Gude Landfill Remediation Design
Project Manual
Montgomery County, Maryland

90% Submission

Prepared for

Northeast Maryland Waste Disposal Authority and
Montgomery County Department of Environmental Protection
Recycling and Resource Management Division
Montgomery County, Maryland

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GUDE LANDFILL REMEDIATION
CONSTRUCTION SPECIFICATIONS
Note: Sections that are struck through are anticipated for 100% Design submittal.

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SECTION 01 11 00
SUMMARY OF WORK

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The Work to be performed under these Contract Documents consists of the construction of a closure cap for the Gude Landfill located in Montgomery County, Maryland. This Specification Section provides a general description of the scope of work which is not intended to be an all-encompassing listing of the project work to be performed by the CONTRACTOR. The CONTRACTOR shall refer to the appropriate detailed Specification Section for additional information. The work includes, but is not limited to, the following:

1. Gude Landfill Closure:

a. Placement and maintenance of erosion and sediment controls as depicted in the Contract Drawings and in accordance with applicable local and state regulations including silt fence, super silt fence, bench construction, swale construction, pumping and filtering practices, and temporary stabilization.

b. Clearing, grubbing, and stripping vegetation from all areas within the limit of work.

c. Demolition of existing stormdrains and drainage structures, buildings, and foundations as noted in the Contract Drawings.

d. Preparation of the landfill closure cap subgrade which consists of:

1) Existing cover soil removal and stockpiling.

2) Grading and onsite waste excavation and relocation of waste materials within the landfill with leachate management.

3) Placement of minimum one (1) foot of final cover soil over regraded waste.

e. Construction of landfill closure cap from bottom to top grade consisting of:

1) Hydraulic barrier layer consisting of forty (40)-mil textured linear low density polyethylene geomembrane, underlain by geotextile.

2) Geosynthetic drainage layer consisting of double-sided geocomposite.

3) Minimum twenty (20)-inch-thick layer of Vegetative Support Soil and minimum four (4)-inch-thick layer of Topsoil.

4) An alternate closure cap may be selected by the OWNER and would consist of a material that combines the geomembrane and geocomposite drainage layer into a single product.

f. Construction of surface water drainage benches, swales, and gabion slope drainage channels.

g. Construction of daylighted drainage systems.

h. Improvements to active landfill gas collection system including modifying existing extraction wells, new extraction wells, new below-grade lateral and header collection piping, and installing new condensate drains.

i. Modification to the existing temporary piezometers and dewatering sumps.

j. Construction of access roads.

k. Construction/implementation of stormwater management controls and improvements.

l. Site security, including the installation of video surveillance and replacement of the existing chain-link fence and gates.

m. Site stabilization and development of passive land use features.

n. Other project or Contract work as shown on the Contract Drawings and as specified herein.

B. The project site is located in Montgomery County, Maryland, at 600 East Gude Drive, Rockville, Maryland 20850. The primary entrance for heavy construction vehicles will be Incinerator Lane, located off of Southlawn Lane, Rockville, Maryland. The detailed scope of work is annotated in the following sections. The CONTRACTOR is to coordinate his work (materials handling and traffic) with the landfill operators and other site contractors. The CONTRACTOR is to be advised that Work operations will be adjacent to private homeowners, commercial businesses, and recreational pedestrians; therefore, working hours as well as noise, odor, and dust control will be monitored and strictly enforced.

C. Hours of Work are defined in the General Conditions.

D. The summary of the Work described in the Division 01 Sections is an overall summary of the responsibilities of the CONTRACTOR and his relationship to the OWNER. It

does not represent an all-encompassing listing of the project work nor does it supersede the specific requirements elsewhere in the Contract Documents.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Contracts

A. The Work shall be coordinated by the CONTRACTOR.

1.11 Work By Others

A. Work by OWNER:

1. The OWNER may let other contractors within the Gude Landfill site during the term of this Contract. The CONTRACTOR will cooperate with other contractors and activities associated with this Work.

1.12 Sequence of Work

A. CONTRACTOR is responsible for establishing a schedule, to be approved by the CONSTRUCTION MANAGEMENT ENGINEER, for the sequence and progress of the Work. CONTRACTOR shall be solely responsible for coordination of all the Work to ensure completion of the Work within the time limits specified in the Contract.

1.13 Contractor's Use of Premises

A. CONTRACTOR'S use of the premises shall be confined to the areas within the Limits of Disturbance or as approved by the OWNER.

B. CONTRACTOR shall:

1. Assume full responsibility for protection and safekeeping of products stored on or off premises.

2. Move/relocate stored products that interfere with the operations of OWNER.

3. Obtain and pay for all additional storage or work areas required for the construction operations.

C. Limits on CONTRACTOR'S use of site:

1. Shall be by agreement between the OWNER and the CONTRACTOR.

2. CONTRACTOR shall provide and maintain temporary facilities and access to these facilities for the duration of the Contract.

2. MATERIALS

A. Not used.

3. EXECUTION

A. Not used.

-- End of Section --

SECTION 01 20 00 MEASUREMENT AND PAYMENT
[PROVIDED UNDER SEPARATE SUBMITTAL]

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

1. GENERAL

1.1 Description

A. General

1. This Section expands upon provisions of the General Conditions and Supplementary Conditions, and includes:

   a. Requests for interpretation.
   b. Minor variations in the Work and Field Orders.
   c. Work Change Directives.
   d. Proposal requests.
   e. Change Order proposals.
   f. Change Orders.

B. Submit Contract modification documents to CONSTRUCTION MANAGEMENT ENGINEER at addresses in Section 01 33 00, Submittals.

C. Retain at CONTRACTOR'S office and at the Site complete copy of each Contract modification document and related documents, and OWNER'S and CONSTRUCTION MANAGEMENT ENGINEER'S responses.

1.1.1 Requests For Interpretation

A. General

1. Submit written requests for interpretation to CONSTRUCTION MANAGEMENT ENGINEER.

2. Submit request for interpretation to obtain clarification or interpretation of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents using requests for interpretation.

3. Do not submit request for interpretation when other form of communication is appropriate, such as submittals, requests for substitutions or "or equals," notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action and noted as such.

B. Procedure

1. Submit one (1) original, one (1) hardcopy, and an electronic PDF document of each request for interpretation to the CONSTRUCTION MANAGEMENT ENGINEER for distribution. CONSTRUCTION MANAGEMENT ENGINEER will forward the request for distribution to the following:

   a. CONSTRUCTION MANAGEMENT ENGINEER (original).
   b. OWNER (electronic copy).

2. CONSTRUCTION MANAGEMENT ENGINEER will provide review of requests for interpretation and will provide response within five (5) days. Allow sufficient time for review and response.

3. CONSTRUCTION MANAGEMENT ENGINEER will maintain log of requests for interpretation. An electronic copy of log will be provided upon request.

4. CONSTRUCTION MANAGEMENT ENGINEER will provide written response to each request for interpretation. An electronic copy of CONSTRUCTION MANAGEMENT ENGINEER'S electronic response (via email) will be distributed to CONTRACTOR and OWNER.

5. If CONSTRUCTION MANAGEMENT ENGINEER requests additional information to make an interpretation, provide information requested within five (5) days, unless CONSTRUCTION MANAGEMENT ENGINEER allows additional time, via correspondence referring to request for interpretation number.

6. If CONTRACTOR believes that a change in Contract Price or Contract Times or other change to the Contract is required, notify CONSTRUCTION MANAGEMENT ENGINEER in writing before proceeding with Work associated with the request for interpretation.

C. Each request for interpretation shall be submitted on the request for interpretation form included with this Section, or other form acceptable to CONSTRUCTION MANAGEMENT ENGINEER.

1. Number each request for interpretation as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three (3)-digit sequential number. Example: First request for interpretation on the general contract for project titled, "Contract No. XXXX Gude Remediation" would be, "RFI No. X Contract XXXX-GC-001."

2. In space provided on form, describe the interpretation requested. Provide additional sheets as required. Include text and sketches as required in sufficient detail for CONSTRUCTION MANAGEMENT ENGINEER's response.

3. When applicable, request for interpretation shall include CONTRACTOR'S recommended resolution.

1.1.2 Minor Variations in Work and Field Orders

A. General

1. A Field Order, when required, will be initiated by CONSTRUCTION MANAGEMENT ENGINEER and issued by OWNER.

2. Field Orders authorize minor variations in the Work, but do not change the Contract Price or Contract Times.

3. Field Orders will be submitted on the field order form included with this Section.

4. CONSTRUCTION MANAGEMENT ENGINEER will maintain a log of Field Orders Issued.

B. Procedure

1. One (1) hardcopy and an electronic copy of each Field Order will be distributed to:

   a. CONTRACTOR.
   b. OWNER (electronic only).
   c. CONSTRUCTION MANAGEMENT ENGINEER.

2. If Field Order is unclear, submit request for interpretation.

3. If CONTRACTOR believes that a change in Contract Price or Contract Times or other change to the Contract is required, immediately notify OWNER and CONSTRUCTION MANAGEMENT ENGINEER in writing. Approval is required before proceeding with Work associated with the Field Order.

1.1.3 Work Change Directives

A. General

1. Work Change Directives are for use in situations involving changes in the Work which, if not processed expeditiously, might delay the project. These changes are often initiated in the field and may affect the Contract Price or the Contract Times. They are not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order.

2. Work Change Directives, when required, order additions, deletions, or revisions to the Work.

3. Work Change Directives do not change the Contract Price or Contract Times, but are evidence that the parties to the Contract expect that the change ordered or documented by the Work Change Directive will be incorporated in subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times. Work Change Directives with no effect on Contract Price or Contract Times may be formalized as a "Zero-Dollar Change Order." Work Change Directives require approval from the Northeast Maryland Waste Disposal Authority prior to implementation.

4. Work Change Directives will be submitted on the work change directive form included with this Section.

B. Procedure

1. Three (3) originals and an electronic copy of the Work Change Directive signed by OWNER and CONSTRUCTION MANAGEMENT ENGINEER will be furnished to CONTRACTOR, who shall promptly sign each original Work Change Directive and, within five (5) days of receipt, return all originals to CONSTRUCTION MANAGEMENT ENGINEER.

2. Original, signed Work Change Directives will be distributed as follows:

   a. CONTRACTOR: One (1) original.
   b. OWNER: One (1) original.
   c. CONSTRUCTION MANAGEMENT ENGINEER: One (1) original.

3. When required by CONSTRUCTION MANAGEMENT ENGINEER, documentation for the Work performed under each separate Work Change Directive, for each day, the number and type of workers employed and hours worked; equipment used including manufacturer, model, and year of equipment, and number of hours; materials used, receipts for and descriptions of materials and equipment incorporated into the Work, invoices and labor and equipment breakdowns for Subcontractors and Suppliers, and other information required by OWNER or CONSTRUCTION MANAGEMENT ENGINEER, in a format acceptable to CONSTRUCTION MANAGEMENT ENGINEER. Submit this documentation to CONSTRUCTION MANAGEMENT ENGINEER as a Change Order proposal.

4. Once the Work covered by this directive is completed or final costs and times are determined, CONTRACTOR shall submit documentation for inclusion in a Change Order.

