTER OF TRANSMITTAL

S&ME, Inc.
6190 Enterprise Ct.
Dublin, Ohio 43016
(614) 793-2226 – Phone
(614) 793-2410 – Fax
www.smeinc.com

Date: July 13, 2021
S&ME Project No: 212937 – B
Project Name: AHRC Landfill, 2021
Reference: Laboratory Test Results

To: Kilbarger Construction Co.
450 Gallagher – P.O. Box 946
Logan, Ohio 44830
Attention: Mr. Mark Ruof

With this e-mail, we are sending you the following:

Document	Number of Pages
Laboratory Test Results for Sample SF-1 • 1 Gradation (ASTM C136) • 1 Granular Permeability (ASTM D2434) • 1 Insoluble Carbonate Residue (ASTM D3042) • 1 Summary	4 including cover

These documents are transmitted as checked below:

[ ] For Approval [ ] For Your Use [X] As Requested [ ] For review & comment [ ] _____

Signed: Paula J Manning

Paula J. Manning,
Group Leader/
Project Manager

Distribution: 1 Copy – AHRC Landfill
Mr. Mark Ruof

IF ENCLOSURES ARE NOT AS NOTED, PLEASE NOTIFY US AT ONCE.

SUM EPA-CARB

SUMMARY OF LABORATORY TEST RESULTS

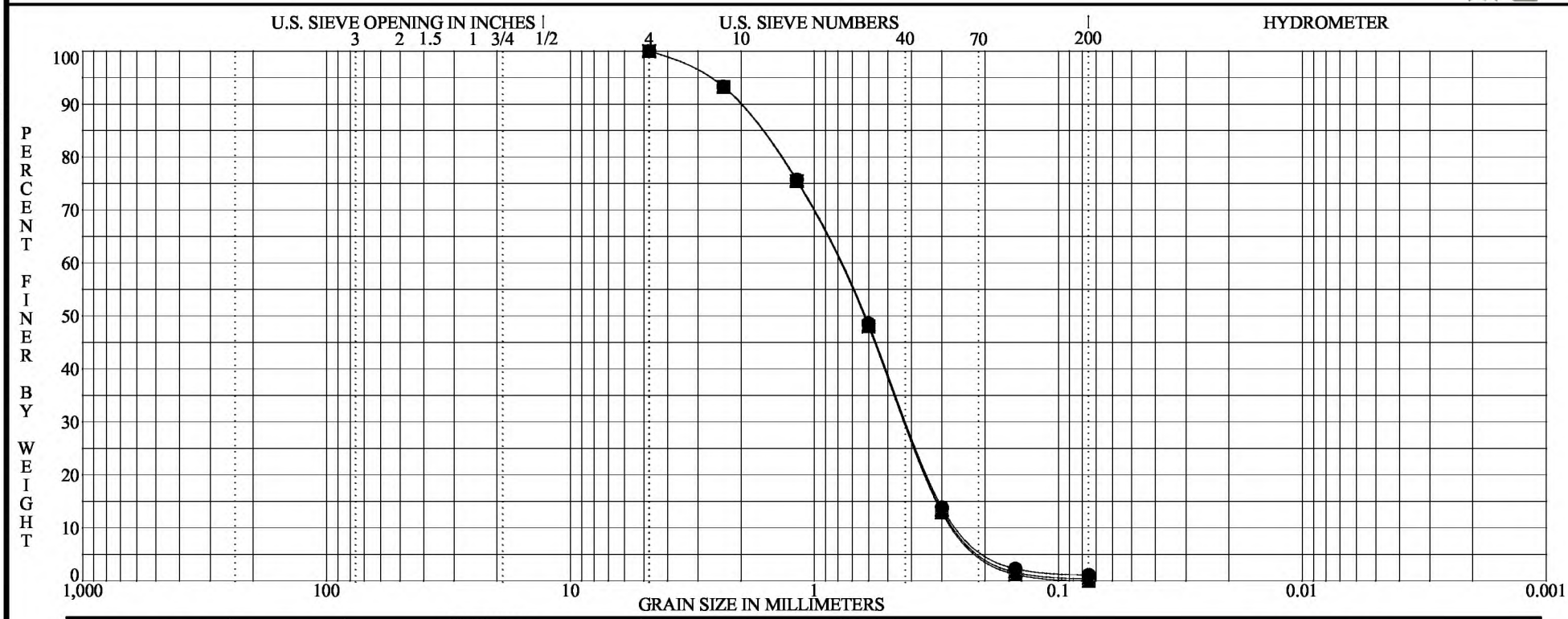
SPECIMEN ID	PT.ID	MC	LL	PL	PI	% passing #200	% carbonate residue	opt.	pcf	PERMEABILITY	ASTM Classification
21-S1	**0.0**					**1.1**	**0.40**			**4.15E-02 cm/sec**	**POORLY GRADED SAND SP**
21-S1	**1.0**					**0.0**					
21-S1	**2.0**					**0.4**					

BULK SAMPLES

PROJECT AHRC Landfill
LOCATION Logan, Ohio
JOB NO. 212937-B DATE 7/13/21

PLATE 1

GRN-CARB



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

	Specimen Identification - Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**21-S1 As received**	**POORLY GRADED SAND SP**					**0.903**	**3.349**
⊠	**21-S1 Before pH 4**						**0.868**	**3.191**
▲	**21-S1 After pH 4**	%-CARBONATE RESIDUE CONTENT = 0.40 PERMEABILITY @ 20C = 4.15E-02 cm/sec					**0.881**	**3.252**

	Specimen Identification - Depth	D100	D95	D60	D50	D10	%Gravel	%Sand	%Silt	%Clay
●	**21-S1 As received**	**4.7500**	**2.8131**	**0.7972**	**0.6213**	**0.2380**	**0.00**	**98.9**	**1.1**	
⊠	**21-S1 Before pH 4**	**4.7500**	**2.8294**	**0.8060**	**0.6299**	**0.2526**	**0.00**	**100.0**	**0.0**	
▲	**21-S1 After pH 4**	**4.7500**	**2.8294**	**0.8027**	**0.6267**	**0.2468**	**0.00**	**99.6**	**0.4**	

ASTM D422 | **GRADATION CURVE**

PROJECT: AHRC Landfill
LOCATION: Logan, Ohio
JOB NO.: 212937-B
DATE: 7/9/21

PLATE 1

PERMEABILITY TEST (ASTM D-2434) DATA AND COMPUTATION SHEET

Project: AHRC Job No.: 212937B Date: 7/9/2021

Boring: 21-S1 Depth: n/a

Natural: Remolded: X

Material: POORLY GRADED SAND, (SP)

Height:	5.60 in	Circ.:	9.40 in	23.88	cm	Area:	7.03	in^2
	14.21 cm	Dia.:	2.99 in	7.60	cm	(A):	45.36	cm^2
		Volume:		644.75	cm^3			
		Wet Wt. of Sample:		1116.70	grams	Void Ratio:	0.5589	
		Unit Wet Weight:		108.13	pcf			
		Unit Dry Weight:		107.92	pcf	Water Type:	Filtered Tap Water	
		Assumed Specific Gravity:		2.7				
		(L) Adjusted length:		7.738	cm			

Moisture Content:

	Before Test	After Test
Pan No.	O	A-72
Wet Wt. + Pan	315.69	1584.86
Dry Wt. + Pan	315.36	1367.92
Wt. of Pan	143.34	263.23
Wt. of Dry Soil	172.02	1104.69
Wt. of Water	0.33	216.94
% Moisture	0.19	19.64

RUN NUMBER	TEST DATE	Time READINGS INITIAL	Time READINGS FINAL	Accumulated Time (T) Seconds	MANOMETER TOP CM	MANOMETER BOTTOM CM	HYDRAULIC HEAD CM	WATER VOLUME CC	WATER TEMP. C	Permeability CM/SEC K"
1	7/8/2021	11:51:00 AM	11:51:43 AM	43	51.80	28.30	23.50	250	20.5	4.22E-02
2	7/8/2021	11:51:43 AM	11:52:27 AM	44	51.80	28.30	23.50	250	20.5	4.12E-02
3	7/8/2021	11:52:27 AM	11:53:10 AM	43	51.80	28.30	23.50	250	20.5	4.22E-02
4	7/8/2021	11:53:10 AM	11:53:53 AM	43	51.80	28.30	23.50	250	20.5	4.22E-02
5	7/8/2021	11:53:53 AM	11:54:36 AM	43	51.80	28.30	23.50	250	20.5	4.22E-02
6	7/8/2021	11:54:36 AM	11:55:19 AM	43	51.80	28.30	23.50	250	20.5	4.22E-02

$K = \frac{VL}{THA}$

Where ;

V = Volume of Water
T = Time Interval
L = Sample Length
H = Hydraulic Head
A = Cross-Sectional Area

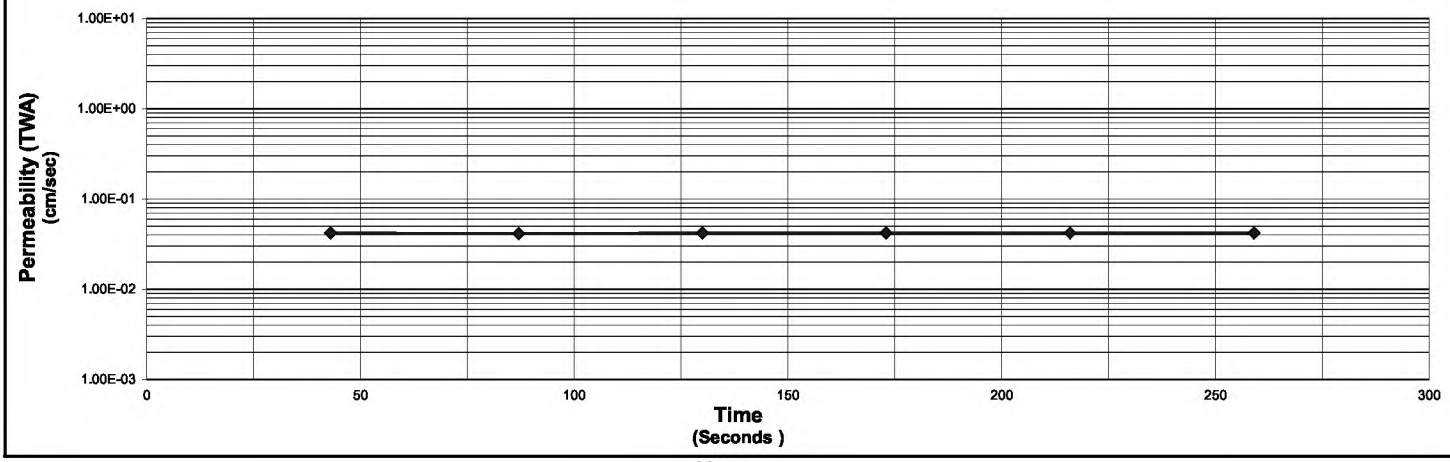
Average K = 4.20E-02 cm/sec

Temperature Corrected K = 4.15E-02 cm/sec

Tested By: SC

Remarks: Remolded in several layers with light tapping after each addition of material.

PERMEABILITY vs. TIME



S&ME, Inc.

APPENDIX B
QUALITY ASSURRANCE DOCUMENTATION

APPENDIX B
SECTION 1
FIELD NOTES – STRUCTURAL FILL

Foundation

Athens-Hocking Reclamation Center Landfill

Test	Frequency and Timing	Acceptance Parameters	Sample Location	Procedures to Follow if Test Fails	Pass/ Fail
Excavated Bedrock					
Loose bedrock or jointing	Continuous	No significant loose bedrock or jointing	Top of excavated bedrock	Define area of concern: (1) remove loose bedrock (2) remove or fill jointed bedrock	P
Survey to confirm excavation	100-foot grid plus grade breaks and other critical locations	Approximate the elevation in the approved permit and appropriate grade is maintained	Top of excavated bedrock	Excavate to grade or add appropriate structural fill and resurvey as required	P
Structural Soil Fill					
Free of Unacceptable Material	General construction observation	No solid waste, debris, foreign material, or deleterious material	Placed material	Reject stockpile and remove unacceptable material or implement unacceptable material picking as required	P
Counting number of passes per lift	General construction observation	A minimum of four passes (contacts) required	Placed material	Compact area with additional passes until the appropriate number of passes are made	P
Lift Thickness	Every lift, measure with grade stakes, visual observation or surveying	A maximum lift thickness of 1 foot loose	Placed material	Decrease lift thickness in identified area until it less than or equal to one foot in loose thickness	P
Density/Moisture relationship per ASTM D698 or D1557)	Every 10,000 cubic yard of structural soil material to be used	No predefined acceptance criteria	10,000 cubic yard borrow source	Not applicable	P
Density (ASTM D2922)	5 tests per acre per lift	Be compacted to at least 95% of the maximum dry density as determined by ASTM D698 or at least 90% of the maximum dry density as determined by ASTM D1557	Placed material	Define failed area. Disc if material is too wet and let dry. Recompact and retest with a minimum of two additional tests. Remove material if unable to pass.	P
Moisture (ASTM D3017)	5 tests per acre per lift	Moisture content should be ± 3% of the optimum moisture content determined by ASTM D698 or D1557.	Placed Material	Define failed area. Process and add water or dry out as necessary, recompact and retest with a minimum of two additional tests.	P
Structural Rock Fill					
Particle Size	Continuous	100% of particles must have a maximum dimension that is ≤ 24 inches	Placed material	Remove oversized material	P
Lift Thickness	Every lift	Lift thickness must be ≤ 24 inches	Placed material	Remove rock particles until lift thickness is ≤ 24 inches	P
Lift Compaction	Every lift	Visual Observation of non-movement	Placed material	Continue compaction until non-movement is observed	P

Structural Soil Fill Field Tests

Athens-Hocking Reclamation Center Landfill

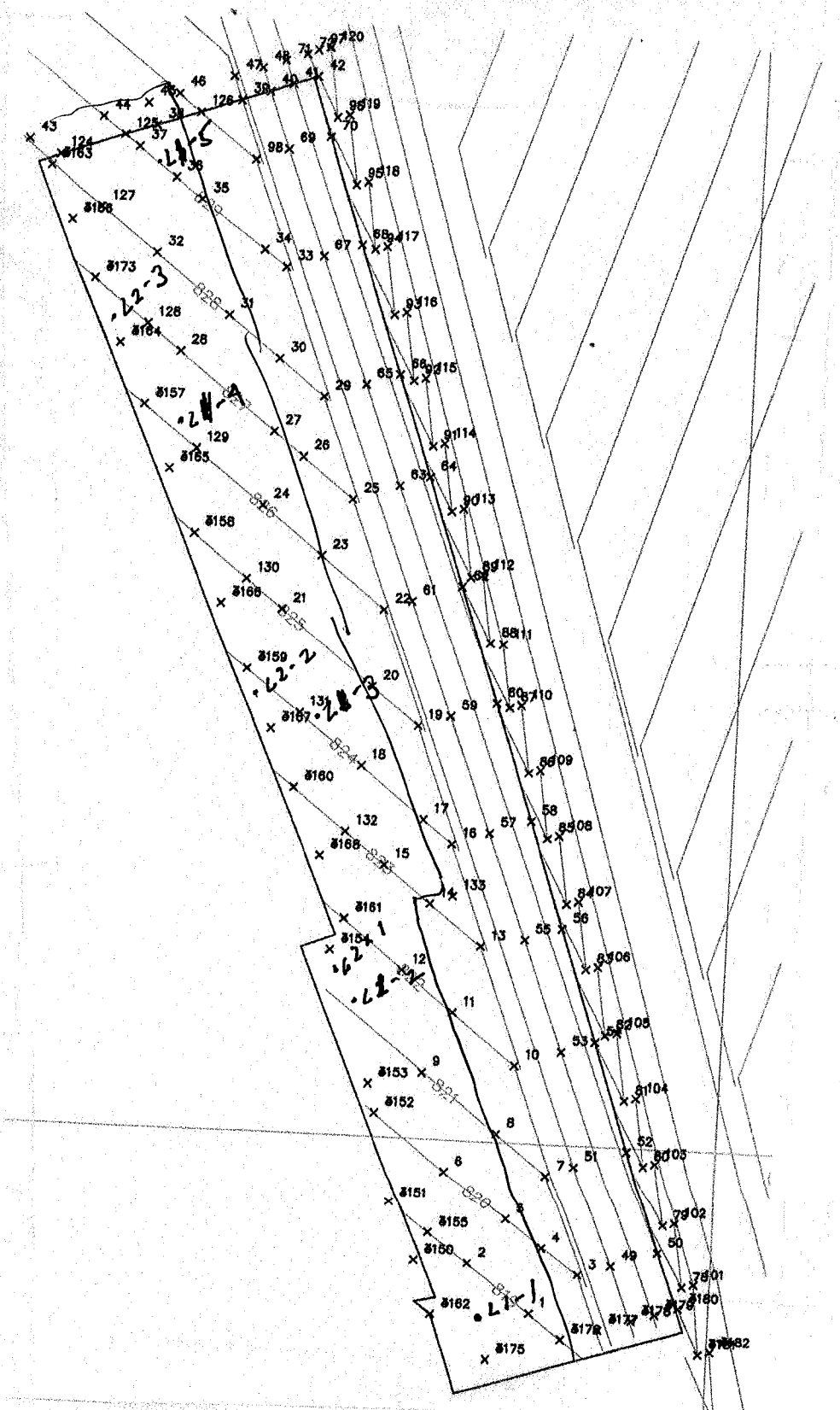
Area	Lift Number	Station Number	Borrow Sample Number	Date Tested	Maximum Dry Density (PCF) (ASTM D698) or ASTM (D1557)	Percent of MDD (PCF)	Field Density (PCF) (ASTM D2822-01)	Relative Compaction (%)	Optimum Moisture Content (%) (ASTM D698)	Field Moisture Content (%) (ASTM D3017-01)	Difference in Moisture (%)	Pass/Fail
	1	1	SF-1	7/22	135.9	90	127.7		6.7	5.3		P
A	1	2	SF-1	7/22		90	128.2			6.5		P
30	1	3	SF-1	7/22		90	124.3			6.1		P
	1	4	SF-1	7/23		90	125.1			7.2		P
	1	5	SF-1	7/23		90	126.9			6.3		P
A	2	1	SF-1	7/24	135.9	90	126.2		6.7	6.8		P
30	2	2	SF-1	7/24		90	128.1			5.9		P
	2	3	SF-2	7/24		90	129.5			6.3		P

Note: Passing criteria are ≥ 90% of the modified Proctor maximum dry density or ≥ 95% of the standard Proctor maximum dry density and ±3.0% of the laboratory optimum moisture content.

FIELD NOTES

CLIENT: KILBARGER CONSTRUCTION
PROJECT: AHRC - CELL #30
1" = 100'

BY: MAR
DATE:



APPENDIX B
SECTION 2
FIELD NOTES – RECOMPACTED SOIL LINER

Placement of the Recompacted Soil Liner

Athens-Hocking Reclamation Center Landfill

Test	Frequency and Timing	Acceptance Parameters	Sample Location	Procedures to Follow if Test Fails	Pass/ Fail
Survey to confirm bottom of RSL	100-foot grid plus grade breaks and other critical locations	Approximates the elevation in the approved permit and appropriate grade is maintained.	Bottom of RSL	Excavate to grade or add appropriate structural fill and resurvey as required	P
Free of Unacceptable Material	General construction observation	No solid waste, debris, foreign material, or deleterious material	Placed material	Reject stockpile and remove unacceptable material or implement unacceptable material picking as required	P
Counting number of passes per lift	General construction observation	A minimum of six passes (contacts) is required	Placed material	Compact area with additional passes until the appropriate number of passes are made	P
Lift Thickness	Every lift, measure with grade stakes, visual observation or surveying	A maximum lift thickness of 8 inches loose	Placed material	Decrease lift thickness in identified area until it less than or equal to 8 inches in loose thickness	P
Density (ASTM D2922)	5 tests per acre per lift	Be compacted to at least 95% of the maximum dry density as determined by ASTM D698	Placed material	Define failed area. Disc if material is to wet and let dry. Recompact and retest with a minimum of two additional test. Remove material if unable to pass.	✓
Moisture (ASTM D3017)	5 tests per acre per lift	Moisture content should be at or wet of the optimum moisture content determined by ASTM D698	Placed Material	Define failed area. Process and add water or dry out as necessary, recompact and retest with a minimum of two additional tests	P
Survey to confirm top, bottom, and total thickness of the RSL	100-foot grid plus grade breaks and other critical locations	The top of the RSL elevation ≥ the approved permit, the appropriate grade is maintained, and the thickness of RSL is ≥ 3.0 feet	Top of RSL	Compact additional RSL per specifications and resurvey as required	P

SOIL FIELD DATA SHEET

CLIENT: Kilbarger Construction, Inc

PROJECT: Athens-Hocking Reclamation Center Landfill
Cell #30

DATE	SAMPLE	LIFT	STATION	%PR	%M	DD	WD	M
7/27/21	116.8	A1-L1	1	102.8	12.5	120.1	135.1	15.0
	12.1		2	101.1	12.9	118.1	133.2	15.1
		A2-L1	1	98.2	13.6	114.7	130.3	15.6
			2	99.7	12.1	116.4	130.5	14.1
		A1-L2	1	98.3	13.5	114.8	130.3	15.5
			2	98.5	14.2	115.0	131.3	16.3
		A2-L2	1	99.2	12.2	115.9	130.0	14.1
			2	98.9	12.4	115.5	129.9	14.3
		A1-L3	1	99.1	12.8	115.7	130.5	14.8
			2	99.6	12.2	116.3	130.5	14.2
		A2-L3	1	101.9	12.4	119.0	133.7	14.7
			2	98.3	13.9	114.8	130.8	16.0
7/28/21	116.8	A1-L4	1	101.6	14.3	118.6	135.5	16.9
	12.1		2	99.1	12.5	115.9	130.7	14.5
		A2-L4	1	102.7	12.4	120.0	134.8	14.9
			2	98.9	13.6	115.5	131.2	13.7
		~~[illegible]~~	~~[illegible]~~					
		A1-L5	~~2~~ 1	102.7	14.2	119.9	136.9	17.0
		~~A2-L5~~	~~2~~ 2	100.[illegible]	13.2	118.8	134.5	15.6
		A2-L5	~~1~~ 1	99.1	14.4	115.7	132.3	16.6
			2 2	95.4	15.4	111.4	128.5	17.1
		A3-L1	1	102.7	13.2	120.0	135.8	15.9
			2	98.1	13.0	114.6	129.5	14.9
7/29/21	116.8	A3-L2	1	101.2	14.1	118.2	134.9	16.7
	12.1		2	100.0	13.4	116.8	132.4	15.6
		A3-L3	1	100.3	14.0	117.1	133.5	16.4
			2	98.4	13.3	114.9	130.2	15.2
		A3-L4	1	97.0	13.1	113.3	128.1	14.8
			2	100.2	12.8	117.0	132.0	15.0
7/30/21	116.8	A3-L5	1	99.0	12.5	115.6	130.1	14.5
	12.1		2	100.8	14.2	117.7	134.5	16.0

Notes: 7/27/21 Start 0800, Sunny 70's. Place A1-L1, ≤8", H_2O, 6C, passes. A2-L1, ≤8", H_2O, 6C passes ~~[illegible]~~ H_2O, place A1-L2, ≤8", H_2O, 6C passes, H_2O, A2-L2, ≤8", H_2O, 6P PM: High 80's. H_2O, A1-L3, ≤8", H_2O, 6C, passes, H_2O A2-L3, ≤8", H_2O, 6P, passes. H_2O, A1-L4, ≤8", H_2O. Shut job down.
7/28/21 H_2O Placing A2-L4, ≤8", H_2O, 2C with CAT, Reset, 6C - lots pass - H_2O
Place A1-L5, H_2O, 6C, passes. A3-L1, ≤8", H_2O, 6C, passes.
7/29/21 A3-L2, H_2O, ≤8" H_2O 6C passes. A3-L3 → chance of rain, smooth drum. No Rain
Scar. by 1 ft, H_2O, 2C, H_2O, 6C, passes (A3-L4). Chance rain, smooth drum.
7/30/21 Scarify A3-L4, ADD H_2O, Place A3-L5, H_2O, 2C, H_2O, 6C, passes

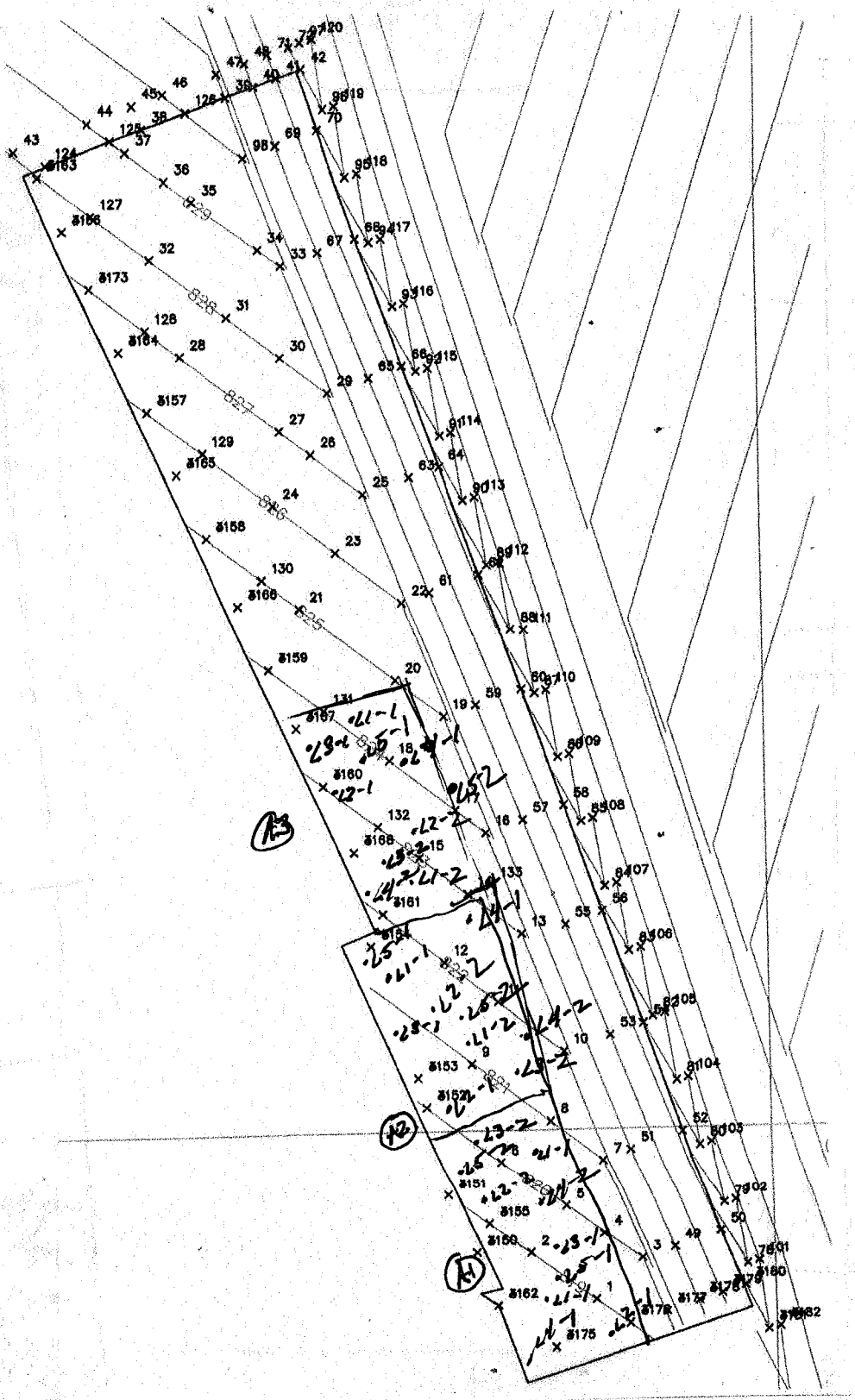
} placing H_2O before and after lift placement

7/27/21 MS 665 -1.2% D DS 1737 0.1% P
7/28/21 MS 671 0.0% P DS 1744 0.4% P
7/29/21 MS 670 -0.1% D DS 1737 -0.1% P
MS 671 0.2% P DS 1746 0.4% P

FIELD NOTES

CLIENT: KILBARGER CONSTRUCTION
PROJECT: AHRC - CELL #30
1" = 100'

BY: MAR
DATE: 7/27/21 – 7/30/21



SOIL FIELD DATA SHEET

CLIENT: Kilbarger Construction, Inc

PROJECT: Athens-Hocking Reclamation Center Landfill
Cell #30

7/30/21 - 8/3/21

DATE	SAMPLE	LIFT	STATION	%PR	%M	DD	WD	M
7/30/21	116.8	A4-L1	L1-1	101.9	13.2	119.1	134.8	15.5
	12.1	A4-L1	L1-2	98.4	12.9	114.9	129.7	14.8
		A4-L2	L2-1	102.4	12.9	119.1	135.1	15.5
		A4-L2	L2-2	97.2	13.0	113.8	130.5	17.0
7/31/21	116.8	A4-L3	L3-1	98.6	14.1	115.2	131.4	16.2
	12.1	A4-L3	L3-2	97.6	16.2	114.0	132.5	18.4
		A4-L4	L4-1	96.8	13.2	113.1	129.0	15.0
		A4-L4	L4-2	97.5	13.5	113.9	129.3	15.4
8/2/21	116.8	A4-L5	L5-1	101.9	12.3	119.0	133.6	14.6
	12.1	A4-L5	L5-2	100.8	11.4	117.7	131.1	13.4
		A4-L5	L5-3	98.9	11.9	115.5	129.3	13.8
		A4-L5	L5-4	96.9	15.4	113.2	130.3	17.1
		A4-L5	L5-5	99.7	12.7	116.5	131.3	14.8
		SWALE		95.8	14.1	111.9	127.7	15.8
			L5-2	94.2	16.0	110.0	128.5	18.5
			L5-3	95.5	14.3	111.5	127.6	16.0
			L5-4	98.8	12.9	115.3	130.2	14.9
8/3/21	116.8	A1-L6	L6-1	100.8	13.6	117.2	133.7	16.5
	12.1		L6-2	98.2	15.9	114.7	132.9	18.3
		A2-L6	L6-1	97.8	17.0	113.6	133.0	19.2
			L6-2	100.1	13.2	116.5	132.3	15.7
		A3-L6	L6-1	100.3	13.9	117.2	133.4	16.3
			L6-2	97.8	16.4	114.2	132.9	18.7
		A4-L6	L6-1	99.4	15.7	116.1	134.3	18.3
			L6-2	98.2	12.8	114.7	129.4	14.7