1.1.4 Proposal Requests

A. General

1. Proposal requests are initiated by OWNER.

2. Proposal requests are for requesting the effect on Contract Price and Contract Times and other information relative to contemplated changes in the Work.

3. Proposal requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.

4. Proposal requests will be furnished using the proposal request form included with this Section.

B. Procedure

1. One (1) hardcopy and an electronic copy of each signed proposal request will be furnished to the CONTRACTOR with one (1) hardcopy and an electronic copy each to:

   a. OWNER.
   b. CONSTRUCTION MANAGEMENT ENGINEER.

2. Submit request for interpretation to clarify conflicts, errors, ambiguities, and discrepancies in proposal request.

3. Upon receipt of proposal request, CONTRACTOR shall prepare and submit a Change Order proposal, in accordance with this Section, for the proposed Work described in the proposal request.

1.1.5 Change Order Proposals

A. General

1. Submit written Change Order proposal to OWNER and CONSTRUCTION MANAGEMENT ENGINEER in response to each proposal request, and when CONTRACTOR believes a change in the Contract Price or Contract Times or other change to the terms of the Contract is required.

B. Procedure

1. Submit to CONSTRUCTION MANAGEMENT ENGINEER one (1) original, four (4) hardcopies, and an electronic copy of each Change Order proposal with accompanying documentation. Pages are to be numbered. CONSTRUCTION MANAGEMENT ENGINEER will distribute for review.

2. CONSTRUCTION MANAGEMENT ENGINEER will review Change Order proposal and either request additional information from CONTRACTOR or provide to OWNER recommendation regarding approval of the Change Order proposal.

3. If CONSTRUCTION MANAGEMENT ENGINEER requests additional information to render a decision, submit required information within five (5) days of receipt of CONSTRUCTION MANAGEMENT ENGINEER's request, unless CONSTRUCTION MANAGEMENT ENGINEER allows greater amount of time. Submit the required information via correspondence that refers to Change Order proposal number.

4. Upon completing review, one (1) hardcopy, and an electronic copy of CONSTRUCTION MANAGEMENT ENGINEER's written response, if any, will be distributed to:

    a. CONTRACTOR.
    b. OWNER.
    c. CONSTRUCTION MANAGEMENT ENGINEER.

5. If Change Order proposal is recommended for approval by CONSTRUCTION MANAGEMENT ENGINEER and approved by OWNER, a Change Order will be issued.

6. If parties do not agree on terms for the change, OWNER or CONTRACTOR may file a Claim against the other, in accordance with the General Conditions and the Supplementary Conditions.

C. Each Change Order proposal shall be submitted on the Change Order proposal form included with this Section, or other form acceptable to OWNER.

1. Number each Change Order proposal as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three (3)-digit sequential number. Example: First Change Order proposal for the general contract for project named "Contract XXXX" would be, "Change Order Proposal No. XXXX."

2. In space provided on form:

    a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for CONSTRUCTION MANAGEMENT ENGINEER'S review and response. If a change item is submitted in response to proposal request, write in as scope, "In accordance with Proposal Request No." followed by the proposal request number. Provide written clarifications, if any, to scope of change.

    b. Provide justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Proposal Request No." followed by the proposal request number.

    c. List the total change in Contract Price and Contract Times for each proposed change.

3. Unless otherwise directed by CONSTRUCTION MANAGEMENT ENGINEER, attach to the Change Order proposal detailed breakdowns of pricing (Cost of the Work and CONTRACTOR'S fee) including:

    a. List of Work tasks to accomplish the change and any reference to applicable specification(s) and/or drawing(s).

    b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification, including data on MFD participation.

    c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each.

    d. Detailed breakdown of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations.

    e. Breakdowns of the Cost of the Work and fee for Subcontractors, including labor, construction equipment and machinery, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees.

    f. Breakdown of other costs eligible, in accordance with the General Conditions and the Supplementary Conditions.

    g. Breakdown of pricing shall be in accordance with the unit pricing of any existing Bid and Contingency items when applicable.

    h. Other information required by CONSTRUCTION MANAGEMENT ENGINEER.

    i. CONTRACTOR'S fees applied to eligible CONTRACTOR costs and eligible Subcontractor costs.

1.1.6 Change Orders

A. General

1. Change Orders will be recommended by CONSTRUCTION MANAGEMENT ENGINEER, signed by CONTRACTOR and approved by OWNER, to authorize additions, deletions, or revisions to the Work, or changes to the Contract Price or Contract Times.

2. Change Orders will be issued utilizing the form included.

B. Procedure

1. Three (3) originals and one (1) electronic copy of each Change Order will be furnished to CONTRACTOR, who shall promptly sign each original Change Order and return all originals to OWNER within five (5) days of receipt. Electronic copies need to include all attachments with the pages numbered.

2. Each original Change Order will be signed by representatives of OWNER and forwarded to the Northeast Maryland Waste Disposal Authority for approval.

3. After approval by County, original Change Orders will be distributed to CONTRACTOR, OWNER, and CONSTRUCTION MANAGEMENT ENGINEER.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Contracts

A. Not used.

1.11 Work By Others

B. Not used.

1.12 Sequence of Work

C. Not used.

1.13 CONTRACTOR'S Use of Premises

A. Not used.

2. MATERIALS

A. Not used.

3. EXECUTION

A. Not used.

-- End of Section --

MONTGOMERY COUNTY, MARYLAND
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RECYCLING AND RESOURCE MANAGEMENT DIVISION
GUDE LANDFILL REMEDIATION PROJECT

REQUEST FOR INTERPRETATIONS

CONTRACTOR: _____ RFI No. _____
Date Transmitted: _____ Date Received: _____
Date Response Requested: _____ Date Response Transmitted: _____

Subject: _____
Specification Section and Paragraph: _____
_____
Drawing References: _____
_____

INTERPRETATION REQUESTED:

Signature: _____ Date: _____

CONSTRUCTION MANAGEMENT ENGINEER'S RESPONSE:

Signature: _____ Date: _____

MONTGOMERY COUNTY, MARYLAND
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RECYCLING AND RESOURCE MANAGEMENT DIVISION
GUDE LANDFILL REMEDIATION PROJECT

WORK CHANGE DIRECTIVE NO. _____

DATE OF ISSUANCE: _____ EFFECTIVE DATE: _____

CONTRACTOR: _____

Contract: _____

You are directed to proceed promptly with the following change(s):
Description:

Purpose of Work Change Directive:

Attachments: (List documents supporting change)

If OWNER or CONTRACTOR believe that the above change has affected Contract Price any Claim for a Change Order based thereon will involve one (1) or more of the following methods as defined in the Contract Documents.
Method of determining change in Contract Price:

- ☐ Unit Prices
- ☐ Lump Sum
- ☐ Cost of the Work _____

Estimated change in Contract Price and Contract Times:

Contract Price $ _____ (increase/decrease) Contract Time _____ (increase/decrease) days

MFD Price $ _____ (increase/decrease) MFD %_____ (increase/decrease)

If the change involves an increase, the estimated amounts are not to be exceeded without further authorization.

Recommended for Approval by Construction Management Engineer:	Date
Authorized for Owner by:	Date
Accepted for Contractor by:	Date
Approved by Northeast Maryland Waste Disposal Authority:	Date:

MONTGOMERY COUNTY, MARYLAND
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RECYCLING AND RESOURCE MANAGEMENT DIVISION
GUDE LANDFILL REMEDIATION PROJECT

PROPOSAL REQUEST

Proposal Request No.: _____ Date: _____

Contract Name and No.: _____

Contractor: _____

Other Contracts Involved in Proposed Change: _____

_____

TO CONTRACTOR: Please submit a complete Change Order proposal for the proposed modifications described below. If the associated Change Order proposal is approved, a Change Order will be issued to authorize adjustment so the scope of Work. This Proposal Request is not a Change Order or an authorization to proceed with the proposed Work described below.

SCOPE OF PROPOSED WORK:

1. *Item*:
2. *Item*:
3. *Item*:

Proposal Requested By: _____

Signature of Requestor: _____

MONTGOMERY COUNTY, MARYLAND
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RECYCLING AND RESOURCE MANAGEMENT DIVISION
GUDE LANDFILL REMEDIATION PROJECT

CHANGE ORDER PROPOSAL

Change Order Proposal No.: _____ Date: _____

Submitted in Response to Proposal Request No.: _____

Contract Name and No.: _____

Contractor: _____

Subject: _____

_____

The following changes to the Contract are proposed:

SCOPE OF WORK: *(attach and list supporting information as required)*

1. *Item*:
2. *Item*:

JUSTIFICATION:

1. *Item*:
2. *Item*:

CHANGES IN CONTRACT PRICE AND CONTRACT TIMES:

We propose that the Contract Price and Contract Times be changed as follows:

For Contract Price, when requested by CONSTRUCTION MANAGEMENT ENGINEER, attach detailed cost breakdowns, Supplier quotations, MFD price and percentage, and other information required.

For Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to Contract Times.

Description	Amount	Contract Times (days)	
		Substantial	Final
1. Item	$0.00	0	0
2. Item	$0.00	0	0
Total This Change Order Proposal	*$0.00*	*0*	*0*

Changes to Milestones, if any: _____

The adjustment proposed is the entire adjustment to the Contract to which the proposer believes it is entitled as a result of the proposed change.

Change Order Proposal By: _____

Signature of Proposer: _____

You are directed to make the following changes in the Contract Documents:

Description:
1. *Item:*

PROPOSAL NO: _____ **PROJECT:** Gude Landfill Remediation Project
DATE: _____ **CONTRACTOR:** _____

Reason for Change Order:
1. *Item:*

Attachments: (List documents supporting change): 1. *Item:*

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES
Original Contract Price: $ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____ (days or dates)
Net increase (decrease) from previous Change Orders No. _____ to _____: $ _____	Net change from previous Change Orders No. ___ to ___ Substantial Completion: _____ Ready for final payment: _____ (days)
Contract Price prior to this Change Order: $ _____	Contract Times prior to this Change Order Substantial Completion: _____ Ready for final payment: _____ (days or dates)
Net increase (decrease) of this Change Order $ _____	Net increase (decrease) of this Change Order Substantial Completion: _____ Ready for final payment: _____ (days)
Contract Price with all approved Change Orders $ _____	Contract Times with all approved Change Orders Substantial Completion: _____ Ready for final payment: _____ (days or dates)

RECOMMENDED:

By: _____
Project Manager, Construction Management Engineer

Date: _____

RECOMMENDED:

By: _____
Project Manager, Recycling and Resource Management Division

Date: _____

Date: _____

APPROVED:

By: _____
Section Chief, Recycling and Resource Management Division

Date: _____

APPROVED:

By: _____
Director of Procurement, Northeast Maryland Waste Disposal Authority

Date: _____

ACCEPTED:

By: _____
(Contractor)

Date: _____

SECTION 01 31 19.13
PRECONSTRUCTION MEETING

1. GENERAL

1.1 Description

A. The Preconstruction Meeting will be held to establish a working understanding among the parties as to the Work and to discuss the Preliminary Schedules, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. CONTRACTOR shall attend the meeting prepared to discuss all items on the agenda. The representatives present for each party shall be authorized to act on their behalf.

C. Purpose of the meeting is to designate responsible personnel, establish working relationships, and establish administrative provisions for the Project. Matters requiring coordination will be discussed and procedures for handling such matters will be established.

D. Date, Time and Location: Meeting will be held after execution of the Contract and before Work starts at the Site. CONSTRUCTION MANAGEMENT ENGINEER will determine the date, time, and location of the meeting and advise the interested and involved parties.

E. CONSTRUCTION MANAGEMENT ENGINEER will distribute an agenda and preside at the meeting. CONSTRUCTION MANAGEMENT ENGINEER will prepare and distribute meeting minutes to all meeting participants and others as requested. CONTRACTOR will review the draft minutes and provide written comment or acceptance to all within five (5) days.

F. CONTRACTOR shall provide data required and contribute appropriate items for discussion. Unless previously submitted to OWNER and CONSTRUCTION MANAGEMENT ENGINEER, CONTRACTOR shall bring to the meeting a draft of each of the following or any other pertinent (relevant) information:

1. Progress Schedule.
2. List of required Shop Drawings and submittals.
3. Schedule of Values.
4. Contractor's Site-Specific Health and Safety Plan.
5. List of emergency contact information.

1.1.1 Required Attendance

A. Meeting shall be attended by CONTRACTOR'S project manager, Site superintendent, and major Subcontractors and major equipment Suppliers, as CONTRACTOR deems appropriate.

B. Other attendees will be representatives of:

1. Montgomery County Department of Environmental Protection (OWNER).
2. CONSTRUCTION MANAGEMENT ENGINEER.
3. Northeast Maryland Waste Disposal Authority representative.
4. Governmental agencies having control or responsibility, if available.
5. Others as requested by OWNER, CONTRACTOR, or CONSTRUCTION MANAGEMENT ENGINEER.

1.1.2 Agenda

A. Agenda: CONTRACTOR shall be prepared to discuss the following:

1. Designation of responsible personnel.
2. Communications and correspondence.
3. Coordination with other contractors.
4. Emergency contact information.
5. Review of Scope of Work.
6. Review of Contract Times, Milestones, and completion dates.
7. Subcontractors.
8. Progress Schedule.
9. Schedule of Values.
10. Project coordination and coordination with OWNER'S operations.
11. Progress meetings.
12. Submittals and Shop Drawings: processing and schedule of submittals.
13. Substitutions.
14. Owner's tax-exempt status.
15. Payments, retainage, payrolls, and Substantial Completion.
16. Processing of Field Orders and Change Orders.
17. Use of premises, security, housekeeping, safety, CONTRACTOR'S responsibility for safety and first aid procedures, Site access.
18. Field offices, trailers, temporary facilities.
19. Storage of materials.
20. Construction photographs.
21. Record drawings.
22. Clarifications.
23. Requirements for copies of Contract Documents and availability.
24. CONTRACTOR correction period.
25. Layouts and surveys.
26. Hours of Work and overtime.

27. Restoration.
28. Permits.
29. Insurance in force.
30. Financing.
31. Disposal of demolition materials.
32. Next meeting.
33. General discussion and questions.
34. Site visit if required.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Contracts

A. Not used.

1.11 Work By Others

A. Not used.

1.12 Sequence of Work

A. Not used.

1.13 Contractor's Use of Premises

A. Not used.

2. MATERIALS

A. Not used.

3. EXECUTION

A. Not used.

-- End of Section --

SECTION 01 31 19.23
PROGRESS MEETINGS

1. GENERAL

1.1 Description

A. Progress meetings will be held throughout the Project. CONTRACTOR shall attend each meeting prepared to discuss all items on the agenda. The representatives present for each party shall be authorized to act on their behalf.

B. Date and Time:

1. Every two (2) weeks on a day and time agreeable to OWNER, CONSTRUCTION MANAGEMENT ENGINEER, and CONTRACTOR.

2. Frequency may be adjusted as required by progress of Work.

C. Place: CONTRACTOR'S or CONSTRUCTION MANAGEMENT ENGINEER'S trailer or other mutually agreed upon location.

D. OWNER and CONSTRUCTION MANAGEMENT ENGINEER will preside at meetings. CONSTRUCTION MANAGEMENT ENGINEER will prepare and distribute meeting minutes to all meeting participants and others as requested.

E. CONTRACTOR shall provide to the CONSTRUCTION MANAGEMENT ENGINEER the following data a minimum of two (2) days prior to the meeting:

1. List of work accomplished since the previous progress meeting

2. Schedule of Work with specific starting and ending dates for each task, planned until the next progress meeting

3. "Look-ahead" Schedule of Work for major shutdowns, major equipment installations, and other important milestones

4. List of upcoming planned time off, including dates, for personnel with significant roles on the project and designated contact person during their absence

1.1.1 Minimum Attendance

A. CONTRACTOR:

1. CONTRACTOR'S project manager.

2. CONTRACTOR'S site superintendent.

3. When needed for the discussion of a particular agenda item, CONTRACTOR shall require representatives of Subcontractors or Suppliers to attend a meeting.

B. OWNER'S Project Manager.

C. CONSTRUCTION MANAGEMENT ENGINEER.

D. Northeast Maryland Waste Disposal Authority.

E. Others, as appropriate.

1.1.2 Agenda

A. Agenda will include, but will not necessarily be limited to, the following:

1. Review and comment on minutes of previous meeting.

2. Review of progress since the previous meeting.

3. Planned progress for next period.

4. Review of overall project schedule, including offsite fabrication and delivery schedules and corrective measures, if required.

5. Review of status of critical submittals, including Shop Drawings and Applications for Payment.

6. Review of change issues and change orders.

7. Problems, conflicts and observations.

8. Quality standards and control.

9. Coordination between parties.

10. Safety concerns.

11. Permits.

12. Construction photographs.

13. Record drawings.

14. Punch list status.

15. Other business.

B. CONSTRUCTION MANAGEMENT ENGINEER will provide an adequate number of copies of the agenda for each attendee.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Contracts

A. Not used.

1.11 Work By Others

A. Not used.

1.12 Sequence of Work

A. Not used.

1.13 Contractor's Use of Premises

A. Not used.

2. MATERIALS

A. Not used.

3. EXECUTION

A. Not used.

-- End of Section --

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. CONTRACTOR shall designate onsite personnel to perform services specified, including:

1. Digital photography.

B. Provide photographic documentation for the following:

1. Preconstruction.
2. Construction progress.
3. Final.

C. Image Quality:

1. All photographic documentation shall be in color.

2. Photographic images shall be suitably staged and set up ("framed"), focused, and with adequate lighting.

3. For still photographs, use digital camera with minimum 10.1-megapixel resolution.

1.1.2 Related Work Specified Elsewhere

A. Section 00 73 00, Supplementary Conditions.

B. Section 01 33 00, Submittals.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Frequency of Photographic Documentation Submittals:

1. Preconstruction—Submit preconstruction photographic documentation (online and USB drives) prior to mobilizing to and disturbing the Site. Provide preconstruction photographic documentation no later than first Application for Payment, unless other schedule is accepted by CONSTRUCTION MANAGEMENT ENGINEER.

2. Progress—Provide construction progress photographic documentation (online USB drives) monthly. Submit with each Application for Payment, unless otherwise agreed to by CONSTRUCTION MANAGEMENT ENGINEER.

3. Final—Submit acceptable final photographic documentation (online and USB drives) prior to submitting final Application for Payment.

B. Photographic Prints:

1. Print Size and Finish:

a. Provide the following information on back of each print and front of each USB drive containing photographic documentation:

1) Date photograph was taken.
2) Project name.
3) Description of view shown in photograph.
4) Digital File name.

C. Digital Files of Photographs:

1. For each photograph taken, provide high-quality digital image on a USB drive in uncompressed "*.JPG" or "TIF" file format. USB drive shall be compatible with Microsoft Windows 10.

2. Image resolution shall be sufficient for clear, high-resolution prints. Resolution shall be the maximum provided by the camera.

3. Provide a date stamp on the front of each picture.

4. Post photographic images online and provide two (2) copies of each USB drive with photographic images.

5. Provide, with each USB drive and online, a photo log with the following information:

    a. Digital file name.
    b. Date photograph was taken.
    c. Project name.
    d. Description of view shown in photograph.

6. Label each USB drive with Project Name, date range of photos, and a brief description.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. CONSTRUCTION MANAGEMENT ENGINEER will approve the views to be taken and select time at which images will be taken. Photographic subjects, views, and angles will vary with progress of the Work.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

A. Not used.

3. EXECUTION

3.1 Preconstruction Photographic Documentation

A. Preconstruction Photographic Documentation:

1. Obtain and submit sufficient preconstruction photographic documentation to record Site conditions prior to construction. Photographs shall document all work areas.

2. Furnish to CONSTRUCTION MANAGEMENT ENGINEER specified number of photographs. Preconstruction photographs are not part of required number of construction progress photographs specified in Paragraph 1.5 of this Section.

B. If dispute arises and preconstruction photographic documentation was not submitted prior to the dispute, restore disputed area to extent directed by CONSTRUCTION MANAGEMENT ENGINEER and to complete satisfaction of OWNER.

3.2 Construction Progress Photographic Documentation

A. Progress Photographs:

1. Take photographs on a regular basis to document progress of the Work. At minimum, photographs shall be taken once per day of each area where work is being performed.

2. The minimum of weekly progress photographs taken shall be twenty-five (25). Submit additional monthly photographs as necessary to adequately document all aspects of the progress of Work.

3. Provide interior and exterior photographic documentation of each structure as directed by CONSTRUCTION MANAGEMENT ENGINEER.

4. Provide photographic documentation of all material deliveries, stored materials, and representative material assembly and testing.

3.3 Final Photographic Documentation

A. Final Photographs:

1. Take photographs at time and day acceptable to CONSTRUCTION MANAGEMENT ENGINEER. Do not take final photographs prior to Substantial Completion. Work documented in final photographs shall be generally complete, including painting, furnishings, landscaping, and other visible Work.

2. Take a minimum four hundred fifty (450) final photographs, based on scope of Work at the time Contract Times commence running. Proportionately modify the number of final photographs if scope of Project is modified. Final photographs are not part of construction progress photographs required under Paragraph 3.2.A of this Section.

-- End of Section --

SECTION 01 33 00
SUBMITTALS

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes general requirements and procedures related to the CONTRACTOR'S responsibilities for preparing and transmitting submittals to the CONSTRUCTION MANAGMENT ENGINEER to demonstrate that the performance of the Work will be in accordance with the Contract requirements. Submittals include schedules, test results, topographic surveys, CONTRACTOR'S drawings, samples, manuals, methods of construction, and record drawings. Other requirements for submittals are specified under applicable sections of the Project Manual.

B. CONTRACTOR shall provide submittals in accordance with the General Conditions as modified by the Supplementary Conditions, and this Section, well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of material or equipment and to implement procedures following CONSTRUCTION MANAGMENT ENGINEER'S approval or acceptance of the associated submittal.

C. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Section 00 73 00, Supplementary Conditions.