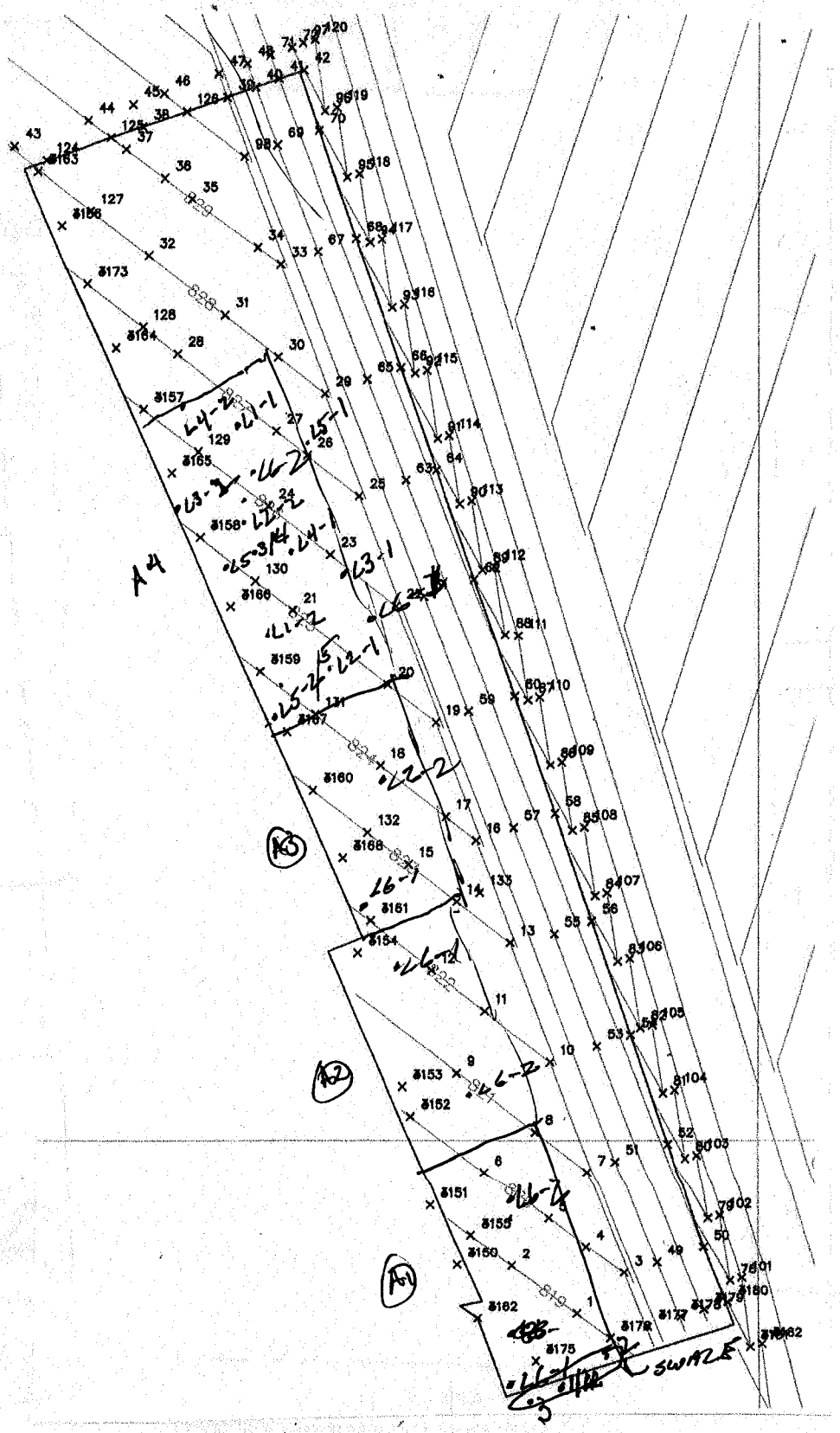
Notes: 7/30/21 Scarify area 1 and water, Place A4-L1, H_2O, GC, passes. Plac A4, L2, ≤8", H_2O, initial compaction, H_2O, GC, passes.
7/31/21 Half day, Place A4/L3 ≤8", H_2O, GC passes. Place A4-L4, H_2O, IC, H_2O, GC → passes. Shut down → sandbags drum for weekend.
8/2/21 Rains yesterday/overnight. Pump small water hole. Worker over existing liner in southeast corner. No water under existing geomembrane. Scarify A4-L4, H_2O. Place A4-L5, 8", GC, Tk moisture. Water 1 Pt, GC compact → passes. Work on swale, L1 good, L2 Pad compact, 6 Pt 8. 8/3/21 Placing final 1 Pt (6) complete Areas 1 - Thru 4. Placed ≤8", H_2O, IC, H_2O, GC → all 1 Pts passed.

FIELD NOTES

CLIENT: KILBARGER CONSTRUCTION
PROJECT: AHRC - CELL #30

BY: MAR
DATE: 7/30/21 – 8/3/21

1" = 100'



SOIL FIELD DATA SHEET

CLIENT: Kilbarger Construction, Inc

PROJECT: Athens-Hocking Reclamation Center Landfill
Cell #30

DATE	SAMPLE	LIFT	STATION	%PR	%M	DD	WD	M
8/4/21	A5-L1	1	1	98.7	12.9	115.3	130.2	14.9
		2	2	99.0	13.1	116.6	130.7	16.1
	A5-L2	1	1	98.7	12.6	114.7	129.2	14.5
		2	2	97.5	13.0	113.9	128.1	14.9
	A5-L3	1	1	94.3	13.4	110.1	124.4	14.3
		2	2	96.8	12.9	110.7	125.0	14.3
		1	1	98.6	13.6	111.7	126.9	15.2
		2	2	96.0	13.3	112.1	127.0	14.9
8/5/21	A5-L4	A5-L4	1	98.6	12.9	116.2	130.1	14.9
		A5-L4	2	99.7	12.8	116.0	130.9	14.9
		A5-L5	1	100.2	13.2	117.0	131.3	14.3
		A5-L5	2	98.8	13.0	115.4	130.4	15.0
		A5-L6	1	99.4	12.9	116.1	130.5	14.4
		A5-L6	2	99.1	12.6	116.7	130.3	14.6

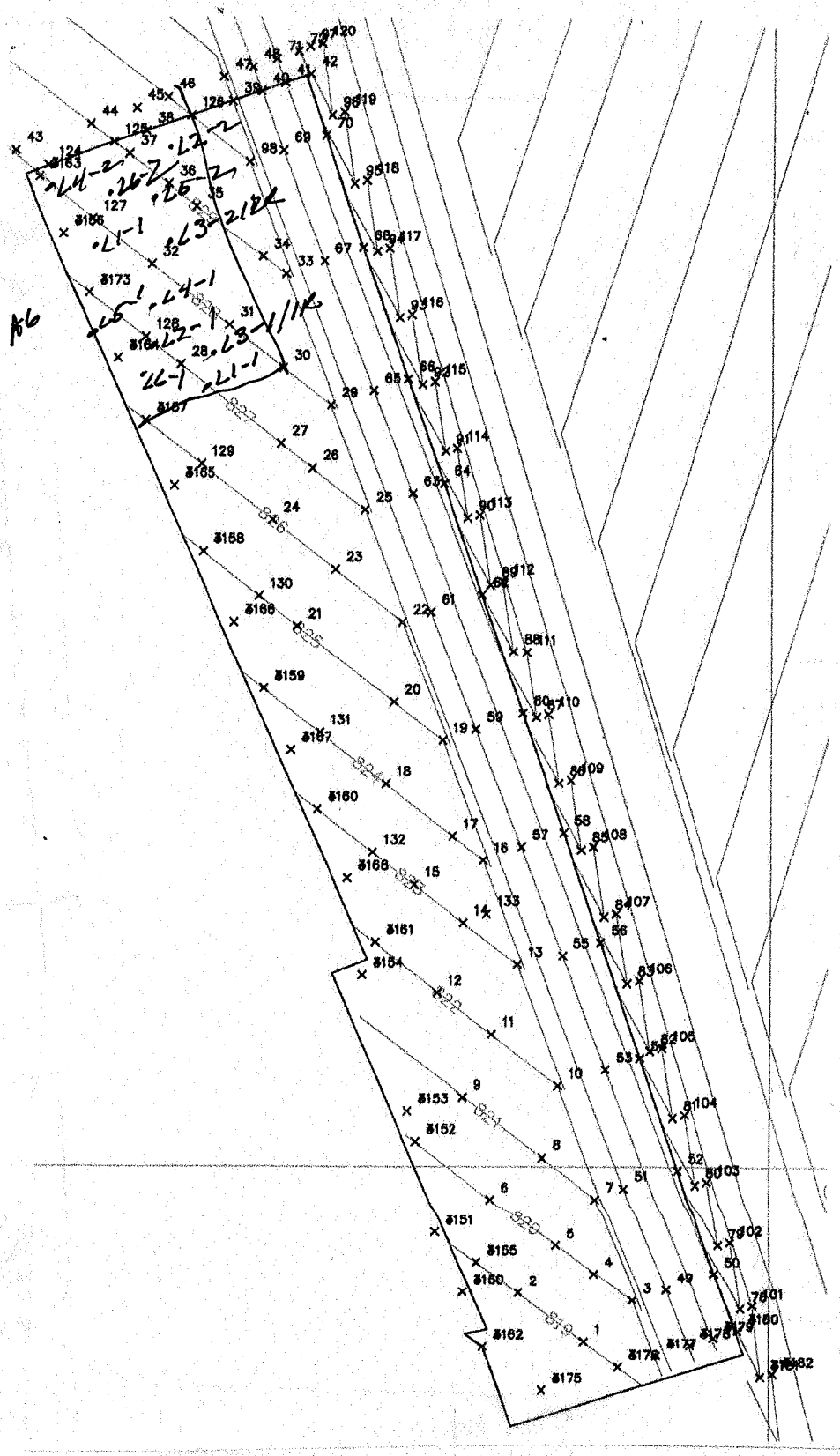
Notes:

FIELD NOTES

CLIENT: KILBARGER CONSTRUCTION
PROJECT: AHRC - CELL #30

BY: MAR
DATE: 8/30/21 - 8/31/21

1" = 100'



The Mark James Corporation

7/19/21 Sunny, 69°@0900.

1. Rain Friday night ≈ 0.9". Subgrade is soft in places, drying.
2. Cleaning sand from geomembrane/geocomposite, from N to S. Everything good for ± 230', no rips/tears.
3. To end of snow area, cleaned off, good shape
4. Continue clean soil off liner in NSW area.
5. Discuss w/ Bruce/B.H./Clint → continue to clean until Eng. is on site wed.

7/20/21 Sunny, warm

1. Remove soil cover off of entire tie-in except portion along south.
2. Begin removing sand protective cover.

7/21/21 Partly Cloudy 64°@0700

1. Continue working towards southern corner. Some ripped areas near corner that will have to be patched. South tie-in clear. No issues. The connection for the leachate pipe in this area is set back some. Take extra material off.
2. Begin loading sand/soil out.

7/22/21 Sunny, warm

1. Continue to load sand/soil out. Clean out mud from surface water collection/pump area.

7/23/21

1. Cleaning sand off of RSC in tie-in area + full length
2. Final grading on area in the SW portion of cell. Cut/grade/shoot
   ok. Smooth drum area.
3. Start filling in NSW area. A small portion is below grade.
   TEST LIFT 1 ok.

7/24/21 Clean out sump area where actual inlet hose was located. Shoot location of new sump. Fill sump with well graded rock fill. Size range 6" ∅ to 1.0. Place 1 lift, all fill area between Fill 0.3 - 1.0. Small cuts. Small section of rock sticks out in to cell. Stake it to begin excavating, it as time permits

116-B
12-V

7/28/21
Start RSC placment @ 0800. Water subgrade and proof-roll w/ CAT Loader. A1-L1 and A2-L2 dry-ish over 100%, probably ready to AP, in part, off of subgrade. Compacted RSC running close to OMC. Increase H_2O on Lift. Day was sunny 70's in AM, high 80's PM. Microwave H_2O of borrow = 11.9%

7/29/21 H_2O content in borrow is @ or slightly below OMC. Increase H_2O for the day. Method: Place Lift, add H_2O, 2C once entire Lift, add H_2O, → 6C. Mark Moorefield, Mike Loogen on-site. Review RSC, discuss leachate tanks.

7/29/21 Working on Area 3. Continue method of H_2O, place Lift, H_2O, 2C, H_2O, 6C. Chance of rain @ 1000. Smooth drum Lift A3-L3. No rain. Scarify Lift and water place A3-L4. Chance of rain overnight. Smooth drum A3-L4.

7/30/21 The heavy rains missed the facility last night. Got a light rain, + helped settle dust on haul road. Scarify Lift A3-L4 and add H_2O. Place A3-L5, H_2O, 2C, H_2O, 6C. Begin Area 4, Lift 1 to Lift 2.

7/31/21 Working on Area 4, complete Lift 3 + 4. Half day, shut down @ noon.

8/2/21 Rained over weekend. Pump water off of RSC. Water over geomembrane in southwest corner, none under. Pump off water. Scarify A4-L4 and work on Lift 5. Some problem getting moisture on L5 to pass. Finally ok. And then work on swale on south tie-in between new cell and Cell #2a

8/3/21 Placing final lifts on Areas A1-A4. all pass.

8/4/21 Work on final area (Area 5). Lift 1 + 2 ok. Lift 3, ~~dense~~ scarify, water and compact entire Lift → passes. Smooth drum Lift.

8/5/21 Scarify A3-L3. Work on ~~AP~~ Lifts 4 to 6. All passed no issues. Water entire cell (Area 1-5), let dry slightly, then smooth drum entire cell.

8/6/21 Smooth drum cell, wait for Chesapeake.

8/6 - 8/9 Install geomembrane and geocomposite

8/9 No work on cell

8/10 Board up welding supplies and pipe to install leachate collection system and thermocouple pipe.

FIELD NOTES

CLIENT: Gunaphe
PROJECT: Cell #30

BY: MAR
DATE: 8/1/21 to

8/1/21 - 8/4/21
Work on welding 6" HDPE SDR9 pipe and 3" HDPE SDR9 pipe. String thermocouples in 3" pipe.

8/12 pull wires from 3" thermocouples #6 and #7. Wind cable and wires on spools. Bring back to cell #30 and unspool. 8/13-8/14 Replace all connectors and thermocouples on lines #6 and #7. Coat connectors in 3" pipe with Flex Seal and high temperature engine gasket material to try and seal water from connectors. Add thermocouples. 8/14/21 Pull leads #6 and #7 through pipes. Check once pulled through. All seem to be working.

8/14/21 Late in day, begin to place sand, gravel 1st pipe.

8/15/21 Place sand over 1st pipe (from north) and move to 2nd pipe. Gravel 2nd pipe. Place sand rock over pipe #1 to pipe #2. Rock from cover 90-1 rolled downhill landed at the lowest cell. Locate a patch. Call CCS for repair.

8/18/21 Heavy rain overnight. Arrive @ site. Water from highwall diversion channel flowing into lower (non-cell) area. Have AK personnel repair channel, dig new one. Check 6" pump. It is partially silted up. Pull suction hose out and reset. Water runs over part of cell in southern area. Begin pumping down w/ 3" pump. Pumped down by 0930 hrs. Small amount of H_2O under liner. Cut and drain ~ 5-10 gallons from beneath liner. Locate patch.

8/19/21 Work up to pipe #3, gravel. Bring in sand rock.

~~8/19/21 Work up to pipe #3, gravel. Bring in sand rock.~~

8/20/21 CCS on-site @ 0830 - 1030 repair 2 damage locations. Run final weld. Rock @ 902, VBox okay. Coat two H_2O @ 0940, VBox okay. Placing sand up to pipe #4

8/21/21 Place sand/sand rock to pipe #4.

8/23/21 Place ground around 6" and 3" pipes. Stand up backhoe & rip. Begin placing sand to pipe #5. Sand rock to pipe #5. Gravel 6" & 3" pipe, ~~place~~ geotextile, sand. Begin to cross over pipe w/ sand.

8/24/21 Push sand, switch to sand rock for last section over pipe #5.

8/25/21 - 8/28/21 Place sand in new area, pipes #6 - #5. Remove muddied geocomposite in southern section. Replace ~ 2600 ft^2 of geocomposite.

8/30 → 9/3/21 Finish placing all of sand rock in grave area

APPENDIX B
SECTION 3
FIELD NOTES – GEOMEMBRANE
PANEL PLACEMENT

GEOMEMBRANE PANEL PLACEMENT LOG

CELL #30

Date: 8/6/21 Weather: Clear, Warm Temperature: 80's °F Wind: Slight

PANEL NUMBER 1 Material: HDPE 60 T

Roll No.: 51227

Time: 1350

Subgrade Conditions

Line & Grade: OK

Surface Compaction: OK - Smooth Drum

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid Steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P1/P2 and

Seaming Crew: RL MITZ TBO 450 1514PM, MITZ TBO 1480 1416

Sm.Crew Testing:

Notes: P1/P5 P1/P6 ANTR #1739 860° 500

P1/E ANTR #1739 860 480

PANEL NUMBER 2 Material: HDPE 60 T

Roll No.: 51227

Time: 1400

Subgrade Conditions

Line & Grade: OK

Surface Compaction: OK - Smooth Drum

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid Steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P2/P4

Seaming Crew: RL MITZ TBO 450 1514PM

Sm.Crew Testing:

Notes:

GEOMEMBRANE PANEL PLACEMENT LOG

CELL #30

Date: 8/6/21 Weather: Clear, Warm Temperature: 80's °F Wind: Light

PANEL NUMBER P3 Material: HDPE 60 t

Roll No.: 51229

Time: _____

Subgrade Conditions

Line & Grade: OK

Surface Compaction: OK - Smooth Drum

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P2/P3

Seaming Crew: ANJR #4739 860@460° #4773

Sm.Crew Testing: P3/P4 RL #4739 860°@450° 1555

Notes: _____

PANEL NUMBER P4 Material: HDPE 60 t

Roll No.: 51228

Time: 1300

Subgrade Conditions

Line & Grade: OK

Surface Compaction: OK - Smooth Drum

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid Steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: _____

Seaming Crew: _____

Sm.Crew Testing: _____

Notes: _____

GEOMEMBRANE PANEL PLACEMENT LOG

Cell #30

Date: 8/6/21 Weather: Clear, Warm Temperature: 80's °F Wind: Slight

PANEL NUMBER P5 Material: HDPE 60 T

Roll No.: 51228

Time: 1305

Subgrade Conditions

Line & Grade: OK

Surface Compaction: Smooth Drum - OK

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid Steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P5/P6

Seaming Crew: RM WF1739 T860 400

Sm.Crew Testing:

Notes:

PANEL NUMBER P6 Material: HDPE 60 T

Roll No.: 51228

Time: 1507

Subgrade Conditions

Line & Grade: OK

Surface Compaction: Smooth Drum - OK

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P3/P7 P4/P8

Seaming Crew: BL WT12 T860 450

Sm.Crew Testing:

Notes:

GEOMEMBRANE PANEL PLACEMENT LOG

CELL #30

Date: 8/6/21 Weather: Hazy, Warm Temperature: 80's °F Wind: Slight

PANEL NUMBER P7 Material: 60 MIL HDPE T

Roll No.: 51229

Time: 1530

Subgrade Conditions

Line & Grade: OK

Surface Compaction: Smooth Drum OK

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid Steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P7/P8

Seaming Crew: AMSR M#1739 360@450 1546

Sm.Crew Testing: P7/P8 RL M#1712 360@450

Notes:

PANEL NUMBER P8 Material: 60 MIL HDPE SMOOTH

Roll No.: 51239

Time: 1540

Subgrade Conditions

Line & Grade: OK

Surface Compaction: Smooth Drum - OK

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid Steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: P8/P9 AMSR M#1739 360°/500 1714

Seaming Crew:

Sm.Crew Testing:

Notes:

Sheet 5 of 5

GEOMEMBRANE PANEL PLACEMENT LOG

CELL #30

Date: 8/6/21 Weather: ~~80's~~ Overcast Temperature: 80's °F Wind: Slight

PANEL NUMBER P9 Material: 60 mil HDPE

Roll No.: 51235

Time: 1700

Subgrade Conditions

Line & Grade: OK

Surface Compaction: Smooth Drum

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment: Skid steer

Visual Panel Inspection: OK

Temporary Loading/Welds/Bonds: Sand Bags

Damages: None

Seam Details

Seam Nos.: ~~P1/P2~~ P1/P2 to Existing

Seaming Crew: ~~A~~ P4 to Existing

Sm.Crew Testing:

Notes: P1/P2 to Existing

0800 AMSR MH#1739 08/07/21 860°@400

PANEL NUMBER Material: 60 mil HDPE

Roll No.:

Time:

Subgrade Conditions

Line & Grade: OK

Surface Compaction: Smooth Drum

Protrusions: None

Ponded Water: None Desiccation: Slight

Panel Conditions

Transport Equipment:

Visual Panel Inspection:

Temporary Loading/Welds/Bonds:

Damages:

Seam Details

Seam Nos.:

Seaming Crew:

Sm.Crew Testing:

Notes:

APPENDIX B
SECTION 4
FIELD NOTES - GEOMEMBRANE FIELD TESTING LOGS

Liner System Geomembrane Repair Test Log

Athens-Hocking Reclamation Center Landfill

TEST Date	Seam	Panel	Location	Material Type	Description of Damage	Repair Type	Repair Test	Pass/ Fail
08/07		#6	R1	HD	Cross Seam 2x2 8/6/21 MX42 HMR 1740	P	Vbox	P
08/07		#7	R2	HD	Cross Seam 2x2 8/6/21 MX42 HMR 1748	P	VB	P
08/07		#8	R3	HD	DS-2 (5x2) 8/6/21 MX42 HMR 1759	P	VB	P
08/07		#10	R4	HD	Burnout (2x2) MX42 HMR 1758	P	VB	P
08/07		#37	R5	HD	P6/P1/EX Tie In Patch (5x2) 8/6/21 MX42 HMR 1813	P	VB	P
08/07		#35	R6	HD	P1/P5/P6 CS Patch (2x2) 8/6/21 MX42 HMR 1803	P	VB	P
08/07		#34	R7	HD	P5/P6/EX CS Patch (2x2) 8/6/21 MX42 HMR 1830	P	VB	P
08/07		#11	R9	HD	PATCH CORNER DS-1 (8x2) 8/7/21 MX42 HMR 0821	P	VB	P
08/07		#16	R16	HD	DS-3 (5x2) 8/7/21 MX42 HMR 0821	P	VB	P
08/07		#15	R14	HD	DS-4 (5x2) 8/7/21 MX42 HMR 0807	P	VB	P
08/07		#22	R15	HD	DS-5 (5x2) 8/7/21 MX42 HMR 0813	P	VB	P
08/07		#23	R11	HD	DS-6 (5x2) 8/7/21 MX42 HMR 0843	P	VB	P
08/07		#36	R8	HD	DS-7 (6x2 8/7/21 MX42 HMR	P	VB	P
08/07		#14	R13	HD	Burnout (2x2) 8/7/21 MX42 HMR 0853	P	VB	P
08/07		#4	R12	HD	P7/P8/P3/P4 (3x2) MX42 HMR 08/07 0835	P	VB	P
08/07		#25	R10	HD	EX/P7/P1/P3 (5x2) MX42 HMR 08/07 0828	P	VB	P
08/07		#40	R21	HD	P4/EX (5x2) MX42 HMR 08/07 1005	P	VB	P
08/07		#27	R22	HD	P2/EX (2x2) MX42 HMR 08/07 0853	P	VB	P

Liner System Geomembrane Repair Test Log

Athens-Hocking Reclamation Center Landfill

Date	Seam	Panel	Location	Material Type	Description of Damage	Repair Type	Repair Test	Pass/ Fail
08/08		#26	R20	HDT	(3x3) P2/04/EX MX42 HMR 08/08 0952	P	VBox	P
08/08		#39	R19	HDT	2x3 P1/EX MX42 HMR 08/08 0947	P	VBox	P
08/08		#31	R18	HDT	3x2 P1/02/EX MX42 HMR 08/08 0943	P	VBox	P
08/08		#32	R17	HDT	6X2 P1/EX MX42 HMR 08/08 0938	P	VBox	P
08/10	DOCK	#32 EX	R23	HDT	2x2 EX MX42 HMR 08/10 0840	P	VBox	P
08/11	WATER	#41 EX	R24	HDT	2x2 EX MX42 HMR 08/11 1005	P	VBox	P

CELL 30

Trial Seam Testing

Athens-Hocking Reclamation Center Landfill
Cell 30

I = Inside Track
O = Outside Track

SS on chesapeake
(A) ST
(B) SS
(C) TT
(D) TT
(E) Tie SS

Date	Time	Machine	Operator	Machine Temp./Speed	~~Shear~~ ← Peel	P/F
850 F						
8/6/21	1402	M 1712	RL	860 / 450	138 / 111 / 117 / 118 / 115 (A) - I	P
"	1400	M 1739	AM	860 / 500	140 / 118 / 128 / 126 / 133 (B) - I	P
"	1407	M 1739	AM	860 / 400	131 / 149 / 138 / 138 / 138 (C) - I	P
"	1409	M 1712	RL	860 / 350	148 / 130 / 140 / 135 / 134 (D) - I	P
"	1410	M 1739	AM	860 / 450	123 / 119 / 107 / 120 / 105 (E) - I	P
"	1402	M 1712	RL	860 / 450	116 / 107 / 135 / 106 / 122 (A) - O	P
"	1400	M 1739	AM	860 / 500	120 / 119 / 126 / 119 / 112 (B) - O	P
"	1407	M 1739	AM	860 / 400	137 / 128 / 131 / 129 / 139 (C) - O	P
"	1409	M 1712	RL	860 / 350	133 / 142 / 137 / 133 / 130 (D) - O	P
"	1410	M 1739	AM	860 / 450	105 / 106 / 100 / 104 / 121 (E) - O	P
88 F						
8/6/21	1735	M 42	HMR	550 / 550	119 / 100 / 128 / 122 / 108	P - Ext
8/7/21	0748	M 42	HMR	550 / 550	91 / 92 / 105 / 92 / 81	P - Ext
8/7/21	0740	M 1739	AM	860 / 450	129 / 107 / 107 / 132 / 139 - I	P
					135 / 119 / 134 / 128 / 132 - O	P

All tests by CR

Non-Destructive Liner System Geomembrane Seam Test Log

Athens-Hocking Reclamation Center Landfill

Seam No.	Seam Length	Visual Inspection	Air Temp.	Test Method	Pressure Init./Final	Time Start	Time End	Location	Date	Pass/ Fail
P1/P3		Good	87	APT	30/30	1625	1630	Full	8/6/21	P
P2/P3	22'	Good	"	"	30/30	1630	1635	Full	"	P
P4/P3		Good	"	"	30/30	1630	1635	Full	"	P
P1/P2	238'	Good	"	"	30/30	1637	1642	Full	"	P
P2/P4		Good	"	"	30/30	1639	1643	Full	"	P
P1/WTie	175'	Good	"	"	30/30 Burnout	1648	1653	N EDGE to 175'	"	P
P1/WTie	66'	Good	"	"	30/30 "	1648	1653	175' to SE EDGE	"	P
P5/P6	10'	Good	"	"	30/30	1651	1656	Full	"	P
P1/P6	25'	Good	"	"	30/29	1657	1702	Full	"	P
P1/P5	23'	Good	"	"	30/30	1657	1702	Full	"	P
P7/W Tie	39'	Good	82°	APT	30/30	1933	1938	39' to SE EDGE	"	P
P7/WTie	495'	Good	"	"	30/30	1936	1941	39' to NE EDGE	"	P
P7/P8	540'	Good	"	"	32/32	1940	1945	Full	"	P
P1/WTie	22'	Good	"	"	30/29	1945	1950	E/W leg	"	P
P8/P9	539'	Good	"	"	31/31	1850	1855	Full	"	P
P4/P8	22'	Good	"	"	30/30	1853	1858	Full	"	P
P3/P7	22'	Good	"	"	30/29	1852	1857	Full	"	P
P4/STie	22'	Good	81°	APT	30/30	0812	0817	Full	8/7/21	P
P2/STie	22'	Good	"	"	30/30	0812	0817	Full	"	P
P1/STie	22'	Good	"	"	30/30	0812	0817	Full	"	P

Notes:

APPENDIX B
SECTION 5
DESTRUCTIVE SEAM TESTS

PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-001
MATERIAL: 60 mil HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-1

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	131.2	SE1	<10
2	130.9	SE1	<10
3	138.0	SE1	<10
4	142.5	SE1	<10
5	129.2	SE1	<10
AVERAGE	**134.4**		
STD. DEV.	5.06		
INSIDE TRACK (WELD "B")			
1	111.1	SE1	<10
2	114.3	SE1	<10
3	112.6	SE1	<10
4	112.4	SE1	<10
5	112.5	SE1	<10
AVERAGE	**112.6**		
STD. DEV.	1.02		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	156.4	SE1
2	166.0	SE1
3	164.3	SE1
4	156.2	SE1
5	159.3	SE1
AVERAGE	**160.4**	
STD. DEV.	4.04	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-002
MATERIAL: 60 mil HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-2