B. Section 01 70 00, Execution and Closeout Requirements.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not later than fifteen (15) days after the receipt of Notice to Proceed, the CONTRACTOR shall submit in writing a list of materials and equipment that will be purchased, giving name, address, and telephone number of supplier, manufacturer, or processor. No material shall be incorporated into the Work until approval of the source has been given. Delivery of materials to the Contract Site prior to approval is made at the CONTRACTOR'S risk and is subject to immediate removal at no cost to the OWNER should it be determined that the source is not acceptable.

B. Submittals shall be scheduled and coordinated with the CONSTRUCTION MANAGMENT ENGINEER and CONTRACTOR'S construction schedule.

C. A complete submittal schedule and list of required submittals shall be submitted prior to the Preconstruction Meeting. The schedule for submission of submittals shall be arranged so that related equipment items are submitted concurrently. The CONSTRUCTION MANAGMENT ENGINEER may require changes to the submittal schedule to permit concurrent review of related equipment.

D. No progress payment shall be made to CONTRACTOR until acceptable Construction Schedule, Submittal Schedule and Schedule of Values are submitted to CONSTRUCTION MANAGMENT ENGINEER and approved.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. The address for the Site is:

600 East Gude Drive
Rockville, Maryland 20850

B. The material delivery address for the Site is:

Incinerator Lane
Rockville, Maryland 20850

C. The mailing address for OWNER is:

Montgomery County
Resource Conversion Section
Recycling and Resource Management Division
Department of Environmental Protection
16101 Frederick Road
Derwood, Maryland 20855

D. The mailing address for the Northeast Maryland Waste Disposal Authority is:

Northeast Maryland Waste Disposal Authority
Tower II, Suite 402
100 S. Charles Street
Baltimore, Maryland 21201-2705

E. The mailing address for CONSTRUCTION MANAGMENT ENGINEER is:

SCS Engineers
11260 Roger Bacon Drive, Suite 300
Reston, Virginia 20190

1.9 Schedule

A. Not used.

1.9.1 Construction Schedule (Schedule of Work)

A. At or before the preconstruction meeting, CONTRACTOR shall prepare and submit for review to the CONSTRUCTION MANAGMENT ENGINEER an "expanded" construction schedule showing the order in which he/she proposes to carry out the work and the dates upon which he/she proposes to start and complete each major work item. Overlapping work items in sufficient detail shall be provided for approval. The expanded schedule shall be an elaboration of the bid schedule with completion dates remaining unchanged. The schedule shall show each major work item provided in the Contract, and shall include the dates for submittals, sample testing, approval of materials and CONTRACTOR'S drawings, and the procurement of materials and equipment. The construction schedule shall be in chart form showing expected completion percentages and arranged to record actual completion percentages at stated intervals. The schedule will outline in detail the proposed equipment, manpower, and production rates necessary to achieve the schedule.

B. The CONTRACTOR shall update the schedule every month with any and all changes in equipment, manpower, etc. annotated. The Schedule shall be prepared in Microsoft Project and the CONTRACTOR shall provide the schedule to the CONSTRUCTION

MANAGMENT ENGINEER for review in Microsoft Project format and PDF (portable document format).

C. The CONSTRUCTION MANAGMENT ENGINEER may require and the CONTRACTOR shall furnish such additional information and data as required to justify the basis of the schedule.

D. The accepted construction schedule shall be kept up to date as work progresses, including work added by change order, and shall be submitted to the CONSTRUCTION MANAGMENT ENGINEER every month and with the request for payment. If the CONTRACTOR fails to submit the updated schedule within the time prescribed, the CONSTRUCTION MANAGMENT ENGINEER may withhold approval of progress payment estimates until such time as the CONTRACTOR submits the updated schedule.

E. The construction schedule shall determine the order in which the Work is to proceed. However, the CONSTRUCTION MANAGMENT ENGINEER may request and authorize minor changes to this schedule whenever such changes are of advantage to or necessary for the operations of the OWNER.

1.10 Contractor's Submittals

1.10.1 General

A. The CONTRACTOR'S drawings shall be neat in appearance, legible, and explicit to enable proper review and ensure Contract compliance. They shall be complete and detailed to show fabrication, assembly and installation details, wiring and control diagrams, catalog data, pamphlets, descriptive literature, and performance and test data. They shall be accompanied by calculations or other sufficient information to provide a comprehensive description of the structure, machine, or system provided, and its intended manner of use. If the CONTRACTOR'S drawings deviate from the Contract Documents, the CONTRACTOR shall advise the CONSTRUCTION MANAGMENT ENGINEER in writing with the submittal and state the reason therefore.

B. No portion of the work requiring a CONTRACTOR'S drawing shall be started, nor shall any materials be fabricated, delivered to the Site, or installed, prior to the approval by the CONSTRUCTION MANAGMENT ENGINEER. Fabrication performed, materials purchased, or onsite construction accomplished that does not conform to approved CONTRACTOR'S drawings shall be at the CONTRACTOR'S risk. The OWNER will not be liable for any expense or delay due to corrections or remedies to accomplish conformity.

C. The review and approval of CONTRACTOR'S drawings by the CONSTRUCTION MANAGMENT ENGINEER shall not relieve the CONTRACTOR from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the CONTRACTOR, and the CONSTRUCTION MANAGMENT ENGINEER will have no responsibility.

D. Contract work, materials, fabrication, and installation shall conform with approved CONTRACTOR'S drawings.

1.10.2 Shop Drawings

A. Shop drawings shall show types; sizes; accessories; layouts, including plans, elevations, and sectional views; components; assembly and installation details; and all other information required to illustrate how applicable portions of the Contract requirements will be fabricated and/or installed. In the case of fixed mechanical and electric equipment, layout drawings drawn to scale shall be submitted to show required clearances for operation, maintenance, and replacement of parts. This will include manufacturer's certified testing data, catalog cuts, pamphlets, descriptive literature, installation, and application recommendations, as required. Shop drawings for closely related items such as a well head and piping, and geosynthetics, shall be submitted together. Additional shop drawings and information required will be listed in appropriate specification sections. Shop drawings shall be specific for this project. Shop drawings which provide only generic information or are of a generic nature are not sufficient.

1.10.3 Catalog Data

A. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model number, complete part number, nameplate data, size, layout dimensions, capacity, project specification, and paragraph reference.

B. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets.

C. Clearly indicate proposed unit on all generalized cut sheets. If the catalog data provided has multiple options (dimensions, sizes, optional accessories, etc.) of a piece of equipment proposed for this project, CONTRACTOR must clearly and visibly indicate which option is proposed for this specific project site. Catalog data with multiple options and no indication of proposed selection from CONTRACTOR will be rejected.

1.10.4 Installation Drawings

A. Submit installation drawings that depict Contractor-designed items and methods of construction. Review and approval of such drawings by the CONSTRUCTION MANAGMENT ENGINEER shall not relieve the CONTRACTOR from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error are assumed by the CONTRACTOR.

1.10.5 Material List

A. The CONTRACTOR shall submit, along with Shop Drawings, a materials list which shall include full information, including manufacturer's complete part number, regarding all components of the equipment. Materials of construction shall be presented in the listing by ASTM reference and grade.

1.10.6 Manufacturer's Installation Recommendations

A. Manufacturer's installation recommendations and instructions shall provide written detailed step-by-step preparation and installation of the materials and products, including recommended quality control testing, seaming and joining of geosynthetics, pipe joining, supports and welding, etc.

1.10.7 Method of Construction

A. When so specified or directed by the CONSTRUCTION MANAGMENT ENGINEER, submit proposed methods of construction for specific portions of the Work. This submittal shall include a detailed written description of all phases of the construction operation to fully explain to the CONSTRUCTION MANAGMENT ENGINEER the proposed method of construction. If required by the specifications, submit installation drawings to supplement the description. Review and approval by the CONSTRUCTION MANAGMENT ENGINEER will be in accordance with the approval process herein and shall not relieve the CONTRACTOR from his responsibility with regard to fulfillment of the terms of the Contract. All risks associated with the proposed method remain the CONTRACTOR'S responsibility, and therefore the CONSTRUCTION MANAGMENT ENGINEER shall have no responsibility.

B. After review and approval, if, in the opinion of the CONTRACTOR, modifications are necessary, submit such modifications in detail, including reasons for the modifications. Modifications shall not be implemented without review and approval by the CONSTRUCTION MANAGMENT ENGINEER.

1.10.8 Closeout Submittals

A. Operation and Maintenance Data

1. Submit in PDF composite electronic indexed file.

2. Submit data bound in eight and a half (8½)- by eleven (11)-inch text pages, three (3)-ring binders with durable plastic covers.

3. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS, GUDE LANDFILL REMEDIATION," and subject matter of binder when multiple binders are required.

4. Internally subdivide binder contents with permanent page dividers, logically organized as described below, with tab titling clearly printed under reinforced laminated plastic tabs.

5. Drawings—Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

6. Contents—Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three (3) parts as follows:

    a. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

    b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:

        1) Significant design criteria.

        2) List of equipment.

        3) Parts list for each component.

        4) Operating instructions.

        5) Maintenance instructions for equipment and systems.

        6) Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

        7) Safety precautions to be taken when operating and maintaining or working near equipment.

    c. Part 3 – Project documents and certificates, including the following:

        1) Shop Drawings and product data.
        2) Certificates.
        3) Originals of warranties.

B. Manual for Equipment and Systems

1. Submit four (4) copies of preliminary draft or proposed formats and outlines of contents before start of Work. CONSTRUCTION MANAGEMENT ENGINEER will review draft and return one (1) copy with comments.

2. For equipment, or component parts of equipment put into service during construction and operated by OWNER, submit documents within ten (10) days after acceptance.

3. Submit four (4) copies of completed volumes before Substantial Completion, fifteen (15) days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with CONSTRUCTION MANAGMENT ENGINEER comments. Revise content of document sets as required prior to final submission.

4. Submit four (4) sets of revised final volumes within ten (10) days after receipt of CONSTRUCTION MANAGMENT ENGINEER'S comments.

5. Submit in PDF composite electronic indexed file of final manual within ten (10) days after receipt of CONSTRUCTION MANAGMENT ENGINEER'S comments.

6. Each Item of Equipment and Each System—Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

7. Panelboard Circuit Directories—Provide electrical service characteristics, controls, and communications.

    a. Include color-coded wiring diagrams as installed.

8. Operating Procedures—Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.

9. Maintenance Requirements—Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

10. Include servicing and lubrication schedule and list of lubricants required.

11. Include manufacturer's printed operation and maintenance instructions.

12. Include sequence of operation by controls manufacturer.

13. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

14. Include control diagrams by controls manufacturer as installed.

15. Include CONTRACTOR'S coordination drawings with color-coded piping diagrams as installed.

16. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

17. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

18. Additional Requirements—As specified in individual product Specification Sections.

19. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

C. Spare Parts and Maintenance Products

1. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

D. Product Warranties

1. Obtain warranties executed by responsible Subcontractors, suppliers, and manufacturers within ten (10) days after completion of applicable item of Work.

2. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

3. Verify documents are in proper form, contain full information, and are notarized.

4. Submit prior to final Application for Payment.

E. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with OWNER'S permission, submit documents within ten (10) days after acceptance.

2. Make other submittals within ten (10) days after date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten (10) days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.10.9 Submittal Process

1.10.9.1 General

A. Each CONTRACTOR'S submittal shall have affixed to it the following certification statement signed by the CONTRACTOR:

"Certification Statement:

By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and pertinent data, and I have checked and coordinated each item with other applicable approved drawings and all contract requirements."

1.10.9.2 Identification

A. With the first submittal, submit a CONTRACTOR'S drawing submittal schedule listing as near as practical, by specification section number, all submittals required and approximate date the submittal will be forwarded. All submittals for approval shall have the following identification data, as applicable:

1. Submittal Number.
2. OWNER'S name.
3. Project name and location.
4. Product identification.
5. Drawing title, drawing number, revision number, and date of drawing and revision.
6. Applicable Contract Drawing numbers and Specification section and paragraph numbers.
7. Subcontractor's, vendor's, and/or manufacturer's name, address, and phone number.
8. CONTRACTOR'S certification statement.

B. Submittal Identification System: Use the following submittal identification system, consisting of submittal number and review cycle number.

1. Submittal Number: Shall be separate and unique number correlating to each individual submittal required. CONTRACTOR shall assign submittal number as follows:

a. First part of submittal number shall be the applicable Specification section number, followed by a hyphen.

b. Second part of submittal number shall be a three (3)-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique submittal provided under the associated Specification. Section 31 05 19.13, Geotextiles, would be "31 05 19.13-003."

2. Review Cycle Number: Shall be a letter designation indicating the initial submittal or re-submittal associated with each submittal number:

a. "A" = Initial (first) submittal.
b. "B" = Second submittal (e.g., first re-submittal).
c. "C" = Third submittal (e.g., second re-submittal).

3. Examples:

	Submittal Identification	
Example Description	**Submittal No.**	**Review Cycle**
Initial (first) review cycle of the third submittal provided under Section 31 05 19.13, Geotextiles	31 05 19.13-003-	A
Second review cycle (first re-submittal) of third submittal provided under Section 31 05 19.13, Geotextiles	31 05 19.13 003-	B

C. For catalog product data or brochures submitted in packages of multiple items, the identification is needed only on the exterior. In such instances, the identification shall include page and catalog item numbers for items submitted for approval. If one (1) or more of the items in such a submittal are not approved, resubmittal of only the unapproved items is required. Catalog, product data, or brochures containing various products, sizes, and materials shall be highlighted to show the particular item being submitted. Likewise, items not applicable to the Contract shall be marked "not applicable" or crossed out.

1.10.9.3 Space

A. Vacant space of approximately two and a half (2.5) inches high by four (4) inches wide shall be provided adjacent to the identification data to receive the CONSTRUCTION MANAGMENT ENGINEER'S status stamp.

1.10.9.4 Number of Copies

A. For the original submittal and each subsequent resubmittal that may be required, submit two (2) legible prints and an electronic PDF document of all shop and working drawings, and three (3) copies of catalog data, method of construction, and manufacturer's installation recommendation to the CONSTRUCTION MANAGMENT ENGINEER for approval. One (1) PDF of CONTRACTOR'S submittals will be returned to the

CONTRACTOR with any comments from the CONSTRUCTION MANAGMENT ENGINEER.

1.10.9.5 Approval Process

A. Each submittal shall be in accordance with the CONTRACTOR'S drawings submission schedule. Allow twenty (20) days for checking and appropriate action by the CONSTRUCTION MANAGMENT ENGINEER. Contractor's drawings will be returned stamped with one (1) of the following classifications:

1. APPROVED—No corrections, no marks.

2. APPROVED AS NOTED—A few minor corrections. All items may be fabricated as marked without further resubmission. Resubmit a corrected copy to the CONSTRUCTION MANAGMENT ENGINEER.

3. REVISE AND RESUBMIT—Minor corrections. Items not noted to be revised and corrected may be fabricated. Resubmit drawings as per original submissions with corrections noted. Allow twenty (20) days for checking and appropriate action by the CONSTRUCTION MANAGMENT ENGINEER.

4. NOT APPROVED—Requires corrections or is otherwise not in accordance with the contract documents. No items shall be fabricated. Allow twenty (20) days for checking and appropriate action by the CONSTRUCTION MANAGMENT ENGINEER.

1.11 Samples

1.11.1 General

A. The CONTRACTOR is required to collect and test material samples to certify that they meet the requirements of these Specifications. The cost of sample testing shall be borne by the CONTRACTOR. These certified test results shall be submitted by the CONTRACTOR to the CONSTRUCTION MANAGMENT ENGINEER for approval of the material. The CONSTRUCTION MANAGMENT ENGINEER may conduct separate testing of material samples to confirm test results.

B. As soon as practicable after the issuance of the Notice to Proceed, the CONTRACTOR shall submit names of material suppliers and borrow sources, along with samples required by the Specifications or requested by the CONSTRUCTION MANAGMENT ENGINEER. Unless otherwise specified, the original submittal shall be a sample of each item. Approval shall be obtained from the CONSTRUCTION MANAGMENT ENGINEER prior to delivery of the material to the contract site. Such samples shall be representative of the actual material proposed for use in the project and of sufficient size to demonstrate design, color, texture, and finish when these attributes will be exposed to view. If samples deviate from requirements in the Contract Documents, the

CONTRACTOR shall so advise the CONSTRUCTION MANAGMENT ENGINEER in writing with the submittal and state the reason therefore.

1.11.2 Identification

A. Each sample or laboratory test data results shall have the following identification data permanently attached:

1. Owner.

2. Project name and location.

3. Applicable Contract Drawing and/or Specification section number.

4. Subcontractor's, vendor's, and/or manufacturer's name, address, and phone number.

B. Mail under separate cover a letter submitting each shipment of samples containing the identification information listed herein. Enclose a copy of this letter with the shipment.

1.11.3 Approval Process

A. Allow fourteen (14) days for checking and appropriate action by the CONSTRUCTION MANAGMENT ENGINEER. Certain samples may be tested for specified requirements by the OWNER before approval is given. Failure of a sample to pass such tests will be sufficient cause for refusal of that material and its source. Rejected samples will be returned upon request, and any or all resubmittals required shall consist of new samples and an additional fourteen (14) days for checking and approval. All sample testing will be performed by the CONTRACTOR at the CONTRACTOR'S own expense. Upon approval, one (1) sample so noted will be returned and the remainder will be retained by the CONSTRUCTION MANAGMENT ENGINEER until completion of the work. When requested, all but one (1) approved sample will be returned for installation provided their identity is maintained in an approved manner until final acceptance of the project.

B. Samples of various materials or equipment delivered to the site may be taken by the CONSTRUCTION MANAGMENT ENGINEER for testing. Samples failing to meet the requirements of this Contract will automatically void previous approvals, and resubmittal or retesting of the samples will be required.

1.12 Record Documents

A. The CONTRACTOR shall keep one (1) record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications at the site in good order and annotated to show all revisions made during construction. Such annotations shall be kept current. These record documents together with all approved Samples and Shop Drawings, inspection reports,

test results and Manufacturer's instructions will be available to OWNER, CONSTRUCTION MANAGMENT ENGINEER, and the Northeast Maryland Waste Disposal Authority for reference at any time. Failure to maintain current record documents will be cause to withhold progress payments. Record drawings shall be available to the OWNER, CONSTRUCTION MANAGMENT ENGINEER, and the Northeast Maryland Waste Disposal Authority at all times during the life of the Contract.

B. All drawings shall be made a part of the record documents. Record Drawings (As-Builts) shall include the following:

1. Contract Drawings—Annotate or redraft, as required, to show all revisions, substitutions, variations, omissions, and discrepancies made or discovered during construction. These shall include, but are not limited to, location and depth of utilities, piping, conduits, manholes, excavations, piping connections, and other equipment. Revisions shall be made and shown on all drawing views with actual dimensions established to permanent points.

2. Installation Drawings—Same as Contract Drawings above when installation drawings are required. Include, for example, layout and piping connections and well head assembly. Sections and details shall be added, as required, for clarity.

C. The scanned drawing sets shall be complete. Each individual sheet contained in the Contract Drawings shall be included in the electronic submittal, with each sheet being converted into an individual TIF (tagged image file). The plan sheets shall be scanned in .tif format Group 4 at four hundred (400) dpi resolution to maintain legibility of each drawing. Then, the TIF images shall be embedded into a single PDF file representing the complete plan set.

D. In addition to PDFs, CAD files (AutoCAD) of CONTRACTOR prepared Record Drawings shall be submitted.

E. Prior to inspection for Substantial Completion, submit two (2) copies and PDF files of Record Drawings (As-Builts) to CONSTRUCTION MANAGMENT ENGINEER for review. Plot and print each Drawing, whether or not changes and additional information were recorded.

F. At the completion of the Contract, or at the CONSTRUCTION MANAGMENT ENGINEER'S request and before final payment is made, furnish the CONSTRUCTION MANAGMENT ENGINEER one (1) set of reproducibles and two (2) copies of the final Record Documents. Include two (2) sets of Record Documents in electronic format on USB drive.

G. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to CONSTRUCTION MANAGMENT ENGINEER for OWNER.

2. MATERIALS

A. Not used.

3. EXECUTION

A. Not used.

-- End of Section --

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SECTION 01 40 00
QUALITY CONTROL

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes requirements of a general nature related to the CONTRACTOR'S responsibility for quality control involving inspections, tests, certificates, and reports. Requirements for general quality control applicable to geosynthetics are included herein, and additional quality control for specific products are included in individual Specification Sections.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Not used.

1.3 Definitions

A. Geosynthetics Testing Laboratory—the CONTRACTOR'S independent geosynthetics testing laboratory, approved by the CONSTRUCTION MANAGEMENT ENGINEER, that shall perform the required preconstruction and frequency testing and quality control (QC) testing on samples supplied by and at the expense of the CONTRACTOR.

B. Geosynthetics Installer shall be responsible for the installation of geomembrane, geocomposite, and geotextiles in accordance with the Contract Documents. The Geosynthetics Installer shall provide sufficient evidence of installation experience and competence with geosynthetics, and shall demonstrate an acceptable level of training and supervision will be utilized in order to ensure the quality of the installation. The CONTACTOR shall be responsible for the performance of the Geosynthetics Installer.

C. Geotechnical Testing Laboratory—the CONTRACTOR'S independent soils testing laboratory, approved by the CONSTRUCTION MANAGEMENT ENGINEER, that shall perform the required preconstruction and frequency testing and QC testing on samples supplied by and at the expense of the CONTRACTOR.

1.4 Qualifications

A. Geosynthetics Testing Laboratory shall be accredited via the Geosynthetic Accreditation Institute's Laboratory Accreditation Program for the tests the QC Laboratory will be required to perform. The Geosynthetics Testing Laboratory shall have provided QC testing of the proposed geosynthetics and geosynthetic seams for at least five (5) completed projects having a total minimum area of ten (10) million square feet.

B. Geosynthetics Installer must be qualified to install geomembrane, geocomposite, and geotextiles in accordance with the following:

1. The Geosynthetics Installer shall be a specialist in the installation of geomembrane (linear low-density polyethylene [LLDPE]). The Geosynthetics Installer shall demonstrate a minimum of twenty-five (25) million square feet of geomembrane (LLDPE) during the last five (5) years, as applicable, and shall have at least five (5) continuous years of experience in the installation of geomembrane (LLDPE). In addition, the Geosynthetics Installer shall be an "Approved Installer" of the geomembrane manufacturer (LLDPE), if the manufacturer approves installers.