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	143.9	SE1	<10
2	129.6	SE1	<10
3	137.1	SE1	<10
4	142.2	SE1	<10
5	123.0	SE1	<10
AVERAGE	**135.2**		
STD. DEV.	7.85		
INSIDE TRACK (WELD "B")			
1	124.5	SE1	<10
2	149.8	SE1	<10
3	146.2	SE1	<10
4	131.5	SE1	<10
5	139.0	SE1	<10
AVERAGE	**138.2**		
STD. DEV.	9.29		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	157.4	SE1
2	160.0	SE1
3	164.0	SE1
4	159.8	SE1
5	158.4	SE1
AVERAGE	**159.9**	
STD. DEV.	2.25	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-003
MATERIAL: 60 mil HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-3

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	106.5	SE1	<10
2	113.9	SE1	<10
3	104.8	SE1	<10
4	103.7	SE1	<10
5	107.4	SE1	<10
AVERAGE	**107.3**		
STD. DEV.	3.56		
INSIDE TRACK (WELD "B")			
1	105.5	SE1	<10
2	118.5	SE1	<10
3	105.7	SE1	<10
4	110.5	SE1	<10
5	114.0	SE1	<10
AVERAGE	**110.8**		
STD. DEV.	4.97		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	154.3	SE1
2	155.0	SE1
3	156.0	SE1
4	152.3	SE1
5	154.4	SE1
AVERAGE	**154.4**	
STD. DEV.	1.21	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-004
MATERIAL: 60 mil HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-4

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	151.3	SE1	<10
2	157.3	SE1	<10
3	148.2	SE1	<10
4	157.3	SE1	<10
5	148.4	SE1	<10
AVERAGE	**152.5**		
STD. DEV.	4.07		
INSIDE TRACK (WELD "B")			
1	122.0	SE1	<10
2	130.7	SE1	<10
3	123.1	SE1	<10
4	124.5	SE1	<10
5	121.0	SE1	<10
AVERAGE	**124.3**		
STD. DEV.	3.42		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	161.3	SE1
2	167.8	SE1
3	164.2	SE1
4	163.6	SE1
5	160.9	SE1
AVERAGE	**163.6**	
STD. DEV.	2.47	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-005
MATERIAL: 60 mil HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-5

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	123.9	SE1	<10
2	129.5	SE1	<10
3	115.8	SE1	<10
4	128.8	SE1	<10
5	120.7	SE1	<10
AVERAGE	**123.7**		
STD. DEV.	5.12		
INSIDE TRACK (WELD "B")			
1	135.0	SE1	<10
2	127.4	SE1	<10
3	122.4	SE1	<10
4	127.6	SE1	<10
5	126.1	SE1	<10
AVERAGE	**127.7**		
STD. DEV.	4.10		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	167.2	SE1
2	161.7	SE1
3	167.0	SE1
4	164.1	SE1
5	164.9	SE1
AVERAGE	**165.0**	
STD. DEV.	2.03	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-006
MATERIAL: 60 mil HDPE
SEAM TYPE: DOUBLE FUSION

SAMPLE I.D.: DS-6

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	144.1	SE1	<10
2	160.4	SE1	<10
3	154.4	SE1	<10
4	148.2	SE1	<10
5	147.6	SE1	<10
AVERAGE	**150.9**		
STD. DEV.	5.78		
INSIDE TRACK (WELD "B")			
1	143.2	SE1	<10
2	144.0	SE1	<10
3	150.7	SE1	<10
4	149.1	SE1	<10
5	164.2	SE1	<10
AVERAGE	**150.2**		
STD. DEV.	7.55		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	168.9	SE1
2	166.0	SE1
3	171.7	SE1
4	168.2	SE1
5	166.2	SE1
AVERAGE	**168.2**	
STD. DEV.	2.08	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #3
PROJECT NO.: L21-109-003
LAB ID NO.: L21-109-003-007
MATERIAL: 60 mil HDPE
SEAM TYPE: EXTRUSION

SAMPLE I.D.: DS-7

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
1	113.8	SE3	<10
2	92.6	SE3	<10
3	89.1	SE3	<10
4	113.9	SE3	<10
5	93.7	SE3	<10
AVERAGE	**100.6**		
STD. DEV.	10.91		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	152.0	SE1
2	154.6	SE1
3	155.6	SE1
4	155.7	SE1
5	153.4	SE1
AVERAGE	**154.3**	
STD. DEV.	1.40	

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APPENDIX C
GEOSYNTHETICS – QUALITY CONTROL DOCUMENTATION

APPENDIX C
SECTION 1
HDPE GEOMEMBANE CONFORMANCE TESTS

OWNERS CONFORMANCE TESTING

CONFORMANCE TEST RESULTS

geotechnics
geotechnical & geosynthetic testing

CLIENT: Chesapeake Containment Systems, Inc.
CLIENT PROJECT: CCS
PROJECT NO.: L21-050-004
LAB ID NO.: L21-050-004-001
MATERIAL: Solmax 60 mil Textured HDPE
ROLL NO: 1001-151225

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
THICKNESS	D 5994	mils	62	62	61	62	63		
			62	59	61	61	60	**61**	1.10
ASPERITY	D7466	mils	25	23	28	26	29		
HEIGHT	SIDE A		28	25	27	28	28	**27**	1.79
ASPERITY	D7466	mils	23	23	25	25	28		
HEIGHT	SIDE B		28	24	24	25	25	**25**	1.67
DENSITY	D 1505	g/cc	0.9478	0.9478	0.9476			**0.9477**	0.0001
CARBON BLACK CONTENT	D 4218	%	2.42	2.50				**2.46**	0.041
CARBON BLACK	D 5596	CATEGORY	1	1	1	1	1		
DISPERSION			1	1	1	1	1		
PUNCTURE	D 4833	lbs	143.3	133.7	142.1	137.2	141.5		
RESISTANCE			139.4	147.7	142.6	135.4	139.2		
			133.8	137.6	145.5	149.7	141.3	**140.7**	4.60
TEAR	D 1004	MD-lbs	56.3	56.2	57.8	56.7	55.8		
RESISTANCE			54.4	52.8	56.4	55.3	56.4	**55.8**	1.31
		CD-lbs	53.6	53.1	55.2	53.3	53.9		
			51.8	53.6	55.5	55.4	52.8	**53.8**	1.15
TENSILE PROPERTIES	D 6693								
STRENGTH AT YIELD		MD-ppi	160	160	158	165	158	**160**	2.57
		CD-ppi	158	167	170	161	163	**164**	4.04
STRENGTH AT BREAK		MD-ppi	182	180	188	208	229	**197**	18.42
		CD-ppi	180	178	197	182	143	**176**	17.78
ELONGATION AT YIELD		MD%	16	18	16	18	17	**17**	0.89
Lo = 1.3"		CD%	15	16	16	17	16	**16**	0.63
ELONGATION AT BREAK		MD%	490	500	520	590	650	**550**	60.99
Lo = 2.0"		CD%	550	520	580	560	440	**530**	48.99

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CONFORMANCE TEST RESULTS

geotechnics
geotechnical & geosynthetic testing

CLIENT: Chesapeake Containment Systems, Inc.
CLIENT PROJECT: CCS
PROJECT NO.: L21-050-004
LAB ID NO.: L21-050-004-002
MATERIAL: Solmax 60 mil Textured HDPE
ROLL NO: 1001-151233

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
THICKNESS	D 5994	mils	57	58	61	61	57		
			58	55	55	60	60	**58**	2.14
ASPERITY	D7466	mils	23	24	25	28	28		
HEIGHT	SIDE A		26	27	26	22	21	**25**	2.32
ASPERITY	D7466	mils	28	28	26	26	30		
HEIGHT	SIDE B		31	25	25	22	22	**26**	2.87
DENSITY	D 1505	g/cc	0.9472	0.9471	0.9471			**0.9471**	0.0001
CARBON BLACK CONTENT	D 4218	%	2.58	2.53				**2.55**	0.025
CARBON BLACK	D 5596	CATEGORY	1	1	1	1	1		
DISPERSION			1	1	1	1	1		
PUNCTURE	D 4833	lbs	143.2	142.6	150.9	137.6	140.6		
RESISTANCE			144.6	134.6	140.2	141.9	149.9		
			151.1	141.7	143.7	143.4	146.9	**143.5**	4.52
TEAR	D 1004	MD-lbs	56.1	55.7	54.0	53.9	56.2		
RESISTANCE			58.3	55.1	53.0	57.6	52.4	**55.2**	1.82
		CD-lbs	52.6	50.8	51.4	54.4	53.6		
			51.8	52.0	51.3	53.2	52.0	**52.3**	1.07
TENSILE PROPERTIES	D 6693								
STRENGTH AT YIELD		MD-ppi	152	156	148	160	154	**154**	4.13
		CD-ppi	153	152	154	165	151	**155**	5.10
STRENGTH AT BREAK		MD-ppi	205	215	182	168	201	**194**	17.16
		CD-ppi	207	180	184	140	191	**181**	22.28
ELONGATION AT YIELD		MD%	17	19	14	16	18	**17**	1.72
Lo = 1.3"		CD%	15	16	16	17	16	**16**	0.63
ELONGATION AT BREAK		MD%	600	640	520	450	580	**560**	66.45
Lo = 2.0"		CD%	620	560	570	430	590	**550**	65.30

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MANUFACTURERS CONFORMANCE TESTING

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

2690-D Salisbury Hwy
Statesville, NC 28677
P: 704.208.3440
www.ccsliners.com

SUBMITTAL COVER SHEET

DATE: 6/3/2021

SUBMITTAL NUMBER: 03 - Geomembrane MQC Certifications

PROJECT NUMBER:	I21-051
PROJECT NAME:	Athens Hocking Landfill Cell 30
ATTENTION TO:	Mark Ruof

OWNER: Kilbarger Construction	CONTRACTOR: Athens Hocking Landfill 17970 US-33 Nelsonville, OH 45764

MANUFACTURER: Solmax

SPEC. SECTION	SUBMITTAL ITEM DESCRIPTION
Cell 30	HDPE Manufacturer Submittals
N/A	Geomembrane MQC roll certifications with laboratory conformance test results

SUBCONTRACTOR REVIEW: *These are submitted as checked below:* For Approval: X For Your Use: _____ As Requested: _____ Signature of CCS Reviewer: Jennifer Battle	ENGINEER APPROVAL:

LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 21110

REFERENCE NUMBER: SO-001235

PACKING SLIP NUMBER: Pre-SO-001235-1

PROJECT NAME : STOCK

ROLL NUMBER	RESIN LOT NUMBER	MANUFACT. DATE	RESIN MELT INDEX 190/2.16 g/10 min D1238	RESIN DENSITY g/cc D1505	OIT min D3895	HPOIT min D5885	ESCR SP-NCTL hours D5397
Product Code : 1042790							
HDPE 60 mils Black Textured			**1.0**	**> 0.932**	**100**		**500**
1001-151225	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151226	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151227	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151228	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151229	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151230	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151231	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151233	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151235	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151237	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151238	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221
1001-151239	D661L3NL3C	2021-04-20	0.12	0.937	152		>500 Certified 1001-151221

Solmax International Inc.
2801 MARIE-VICTORIN,, VARENNES, QC, CANADA, J3X 0J4

MANUFACTURING QUALITY CONTROL

TEST RESULTS - ROLLS

PROJECT NUMBER: 21110

REFERENCE NUMBER: SO-001235

PACKING SLIP NUMBER: Pre-SO-001235-1

PROJECT NAME : STOCK

PRODUCT: 1042790
HDPE 60 mils Black Textured

CE Certificate = HD-60-TT-BB

Properties	Thickness ave/min.	GeoM Density	Carbon Black Content	Carbon Black Dispersion	Tensile Yield Strength	Tensile Yield Elong.	Tensile Break Strength	Tensile Break Elong.	Tear Resist.	Puncture Resist.	Dimension Stability	Asperity Height In/Out
Unit	mils	g/cc	%	Cat 1 and 2	ppi	%	ppi	%	lbs	lbs	%	mils
Test Method	D5994	D792	D4218	D5596	D6693				D1004	D4833	D1204	D7466
Frequency	Each roll	Every 10 rolls	Every 2 rolls	Every 10 rolls	Every 2 rolls				Every 5 rolls	Every 5 rolls		Every roll
Specification	57.0 / 51.0	≥ 0.940	2.0 - 3.0	Cat. 1 & Cat. 2	132	13	132	150	45	120		16 / 16
1001-151225 MD	59.5 / 57.3	0.946	2.46	10/10 views	158.6	16.0	206	565	57	146		19.0 / 19.4
XD					167.4	14.4	207	601	58			
1001-151226 MD	59.7 / 55.6	0.946	2.66	10/10 views	164.1	17.1	209	567	57	146		19.2 / 19.5
XD					167.7	17.1	194	568	58			
1001-151227 MD	58.1 / 53.9	0.946	2.66	10/10 views	164.1	17.1	209	567	57	146		18.5 / 18.4
XD					167.7	17.1	194	568	58			
1001-151228 MD	58.1 / 55.8	0.946	2.75	10/10 views	159.9	13.8	200	554	57	146		18.6 / 18.9
XD					157.6	16.4	190	567	58			
1001-151229 MD	58.3 / 55.5	0.947	2.75	10/10 views	159.9	13.8	200	554	53	136		18.8 / 19.2
XD					157.6	16.4	190	567	58			
1001-151230 MD	58.2 / 56.7	0.947	2.81	10/10 views	155.8	16.3	194	551	53	136		18.8 / 18.4
XD					156.9	16.4	180	538	58			
1001-151231 MD	57.9 / 55.1	0.947	2.81	10/10 views	155.8	16.3	194	551	53	136		19.2 / 18.5
XD					156.9	16.4	180	538	58			
1001-151233 MD	57.2 / 53.3	0.947	2.62	10/10 views	151.8	15.8	200	574	53	136		18.5 / 18.5
XD					156.3	16.6	186	571	58			
1001-151235 MD	57.8 / 56.6	0.947	2.62	10/10 views	151.8	15.8	200	574	53	136		19.3 / 19.4
XD					156.3	16.6	186	571	58			
[redacted]												
1001-151237 MD	57.4 / 55.5	0.948	2.76	10/10 views	154.6	14.1	191	537	53	142		18.8 / 18.8
XD					155.0	14.3	179	542	57			
1001-151238 MD	57.3 / 53.8	0.948	2.78	10/10 views	151.4	15.8	202	567	53	142		19.1 / 18.3
XD					161.5	15.1	177	526	57			
1001-151239 MD	57.4 / 53.9	0.948	2.78	10/10 views	151.4	15.8	202	567	53	142		19.2 / 19.5
XD					161.5	15.1	177	526	57			

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2801 RTE MARIE-VICTORIN RR 78
VARENNES QC J3X 1P7

Ship From: SEADRIFT
Texas, United States

Certificate of Analysis

Product Name

DOW™ DGDA-5310 NT MDPE GMB Resin

Delivery No.	820677099 / 000010
Order Number	112310484
Shipping Units	194649.998 LB
Date Shipped	2021-03-25 (YYYY-MM-DD)
Shipment No.	38586024

Customer Information

Customer Name	SOLMAX INTERNATIONAL INC
Customer PO number	1468-1
Container ID	CCBX073252
Specification Number	000000456148

Batch Number	D661L3NL3C
Manufacturing Date	2021-03-23 (YYYY-MM-DD)
Net Weight	194649.998 LB / 88291.682 KG

Test	Unit	Lower Limit	Upper Limit	Value	Method
Melt Flow Rate @190degC/21.6kg	**dg/min**	**9.0**	**12.0**	**10.4**	**ASTM D1238**
Melt Flow Ratio I21.6/I5.0		**20.0**	**40.0**	**26.7**	**ASTM D1238**
Density ASTM D4703, A1 Proc C, Test within 1 hr	**g/cm3**	**0.9350**	**0.9390**	**0.9370**	**ASTM D792**

For inquiries please contact Customer Service or local sales

SOLMAX

Chesapeake Containment Systems,Inc.
2690 D Salisbury Highway
Statesville, NC,28677
USA

Canada, May 10, 2021

Project Name:	Stock
Customer PO:	21110
Solmax Order:	SO-001235
ATTN:	Jennifer Battle

To whom it may concern,

Solmax International hereby certifies that 1042790 (*HDPE 60mils Black Textured*) geomembrane supplied for the above-mentioned project complies with the project's specifications.

- Oven aging

(% retained after 90 days)		ASTM D5721
OIT (min.avg)	ASTM D3895	55 %
HPOIT (min.avg)	ASTM D5885	80 %

- UV resistance

(% retained after 1,600 hrs)	GRI-GM11/ASTM D7238	
HP OIT (min.avg)	ASTM D5885	50 %

You will find attached test report on roll produced using the same resin formulation that has been used to manufacture the above product.

Hoping the above information is satisfactory. Please, do not hesitate to contact us if you require any additional information.

Sincerely,

CLAUDE CORMIER
Coordonnateur qualité | Quality Coordinator

T +1 (450) 929-1234

SOLMAX INTERNATIONAL INC.
2801 RTE MARIE-VICTORIN | VARENNES QC, CANADA J3X 0J4

SOLMAX.COM

SOLMAX

GEOMEMBRANE TEST RESULTS

GAI LAP Accreditation No.: 51-05

Technical Department - Canada

Date Certification: 2020-10-05

Report No.: HD76-02 - 2020

Identification:

Type of Material :	**HDPE**	Formulation :	**HD76-02**
Roll Number:	**1001-146135**	Resin Type :	**DOW DGDA-5310**
Production Date :	**2020-02-11**	Lot Number :	**D661JAL3D**

Oxidative Induction Time (ASTM D3895)

	Individual Data			Avg.	S.D.	% CV
OIT (minutes)	144	151		148	5	3.4

High Pressure Oxidative Induction Time (ASTM D5885)

	Individual Data			Avg.	S.D.	% CV
HP OIT (minutes)	359	355		357	3	0.7

UV Resistance (ASTM D7238)

- The resistance to degradation was determined in accordance with ASTM D7238 ;
- Apparatus used : Q-PANEL QUV/se - Lamp: UVA-340;
- Duration of the test: 1600 hours of UV exposure (total of 1920h);
- Cycle : 80 cycles of UVA (20h of light at 75°C followed by 4h of condensation at 60°C)

	Individual Data			Avg.	S.D.	% CV
HP OIT (minutes) : ASTM D5885 - Initial	359	355		357	3	0.7
HP OIT (minutes) : ASTM D5885 - After 1600h of UV	217	215		216	1	0.7

PERCENTAGE RETAINED: **60 %**

Note: No visual change after 1600 hrs

Air-Oven Aging (ASTM D5721)

- The resistance to degradation was determined in accordance with ASTM D5721;
- Duration of the test: The geomembrane was exposed to 90 days in an air oven maintened at 85°C ± 0.5°C;
- Rotation of the exposed specimens : once per week

	Individual Data			Avg.	S.D.	% CV
OIT (minutes) : ASTM D3895 - Initial	144	151		148	5	3.4
OIT (minutes) : ASTM D3895 - After 90 days of Oven Aging	74	71		73	2	2.9

PERCENTAGE RETAINED: **49 %**

	Individual Data			Avg.	S.D.	% CV
HP OIT (minutes) : ASTM D5885 - Initial	359	355		357	3	0.7
HP OIT (minutes) : ASTM D5885 - After 90 days of Oven Aging	294	283		289	8	2.7

PERCENTAGE RETAINED: **81 %**

Note: No visual change after 90 days

The tests were performed by Solmax International. The laboratories of Solmax International are accredited by the GRI.

Simon Gilbert St-Pierre, P.Eng.
Technical Services

DOW CHEMICAL CANADA ULC

SOLMAX INTERNATIONAL INC
2801 RTE MARIE-VICTORIN RR 78
VARENNES QC J3X 1P7

Ship From: SEADRIFT
Texas, United States

Certificate of Analysis

Product Name

DOW™ DGDA-5310 NT MDPE GMB Resin

Delivery No.	817174116 / 000010
Order Number	110418261
Shipping Units	195899.998 LB
Date Shipped	2019-10-31 (YYYY-MM-DD)
Shipment No.	35598978

Customer Information

Customer Name	SOLMAX INTERNATIONAL INC
Customer PO number	118482-3
Container ID	DOWX068347
Specification Number	000000456148

Batch Number	D661JASL3D
Manufacturing Date	2019-10-28 (YYYY-MM-DD)
Net Weight	195899.998 LB / 88858.672 KG

Test	Unit	Lower Limit	Upper Limit	Value	Method
Melt Flow Rate @190degC/21.6kg	**dg/min**	**9.0**	**12.0**	**11.2**	**ASTM D1238**
Melt Flow Ratio I21.6/I5.0		**20.0**	**40.0**	**26.1**	**ASTM D1238**
Density ASTM D4703, A1 Proc C, Test within 1 hr	**g/cm3**	**0.9350**	**0.9390**	**0.9371**	**ASTM D792**

For inquiries please contact Customer Service or local sales

QUALITY CONTROL REPORT

ROLL CERTIFICATION

ROLL IDENTIFICATION

ROLL NUMBER: 1001-146135

PACKING SLIP NUMBER:

PRODUCT CODE: 1037703 HDPE 1.50 mm Black Smooth

PRODUCTION DATE: 11 Feb 2020

LENGTH(± 1%) : 158.50 m

WIDTH: 6.80 m

SHEET AREA: 1,077.8 sqmt

WEIGHT : 1,605 kg

RESIN INFORMATION

RESIN LOT NUMBER : D661JASL3D

RESIN TYPE: HDPE Dow DGDA-5310

RESIN SUPPLIER: DOW CHEMICAL CANADA

PROPERTY	TEST METHOD	RESULTS
Density (g/cc)	ASTM D 1505	0.937
Melt Index (g/10 min.)	ASTM D 1238 (190/2.16)	0.07
ESCR (hrs)	ASTM D 5397	> 500
OIT (min.)	ASTM D 3895	148
HP-OIT (min.)	ASTM D 5885	

PHYSICAL PROPERTY			TEST METHOD	TEST FREQUENCY	TECHNICAL DATA	TEST RESULTS
THICKNESS(MM)	Average		ASTM D5199	Every roll	1.50	1.56
	Minimum				1.35	1.46
ASPERITY(MM)	Average(In/Out)					
TENSILE PROPERTIES			ASTM D6693	Every 2 rolls		
Yield strength	KN/m	TD			23	27.8
		MD				26.5
Yield elongation	(%)	TD			13	17.1
		MD				19.5
Break strength	KN/m	TD			43	58.8
		MD				56.2
Break elongation	(%)	TD			700	972
		MD				887
TEAR RESISTANCE (N)		TD	ASTM D1004	Every 5 rolls	187	220
		MD				209
PUNCTURE RESISTANCE(N)			ASTM D4833	Every 5 rolls	534	591
DENSITY (G/CC)			ASTM D792	Every 10 rolls	≥ 0.940	0.949
CARBON BLACK CONTENT(%)			ASTM D4218	Every 2 rolls	2.0 - 3.0	2.57
CARBON BLACK DISPERSION			ASTM D5596	Every 10 rolls	Cat. 1 / Cat. 2	10
DIMENSIONAL STABILITY (%)		TD				
		MD				

SOLMAX APPROVED QUALITY ASSURANCE

Solmax International Inc.

2801 MARIE-VICTORIN,, VARENNES, QC, CANADA, J3X 0J4

SOLMAX.COM

APPENDIX C
SECTION 2
INTERFACE STRENGTH TESTING

60-MIL HDPE TO RECOMPACTED SOIL LINER

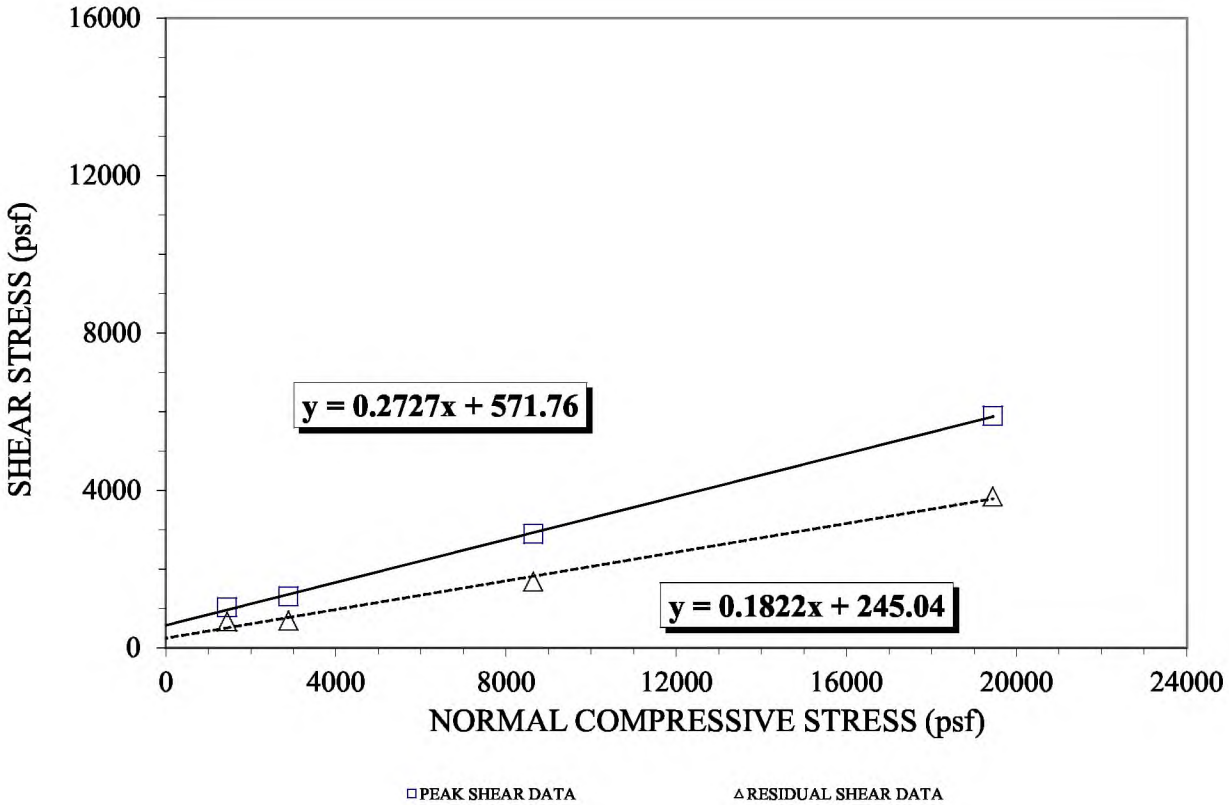
INTERFACE FRICTION TEST RESULTS
ASTM D 5321

CLIENT : Kilbarger Construction, Inc.
CLIENT PROJECT : Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO. : L21-109-002
LAB I. D. NO.: Recompacted Soil, (L21-109-002-001)
GSE Textured 60 mil HDPE Geomembrane, Roll # 1001-151238 (L21-109-002-002)

INTERFACE : **Recompacted Soil @ 114.9 pcf & 15.4% M.C.**
vs. 60 mil Textured HDPE (Bottom Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	15.3	Φ =	10.3
COEFFICIENT OF FRICTION :	=	0.273	=	0.182
ADHESION [Calculated] (psf):	a =	572	a =	245

NOTES:
1.) Soil placement was based upon 95% of the maximum dry density and a moisture content +4% of the optimum.
2.) The interface was loaded & seated for 24 hours prior to shearing.
3.) The peak friction angle was calculated using linear regression on the four data points.
4.) The residual friction angle was calculated using linear regression on the end of test values.