2. The Geosynthetics Installer shall be a specialist in the installation of geocomposite. The Geosynthetics Installer shall provide a field superintendent with demonstrated experience in field seaming, field testing, and other pertinent aspects of geocomposite installation, as applicable.

3. The Geosynthetics Installer shall be a specialist in the installation of polyester and/or polypropylene geotextile, and have a minimum of three (3) years' experience of geotextile installation and have installed a minimum of five (5) million square feet of said geotextile fabric that was used in successful installations.

4. The Geosynthetics Installer shall have a field superintendent with demonstrated experience in field seaming, field testing, and other pertinent aspects of the installation of geomembrane (LLDPE). The field superintendent shall be qualified to inspect the prepared Closure Cap Subgrade and supervise any corrective work required; supervise the unloading, handling, storage, unrolling, and placement of all geomembrane liner sheets; perform all field seaming operations and testing of geomembrane liner; perform all repairs to damaged geomembrane materials; and supervise the placement of the overlying Vegetative Support Soil.

5. The Geosynthetics Installer shall have a field crew foreman with successful installation experience for fifty (50) acres geomembrane (LLDPE) on a minimum of five (5) different projects. The foreman shall also have a minimum of three (3) continuous years of experience welding geomembrane (LLDPE).

6. The Geosynthetics Installer shall meet the requirement for each welding technician to have a minimum of one (1) year of continuous experience welding or ten thousand (10,000) feet of seaming experience for geomembrane (LLDPE).

C. Geotechnical Testing Laboratory must meet "Recommended Requirements for Independent Laboratory Qualification," latest edition, published by American Council of Independent Laboratories and shall be authorized to operate in the State of Maryland.

1.5 Submittals

A. Geosynthetics Testing Laboratory qualifications.

B. Geosynthetics Installer:

1. Documentation to verify the installer's experience in geosynthetics, including approval and certification of the geosynthetics manufacturer.

2. Qualifications and references for the field superintendent, field crew foremen, and welding technicians shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval approximately one (1) month prior to the commencement of geosynthetic installation activities. The CONSTRUCTION MANAGEMENT ENGINEER reserves the right to reject any field superintendent based on the information submitted. Any rejected field superintendent shall be replaced with no delay in the Contract Schedule and at no additional cost to the OWNER.

C. Geosynthetics Installer's Installation Plan shall be submitted for approval at least thirty (30) days prior to delivery of the geosynthetic materials to the site. The CONSTRUCTION MANAGEMENT ENGINEER reserves the right to require changes to the Installation Plan.

1. Geosynthetic Installer's proposed construction repair procedures.

2. Geosynthetic Installer's proposed field seaming procedures and techniques, including methods, overlap, personnel identification, quality assurance/quality control of seaming operations, operating temperatures, and preparation of materials.

3. Geosynthetic Installer's nondestructive and destructive seam testing procedures, including type(s) of tests, a list of equipment required, frequency of tests with locations, methods, qualifications of personnel that perform the tests, and acceptance/rejection criteria for tested seams, as well as recommended repair procedures to remediate those welded seams which fail the required test procedures.

4. Geosynthetic Installer's proposed installation panel layout drawings for the geomembranes to be installed (LLDPE). These proposed layout drawings shall identify the proposed installed configuration of the noted geosynthetic panels and identify each sheet. The layout drawings shall also include anchor trench and pipe penetration details. To accommodate in-field conditions, these proposed layouts may be modified during installation with the approval of the CONSTRUCTION MANAGEMENT ENGINEER. The geomembrane panels shall be placed in the

Work area to permit termination in the perimeter anchor trench or as required by the governing Contract Drawings. The layout of geosynthetics panels/sheets shall minimize the length of field seaming required and locate seams where applied stresses will be minimal. Panel/sheet layout shall take into consideration any expansion and contraction anticipated due to ambient temperature variations. The upgradient panels of the geosynthetic shall overlap the downgradient panels.

5. Geosynthetic Installer's daily QC log format to be used during geomembrane liner installation.

6. Work plan for geosynthetics installation including manpower and equipment requirements.

D. Geotechnical Testing Laboratory qualifications.

E. Qualifications for changes to previously approved personnel, testing laboratories, and manufacturers shall be submitted and approved by the CONSTRUCTION MANAGEMENT ENGINEER prior to commencement or the continuation of work.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Maryland Department of the Environment (MDE) will perform quality assurance inspections and reviews of the closure cap system. MDE approval is required at certain stages of each system installation, as indicated in the Sequence of Construction on the Contract Drawings. The CONSTRUCTION MANAGEMENT ENGINEER will coordinate with MDE to schedule site visits and will submit necessary surveys and test results to MDE for review in advance of the scheduled site visit. The CONTRACTOR is responsible for providing necessary surveys and test results to the CONSTRUCTION MANAGEMENT ENGINEER in a timely manner to minimize potential delays. CONTRACTOR should expect that MDE approval will take five (5) days for each stage of approval.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Inspection

A. The CONSTRUCTION MANAGEMENT ENGINEER has the right to inspect all materials and equipment at all stages of development or fabrication, and shall be allowed access to the site and to the CONTRACTOR'S and supplier's shops to conduct such inspections. Onsite work will be subjected to continuous inspection. Inspection by the CONSTRUCTION MANAGEMENT ENGINEER will not release the CONTRACTOR from responsibility or liability with respect to material or equipment. The CONSTRUCTION MANAGEMENT ENGINEER will provide the CONTRACTOR a minimum of twenty-four (24) hours' notice prior to offsite inspections.

B. When a shop test of mechanical equipment is required by the manufacturer before shipment to the Contract Site, the CONTRACTOR shall give the CONSTRUCTION MANAGEMENT ENGINEER a minimum of ten (10) working days written notice of the time of the required test. The CONTRACTOR shall ensure that the test site is safe, accessible, dry, ventilated, and well lit. Work involved with the installation of such equipment shall not proceed until the test results are approved by the CONSTRUCTION MANAGEMENT ENGINEER.

C. When local codes or laws require approval or inspection of the work by other agencies or organizations before installation or operation, the CONTRACTOR shall obtain such approval and submit one (1) signed original and three (3) copies of the approval to the CONSTRUCTION MANAGEMENT ENGINEER.

1.11 Testing

A. All QC Laboratory testing (not including manufacturers' internal quality assurance) shall be performed by an independent testing laboratory, as approved by the CONSTRUCTION MANAGEMENT ENGINEER, with materials to be tested furnished by the CONTRACTOR and at the expense of the CONTRACTOR.

1.11.1 Field and Laboratory

A. The CONTRACTOR shall contract with an independent QC Laboratory to perform laboratory testing as required by these Specifications, including the following periodic inspections, engineering, and associated services:

1. Soils—Inspect and test the placement and compaction of fills. Perform field density testing using a Troxler 3401 series nuclear moisture-density gauge (or approved equal) to assess the adequacy of compaction. Inspect subgrades and foundations.

2. Concrete—Inspect forms, reinforcement, and placement; witness CONTRACTOR'S slump and air entrainment tests; make cylinder samples and store them onsite; perform seven (7)- and twenty-eight (28)-day unconfined compression tests on the cylinders.

B. The CONTRACTOR shall include the cost of QC Laboratory services in their proposal.

C. The CONTRACTOR shall cooperate with the CONSTRUCTION MANAGEMENT ENGINEER and the QC Laboratory and provide at least twenty-four (24) hours' notice prior to specified testing. The CONTRACTOR shall provide labor, materials, and testing facilities at the site as required by the Specifications and the approved subcontractor.

D. The CONTRACTOR shall be solely responsible for the adequate stability of cut soil slopes at the site and for providing a safe working condition within the excavated areas.

1.11.2 Other Testing

A. Test procedures and requirements are specified in the appropriate Specification Section.

1.12 Reports

1.12.1 Certified Test Reports

A. Where transcripts or certified test reports are required by the Contract Documents, the CONTRACTOR shall submit them for approval by the CONSTRUCTION MANAGEMENT ENGINEER. Approval shall be obtained before delivery of any material to the site. Transcripts of test reports shall be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that the tested material meets the specified requirements and is of the same type, quality, manufacturer, and make as that specified. The certificate shall be signed by an officer of the manufacturer or supplier.

1.12.2 Certificate of Compliance

A. At the option of the CONSTRUCTION MANAGEMENT ENGINEER, or where specified, the CONTRACTOR may, in lieu of the required tests, submit for approval a notarized Certificate of Compliance in the form of a letter from the manufacturer. The Certificate shall include identification of the materials manufactured and shall state the following:

1. Manufacturer has performed all required tests.

2. Materials supplied meet all test requirements.

3. Tests were performed within six (6) months of submittal of the Certificate.

4. Materials that were tested are of the same type, quality, manufacture, and make as those specified.

B. A Certification of Compliance may be provided for the geomembrane, landfill gas pipes, landfill gas pipe fittings, and landfill gas valves.

C. The Certificate shall be signed by an officer of the manufacturer. Materials shall not be delivered until the CONSTRUCTION MANAGEMENT ENGINEER approves the Certificate.

1.12.3 Manufacturer's Certificates

A. The CONTRACTOR shall submit Manufacturer's Certificates for the installation of those items listed in the Specifications.

B. Manufacturer's Certificates shall state that the equipment has been installed under the supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements to the manufacturer's satisfaction.

1.13 Manufacturer Services

A. When required, manufacturer services are specified in appropriate Specification Sections.

1.14 Equipment Calibration

A. All field test equipment will be kept under control of the CONTRACTOR. The CONTRACTOR will be fully trained in the use of equipment, test procedures, and interpretation of results for each piece of test equipment. A copy of the Calibration Certificate will be kept by the CONTRACTOR and supplied to the CONSTRUCTION MANAGEMENT ENGINEER.

B. Calibration of nuclear-density gauges shall conform to the frequencies and methods outlined in ASTM D2922-78 and D3017. Unstable or erratic gauges shall not be used in density testing and shall be immediately removed from the site.

2. MATERIALS

A. Not used.

3. EXECUTION

A. Not used.

-- End of Section --

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SECTION 01 45 00
HEALTH AND SAFETY

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. Site-specific safety and health procedures are required due to the hazardous conditions potentially present on site during landfill closure activities. These procedures must be written by the CONTRACTOR'S certified industrial hygienist and submitted to the CONSTRUCTION MANAGEMENT ENGINEER prior to the initiation of the landfill closure activities. The CONTRACTOR shall implement, maintain, and enforce these procedures at the appropriate time prior to and during all phases of the project.

1. Provisions of this Section provide additional guidance to activities in which the CONTRACTOR will or may come into contact with solid waste materials, liquids, or gas due to intrusive activities into the waste fill area. This includes, at a minimum, waste excavation and relocation, leachate outbreaks, installation of the gabion drainage structures, landfill gas extraction well and pipeline installation, subgrade preparation, and closure cap construction.