APPROVED BY : RO DATE : 6/30/2021

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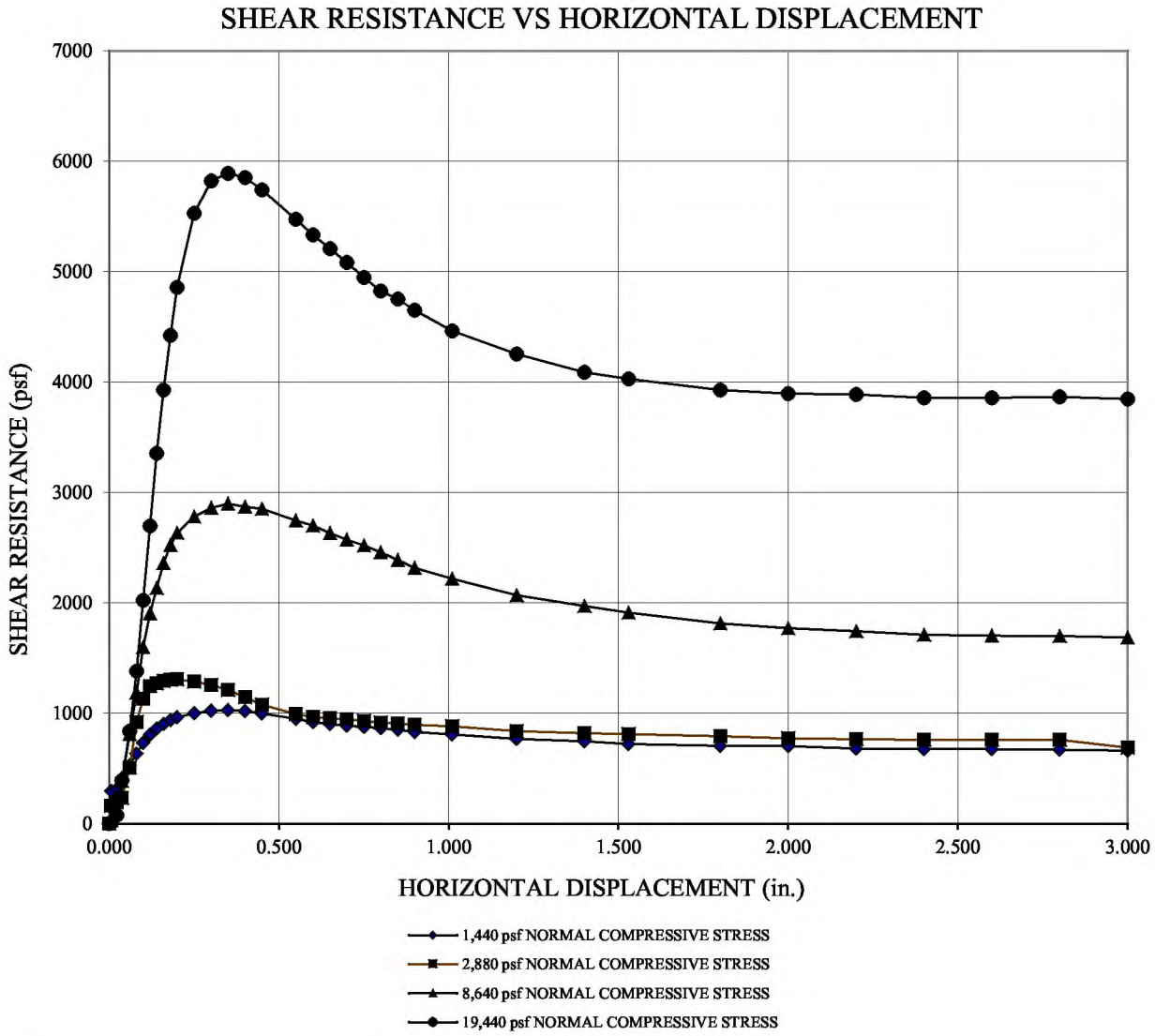
INTERFACE FRICTION TEST RESULTS
ASTM D 5321

CLIENT : Kilbarger Construction, Inc.
CLIENT PROJECT : Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO. : L21-109-002
LAB I. D. NO.: Recompacted Soil, (L21-109-002-001)
GSE Textured 60 mil HDPE Geomembrane, Roll # 1001-151238 (L21-109-002-002)

INTERFACE : **Recompacted Soil @ 114.9 pcf & 15.4% M.C.**
vs. 60 mil Textured HDPE (Bottom Side)



APPROVED BY : RO DATE : 6/30/2021

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INTERFACE FRICTION TEST RESULTS
ASTM D 5321

CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO. : L21-109-002
MATERIALS: Recompacted Soil, (L21-109-002-001)
GSE Textured 60 mil HDPE Geomembrane, Roll # 1001-151238 (L21-109-002-002)

INTERFACE: **Recompacted Soil @ 114.9 pcf & 15.4% M.C.**
vs. 60 mil Textured HDPE (Bottom Side)

STRAIN RATE (in / min) : 0.04
DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Dry
NORMAL LOAD: Bladder System

NORMAL LOAD (psf)	2880	NORMAL LOAD (psf)	8640	NORMAL LOAD (psf)	19440
PEAK SHEAR STRESS (psf)	1307	PEAK SHEAR STRESS (psf)	2897	PEAK SHEAR STRESS (psf)	5890
PEAK SECANT ANGLE (deg)	24.4	PEAK SECANT ANGLE (deg)	18.5	PEAK SECANT ANGLE (deg)	16.9
RESIDUAL SHEAR (psf)	689	RESIDUAL SHEAR (psf)	1685	RESIDUAL SHEAR (psf)	3847
RESID. SECANT ANGLE (deg)	13.5	RESID. SECANT ANGLE (deg)	11.0	RESID. SECANT ANGLE (deg)	11.2
ASPERITY	24	ASPERITY	25	ASPERITY	25

HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	162	162	0.005	27	27	0.005	5	5
0.023	194	194	0.023	107	107	0.023	77	77
0.038	233	233	0.038	388	388	0.038	391	391
0.060	505	505	0.060	812	812	0.060	839	839
0.080	920	920	0.080	1185	1185	0.080	1380	1380
0.100	1131	1131	0.100	1599	1599	0.100	2023	2023
0.120	1246	1246	0.120	1902	1902	0.120	2697	2697
0.140	1269	1269	0.140	2135	2135	0.140	3355	3355
0.160	1292	1292	0.160	2359	2359	0.160	3928	3928
0.180	1303	1303	0.180	2522	2522	0.180	4423	4423
0.200	1307	1307	0.200	2634	2634	0.200	4857	4857
0.250	1287	1287	0.250	2780	2780	0.250	5529	5529
0.300	1257	1257	0.300	2859	2859	0.300	5820	5820
0.350	1211	1211	0.350	2897	2897	0.350	5890	5890
0.400	1145	1145	0.400	2871	2871	0.400	5852	5852
0.450	1076	1076	0.450	2850	2850	0.450	5739	5739
0.550	991	991	0.550	2745	2745	0.550	5474	5474
0.600	966	966	0.600	2700	2700	0.600	5333	5333
0.650	954	954	0.650	2632	2632	0.650	5206	5206
0.700	944	944	0.700	2572	2572	0.700	5081	5081
0.750	930	930	0.750	2520	2520	0.750	4946	4946
0.800	913	913	0.800	2458	2458	0.800	4823	4823
0.850	906	906	0.850	2388	2388	0.850	4752	4752
0.900	894	894	0.900	2317	2317	0.900	4649	4649
1.010	882	882	1.010	2219	2219	1.010	4463	4463
1.200	837	837	1.200	2068	2068	1.200	4254	4254
1.400	819	819	1.400	1971	1971	1.400	4087	4087
1.530	809	809	1.530	1910	1910	1.530	4029	4029
1.800	793	793	1.800	1814	1814	1.800	3927	3927
2.000	772	772	2.000	1769	1769	2.000	3895	3895
2.200	765	765	2.200	1742	1742	2.200	3887	3887
2.400	759	759	2.400	1710	1710	2.400	3857	3857
2.600	760	760	2.600	1703	1703	2.600	3858	3858
2.800	758	758	2.800	1700	1700	2.800	3865	3865
3.000	689	689	3.000	1685	1685	3.000	3847	3847

APPROVED BY : RO DATE : 6/30/2021

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INTERFACE FRICTION TEST RESULTS

ASTM D 5321

CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO. : L21-109-002
MATERIALS: Recompacted Soil, (L21-109-002-001)
GSE Textured 60 mil HDPE Geomembrane, Roll # 1001-151238 (L21-109-002-002)

INTERFACE: **Recompacted Soil @ 114.9 pcf & 15.4% M.C.**
vs. 60 mil Textured HDPE (Bottom Side)

STRAIN RATE (in / min) : 0.04
PLACEMENT CONDITION: Dry

DIRECT SHEAR UNIT: Durham Geo
NORMAL LOAD: Bladder System

NORMAL LOAD (psf)	1440
PEAK SHEAR STRESS (psf)	1029
PEAK SECANT ANGLE (deg)	35.5
RESIDUAL SHEAR (psf)	662
RESID. SECANT ANGLE (deg)	24.7
ASPERITY	23

HORIZONTAL

DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0
0.005	297	297
0.023	317	317
0.038	412	412
0.060	532	532
0.080	635	635
0.100	732	732
0.120	805	805
0.140	863	863
0.160	904	904
0.180	938	938
0.200	963	963
0.250	1000	1000
0.300	1022	1022
0.350	1029	1029
0.400	1021	1021
0.450	999	999
0.550	950	950
0.600	920	920
0.650	902	902
0.700	888	888
0.750	875	875
0.800	864	864
0.850	851	851
0.900	830	830
1.010	809	809
1.200	768	768
1.400	746	746
1.530	722	722
1.800	706	706
2.000	701	701
2.200	681	681
2.400	674	674
2.600	675	675
2.800	669	669
3.000	662	662

APPROVED BY : RO DATE : 6/30/2021

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June 24, 2021

Project No. 2021-382-001

Mr. Mark Ruof
The Mark James Corporation
255 South Liberty Street
Powell, OH 43065

Transmittal
Laboratory Test Results
AHRC Cell #30

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

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

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

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

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

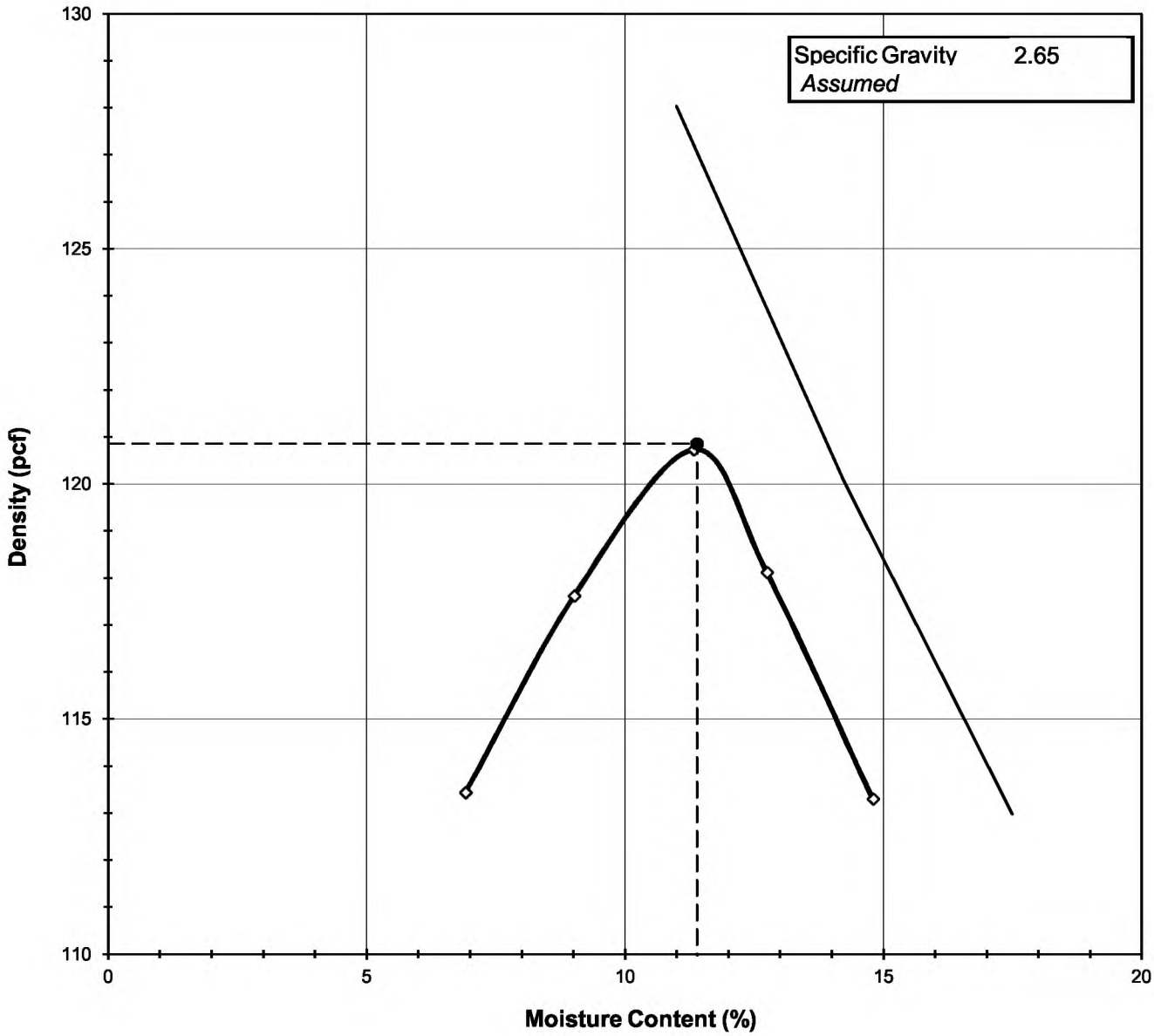
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	The Mark James Corp.	Boring No.:	NA
Client Reference:	AHRC Cell #30	Depth (ft):	NA
Project No.:	2021-382-001	Sample No.:	Soil
Lab ID:	2021-382-001-001	Test Method	**STANDARD**

Visual Description: Gray Clay with Rocks

Optimum Moisture Content (%): 11.4
Maximum Dry Density (pcf): 120.9



Tested By NR *Date* 6/23/21 *Checked By* JLK *Date* 6/24/21

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	The Mark James Corp.	Boring No.:	NA
Client Reference:	AHRC Cell #30	Depth (ft):	NA
Project No.:	2021-382-001	Sample No.:	Soil
Lab ID:	2021-382-001-001		

Visual Description: Gray Clay with Rocks

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.65
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G1916
Mold ID:	G1775
Mold diameter:	6"
Weight of the Mold (g):	5661
Volume of the Mold (cm^3):	2130

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9801	10038	10249	10207	10101
Weight of Mold (g):	5661	5661	5661	5661	5661
Weight of Wet Sample (g):	4140	4377	4588	4546	4440
Mold Volume (cm^3):	2130	2130	2130	2130	2130

Moisture Content / Density

Tare Number:	1122	878	1724	1723	912
Weight of Tare & Wet Sample (g):	501.24	503.27	510.45	490.76	538.74
Weight of Tare & Dry Sample (g):	474.23	470.72	466.87	444.61	483.47
Weight of Tare (g):	83.82	109.90	82.33	82.69	110.14
Weight of Water (g):	27.01	32.55	43.58	46.15	55.27
Weight of Dry Sample (g):	390.41	360.82	384.54	361.92	373.33

Wet Density (g/cm^3):	1.94	2.05	2.15	2.13	2.08
Wet Density (pcf):	121.3	128.2	134.4	133.2	130.1
Moisture Content (%):	**6.9**	**9.0**	**11.3**	**12.8**	**14.8**
Dry Density (pcf):	**113.4**	**117.6**	**120.7**	**118.1**	**113.3**

Zero Air Voids

Moisture Content (%):	11.0	14.3	17.5
Dry Unit Weight (pcf):	128.0	120.0	113.0

Tested By NR *Date* 6/23/21 *Checked By* JLK *Date* 6/24/21

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APPENDIX C
SECTION 3
GEOCOMPOSITE – DOUBLE SIDED

MANUFACTURERS CONFORMANCE TESTING

CHESAPEAKE CONTAINMENT SYSTEMS, INC.

2690-D Salisbury Hwy
Statesville, NC 28677
P: 704.208.3440
www.ccsliners.com

SUBMITTAL COVER SHEET

DATE: 6/22/2021

SUBMITTAL NUMBER: 04 - Geocomposite MQC Certifications

PROJECT NUMBER:	I21-051
PROJECT NAME:	Athens Hocking Landfill Cell 30
ATTENTION TO:	Mark Ruof

OWNER: Kilbarger Construction	CONTRACTOR: Athens Hocking Landfill 17970 US-33 Nelsonville, OH 45764

MANUFACTURER: Skaps Industries

SPEC. SECTION	SUBMITTAL ITEM DESCRIPTION
Cell 30	Geocomposite Manufacturer Submittals
N/A	Geocomposite MQC Roll Certifications

SUBCONTRACTOR REVIEW: *These are submitted as checked below:* For Approval: X For Your Use: _____ As Requested: _____ Signature of CCS Reviewer: Jennifer Battle	ENGINEER APPROVAL:

June 18, 2021
Chesapeake Containment Systems, Inc.
2690 D Salisbury Highway
Statesville, NC, 28677

Ref. : Athens Hocking LF Cell 30 & Cap #4, OH
Customer P.O. # 21118
Product : TN 330-2-8

We hereby certify that the TN 330-2-8 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	300	MAV[6]
Carbon Black	ASTM D 4218	%	2.0 - 3.0	Range
Tensile Strength	ASTM D 7179	lbs/in	55	MAV
Melt Flow	ASTM D 1238[2]	g/10 min	1.0	Maximum
Density	ASTM D 1505	g/cm^3	0.94	MAV
Composite				
Ply Adhesion	ASTM D 7005	lb/in	1.0	MAV
Transmissivity[1a]	ASTM D 4716	m^2/sec	1.70×10^{-4}	MAV
Transmissivity[1b]	ASTM D 4716	m^2/sec	3.36×10^{-6}	MAV
Geotextile[3 & 4]				
Fabric Weight	ASTM D 5261	oz/yd^2	8.0	MARV[5]
Grab Strength	ASTM D 4632	lbs	200	MARV
Grab Elongation	ASTM D 4632	%	50	MARV
Trap Tear Strength	ASTM D 4533	lbs	80	MARV
CBR Puncture	ASTM D 6241	lbs	575	MARV
Permittivity	ASTM D 4491	sec^{-1}	1.20	MARV
AOS	ASTM D 4751	US Sieve	80	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 0.025 and a confining pressure of 17,800 psf between sand & 60mil HDPE textured geomembrane after 100 hours.*
1b. *Transmissivity measured using water at 21 ± 2 ° C (70 ± 4 ° F) with a gradient of 0.33 and a confining pressure of 17,800 psf between sand & 60mil HDPE textured geomembrane after 100 hours.*
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 330-2-8
Project : Athens Hocking LF Cell 30 & Cap #4, OH

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"							
106911010001	3.12	2.86		MULX 200397	0.9556	328	2.23	110	
106911010002				MULX 200397	0.9556				
106911010003				MULX 200397	0.9556				
106911010004				MULX 200397	0.9556				
106911010005				MULX 200397	0.9556				
106911010006				MULX 200397	0.9556				
106911010007				MULX 200397	0.9556				
106911010008				MULX 200397	0.9556				
106911010009				MULX 200397	0.9556				
106911010010				MULX 200397	0.9556				
106911010011				MULX 200397	0.9556				
106911010012				MULX 200397	0.9556				
106911010013				MULX 200397	0.9556				
106911010014				MULX 200397	0.9556				
106911010015				MULX 200397	0.9556				
106911010016				MULX 200397	0.9556				
106911010017				MULX 200397	0.9556				
106911010018				MULX 200397	0.9556				
106911010019				MULX 200397	0.9556				
106911010020	4.11	2.48		MULX 200397	0.9552	330	2.38	112	
106911010021				MULX 200397	0.9552				
106911010022				MULX 200397	0.9552				
106911010023				MULX 200397	0.9552				
106911010024				MULX 200397	0.9552				

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

Product: TN 330-2-8
Project : Athens Hocking LF Cell 30 & Cap #4, OH

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"							
106911010025				MULX 200397	0.9552				
106911010026				MULX 200397	0.9552				
106911010027				MULX 200397	0.9552				
106911010028				MULX 200397	0.9552				
106911010029				MULX 200397	0.9552				
106911010030				MULX 200397	0.9552				
106911010031				MULX 200397	0.9552				
106911010032				MULX 200397	0.9552				
106911010033				MULX 200397	0.9552				
106911010034				MULX 200397	0.9552				
106911010035				MULX 200397	0.9552				
106911010036				MULX 200397	0.9552				
106911010037				MULX 200397	0.9552				
106911010038				MULX 200397	0.9552				
106911010039				MULX 200397	0.9552				
106911010040	3.76	2.89		MULX 200397	0.9555	336	2.27	114	
106911010041				MULX 200397	0.9555				
106911010042				MULX 200397	0.9555				
106911010043				MULX 200397	0.9555				
106911010044				MULX 200397	0.9555				
106911010045				MULX 200397	0.9555				
106911010046				MULX 200397	0.9555				
106911010047				MULX 200397	0.9555				
106911010048				MULX 200397	0.9555				

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Product: TN 330-2-8
Project : Athens Hocking LF Cell 30 & Cap #4, OH

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"							
106911010049				MULX 200397	0.9555				
106911010050				MULX 200397	0.9555				
106911010051				MULX 200397	0.9555				
106911010052				MULX 200397	0.9555				
106911010053				MULX 200397	0.9555				
106911010054				MULX 200397	0.9555				
106911010055				MULX 200397	0.9555				
106911010056				MULX 200397	0.9555				
106911010057				MULX 200397	0.9555				
106911010058				MULX 200397	0.9555				
106911010059				MULX 200397	0.9555				
106911010060	2.11	4.11		MULX 200397	0.9557	331	2.29	117	

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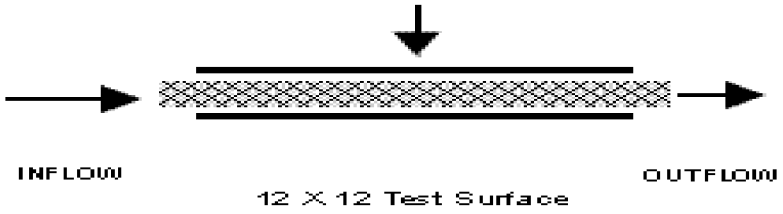
ASTM D 4716
Geocomposite Transmissivity Test

Client:	Chesapeake Containment Systems, Inc.	**Job #:**	10691
Project:	Athens Hocking LF Cell 30 & Cap #4, OH		
Product:	TN 330-2-8		

Test Configuration:



Test Information:

Boundary Conditions:	Sand Geocomposite 60 Mil HDPE Textured Geomembrane	**Normal Load:**	17,800
		Gradient:	0.025
		Seating Time:	100 Hours
		Flow Direction:	MD

Test Results:

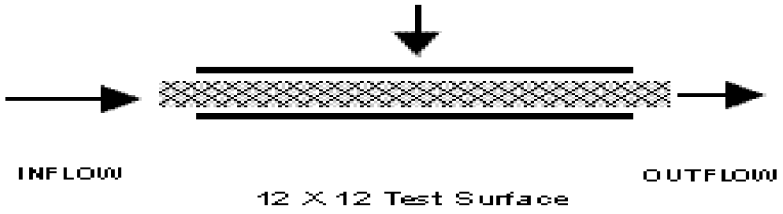
Roll No.	Pressure, psf	Gradient	Transmissivity, m^2/sec
			100 Hours
106911010001	17,800	0.025	7.83×10^{-4}

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

ASTM D 4716
Geocomposite Transmissivity Test

Client:	Chesapeake Containment Systems, Inc.	**Job #:**	10691
Project:	Athens Hocking LF Cell 30 & Cap #4, OH		
Product:	TN 330-2-8		

Test Configuration:



Test Information:

Boundary Conditions:	Sand Geocomposite 60 Mil HDPE Textured Geomembrane	**Normal Load:**	17,800
		Gradient:	0.33
		Seating Time:	100 Hours
		Flow Direction:	MD

Test Results:

Roll No.	Pressure, psf	Gradient	Transmissivity, m^2/sec
			100 Hours
106911010001	17,800	0.33	1.34×10^{-4}

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

POLYETHYLENE RESIN CERTIFICATION

Customer Name : Chesapeake Containment Systems, Inc.
Project Name : Athens Hocking LF Cell 30 & Cap #4, OH
Geocomposite Manufacturer : SKAPS Industries
Geocomposite Production Plant : Commerce, GA
Geocomposite Brand Name : TN 330-2-8

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*
Osterman and Company	MULX 200397	Density	ASTM D1505	g/cm^3	0.9510	0.9504
		Melt flow Index	ASTM D1238[(a)]	g/10 min	0.30	0.27

(a) Condition 190/2.16

* Data from SKAPS Quality Control

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Geotextile Certification

Product: TN 330-2-8
Project : Athens Hocking LF Cell 30 & Cap #4, OH

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}
106911010001	Side A	8.39	232	65	240	85	105	107	736	80	1.39
	Side B	8.58	235	67	243	77	100	114	663	80	1.39
106911010040	Side A	8.52	234	68	242	79	103	116	694	80	1.39
	Side B	8.11	227	72	237	81	96	112	671	80	1.39

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OWNERS CONFORMANCE TESTING

CONFORMANCE TEST RESULTS

CLIENT: Kilbarger Construction, Inc.
CLIENT PROJECT: Athens-Hocking Reclamation Center LF - Cell #30
PROJECT NO.: L21-109-001
LAB ID NO.: L21-109-001-001
MATERIAL: SKAPS TN 330-2-8 Geocomposite
ROLL NO: 106911010002

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
THICKNESS	D 5199	mils	410 420	430 420	440 430	430 430	420 420	**425**	8.0623
PLY ADHESION	D 7005								
	SIDE "A"	MD-lb/in	12.9	15.1	7.4	8.4	4.7	**9.68**	3.795
	SIDE"B"	MD-lb/in	13.0	12.3	6.4	8.1	5.1	**8.96**	3.129

CHECKED BY: JLK DATE: 7/8/2021

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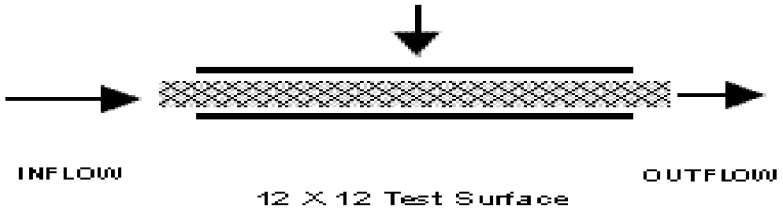
ASTM D 4716
Geocomposite Transmissivity Test

Client:	Chesapeake Containment Systems, Inc.	**Job #:**	10691
Project:	Athens Hocking LF Cell 30 & Cap #4, OH		
Product:	TN 330-2-8		

Test Configuration:



Test Information:

Boundary Conditions:	Sand Geocomposite 60 Mil HDPE Textured Geomembrane	**Normal Load:**	17,800
		Gradient:	0.025
		Seating Time:	100 Hours
		Flow Direction:	MD

Test Results:

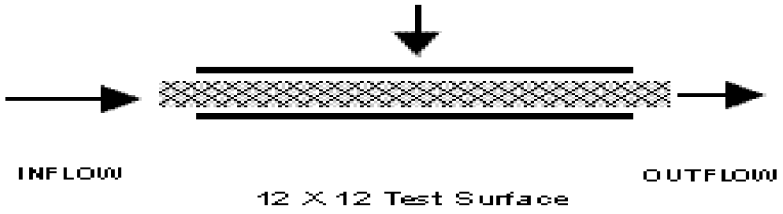
Roll No.	Pressure, psf	Gradient	Transmissivity, m^2/sec
			100 Hours
106911010001	17,800	0.025	7.83×10^{-4}

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

ASTM D 4716
Geocomposite Transmissivity Test

Client:	Chesapeake Containment Systems, Inc.	**Job #:**	10691
Project:	Athens Hocking LF Cell 30 & Cap #4, OH		
Product:	TN 330-2-8		

Test Configuration:



Test Information:

Boundary Conditions:	Sand Geocomposite 60 Mil HDPE Textured Geomembrane	**Normal Load:**	17,800
		Gradient:	0.33
		Seating Time:	100 Hours
		Flow Direction:	MD

Test Results:

Roll No.	Pressure, psf	Gradient	Transmissivity, m^2/sec
			100 Hours
106911010001	17,800	0.33	1.34×10^{-4}

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

TRANSMISSIVITY TEST RESULTS

ASTM D 4716

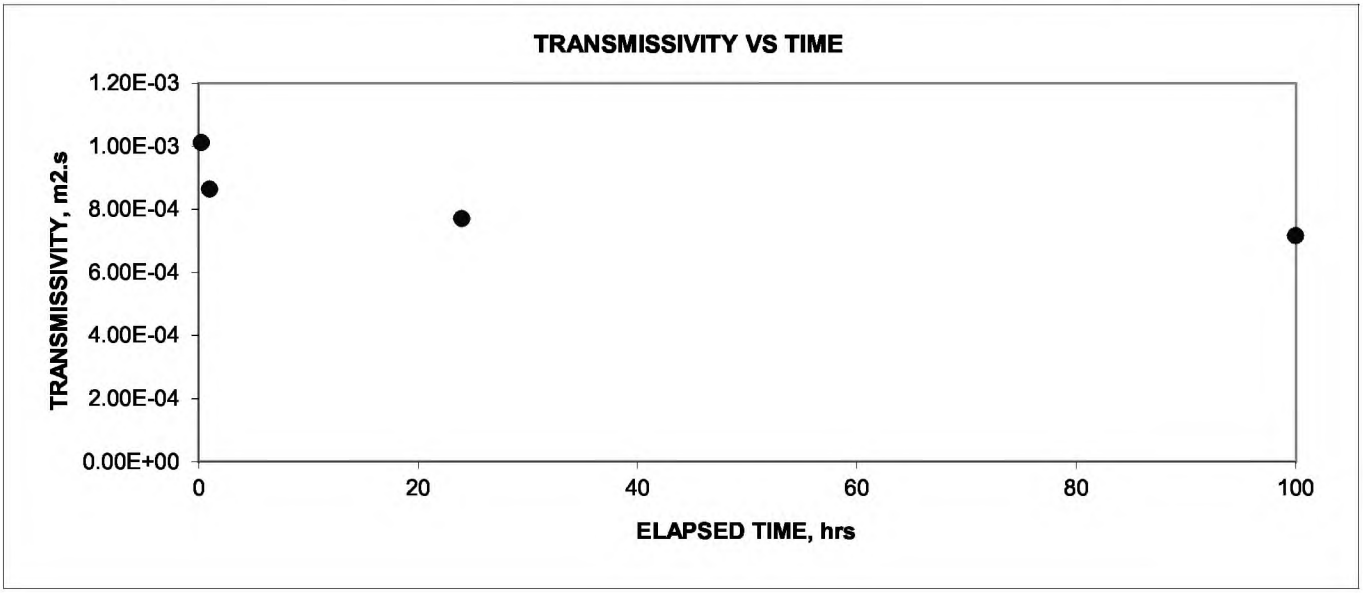
CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF -Cell 30
MATERIAL: SKAPS TN 330-2-8 Geocomposite

PROJECT NO.: L21-109-001
LAB I.D. NO.: L21-109-001-001
SAMPLE NO.: 0
REPLICATE NO.: 1 of 1

TEST SECTION: Ottawa Sand
Geocomposite
60 mil Textured HDPE

18,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.90	0.60	0.025	960 960 960	120 120 120	20.4	2.53E-02	0.122	1.01E-03
1	0.90	0.60	0.025	820 820 820	120 120 120	20.4	2.16E-02	0.104	8.64E-04
24	0.90	0.60	0.025	730 730 730	120 120 120	20.3	1.93E-02	0.093	7.71E-04
100	0.90	0.60	0.025	680 680 680	120 120 120	20.4	1.79E-02	0.087	7.17E-04