2. The CONTRACTOR shall employ such procedures and provide protection equipment as necessary to protect workers and other persons in conformance with Health and Safety Regulations for Hazardous Operations, 29 Code of Federal Regulations (CFR) 1926.120.

B. The Site Safety and Health Plan shall be consistent with the requirements and guidance provided in the following regulations:

1. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in 29 CFR 1926.

2. Maryland Occupational Safety and Health (MOSH) Standards and Regulations applicable regulations.

C. The Site Safety and Health Plan will include at a minimum the following components:

1. Site overview, including identification of potential intrusive activities and type of waste or hazards, such as leachate discharge, landfill gases, anticipated to be encountered.

2. Names of key personnel and alternates responsible for site safety and health.

3. Accident Prevention Plan that addresses the safety hazards expected, personnel responsibilities, task-specific safety procedures, subcontractor supervision, safety meetings, fire prevention and protection, site housekeeping, mechanical equipment inspection, first aid and medical concerns, sanitation, accident reporting, and daily safety inspections conducted by CONTRACTOR personnel.

4. Employee training requirements.

5. Personal protective equipment (PPE) requirements for each intrusive work operation, including types/materials, respiratory protection, and site-specific action levels dictating decisions to upgrade or downgrade and description of decontamination procedures and policies.

6. Location, frequency, and type of air monitoring to be conducted, including instrumentation, methods of maintenance, and calibration of monitoring and sampling equipment to be used. At minimum, the CONTRACTOR shall continuously monitor air quality in the vicinity of all open excavations and boreholes.

7. Site control measures, including communications, security, and site access.

8. Heat and cold stress monitoring.

9. Confined Space Entry.

10. Personnel and equipment decontamination procedures.

11. Emergency Response Plan and contingency procedures, including:

    a. Emergency vehicular access.

    b. Evacuation procedures of personnel from the work area.

    c. Methods of preventing and containing fire and explosion.

    d. Hazardous waste containment.

    e. Severe weather preparedness.

    f. On site first aid, automatic external defibrillator (AED), eye wash, fire suppression, protective gear, and other emergency equipment to be maintained by the CONTRACTOR on site.

    g. Listing of emergency contact personnel with phone numbers, to include the CONTRACTOR, OWNER, CONSTRUCTION MANAGEMENT ENGINEER, Maryland Department of the Environment, fire officials,

ambulance service, state and local law enforcement, and local hospitals (with routes to hospitals).

12. Logs, reports, and recordkeeping.

D. The Site Safety and Health Plan shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER at minimum fourteen (14) days prior to the Notice to Proceed. Submittal of this plan is for information only. The CONTRACTOR is liable for the health and safety of all its employees and agents and shall indemnify the OWNER, the Northeast Maryland Waste Disposal Authority, and CONSTRUCTION MANAGEMENT ENGINEER from any defense costs and damages attributable to any claim of any of its employees, independent contractors or agents for injuries at the site.

E. Specifications delineated in this Section are in addition to or an amplification of procedures and requirements of the above-referenced regulations and documents.

F. Should any unforeseen or site-specific safety factors, health hazard, or conditions become evident during the performance of work at this site, the CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER verbally and in writing as soon as possible for resolution. The CONTRACTOR shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the surrounding community, and the environment.

G. Any changes, updates, revisions, etc. to the Site Safety and Health Plan shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER in writing and approved prior to implementation.

H. Any disregard for the provision of these Specifications shall be deemed just and sufficient cause for termination of Contract or any Subcontract without compromise or prejudice to the rights of the OWNER.

I. The Site Safety and Health Plan developed by the CONTRACTOR shall include provisions for work related to initial site preparation prior to implementation of the intrusive activities such as, but not limited to, waste excavation and handling and other activities described in the Contract. It shall be the responsibility of the CONTRACTOR to conduct whatever testing and monitoring is necessary to ensure a safe operation.

J. The following landfill and landfill gas related information is included to assist the CONTRACTOR in developing a Site Safety and Health Plan and is not intended to encompass all steps that may be necessary to protect the workers or to comply with applicable regulations. Landfills have the potential to create hazardous conditions if working conditions are not controlled or recognized. Some potential hazards may include:

1. Spontaneous fire from exposed and/or decomposing refuse.

2. Fires and explosions from the presence of methane gas.

3. Oxygen deficiency from landfill gases in underground trenches, vaults, conduits and structures.

4. Presence of hydrogen sulfide, or other highly toxic and flammable gases.

5. Caving of trenches and excavations when working over or in refuse fills

K. The CONTRACTOR shall be solely responsible for initiating, maintaining, and supervising all the health and safety precautions and programs for personnel and site property during all phases of the project, including during activities that utilize intrusive activities that may lead to encountering solid waste, leachate or landfill gas. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in performance of their work, nor for the compliance with applicable health and safety laws and regulations.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Health and safety personnel qualifications and certifications.

B. Site Safety and Health Plan.

C. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site.

1.6 Safety

A. CONTRACTOR shall comply with all applicable laws and regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of underground facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

B. CONTRACTOR shall comply with the applicable requirements of OWNER'S safety programs, if any. The Supplementary Conditions identify any OWNER'S safety programs that are applicable to the Work.

C. CONTRACTOR shall inform OWNER and CONSTRUCTION MANAGEMENT ENGINEER of the specific requirements of CONTRACTOR'S safety program with which OWNER'S and CONSTRUCTION MANAGEMENT ENGINEER'S employees and representatives must comply while at the Site. While at the Site, OWNER'S and CONSTRUCTION MANAGEMENT ENGINEER'S employees and representatives shall comply with the specific applicable requirements of CONTRACTOR'S safety programs of which OWNER and CONSTRUCTION MANAGEMENT ENGINEER have been informed.

D. All damage, injury, or loss to any property caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or CONSTRUCTION MANAGEMENT ENGINEER or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. CONTRACTOR'S duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed until Final Acceptance.

F. All persons entering and working in confined spaces are required to follow the requirements of 29 CFR 1910.146 and 29 CFR 1926.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Safety Representative

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. The safety representative may not be the same person as the superintendent.

1.11 Hazard Communication Programs

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with laws or regulations.

B. CONTRACTOR shall provide a centralized location for the maintenance of the material safety data sheets or other hazard communication information required to be made available by any employer on the Site. Location of the material safety data sheets or other hazard communication information shall be readily accessible to the employees of any employer on the Site.

1.12 Site Control

A. The CONTRACTOR shall restrict personnel access to site areas where intrusive activities are occurring.

B. In order to restrict unauthorized access to the site during periods of intrusive activities into the waste fill area, sufficient barricades/fencing shall be provided and maintained if necessary to leave open holes or pits overnight. Vehicular access to areas of the site where intrusive activities are conducted shall be restricted to authorized vehicles only.

1.13 Training Requirements

A. Qualified personnel shall certify that all CONTRACTOR and Subcontractor personnel performing intrusive work into the waste fill areas shall have received appropriate health and safety training in accordance with OSHA and MOSH for the planned work activities. Documentation of all such training shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER and OWNER before any employees will be allowed to

perform intrusive work activities, and no unsatisfactorily trained personnel will be allowed to perform intrusive work activities.

B. In addition to the above training, prior to conducting intrusive work activities, all personnel directly involved with the Work (including visitors), shall read and sign the Site Safety and Health Plan and be familiar with the use of safety, respiratory, and protective equipment, and with the health, safety, and security procedures.

1.14 First Aid Requirements

A. The CONTRACTOR shall have at least one (1) certified First Aid Technician on the site at all active times during the execution of intrusive work activities; this First Aid Technician must be certified by the American Red Cross or other approved agency in first aid and cardiopulmonary resuscitation (CPR) (including use of an AED).

1.15 Emergency Response and Contingency Procedures

A. As part of the Site Safety and Health Plan, the CONTRACTOR shall develop site-specific emergency response and contingency plans for exposure to leachate, personal injury, potential or actual fire or explosion, and environmental accident. These plans shall include evacuation procedures and routes to places of refuge or safe distances from the danger area.

B. In case of emergency, the CONTRACTOR shall take diligent action to remove or reduce the cause of the emergency, to alert the OWNER and the CONSTRUCTION MANAGEMENT ENGINEER, and institute measures necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency. Written notification of emergencies must be provided to the CONSTRUCTION MANAGEMENT ENGINEER within twenty-four (24) hours.

C. The CONTRACTOR shall pre-arrange for emergency medical care services at a primary and alternate medical facility located near the site and shall establish emergency routes. Arrangements for notifying medical staff of the need to contact contaminated skin and/or clothing must be made.

D. A list of emergency contacts and phone numbers shall be included in the plan and also posted onsite.

1.16 Personnel Protective Equipment Requirements

A. The CONTRACTOR shall provide all onsite personnel with appropriate PPE, and shall ensure that all safety equipment and protective clothing is kept clean and well maintained.

1.17 Personal Hygiene and Contamination

A. The CONTRACTOR shall specify personal hygiene concerns and requirements for this site in the Site Safety and Health Plan. The CONTRACTOR shall be required to provide and require that personnel use appropriate storage and disposal for used disposable clothing, and to provide a break area.

B. The CONTRACTOR shall specify required decontamination procedures for both personnel and equipment in the Site Safety and Health Plan, including procedures for removing contaminated clothing, cleaning personnel and equipment, disposing of disposable clothing, and laundering of reusable clothing.

1.18 Air Monitoring

A. The CONTRACTOR shall develop and implement an air monitoring program conforming with federal, state, and local regulations to detect and quantify methane, volatile organic compounds, carbon dioxide, hydrogen sulfide, and general airborne dust monitoring associated with the intrusive work activities into the waste fill areas. In addition, the CONTRACTOR shall determine appropriate safety and personnel protective measures to be implemented during work operations, to document employee exposures, and to assess offsite migration of contaminants potentially released during intrusive work activities so that appropriate control measures and/or contingency plans can be implemented.

B. The CONTRACTOR shall be responsible for establishing and documenting baseline (background) air quality conditions using direct-reading instruments prior to commencement of, during, and after completion of work operations.

C. The CONTRACTOR shall establish action levels for oxygen, methane, volatile organics, and dust in order to direct determination of upgrading and PPE adequacy and to determine appropriate implementation of offsite response procedures for contingency planning. These action levels shall be based upon OSHA permissible exposure limits.

1.19 Logs, Reports, and Recordkeeping

A. The CONTRACTOR shall maintain logs and reports covering the implementation of the Site Safety and Health Plan according to these Specifications and including daily training logs, employee/visitor logs, security logs, air monitoring logs, daily safety logs, and medical certification records.

1.20 Onsite Medical Monitoring

A. The Site Safety and Health Plan must include procedures for monitoring personnel for heat and cold stress. Monitoring shall be performed by a person with a current first aid/CPR certification or who has been trained to recognize the symptoms of heat or cold stress and will comply with the applicable requirements of OSHA and MOSH.

2. MATERIALS

2.1 Emergency Equipment and First Aid

A. Emergency eyewashes and showers proposed shall comply with ANSI/ISEA Z358.1.

B. First aid kits proposed shall comply with ANSI/ISEA Z308.1.

C. Fire extinguishers shall be of sufficient size and type at site facilities and in all vehicles and at any other site locations where flammable or combustible materials present a fire risk.