CHECKED BY: JLK DATE: 6/25/21

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TRANSMISSIVITY TEST RESULTS

ASTM D 4716

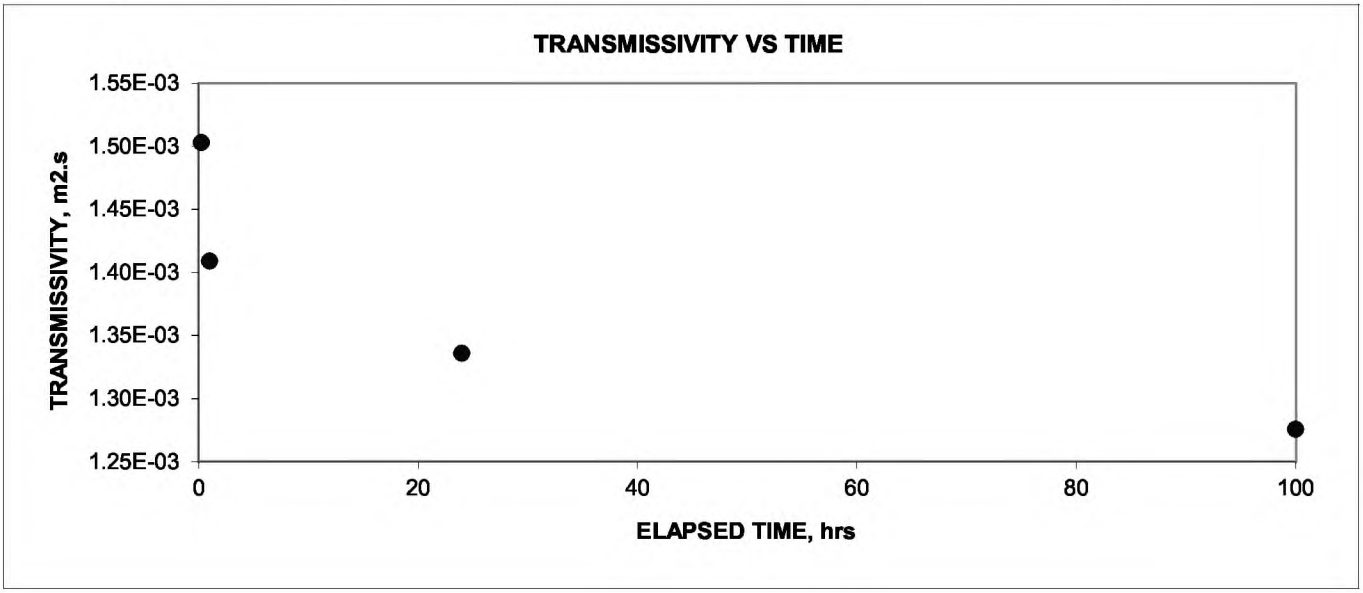
CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF -Cell 30
MATERIAL: SKAPS TN 330-2-8 Geocomposite

PROJECT NO.: L21-109-001
LAB I.D. NO.: L21-109-001-001
ROLL NO.: 106911010002
REPLICATE NO.: 1 of 1

TEST SECTION: Ottawa Sand
Geocomposite
60 mil Textured HDPE

6,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.55	0.25	0.025	1080 1080 1080	90 90 90	20.8	3.76E-02	0.182	1.50E-03
1	0.55	0.25	0.025	1010 1010 1010	90 90 90	20.7	3.52E-02	0.170	1.41E-03
24	0.55	0.25	0.025	960 960 960	90 90 90	20.8	3.34E-02	0.161	1.34E-03
100	0.55	0.25	0.025	910 910 910	90 90 90	20.5	3.19E-02	0.154	1.28E-03



CHECKED BY: JLK DATE: 7/8/21

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TRANSMISSIVITY TEST RESULTS

ASTM D 4716

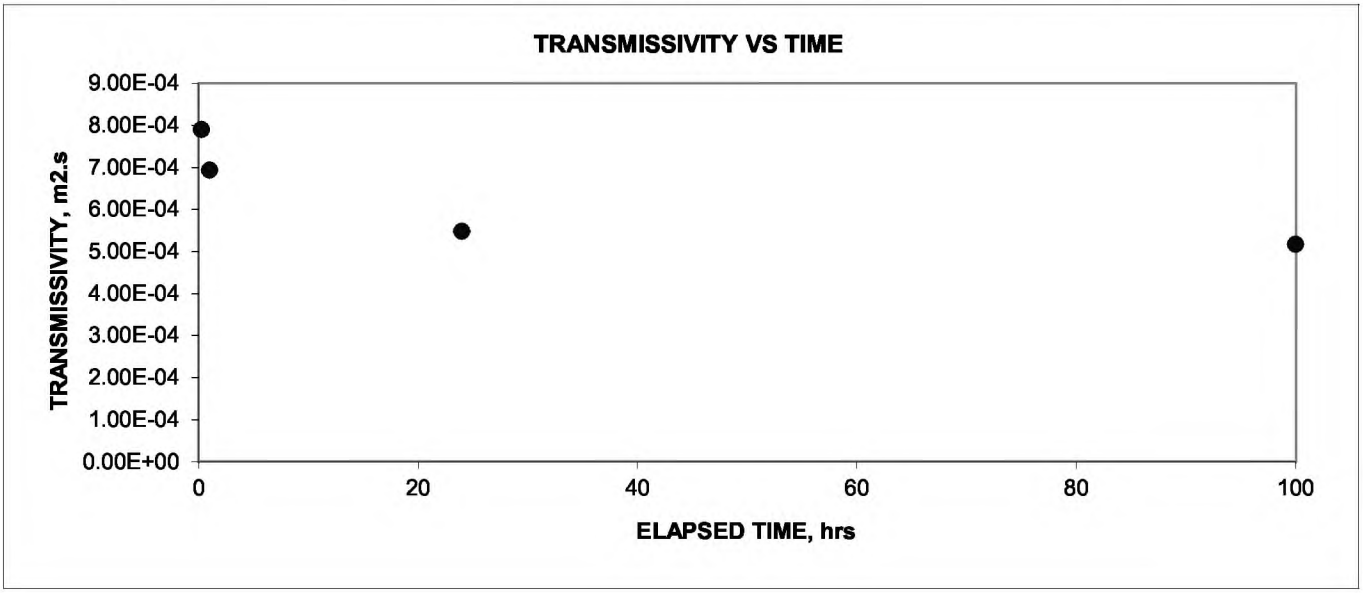
CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF -Cell 30
MATERIAL: SKAPS TN 330-2-8 Geocomposite

PROJECT NO.: L21-109-001
LAB I.D. NO.: L21-109-001-002
ROLL NO.: 106911010023
REPLICATE NO.: 1 of 1

TEST SECTION: Ottawa Sand
Geocomposite
60 mil Textured HDPE

18,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.55	0.25	0.025	750 750 750	120 120 120	20.4	1.98E-02	0.095	7.91E-04
1	0.55	0.25	0.025	660 660 660	120 120 120	20.5	1.74E-02	0.084	6.94E-04
24	0.55	0.25	0.025	780 780 780	180 180 180	20.4	1.37E-02	0.066	5.48E-04
100	0.55	0.25	0.025	740 740 740	180 180 180	20.6	1.29E-02	0.063	5.17E-04



CHECKED BY: JLK DATE: 7/7/21

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TRANSMISSIVITY TEST RESULTS

ASTM D 4716

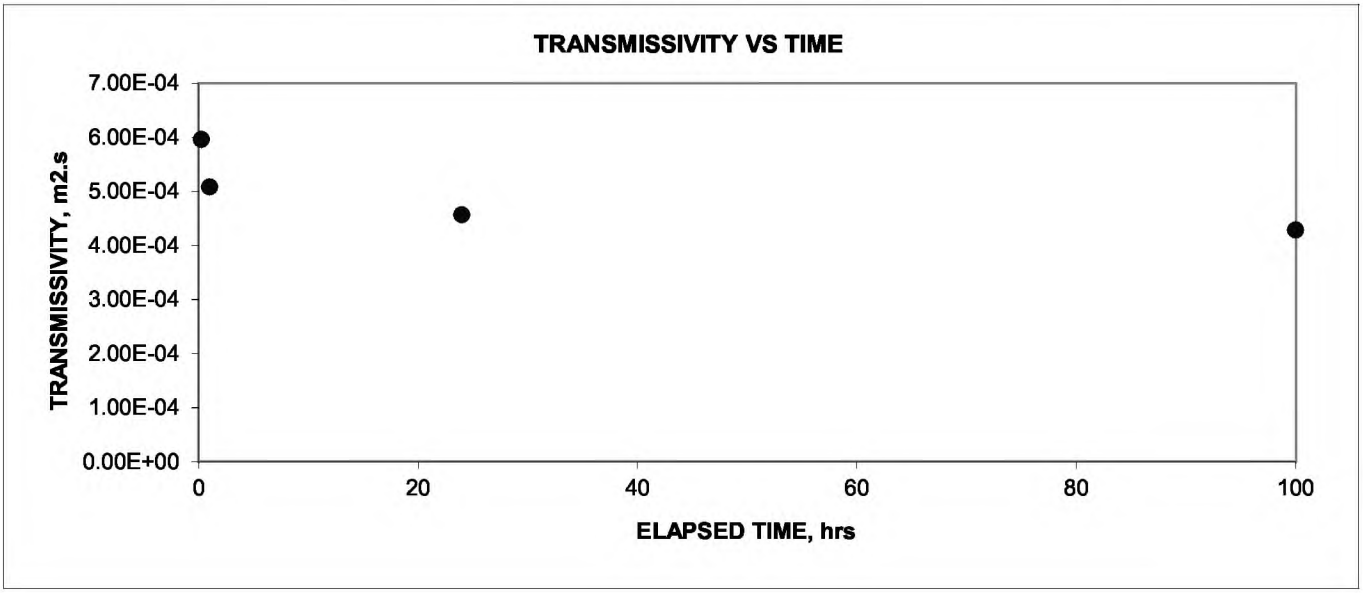
CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF -Cell 30
MATERIAL: SKAPS TN 330-2-8 Geocomposite

PROJECT NO.: L21-109-001
LAB I.D. NO.: L21-109-001-003
ROLL NO.: 106911010044
REPLICATE NO.: 1 of 1

TEST SECTION: Ottawa Sand
Geocomposite
60 mil Textured HDPE

18,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	4.30	0.30	0.33	950 950 950	15 15 15	20.7	1.99E-01	0.961	5.96E-04
1	4.30	0.30	0.33	810 810 810	15 15 15	20.7	1.70E-01	0.819	5.09E-04
24	4.30	0.30	0.33	730 730 730	15 15 15	20.8	1.52E-01	0.736	4.57E-04
100	4.30	0.30	0.33	680 680 680	15 15 15	20.5	1.43E-01	0.691	4.29E-04



CHECKED BY: JLK DATE: 7/8/21

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TRANSMISSIVITY TEST RESULTS

ASTM D 4716

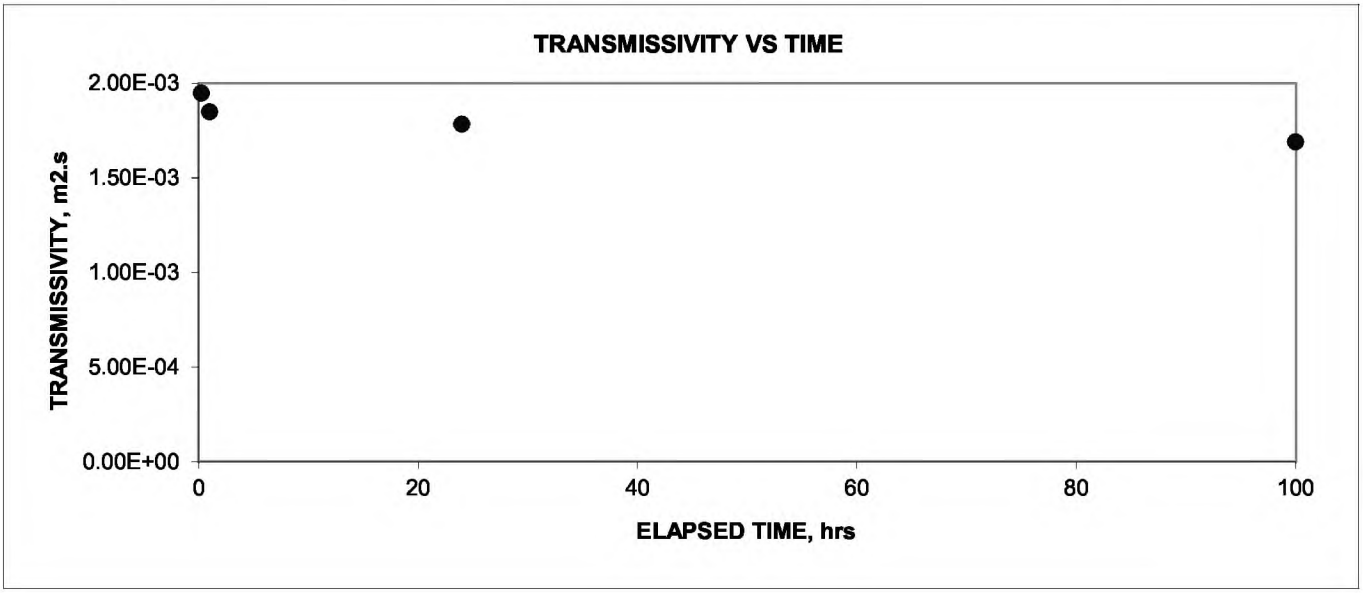
CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF -Cell 30
MATERIAL: SKAPS TN 330-2-8 Geocomposite

PROJECT NO.: L21-109-001
LAB I.D. NO.: L21-109-001-002
ROLL NO.: 106911010023
REPLICATE NO.: 1 of 1

TEST SECTION: Ottawa Sand
Geocomposite
60 mil Textured HDPE

6,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.55	0.25	0.025	1380 1380 1380	90 90 90	20.2	4.87E-02	0.235	1.95E-03
1	0.55	0.25	0.025	1310 1310 1310	90 90 90	20.2	4.63E-02	0.223	1.85E-03
24	0.55	0.25	0.025	1260 1260 1260	90 90 90	20.1	4.46E-02	0.215	1.78E-03
100	0.55	0.25	0.025	1200 1200 1200	90 90 90	20.3	4.23E-02	0.204	1.69E-03



CHECKED BY: JLK DATE: 8/2/21

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TRANSMISSIVITY TEST RESULTS

ASTM D 4716

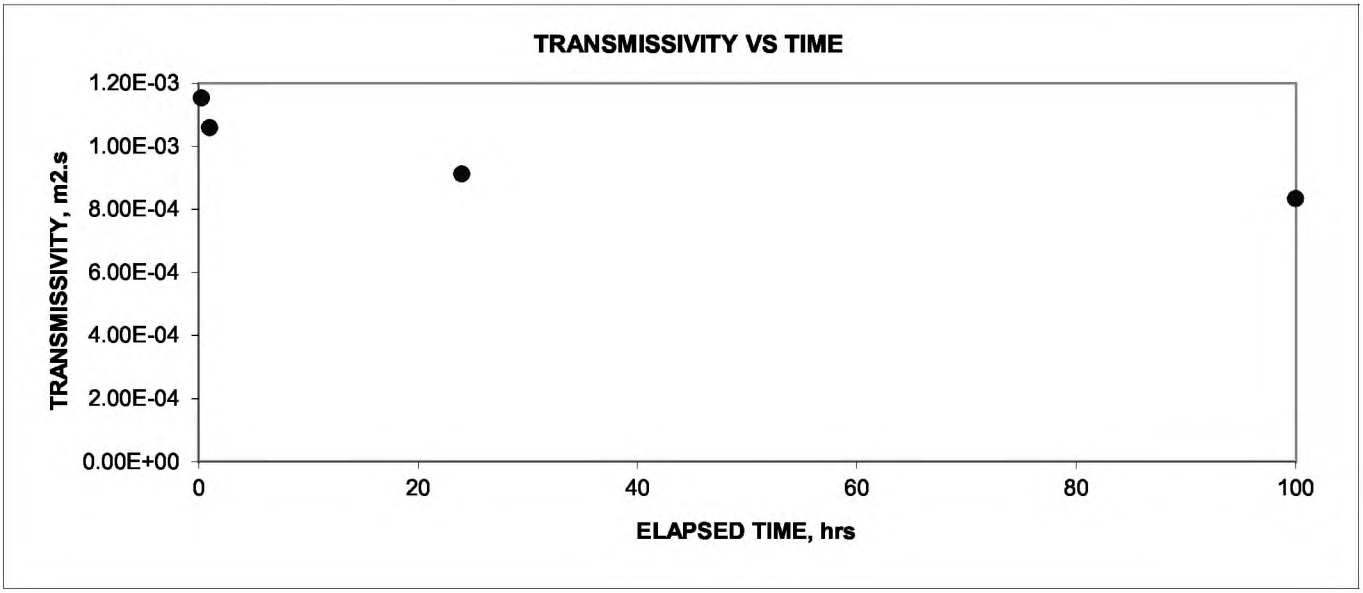
CLIENT: Kilbarger Construction, Inc.
PROJECT: Athens-Hocking Reclamation Center LF -Cell 30
MATERIAL: SKAPS TN 330-2-8 Geocomposite

PROJECT NO.: L21-109-001
LAB I.D. NO.: L21-109-001-002
ROLL NO.: 106911010023
REPLICATE NO.: 1 of 1

TEST SECTION: Ottawa Sand
Geocomposite
60 mil Textured HDPE

12,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.55	0.25	0.025	1090 1090 1090	120 120 120	20.2	2.89E-02	0.139	1.15E-03
1	0.55	0.25	0.025	1000 1000 1000	120 120 120	20.2	2.65E-02	0.128	1.06E-03
24	0.55	0.25	0.025	860 860 860	120 120 120	20.1	2.28E-02	0.110	9.13E-04
100	0.55	0.25	0.025	790 790 790	120 120 120	20.3	2.09E-02	0.101	8.35E-04



CHECKED BY: JLK DATE: 8/2/21

C:\My Documents\EXCEL\Templates\[Trans100hr1Load1Grad.xls]Sheet1
T:\Synthetics\2021 Synthetics\109 Kilbarger Constr - Athens-Hocking Reclam\L21-109-001\[L21-109-001-002 100 hr retest.xls].33 L21-109-001 8/2/2021

APPENDIX D
OWNER CERTIFICTION

To the best of my knowledge, the certification report entitled, "Cell 30 – Construction Certification Report," is true, accurate, and contains all the information required by 3745-27-08(H)

Chris A. Jaquet, PE
Director of Engineering and Environmental Affairs
Rumpke Waste and Recycling Services

Sworn to before me this 16th day of September 2021

Notary Public

My Commission Expires January 11. 2026

Jean Lakamp Hetzer
Notary Public
State of Ohio
Recorded in Hamilton County
My Commission Expires
January 11, 2026

APPENDIX F
PERSONNEL RESUMES

EDWARD BRDICKA, P.E.
Associate
The Mark James Corporation

EDUCATION

Bachelor of Science, 1983; The Ohio State University, Columbus, Ohio

TRAINING

Hazardous Waste Workers Health and Safety 40-Hour Training – OSHA 1910.120
Hazardous Waste 8-Hour Refresher Training – OSHA 1910.120
Manager of Landfill Operations – Training and Certification Course, Solid Waste Association of North America
Various seminars and industry related courses

SUMMARY OF PROFESSIONAL EXPERIENCE

Mr. Brdicka has a background in civil engineering and solid waste design projects. His responsibilities have included the coordination of clients, contractors, regulatory agencies and project staff on a variety of projects, primarily related to solid waste landfills. He has performed layout and design calculations for landfill projects and performed field construction certification services. He has also provided a variety of environmental related services for industrial plants. Supervised central engineering staff at a regulatory agency to promote statewide technical and regulatory accuracy on permit and permit-related projects; coordinated the state's strategy and drafting of rules and policies related to technical and administrative issues in the solid waste permit program.

1998 to Present:	The Mark James Corporation – Associate
1992 - 1998:	Hull & Associates, Inc. – Project Engineer/Manager
1989 – 1992:	Ohio EPA – Solid Waste Engineer/Engineering Supervisor
1984 – 1988:	Operations Supervisor, Yellow Freight Systems, Inc.

PROFESSIONAL AFFILIATIONS

Registered Professional Engineer – State of Ohio

DETAILED EXPERIENCE

The Mark James Corporation

As Associate:

Corporate Responsibilities: Responsible for client coordination and corporate quality assurance and quality control.

Hull & Associates, Inc.

As Project Engineer/Manager:

Design and Permitting of an Industrial Waste Landfill: Project Manager for the design of a 375-acre industrial waste landfill site consisting of two separate landfill areas totaling 110 acres. The design included composite-lined landfill cells for a high moisture industrial sludge, site facilities, three stormwater

basins and pumphouses, forcemain to an off-site wastewater treatment plant, hydrogeologic investigation, and ground-water monitoring network. The design disturbed less than 10 out of 50 acres of wetlands on the property. Draft permit was obtained in seven months and final permit in twelve months. Assisted client with public meetings.

Design and Permitting of a Landfill Expansion: Project Manager for the design of a comprehensive landfill permit update, with fifty acres of new and upgraded acreage. Design included typical landfill containment systems and required the design of a creative barrier to preserve waste filling rights due to hydrogeologic conditions.

Landfill Construction Plan & Contractor Bid Package Preparation: Multiple projects – Project Manager for preparation of construction-ready plans and bid specifications for multiple landfill projects including new cells up to 16 acres and caps up to 20 acres.

Landfill Construction QA/QC – 16-acre Cell: Project Manager for construction QA/QC of the initial 16-acre landfill cell for a new industrial waste landfill involving more than 300,000 cubic yards of earthwork. Installations coordinated and certified included a clay liner, HDPE liner, granular and synthetic leachate collection system, lined basins and ditches, utility trenches, piping and pump stations. Regulatory approval for waste acceptance obtained in two weeks.

Landfill Construction QA/QC – 5-acre Cell: Project Manager for construction QA/QC of a landfill cell joining a lower elevation existing waste area to a future higher area to meet newer aquifer isolation requirements. Installations certified included clay liner, HDPE liner, granular leachate collection system and pump stations.

Landfill Construction QA/QC – 12-acre Cap: Project Manager for construction QA/QC of a 12 acre landfill cap including waste regrading, clay layer, granular/pipe drainage layer, seeded soil cover and leachate toe drain with manhole pump station.

Ohio EPA

As Solid Waste Engineer/Engineering Supervisor:

Rule Development: Primary researcher and drafter of Ohio's residual waste regulations in 1992. In 1990 assisted in the research and drafting of revisions to Ohio's municipal waste landfill regulations. Coordinator and primary drafter of the response to public comments regarding the revisions to the municipal landfill regulations.

Permits and Permit-Related Document Review: Reviewed solid waste permit applications and permit – related documents for regulatory and technical adequacy and wrote permit and exemption recommendations for issuance.

Public Speaking: Permit application public information session and public hearing participant. Guest speaker for citizen's groups, industries, and professional seminars regarding the solid waste regulatory program and solid waste rule development activities.

MARK A. RUOF
President
The Mark James Corporation

EDUCATION

BS (Geology, Minor - Economics) 1980; Allegheny College, Meadville, Pennsylvania
MS (Geology, Emphasis Engineering Geology) 1986; Kent State University, Kent, Ohio

TRAINING

- Troxler Training Course - Nuclear Testing Equipment,
- Hazardous Waste Workers Health and Safety 40-Hour Training – OSHA 1910.120
- Hazardous Waste Managers 8-Hour Training - OSHA 1910.120
- Various seminars and industry related courses

SUMMARY OF PROFESSIONAL EXPERIENCE

Mr. Ruof has a varied background in geology, hydrogeology, and solid waste design and remediation. His responsibilities have included siting, design, permitting and construction of sanitary waste disposal facilities. He has also performed site assessments, feasibility studies, remedial action plans, ground water monitoring and quality assessments, sampling and characterization of unidentified waste streams for industrial and municipal solid waste facilities.

1990 to Present:	The Mark James Corporation – President
1988 – 1990:	Malcolm Pirnie, Inc. – Senior Project Hydrogeologist
1986 – 1988:	Earth Sciences Consultants, Inc. – Project Geologist
1983 – 1986:	Kent State University – Teaching and Research Assitant
1981 – 1982:	Glacier Energy Corporation – Petroleum Geologist
1979 – 1981:	Huntley and Huntley, Inc. – Staff Geologist

DETAILED EXPERIENCE

The Mark James Corporation

As President:

Corporate Responsibilities: As President, Mr. Ruof controls the fiscal, contractual, and day to day operations of The Mark James Corporation.

Design and Permitting of a Sanitary Landfill Expansion: Preparation and implementation of Subtitle D landfill expansions. Work included the implementation of hydrogeologic and soil borrow investigations. Design work for the landfill included typical liner, leachate collection , cap, and surface water systems.

Groundwater monitoring: Ground water sampling at various sanitary and C&DD facilities and preparation of Annual Ground Water Quality Assessments Report for various facilities. Preparation of groundwater detection and assessment monitoring plans.

Air Permitting: Permitting of various emission sources at various sanitary and C&DD landfill. Permitting of Title V operating permit for sanitary landfills.

Quality Assurance and Quality Control (QA\QC) Manager: QA/QC manager for clay and clay/synthetic composite liner systems, cap systems, sedimentation ponds, leachate collection and storage systems, access roads and drainage channels, and daily operations.

Landfill Closures: Project manager for the closure of a 26 acre landfill. Work included the installation of approximately 90,000 cubic yards of clay cap, 105,000 cubic yards of vegetative layer, numerous drainage channels, a passive methane extraction system and seeding of the vegeatative layer. Capping of Subtitle D facilities, including recompacted soil cap, 40-mil LDPE, geonet and vegetative layer.

Landfill Construction: Project manager for construction of Subtitle D liner systems. Construction involved the installation of recompacted soil and HDPE liners, leachate collection systems and protective layer material and auxillory structures.

Landfill Operations: Supervision and general consultation on daily landfill operations. Work included landfill maintenance, surveying of refuse limits, waste stream acceptance, recommendations for daily cell operations and general consultation.

Wetlands: Design, permitting and construction of an eight-acre wetland mitigation site to replace wetlands destroyed in the expansion of a sanitary landfill.

General Construction: Supervised the construction of several sedimentation ponds, a flood protection levee, and general earthwork.

Construction and Demolition Debris Facilities: The design, permitting and construction of construction and demolition debris facilities.

Malcolm Pirnie, Inc.

As Senior Project Hydrogeologist:

Development of Solid Waste Management Plans, in accordance with Ohio House Bill 592, for six Solid Waste Districts located throughout Ohio.

Design of municipal solid waste landfills with Best Available Technology.

Prepared a Source Control Operable Unit Feasibility Study and Proposed Plan for remediation and closure of two municipal/hazardous waste landfills for the State of Minnesota.

Design and implementation of landfill gas monitoring and remedial systems.

QA/QC Manager for the construction of a lined landfill including the placement of a clay liner, 60-Mil HDPE Liner, Leachate Collection System, Leachate Storage Tanks, and initial placement of refuse at the Huron County Landfill.

Earth Science Consultants, Inc.

As Project Geologist:

Project leader responsible for the geologic investigation, siting, design and permitting sanitary, residual and hazardous waste disposal facilities

QA/QC Manager for the installation of an eight acre clay liner at the Y&S Sanitary Landfill.

Performed environmental site assessments, feasibility studies, and remedial action plans of industrial facilities to define extent of contamination.

Designed ground water monitoring systems and performed ground water quality assessments.

Kent State University

As Research Assistant:

Investigated the statistical differences between the engineering properties of old and new coal mine spoil of several coal seams in east central Ohio.

Analyzed the causes of slope failures within reclaimed strip mine embankments and evaluated alternative preventive and remedial measures.

Glacier Energy Corporation

As Petroleum Geologist:

Managed the field office of this oil and gas producer which maintained 100 oil and gas wells. Supervised the drilling, geologic logging, completion and production of oil and gas wells.

Huntley and Huntley, Inc.

As Staff Geologist:

Well site geologist/engineer in charge of the geologic and geophysical logging, completion, and production of oil and gas wells.

DRAWINGS

ATHENS – HOCKING RECLAMATION CENTER

CELL 30 CONSTRUCTION CERTIFICATION

SEPTEMBER 2021

OPERATOR:

RUMPKE WASTE & RECYCLING SERVICES
3990 GENERATION DRIVE
CINCINNATI, OHIO 45251

LANDOWNER:

BELL–WOLFE LTD.
GENERAL PARTNER:

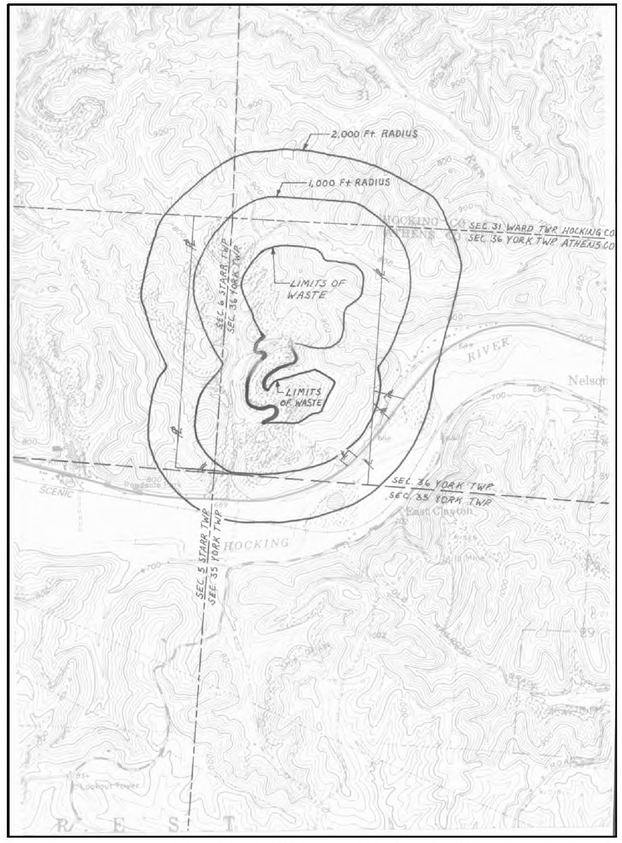
KILBARGER CONSTRUCTION, INC.
P.O. BOX 946
LOGAN, OHIO 43138

LOCATED IN:

SECTION 36, TOWNSHIP 12
RANGE 15, YORK TOWNSHIP
ATHENS COUNTY, OHIO

PREPARED BY:

THE MARK JAMES CORPORATION
255 SOUTH LIBERTY STREET
POWELL, OHIO 43065
PHONE: 614–431–3664



REFERENCE: USGS UNION FURNACE QUAD.

SITE LOCATION MAP

SCALE IN FEET

0 1,500 3,000

SHEET	TITLE
1	TITLE SHEET
2	SURVEY POINT LOCATIONS
3	LIMITS OF EXCAVATION
4	BOTTOM OF SOIL LINER
5	TOP OF SOIL LINER/LEACHATE COLLECTION SYSTEM
6	TOP OF SOIL LINER/LEACHATE COLLECTION SYSTEM
7	GEOMEMBRANE PANEL LAYOUT
8	TOP OF PROTECTIVE LAYER/SURFACE WATER MANAGEMENT
9	TOP OF SOIL BARRIER LAYER
10	CROSS SECTIONS
11	DETAILS

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

SHEET 1
TITLE SHEET

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED
CHECKED
DRAWING NUMBER
C30–SHEET1

The Mark James Corporation

E2,033,000

E2,032,000

E2,031,000

N531,000

N532,000

N533,000

SEDIMENTATION POND #1

POND DISCHARGE PIPE

SEDIMENTATION POND #2

POND DISCHARGE PIPE

SEDIMENTATION POND #3

POND DISCHARGE PIPE

SEDIMENTATION POND #4

POND DISCHARGE PIPE

SEDIMENTATION POND #5

POND DISCHARGE PIPE

LIMITS OF WASTE PLACEMENT

LIMITS OF CELL 30

AREA OF ENLARGEMENT FOR SHEETS 3 THROUGH 9

NORTH

LEGEND

803.00 TOP OF EXCAVATION

803.00 TOP OF EXISTING CONTOURS

x 5 SURVEY POINT LOCATION AND NUMBER

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

0 100 200 400

SCALE: 1"=200'

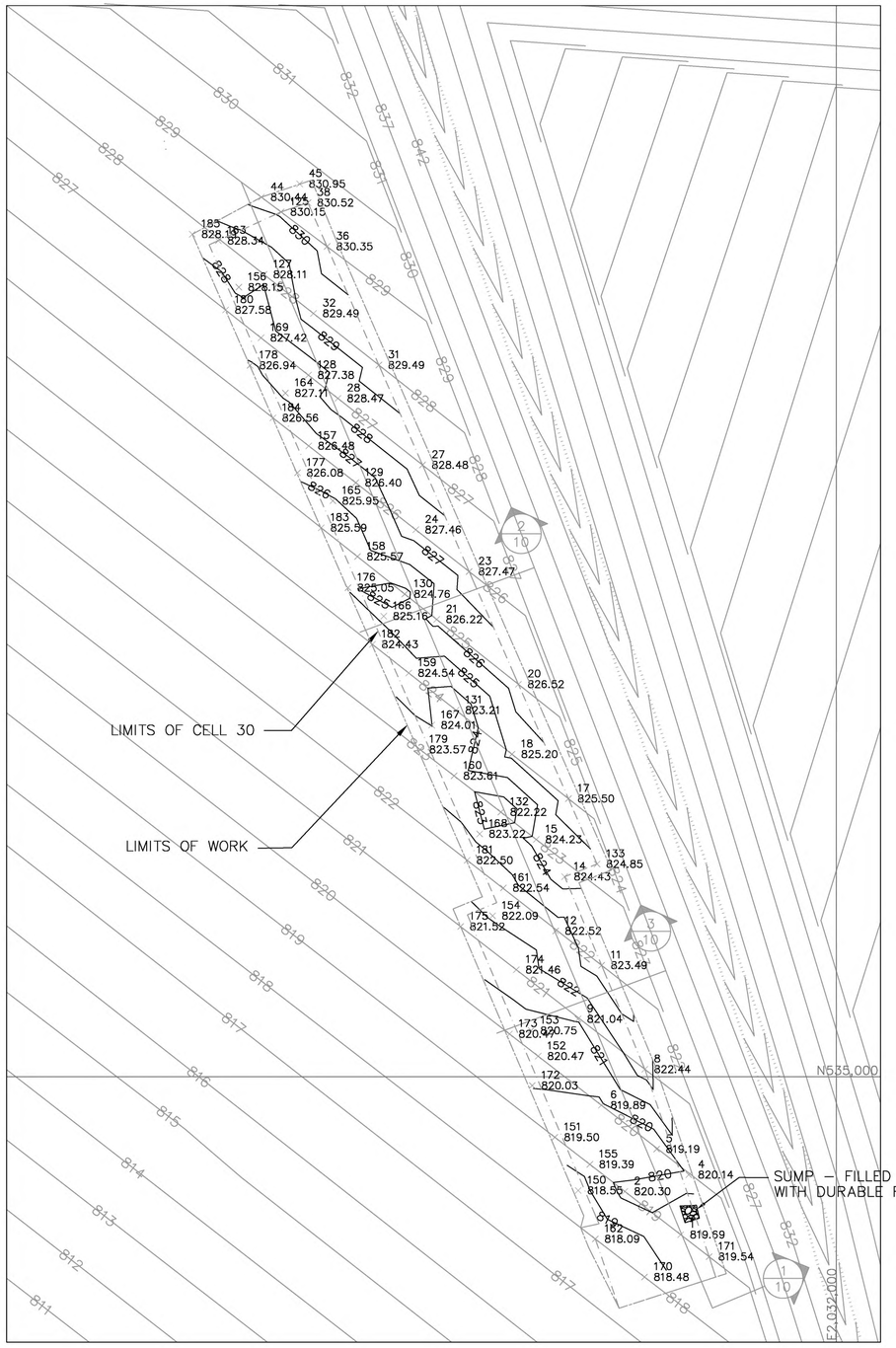
SHEET 2
SURVEY POINT LOCATIONS

ATHENS-HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	
CHECKED	
DRAWING NUMBER	The Mark James Corporation
C30-SHEET2	



LEGEND

- 803.0 — TOP OF EXCAVATION
- 803.0 — PTI TOP OF EXCAVATION/
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE TOP OF EXCAVATION
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- LIMITS OF CELL 30
- LIMITS OF WORK

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

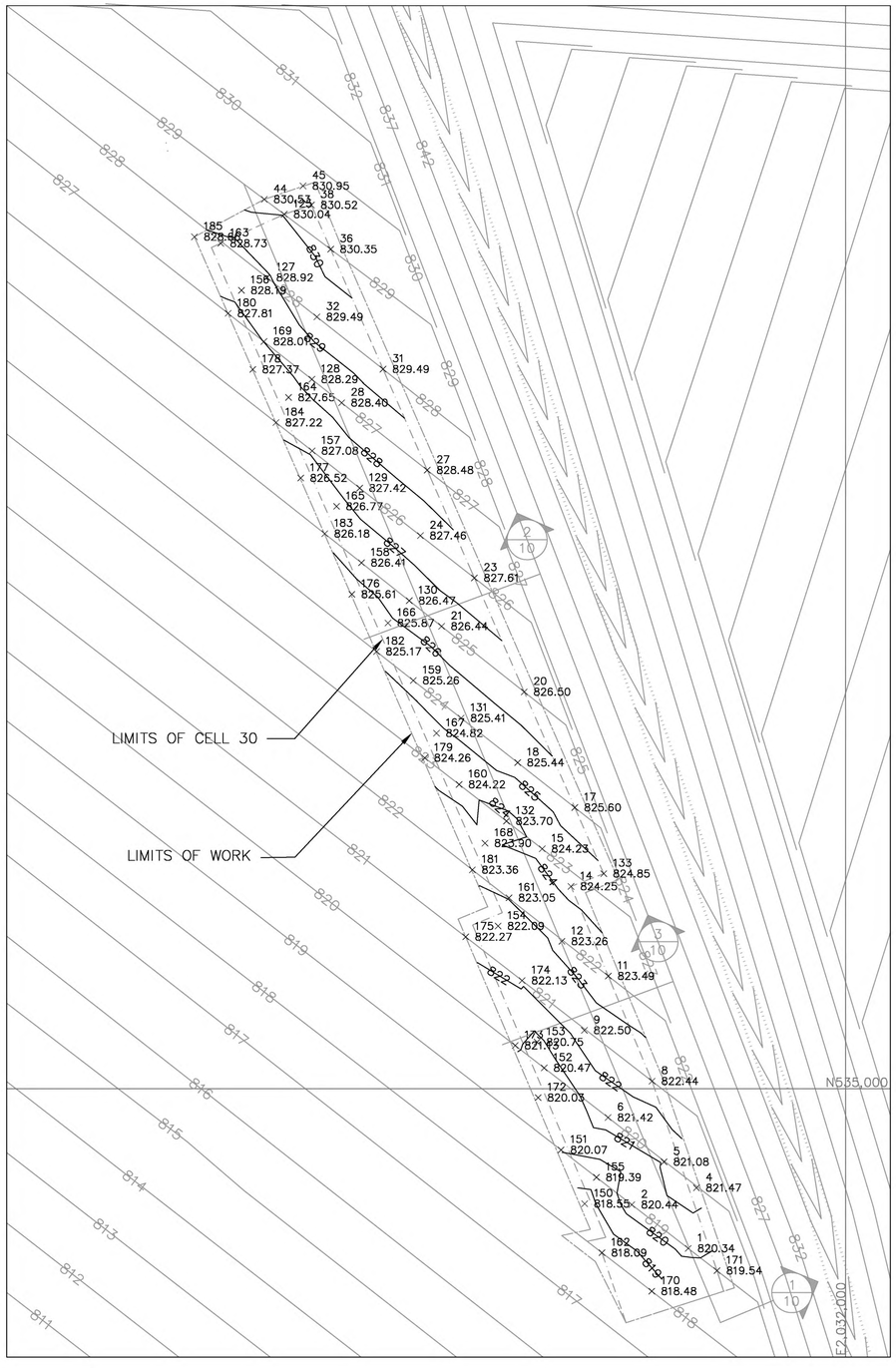
SHEET 3
LIMITS OF EXCAVAVTION

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30–SHEET3	



NORTH

LEGEND

- 803.00 — CONSTRUCTED BOTTOM OF THE RECOMPACTED SOIL LINER CONTOUR
- 803.00 — PTI TOP OF EXCAVATION/PTI BOTTOM OF THE RECOMPACTED SOIL LINER CONTOUR
- X 5 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE BOTTOM OF THE RECOMPACTED SOIL LINER CONTOUR
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

SHEET 4
BOTTOM OF SOIL LINER

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

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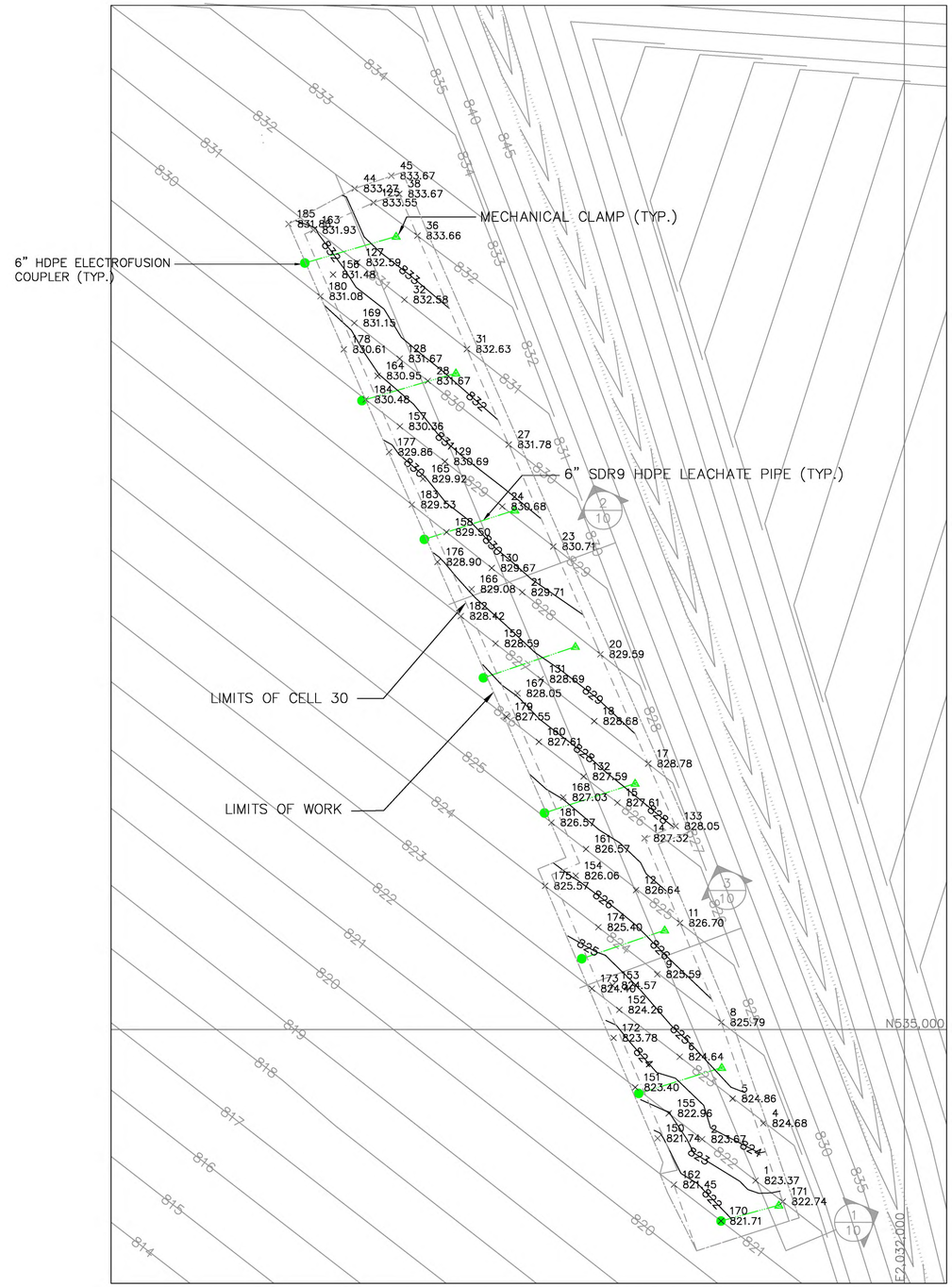
ATHENS HOCKING LANDFILL, INC.

APPROVED	
CHECKED	
DRAWING NUMBER	The Mark James Corporation
C30–SHEET4	



TOP OF CONSTRUCTED SOIL LINER COMPARED TO PTI TOP OF SOIL LINER

NORTH

LEGEND

- 803.00 — TOP OF CONSTRUCTED SOIL LINER/ LEACHATE COLLECTION SYSTEM CONTOUR
- 803.00 — PTI TOP OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE TOP OF THE SOIL LINER/ LEACHATE COLLECTION SYSTEM
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- LEACHATE COLLECTION LATERAL
- 6" SDR9 HDPE ELECTROFUSION COUPLER
- MECHANICAL CLAMP

NOTE:

BECAUSE THE LEACHATE COLLECTION SYSTEM IS COMPRISED OF GEOSYNTHETICS THAT ARE RELATIVELY THIN AND ARE NOT READILY MEASURED BY SURVEYING, THE TOP OF THE LEACHATE COLLECTION SYSTEM AND THE TOP OF THE CONSTRUCTED SOIL LINER ARE ASSUMED TO BE IDENTICAL FOR THIS SUBMITTAL.

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

0 25 50 100
(IN FEET)
1 inch = 50 ft.

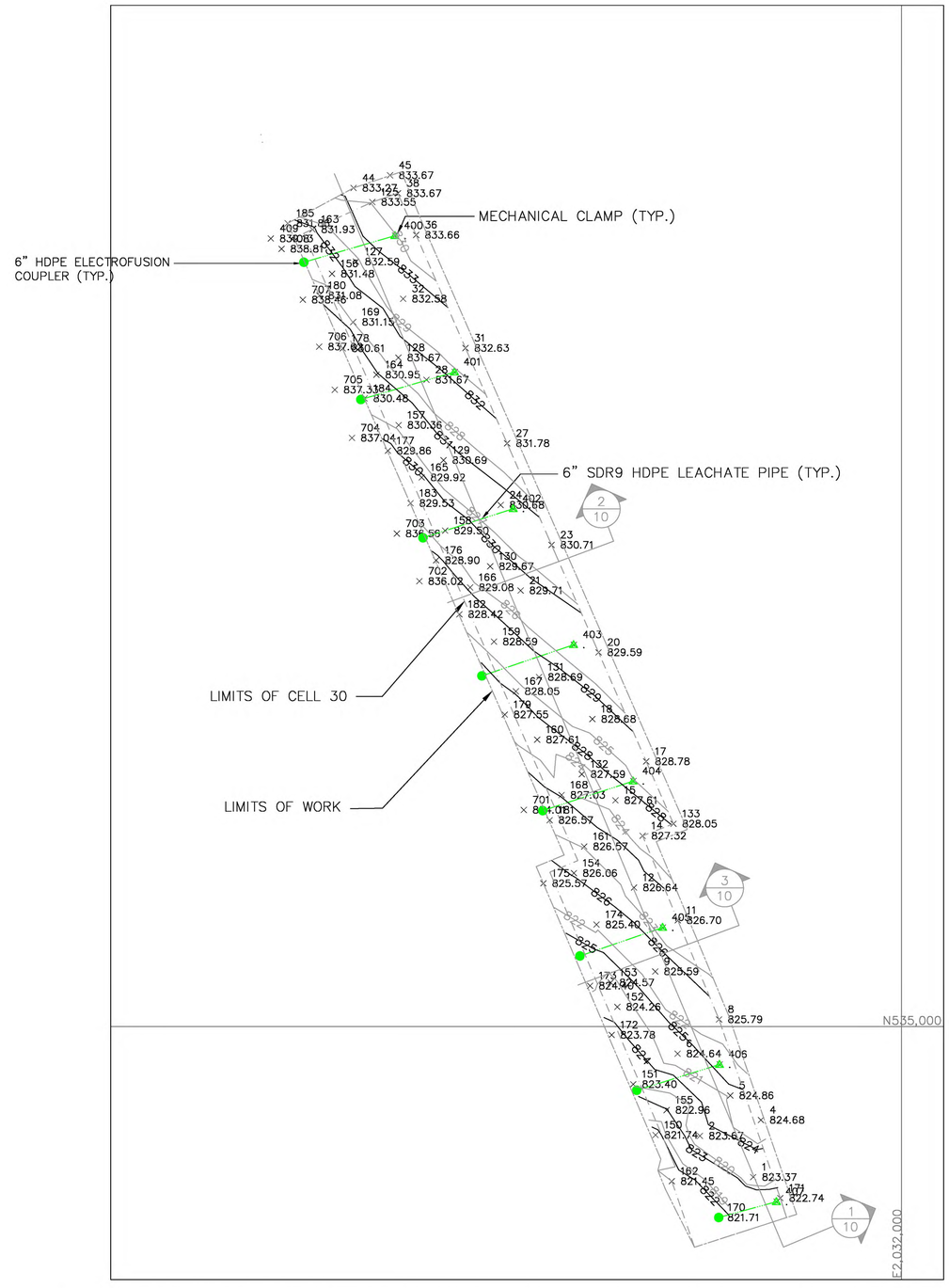
SHEET 5
TOP OF SOIL LINER/ LEACHATE COLLECTION SYSTEM

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30–SHEET5	



TOP OF CONSTRUCTED SOIL LINER COMPARED TO CONSTRUCTED BOTTOM OF SOIL LINER

NORTH

LEGEND

- 803.00 — TOP OF CONSTRUCTED SOIL LINER/ LEACHATE COLLECTION SYSTEM CONTOUR
- 803.00 — CONSTRUCTED BOTTOM OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE TOP OF THE SOIL LINER/ LEACHATE COLLECTION SYSTEM
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- LEACHATE COLLECTION LATERAL
- 6" SDR9 HDPE ELECTROFUSION COUPLER
- MECHANICAL CLAMP

NOTE:

BECAUSE THE LEACHATE COLLECTION SYSTEM IS COMPRISED OF GEOSYNTHETICS THAT ARE RELATIVELY THIN AND ARE NOT READILY MEASURED BY SURVEYING, THE TOP OF THE LEACHATE COLLECTION SYSTEM AND THE TOP OF THE CONSTRUCTED SOIL LINER ARE ASSUMED TO BE IDENTICAL FOR THIS SUBMITTAL.

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

0 25 50 100

(IN FEET)
1 inch = 50 ft.

SHEET 6
TOP OF SOIL LINER/ LEACHATE COLLECTION SYSTEM

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

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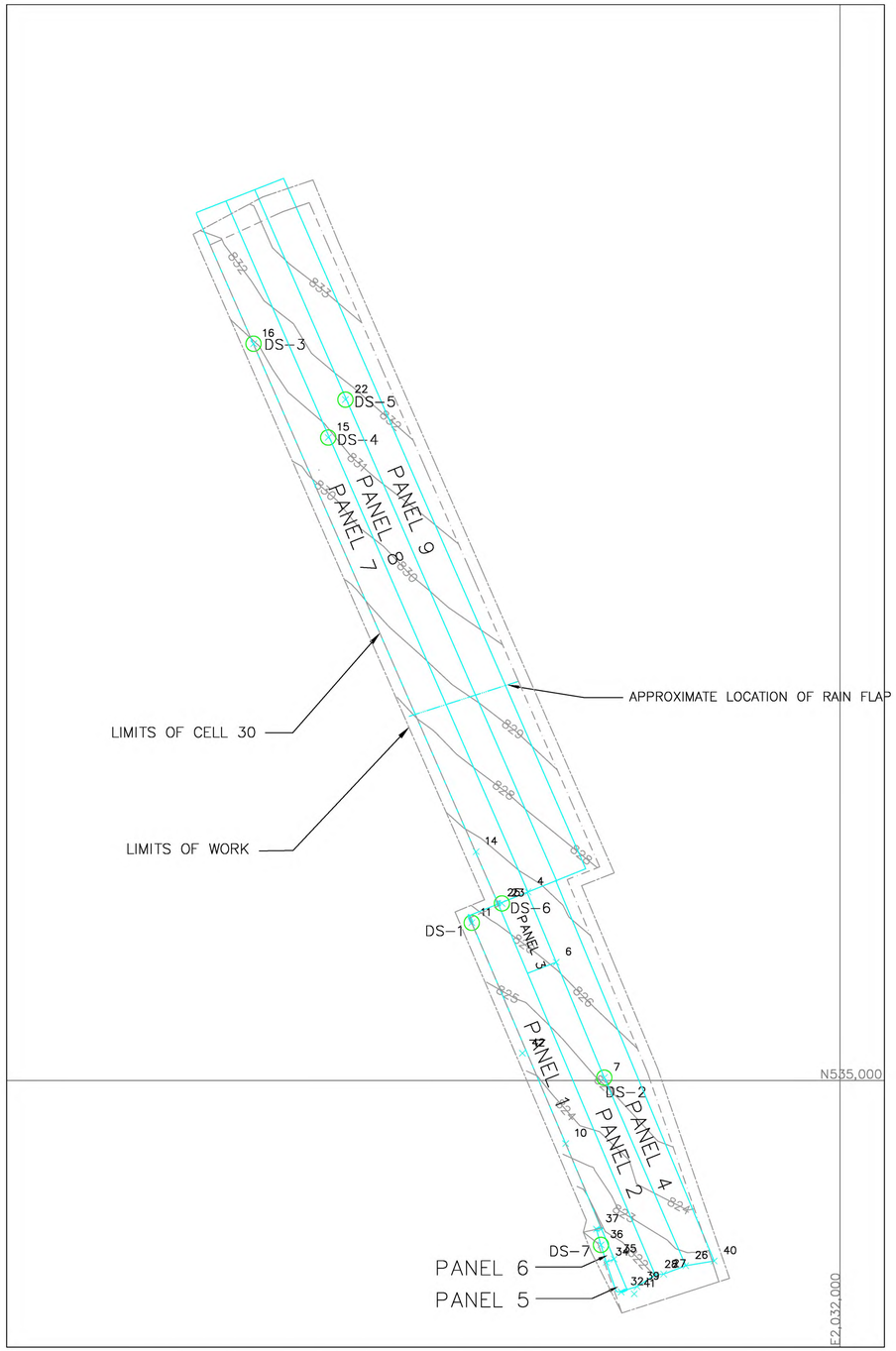
DRAWING NUMBER	
C30–SHEET6	



GEOMEMBRANE PANEL LAYOUT – 60 MIL TEXTURED HDPE

NORTH

PANEL NO.	GEOMEMBRANE ROLL NO.
1	1001–151227
2	1001–151227
3	1001–151228
4	1001–151228
5	1001–151228
6	1001–151228
7	1001–151229
8	1001–151239
9	1001–151235

LEGEND

803.00 — AS CONSTRUCTED TOP OF SOIL LINER CONTOUR

x 5 — SURVEY LOCATION OF GEOMEMBRANE REPAIR PATCH WITH PATCH NUMBER

X DS-1 — DESTRUCT TEST LOCATION AND NUMBER

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/17/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

SHEET 7
GEOMEMBRANE PANEL LAYOUT

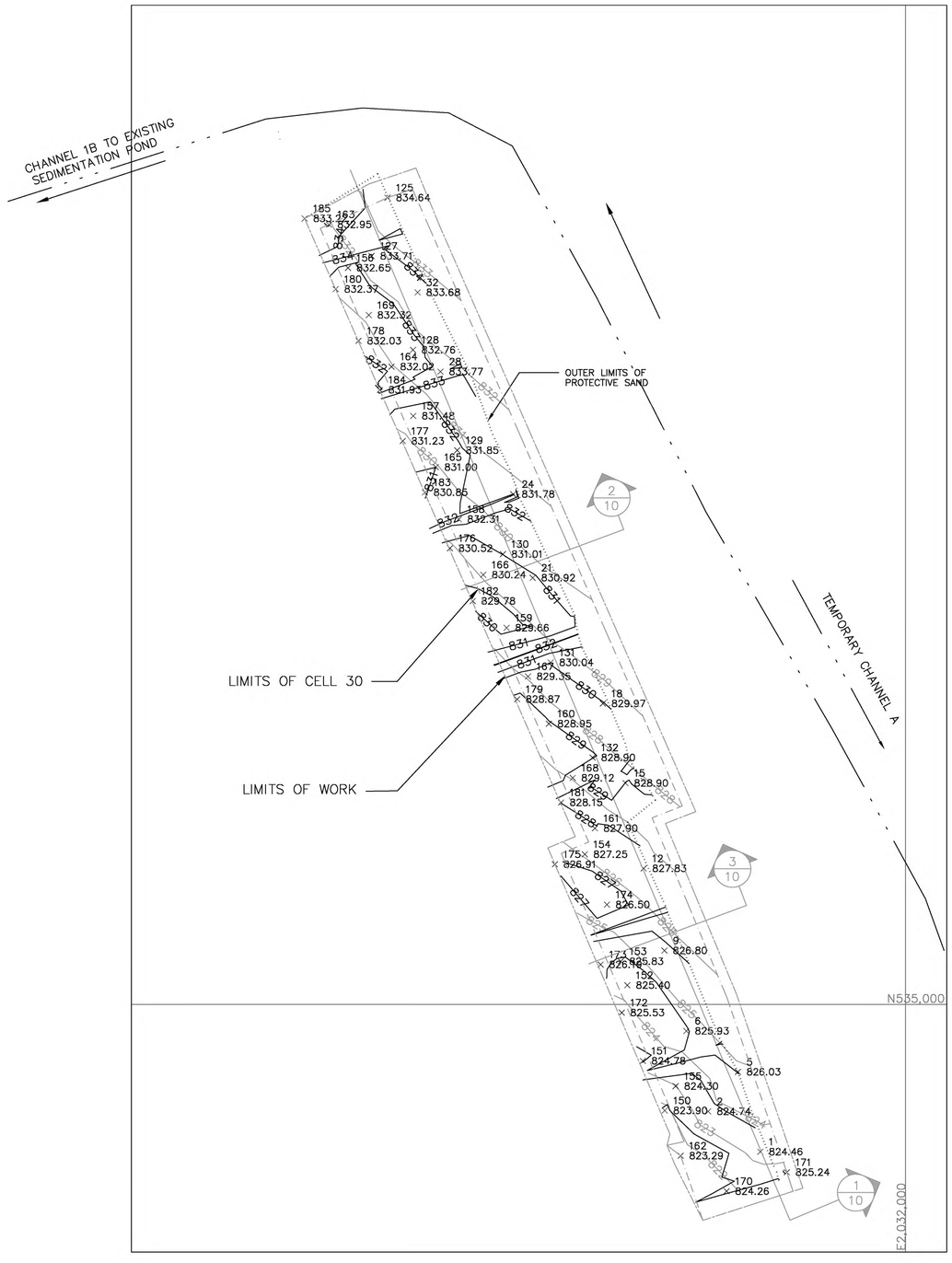
ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED
CHECKED
DRAWING NUMBER
C30–SHEET7

The Mark James Corporation



NORTH

LEGEND

- 803.00 — TOP OF CONSTRUCTED PROTECTIVE LAYER
- 803.00 — AS CONSTRUCTED TOP OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE AS CONSTRUCTED TOP OF PROTECTIVE COVER
- 1/10 — LOCATION OF CROSS SECTION LINE

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

SHEET 8
TOP OF PROTECTIVE LAYER/ SURFACE WATER MANAGEMENT

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
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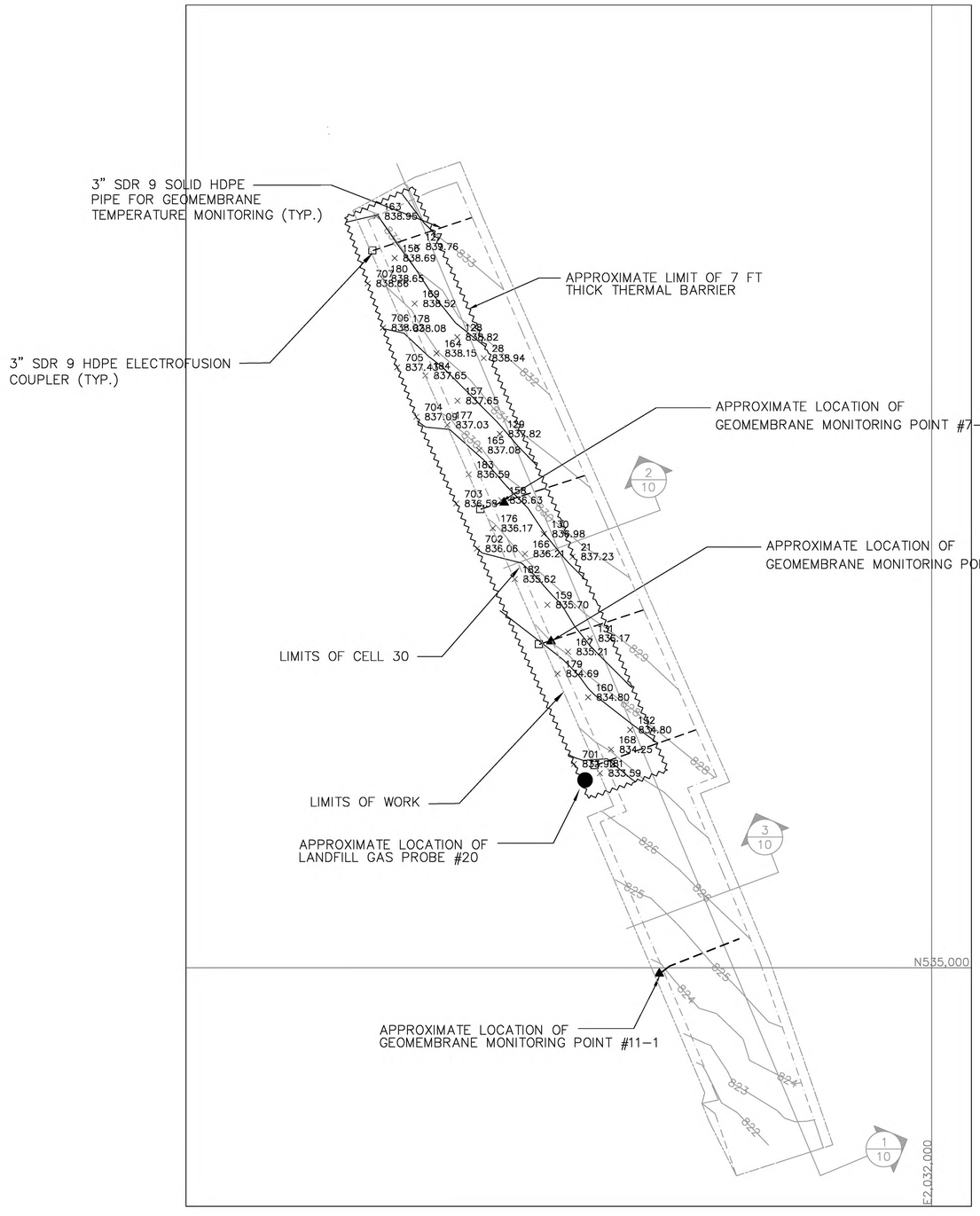
DRAWING NUMBER	
C30–SHEET8	



NORTH

LEGEND

- 803.00 — CONSTRUCTED TOP OF THE THERMAL BARRIER LAYER
- 803.00 — CONSTRUCTED TOP OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE CONSTRUCTED TOP OF THE THERMAL BARRIER LAYER
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- APPROXIMATE OUTER LIMIT OF THE 7 FT. THICK THERMAL BARRIER LAYER
- □ 3" SDR 9 HDPE ELECTROFUSION COUPLER
- ▲ APPROXIMATE LOCATION OF THERMOCOUPLE
- ● APPROXIMATE LOCATION OF LANDFILL GAS PROBE #20

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

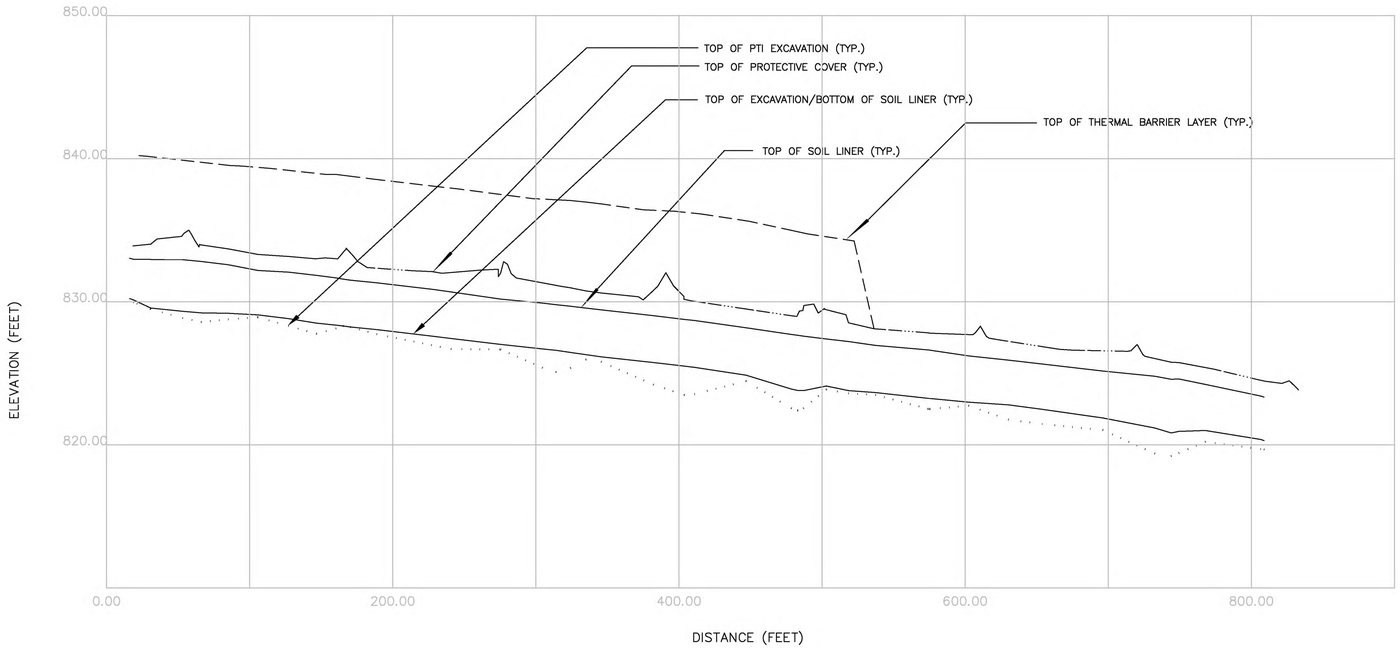
SHEET 9
TOP OF THE THERMAL BARRIER LAYER

ATHENS-HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

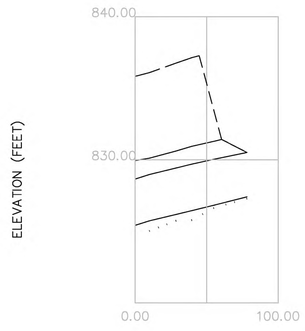
PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30-SHEET9	



SECTION 1



SECTION 2

SECTION 2

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

GRAPHIC SCALES

HORIZONTAL SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

VERTICAL SCALE

0 2.5 5 10

(IN FEET)
1 inch = 5 ft.

SHEET 10
CROSS SECTIONS

ATHENS–HOCKING RECLAMATION CENTER
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

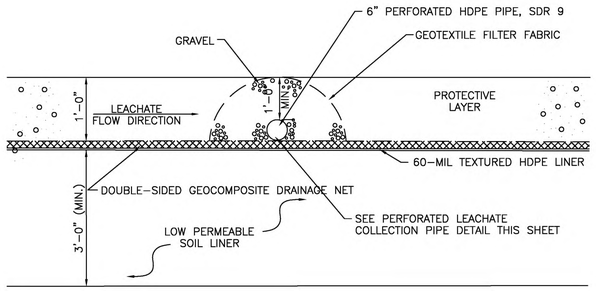
APPROVED

CHECKED

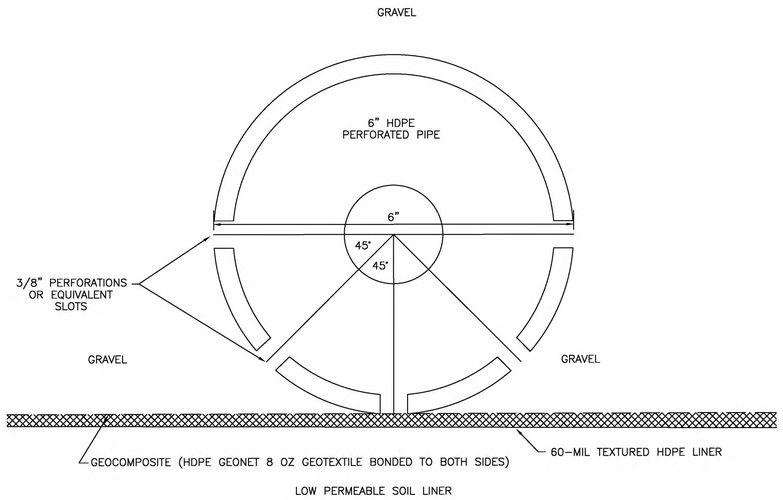
DRAWING NUMBER

C30–SHEET10

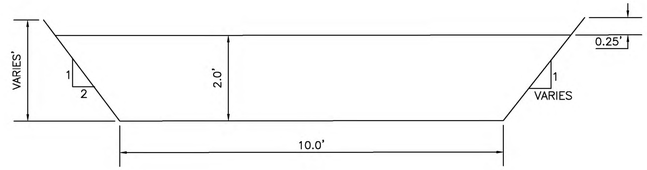
The Mark James Corporation



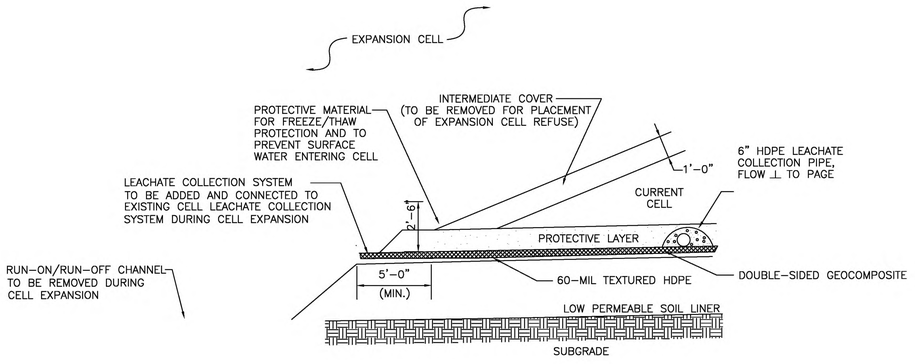
LINER SYSTEM WITH
LEACHATE COLLECTION LATERAL



PERFORATED LEACHATE COLLECTION PIPE

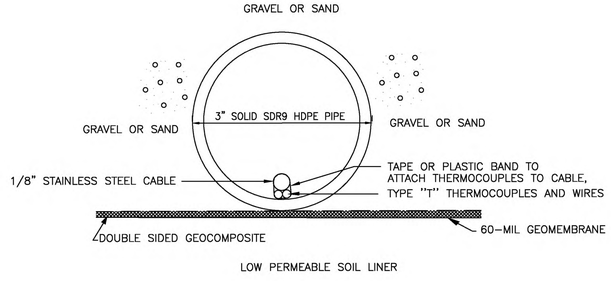


CHANNEL 1B

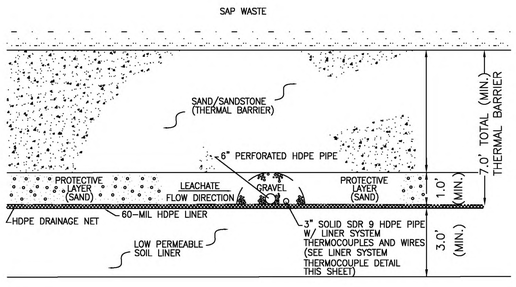


SOIL BERM

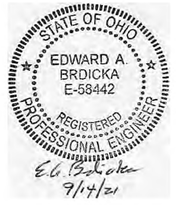
CELL TO CELL INTERFACE AND
TEMPORARY BERM INTERFACE



LINER SYSTEM THERMOCOUPLE



SECONDARY ALUMINUM PRODUCTION WASTE
THERMAL BARRIER DETAIL



NOTE:

DETAILS ARE NOT TO SCALE

SHEET 11
DETAILS

ATHENS-HOCKING RECLAMATION CENTER
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED

CHECKED

DRAWING NUMBER

C30-SHEET11

The Mark James Corporation

ATHENS – HOCKING RECLAMATION CENTER

CELL 30 CONSTRUCTION CERTIFICATION

SEPTEMBER 2021

OPERATOR:

RUMPKE WASTE & RECYCLING SERVICES
3990 GENERATION DRIVE
CINCINNATI, OHIO 45251

LANDOWNER:

BELL–WOLFE LTD.
GENERAL PARTNER:

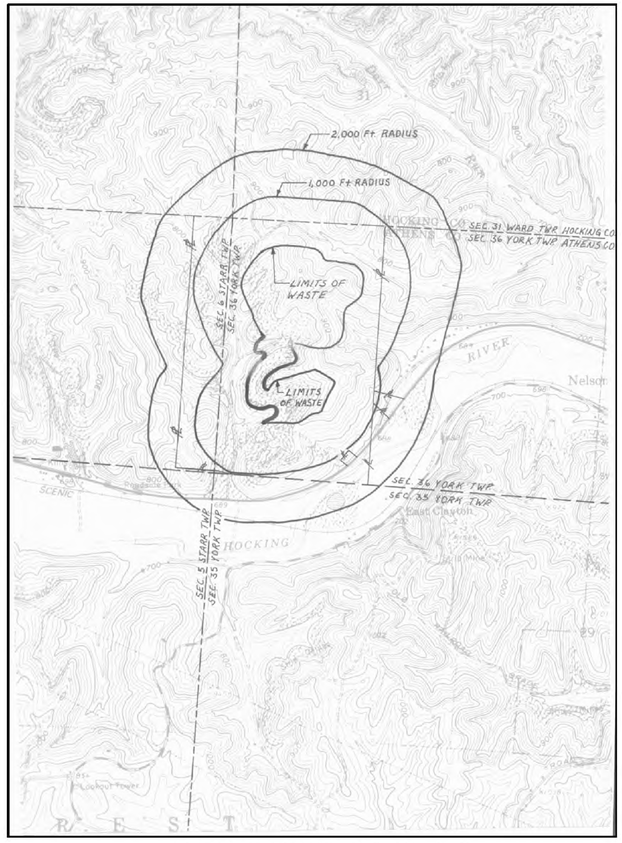
KILBARGER CONSTRUCTION, INC.
P.O. BOX 946
LOGAN, OHIO 43138

LOCATED IN:

SECTION 36, TOWNSHIP 12
RANGE 15, YORK TOWNSHIP
ATHENS COUNTY, OHIO

PREPARED BY:

THE MARK JAMES CORPORATION
255 SOUTH LIBERTY STREET
POWELL, OHIO 43065
PHONE: 614–431–3664



REFERENCE: USGS UNION FURNACE QUAD.

SITE LOCATION MAP

SCALE IN FEET

0 1,500 3,000

SHEET	TITLE
1	TITLE SHEET
2	SURVEY POINT LOCATIONS
3	LIMITS OF EXCAVATION
4	BOTTOM OF SOIL LINER
5	TOP OF SOIL LINER/LEACHATE COLLECTION SYSTEM
6	TOP OF SOIL LINER/LEACHATE COLLECTION SYSTEM
7	GEOMEMBRANE PANEL LAYOUT
8	TOP OF PROTECTIVE LAYER/SURFACE WATER MANAGEMENT
9	TOP OF SOIL BARRIER LAYER
10	CROSS SECTIONS
11	DETAILS

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

SHEET 1
TITLE SHEET

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED
CHECKED
DRAWING NUMBER
C30–SHEET1

The Mark James Corporation

E2,033,000

E2,032,000

E2,031,000

N531,000

N532,000

N533,000

SEDIMENTATION POND #1

POND DISCHARGE PIPE

SEDIMENTATION POND #2

POND DISCHARGE PIPE

SEDIMENTATION POND #3

POND DISCHARGE PIPE

SEDIMENTATION POND #4

POND DISCHARGE PIPE

SEDIMENTATION POND #5

POND DISCHARGE PIPE

LIMITS OF WASTE PLACEMENT

LIMITS OF CELL 30

AREA OF ENLARGEMENT FOR SHEETS 3 THROUGH 9

NORTH

LEGEND

803.00 TOP OF EXCAVATION

803.00 TOP OF EXISTING CONTOURS

x 5 SURVEY POINT LOCATION AND NUMBER

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

0 100 200 400

SCALE: 1"=200'

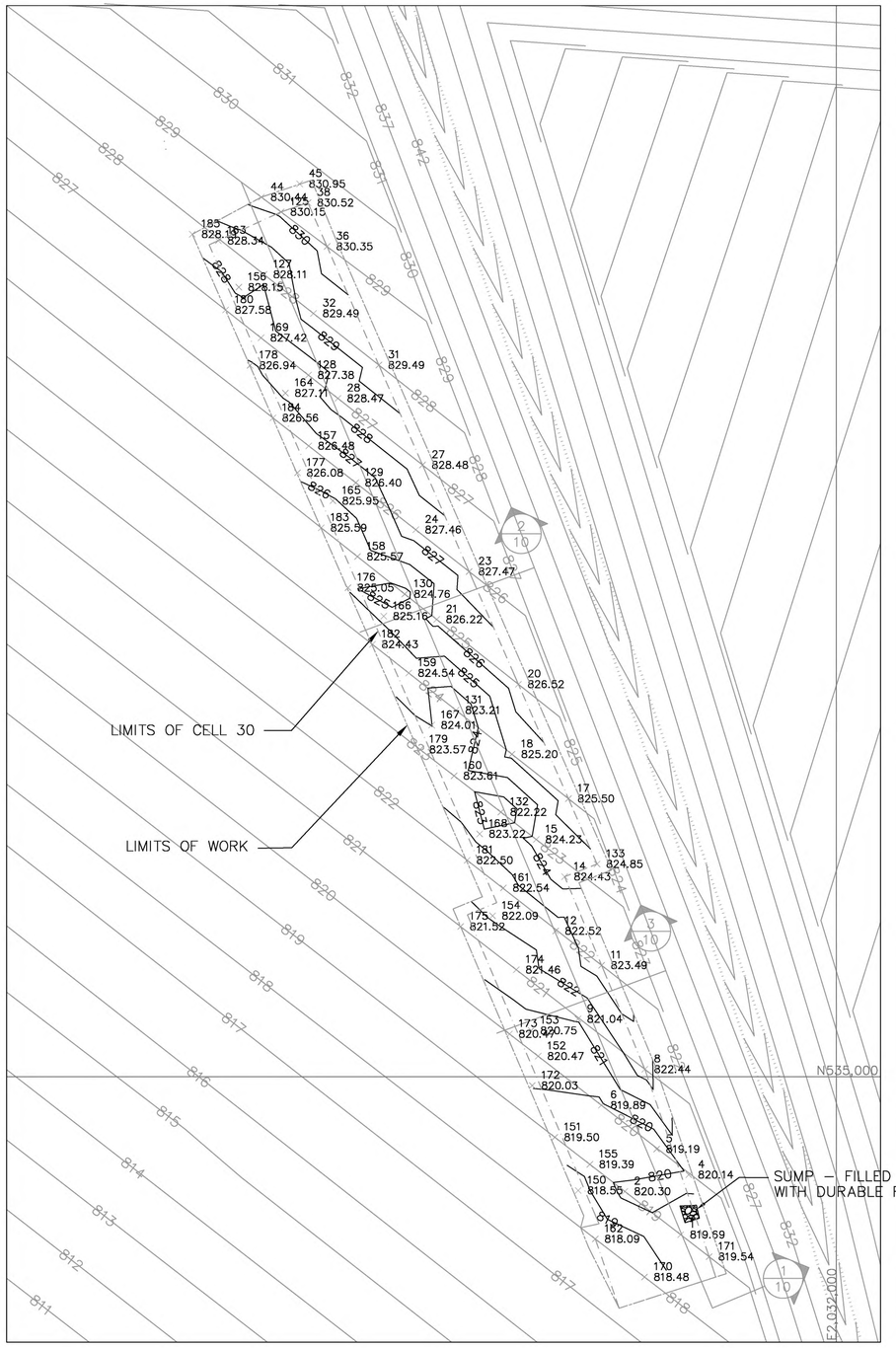
SHEET 2
SURVEY POINT LOCATIONS

ATHENS-HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	
CHECKED	
DRAWING NUMBER	The Mark James Corporation
C30-SHEET2	



LEGEND

- 803.0 — TOP OF EXCAVATION
- 803.0 — PTI TOP OF EXCAVATION/
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE TOP OF EXCAVATION
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- LIMITS OF CELL 30
- LIMITS OF WORK

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

SHEET 3
LIMITS OF EXCAVAVTION

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

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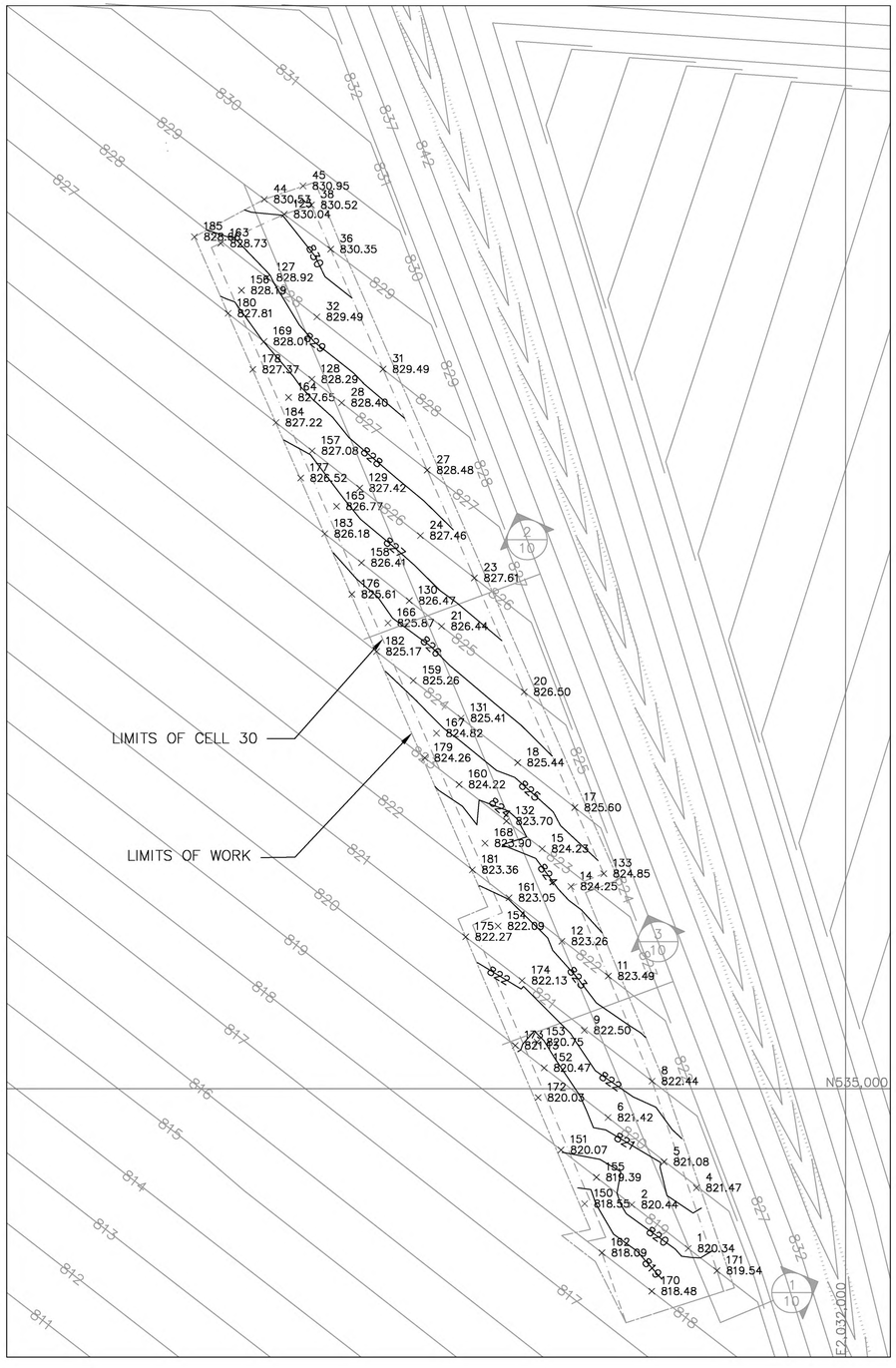
APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30–SHEET3	



NORTH

LEGEND

- 803.00 — CONSTRUCTED BOTTOM OF THE RECOMPACTED SOIL LINER CONTOUR
- 803.00 — PTI TOP OF EXCAVATION/PTI BOTTOM OF THE RECOMPACTED SOIL LINER CONTOUR
- X 5 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE BOTTOM OF THE RECOMPACTED SOIL LINER CONTOUR
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

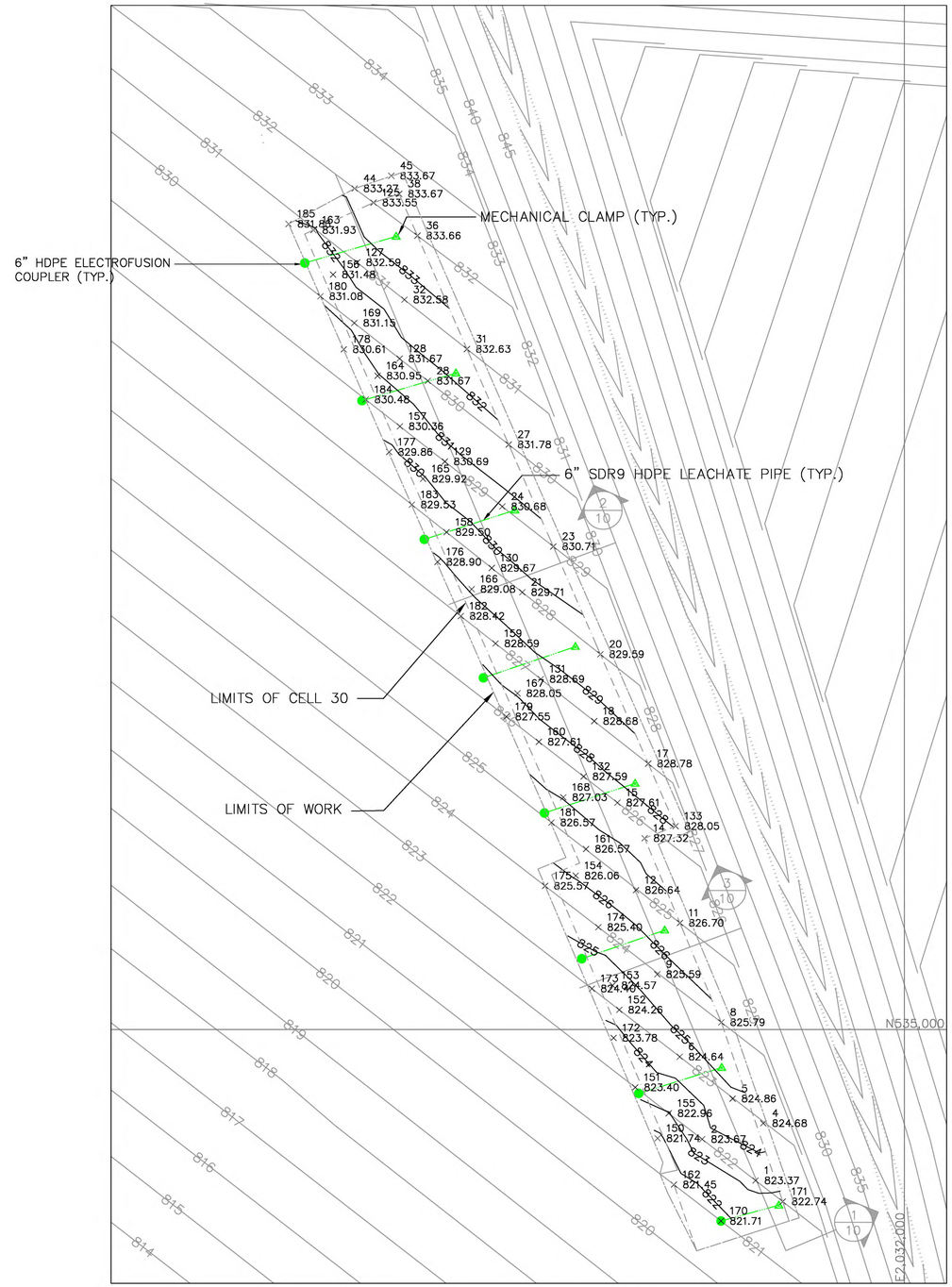
SHEET 4
BOTTOM OF SOIL LINER

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	
CHECKED	
DRAWING NUMBER	The Mark James Corporation
C30–SHEET4	



TOP OF CONSTRUCTED SOIL LINER COMPARED TO PTI TOP OF SOIL LINER

NORTH

LEGEND

- 803.00 — TOP OF CONSTRUCTED SOIL LINER/ LEACHATE COLLECTION SYSTEM CONTOUR
- 803.00 — PTI TOP OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE TOP OF THE SOIL LINER/ LEACHATE COLLECTION SYSTEM
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- LEACHATE COLLECTION LATERAL
- 6" SDR9 HDPE ELECTROFUSION COUPLER
- MECHANICAL CLAMP

NOTE:

BECAUSE THE LEACHATE COLLECTION SYSTEM IS COMPRISED OF GEOSYNTHETICS THAT ARE RELATIVELY THIN AND ARE NOT READILY MEASURED BY SURVEYING, THE TOP OF THE LEACHATE COLLECTION SYSTEM AND THE TOP OF THE CONSTRUCTED SOIL LINER ARE ASSUMED TO BE IDENTICAL FOR THIS SUBMITTAL.

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

0 25 50 100
(IN FEET)
1 inch = 50 ft.

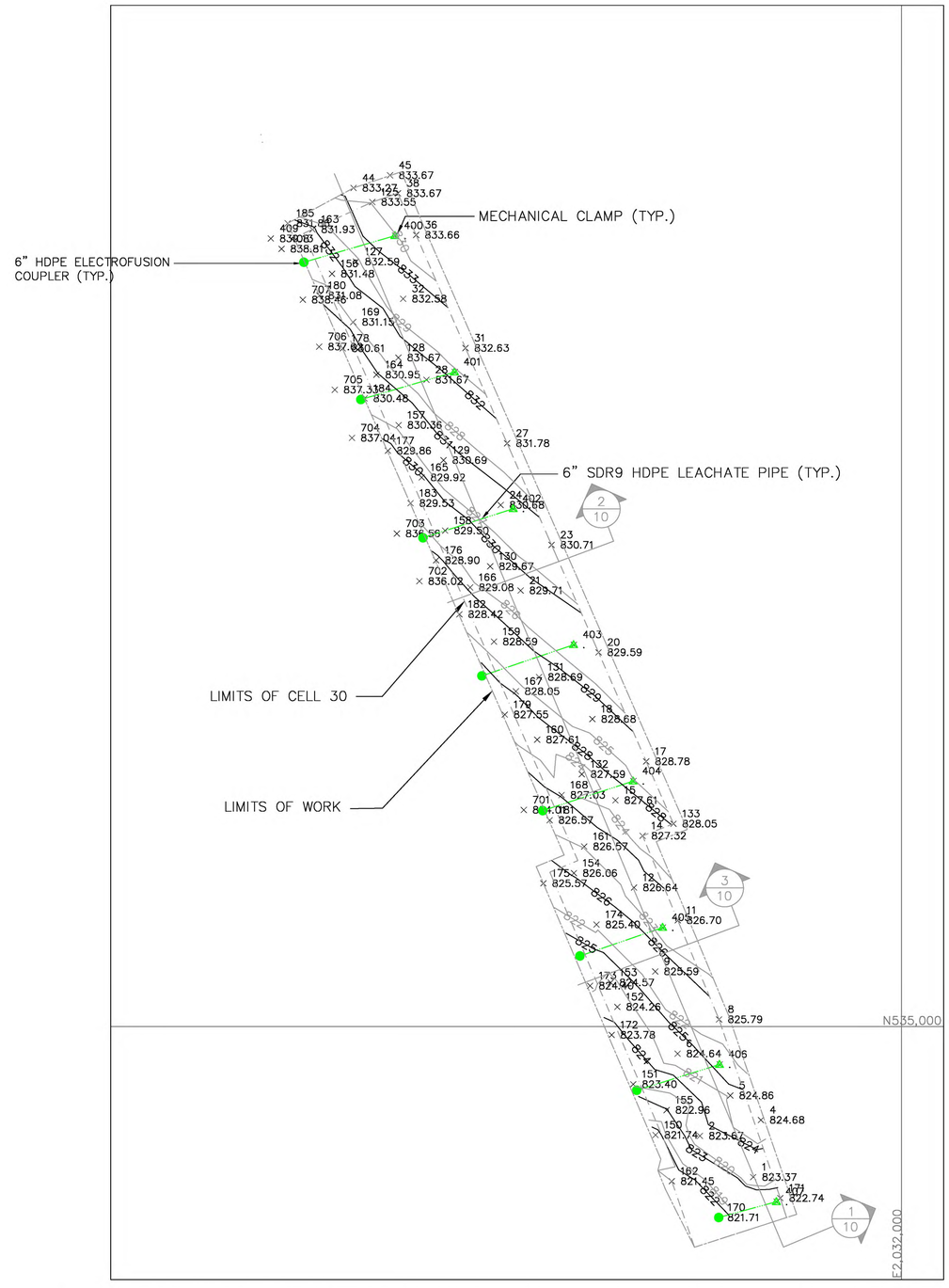
SHEET 5
TOP OF SOIL LINER/ LEACHATE COLLECTION SYSTEM

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30–SHEET5	



TOP OF CONSTRUCTED SOIL LINER COMPARED TO CONSTRUCTED BOTTOM OF SOIL LINER

NORTH

LEGEND

- 803.00 — TOP OF CONSTRUCTED SOIL LINER/ LEACHATE COLLECTION SYSTEM CONTOUR
- 803.00 — CONSTRUCTED BOTTOM OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE TOP OF THE SOIL LINER/ LEACHATE COLLECTION SYSTEM
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- LEACHATE COLLECTION LATERAL
- 6" SDR9 HDPE ELECTROFUSION COUPLER
- MECHANICAL CLAMP

NOTE:

BECAUSE THE LEACHATE COLLECTION SYSTEM IS COMPRISED OF GEOSYNTHETICS THAT ARE RELATIVELY THIN AND ARE NOT READILY MEASURED BY SURVEYING, THE TOP OF THE LEACHATE COLLECTION SYSTEM AND THE TOP OF THE CONSTRUCTED SOIL LINER ARE ASSUMED TO BE IDENTICAL FOR THIS SUBMITTAL.

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

0 25 50 100

(IN FEET)
1 inch = 50 ft.

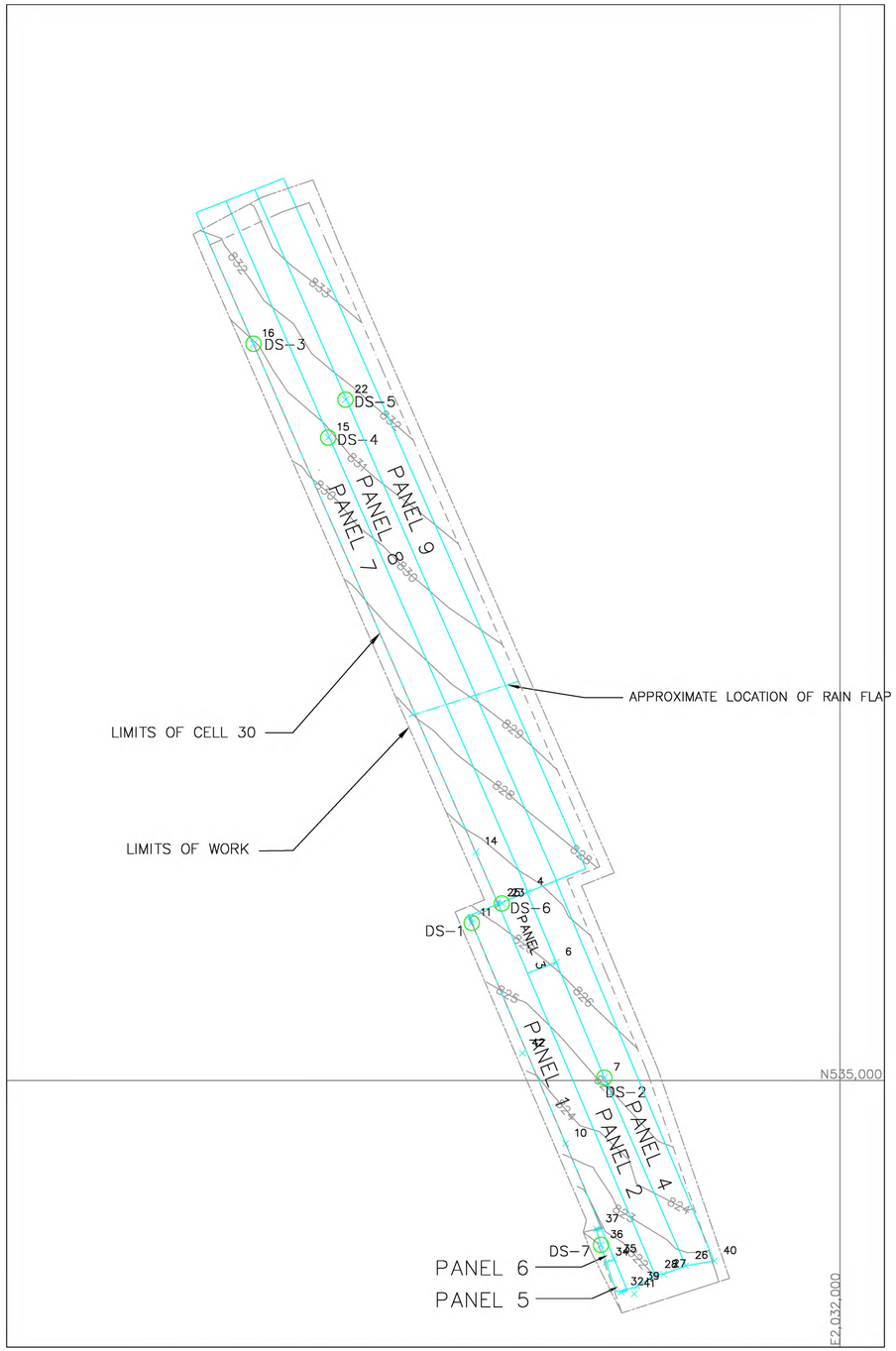
SHEET 6
TOP OF SOIL LINER/ LEACHATE COLLECTION SYSTEM

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30–SHEET6	



GEOMEMBRANE PANEL LAYOUT – 60 MIL TEXTURED HDPE

NORTH

PANEL NO.	GEOMEMBRANE ROLL NO.
1	1001–151227
2	1001–151227
3	1001–151228
4	1001–151228
5	1001–151228
6	1001–151228
7	1001–151229
8	1001–151239
9	1001–151235

LEGEND

803.00 — AS CONSTRUCTED TOP OF SOIL LINER CONTOUR

x 5 — SURVEY LOCATION OF GEOMEMBRANE REPAIR PATCH WITH PATCH NUMBER

X DS-1 — DESTRUCT TEST LOCATION AND NUMBER

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/17/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

SHEET 7
GEOMEMBRANE PANEL LAYOUT

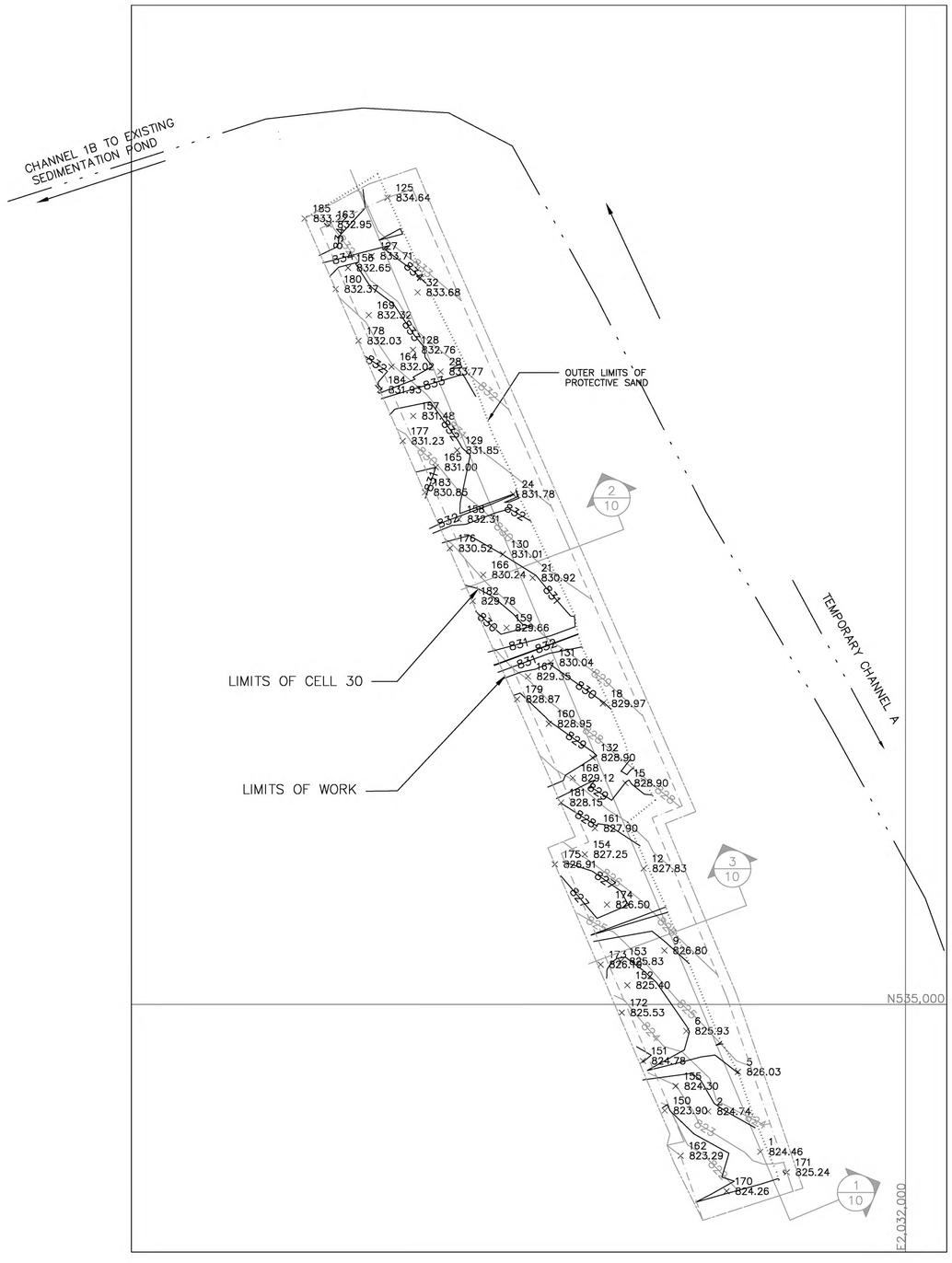
ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED
CHECKED
DRAWING NUMBER
C30–SHEET7

The Mark James Corporation



NORTH

LEGEND

- 803.00 — TOP OF CONSTRUCTED PROTECTIVE LAYER
- 803.00 — AS CONSTRUCTED TOP OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE AS CONSTRUCTED TOP OF PROTECTIVE COVER
- 1/10 — LOCATION OF CROSS SECTION LINE

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

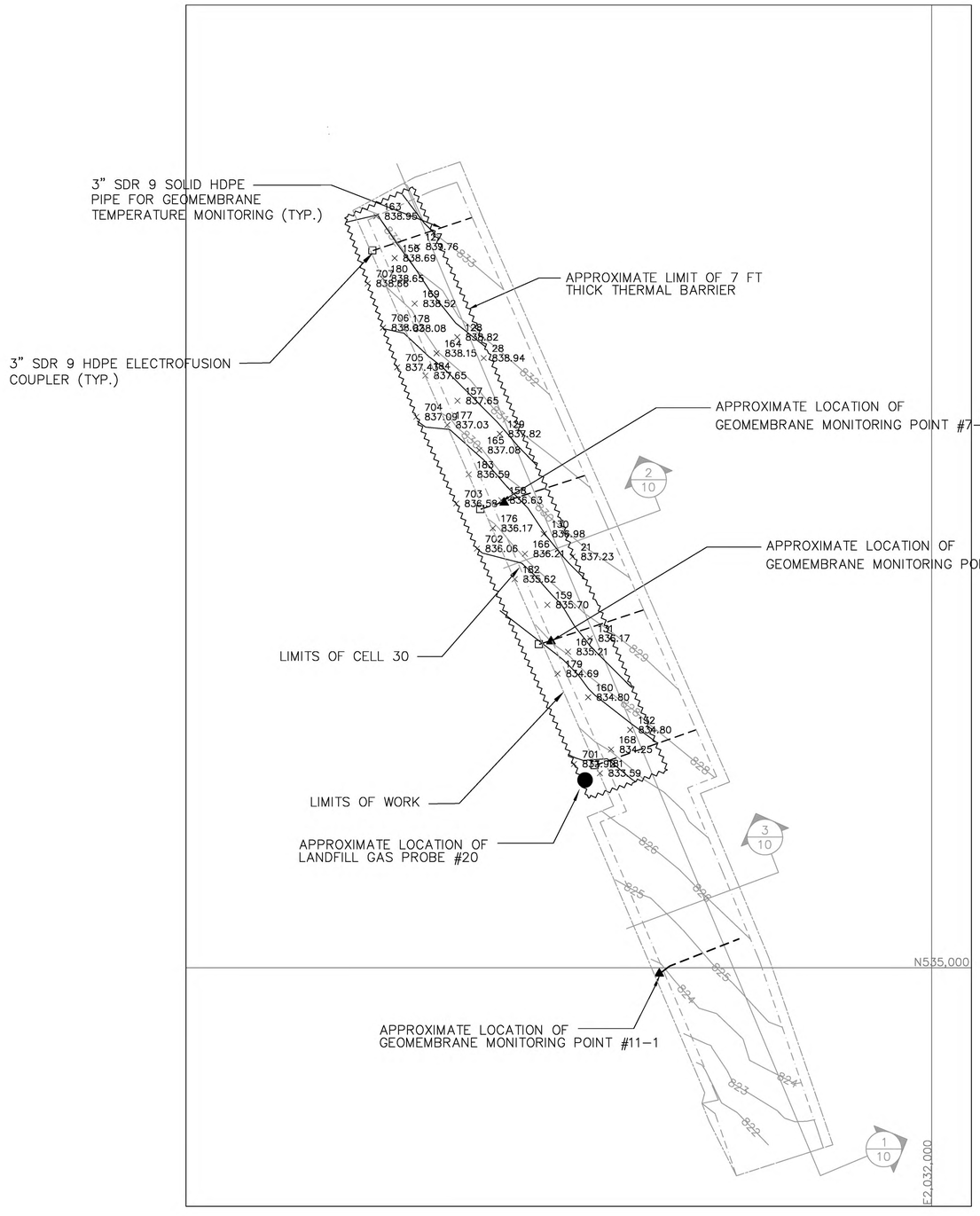
SHEET 8
TOP OF PROTECTIVE LAYER/ SURFACE WATER MANAGEMENT

ATHENS–HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30–SHEET8	



NORTH

LEGEND

- 803.00 — CONSTRUCTED TOP OF THE THERMAL BARRIER LAYER
- 803.00 — CONSTRUCTED TOP OF SOIL LINER CONTOUR
- X 808.35 — SURVEY POINT LOCATION WITH POINT NUMBER AND SPOT ELEVATION FOR THE CONSTRUCTED TOP OF THE THERMAL BARRIER LAYER
- 1/10 — LOCATION OF CROSS SECTION LINE WITH CROSS SECTION #/SHEET #
- APPROXIMATE OUTER LIMIT OF THE 7 FT. THICK THERMAL BARRIER LAYER
- □ 3" SDR 9 HDPE ELECTROFUSION COUPLER
- ▲ APPROXIMATE LOCATION OF THERMOCOUPLE
- ● APPROXIMATE LOCATION OF LANDFILL GAS PROBE #20

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
9/14/21

GRAPHIC SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

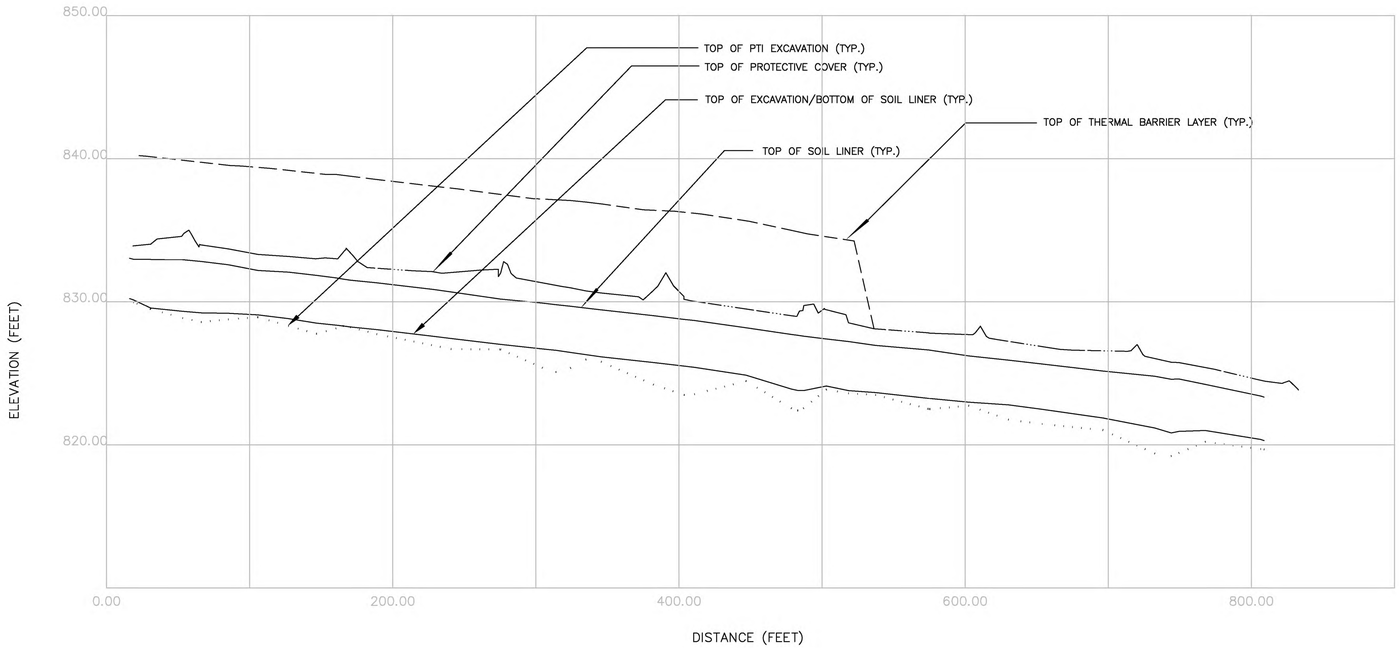
SHEET 9
TOP OF THE THERMAL BARRIER LAYER

ATHENS-HOCKING RECLAMATION CENTER LANDFILL
CELL 30 CONSTRUCTION CERTIFICATION REPORT

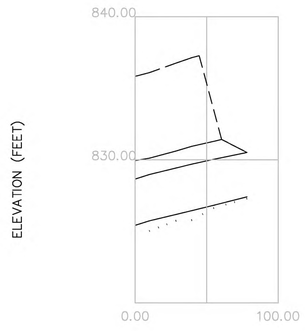
PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED	The Mark James Corporation
CHECKED	
DRAWING NUMBER	
C30-SHEET9	



SECTION 1



SECTION 2

SECTION 2

STATE OF OHIO
EDWARD A. BRDICKA
E-58442
REGISTERED PROFESSIONAL ENGINEER
E.A. Brdicka
9/14/21

GRAPHIC SCALES

HORIZONTAL SCALE

0 25 50 100

(IN FEET)
1 inch = 50 ft.

VERTICAL SCALE

0 2.5 5 10

(IN FEET)
1 inch = 5 ft.

SHEET 10
CROSS SECTIONS

ATHENS–HOCKING RECLAMATION CENTER
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

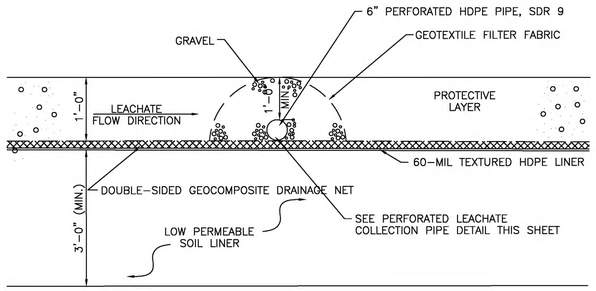
APPROVED

CHECKED

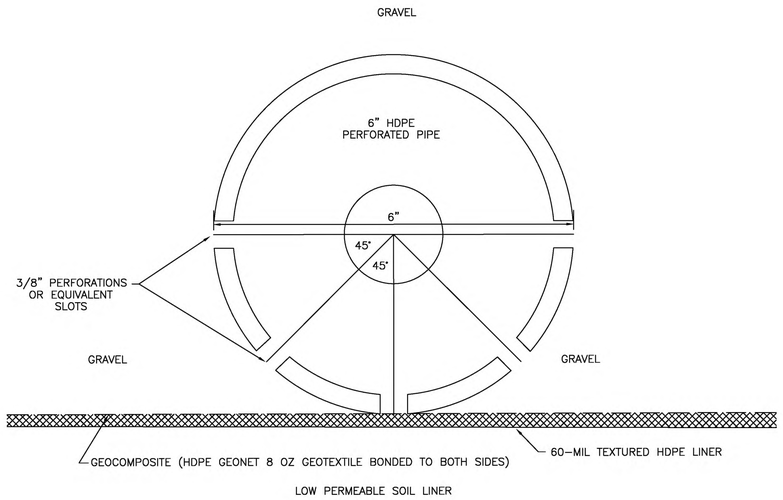
DRAWING NUMBER

C30–SHEET10

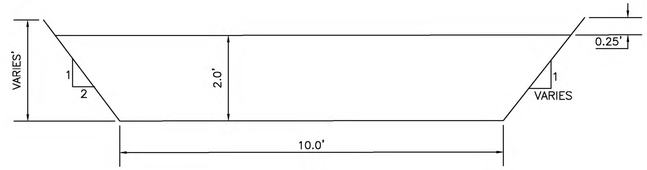
The Mark James Corporation



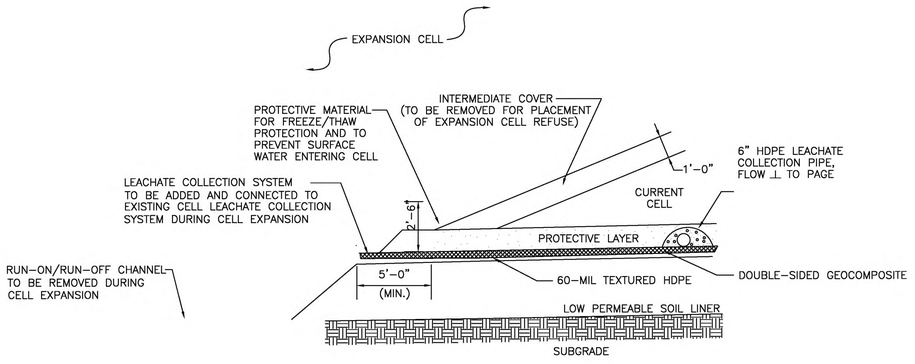
LINER SYSTEM WITH
LEACHATE COLLECTION LATERAL



PERFORATED LEACHATE COLLECTION PIPE

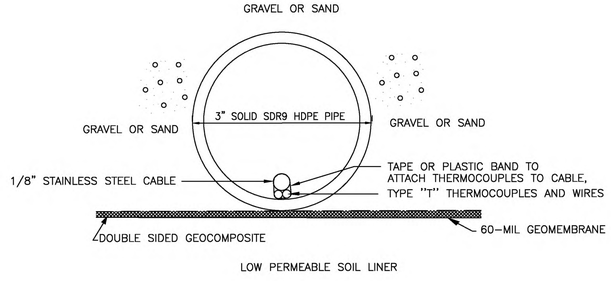


CHANNEL 1B

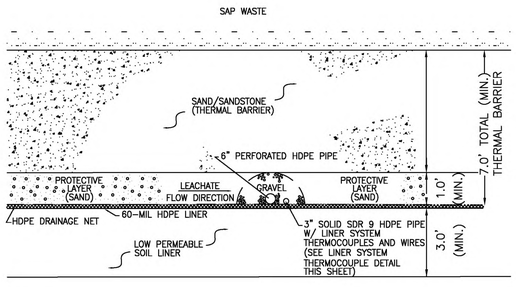


SOIL BERM

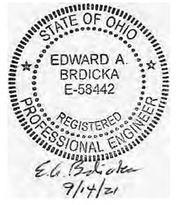
CELL TO CELL INTERFACE AND
TEMPORARY BERM INTERFACE



LINER SYSTEM THERMOCOUPLE



SECONDARY ALUMINUM PRODUCTION WASTE
THERMAL BARRIER DETAIL



NOTE:

DETAILS ARE NOT TO SCALE

SHEET 11
DETAILS

ATHENS-HOCKING RECLAMATION CENTER
CELL 30 CONSTRUCTION CERTIFICATION REPORT

PREPARED FOR

ATHENS HOCKING LANDFILL, INC.

APPROVED

CHECKED

DRAWING NUMBER

C30-SHEET11

The Mark James Corporation