1. Submit documentation that extinguishers and any proposed foams are free of per- and polyfluoroalkyl substances (PFAS).

D. AED's shall be FDA approved.

3. EXECUTION

A. Not used.

-- End of Section --

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SECTION 01 50 00
MOBILIZATION, DEMOBILIZATION, AND TRAFFIC CONTROL

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. Perform construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of CONTRACTOR'S trailer, OWNER/CONSTRUCTION MANAGEMENT ENGINEER'S trailer, buildings, and other facilities necessary to begin work. Provide construction closeout operations, including removal of equipment and personnel from the project site, removal of CONTRACTOR'S trailer, OWNER/CONSTRUCTION MANAGEMENT ENGINEER'S trailer, buildings and other facilities, cleanup and site restoration.

B. The CONTRACTOR is responsible for maintenance of traffic control for the movement of personnel, equipment, and materials to and from the project site, including the entrances located at 600 East Gude Drive and Incinerator Lane off of Southlawn Lane. The CONTRACTOR shall prepare a Temporary Traffic Control Plan in accordance with the most recent Montgomery County Work Zone Traffic Control Standards Book requirements and the Attachment C, Temporary Traffic Control Plan Requirements.

1.1.2 Related Work Specified Elsewhere

A. Section 01 57 19, Temporary Environmental Controls.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Traffic Control

A. Maintain traffic control, both vehicular and pedestrian, on any facility affected by the Work. Provide regular maintenance, sweeping, and dust control on access roadways, including the 600 East Gude Drive and Incinerator Lane Facility entrances, as required by the CONSTRUCTION MANAGEMENT ENGINEER and in accordance with Specification Section 01 57 19, Temporary Environmental Controls.

2. MATERIALS

A. All materials used for traffic maintenance, whether temporary or permanent, shall be approved in writing by the CONSTRUCTION MANAGEMENT ENGINEER.

3. EXECUTION

A. All work performed in providing facilities and services shall be done in a safe and workmanlike manner.

B. CONTRACTOR shall provide all labor, materials, and equipment necessary to maintain vehicular and pedestrian traffic throughout the project duration. CONTRACTOR shall be responsible for obtaining all permits, approvals, and pay any fees necessary from local, OWNER, and state regulatory agencies required to access public roads with earth moving equipment. Signs, light, barricades, flaggers and other manpower shall be provided wherever necessary to protect the traveling public and other contractors and tenants of 600 East Gude Drive from hazardous conditions in accordance with local, OWNER, and state transportation and Occupational Safety and Health Administration requirements. Temporary Traffic Control Plan shall be developed by CONTRACTOR and submitted to CONSTRUCTION MANAGEMENT ENGINEER in accordance with the most recent Montgomery County Work Zone Traffic Control Standards Book and the requirements in Attachment F of the Project Manual. If extended sidewalk

closures (more than fifteen [15] days) and /or roadway/lane closures of any duration are anticipated the CONTRACTOR shall receive the required approvals from Montgomery County Department of Permitting Services.

C. The CONTRACTOR shall contact Utility Locating Company three (3) days prior to starting any work shown on these plans to confirm and identify the location of all utilities and protection requirements of the respective service lines within the limits of work.

D. Prior to initiating construction, the CONTRACTOR shall inspect the site and identify monitoring wells and existing surface conditions.

E. Due to the sensitive nature of the site, the CONTRACTOR shall not engage in work outside the limits of disturbance without the express written direction of the CONSTRUCTION MANAGEMENT ENGINEER.

F. CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work, on a daily basis. Failure to comply herewith constitutes grounds for the CONSTRUCTION MANAGEMENT ENGINEER to recommend not to approve payment.

G. At the completion of the work, CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, construction equipment and machinery, surplus materials, and shall leave the site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

-- End of Section --

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. Not used.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1.2.1 U.S. National Archives And Records Administration (NARA)

A. 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response.

B. 40 CFR 112: Oil Pollution Prevention.

C. 40 CFR 261: Identification and Listing of Hazardous Waste.

D. 40 CFR 300: National Oil and Hazardous Substances Pollution Contingency Plan.

E. 49 CFR 171: General Information, Regulations, and Definitions.

F. 49 CFR 172: Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.

G. 49 CFR 173: Shippers – General Requirements for Shipments and Packagings.

1.3 Definitions

A. *CONTRACTOR Generated Solid Waste*—CONTRACTOR generated solid waste is a solid, liquid, semi-solid, or contained gaseous waste that has been generated by the CONTRACTOR'S operations and does not include solid waste that is currently onsite in the Landfill. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste.

B. *CONTRACTOR Generated Hazardous Waste*—CONTRACTOR generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the CONTRACTOR to execute work but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

C. *Environmental Pollution and Damage*—Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

D. *Environmental Protection*—Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

E. *Hazardous Materials*—

1. Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

2. Hazardous material is any material that: Is regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.120; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

F. *Hazardous Waste*—Hazardous Waste is any material that meets the definition of a solid waste and exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

G. *National Pollutant Discharge Elimination System (NPDES)*—The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

H. *Surface Discharge*—Surface discharge means discharge of water into drainage ditches, storm sewers, creeks or "waters of the United States." Surface discharges are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

I. *Stormwater*—Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

J. *Waters of the United States*—Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

K. *Wetlands*—Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Environmental Protection Plan.

B. Dust Control Plan.

C. Waste Determination Documentation (if determination needed).

D. Disposal Documentation for Hazardous and Regulated Waste (if disposal required).

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

A. Not used.

3. EXECUTION

3.1 Environmental Protection Plan (EPP)

A. The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Include in the EPP measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within thirty (30) days after Contract award and not less than five (5) days before the preconstruction meeting. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this Section will relieve the CONTRACTOR of any applicable federal, state, and local environmental protection laws and regulations. During construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

B. The EPP includes, but is not limited to, the following elements:

1. A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as dust control, odor control, noise suppression, hazardous waste disposal plan.

2. A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

3. Communication and training procedures that will be used to convey environmental management requirements to CONTRACTOR employees and subcontractors.

4. Emergency contact information in case of an environmental impact. Provide name, title/project role, cell phone number, and e-mail address for at least two (2) responsible personnel who have authority to mobilize resources to address environmental issues.

5. Procedures to prevent releases to the environment and notifications in the event of a release to the environment.

6. Dust Control Plan identifying the means and methods for controlling dust from roadways and construction surfaces throughout construction, including manufacturer data for dust control agent(s), should any be proposed, for prior approval before use. The CONTRACTOR shall provide sufficient documentation from the manufacturer of the dust control agent(s) confirming their use is appropriate for the site and for the various potential application areas (slopes, roadways, etc.). The CONTRACTOR shall also demonstrate through documentation that the particular dust control agent(s) proposed for the project do not detrimentally impact the environment, including receiving waters.

7. Noise Suppression Plan describing the means and methods for minimizing noise during construction and compliance with the Montgomery County Noise Control Law.

8. Odor Control Plan.

9. Written plan for location, operation, maintenance, inspection, and monitoring of a temporary fueling operation, if the CONTRACTOR opts to use one. Describe how petroleum, oil, and lubricant (POL) tanks and containers will be stored, managed, and inspected and what protections will be provided. Include a Spill Prevention, Control, and Countermeasure (SPCC) Plan meeting the requirements of 40 CFR 112.

3.2 Dust Control

A. Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. CONTRACTOR may apply water, or a commercial dust control agent approved in the Dust Control Plan.

B. CONTRACTOR shall be responsible for controlling objectionable dust caused by the operation of vehicles and equipment, clearing, or other source, and shall prevent dust from leaving the site. Dust shall be controlled when encountering visible and/or noticeable airborne dust in or surrounding the project areas, or at the request of the CONSTRUCTION MANAGEMENT ENGINEER. Visible dust conditions are those where airborne dust is visible for greater than a five (5) minute period.

C. The CONSTRUCTION MANAGEMENT ENGINEER will require a temporary shutdown of all CONTRACTOR operations if dust is not controlled in accordance with these Specifications. Earthmoving activities occurring on unpaved surfaces shall be suspended when winds exceed twenty-five (25)miles per hour and visible dust plumes occur. All earthmoving activities will be suspended when wind speeds are greater than thirty (30) miles per hour regardless of presence or extent of dust plume.

D. The CONSTRUCTION MANAGEMENT ENGINEER may restrict construction vehicle traffic to fifteen (15) miles per hour unless the road surface and surrounding area is sufficiently stabilized to prevent visible dust emissions.

E. Any schedule delays or additional costs incurred by the CONTRACTOR due to temporary shutdown due to lack of dust control shall have no impact on the overall construction schedule or result in any additional cost to the OWNER.

F. CONTRACTOR is responsible for obtaining water for dust suppression and for any permits, approvals, or payment required.

3.3 Tracked Soil

A. CONTRACTOR shall be responsible for ensuring mud is not tracked onto Incinerator Lane or Southlawn Lane. CONTRACTOR shall clean and maintain all roads free of mud and dirt during construction on a daily basis. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming.

3.4 Noise

A. Make the maximum use of low-noise emission products such as adequate mufflers to control engine noise, localized or directional vehicle backup alarms, white noise vehicle backup alarms, or backup alarms that self-adjust to ambient noise levels.

B. Keep construction activities under surveillance and control to minimize environmental damage by noise. Comply with the provisions of the Montgomery County Noise Control Law.

3.5 Odors

A. The CONTRACTOR shall make efforts to reduce potential odors from migrating to surrounding properties, particularly the Derwood Station community near the northwest slope of the Landfill.

B. CONTRACTOR shall have an odor control misting system and a foam blanket product onsite during waste excavation and placement.

C. When odors are present, the CONSTRUCTION MANAGEMENT ENGINEER may require the CONTRACTOR to initiate odor control at the waste excavation and/or placement area based on the odors.

D. Odor control mist or foam shall be applied at rates recommended by manufacturer to control odor.

E. If the odor control methods are deemed insufficient, CONTRACTOR shall cover waste with daily cover soil and cease waste excavation and relocation activities until more favorable conditions exist.

3.6 Burning

A. Burning is prohibited at the site.

3.7 Petroleum, Oil, Lubricant (POL) Storage and Fueling

A. POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Storage of fuel on the project site must be in accordance with EPA, state, and local laws and regulations.

B. Provide secondary containment and overfill protection for POL storage tanks. Only aboveground storage tanks are allowed. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus five (5) inches freeboard for precipitation. Construct the berm to be impervious to POL for seventy-two (72) hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks.

C. Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

D. Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, immediately notify the CONSTRUCTION MANAGEMENT ENGINEER. Contain and clean up these spills without cost to the OWNER.

-- End of Section --

SECTION 01 58 13
PROJECT IDENTIFICATION AND SIGNS

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. Furnish, install, and maintain temporary project identification and informational signs.

B. The following signs shall be provided:

1. Project Identification Sign.

C. No signs, except those specified, shall be displayed unless approved by OWNER.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Submit for approval the following:

1. Type and grade of materials.
2. Layout, size, trim, framing, supports, and coatings.
3. Size and style of lettering.
4. Samples of colors.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Design

A. Design of Project Identification Sign shall conform to the size, layout and information shown in Figure A.

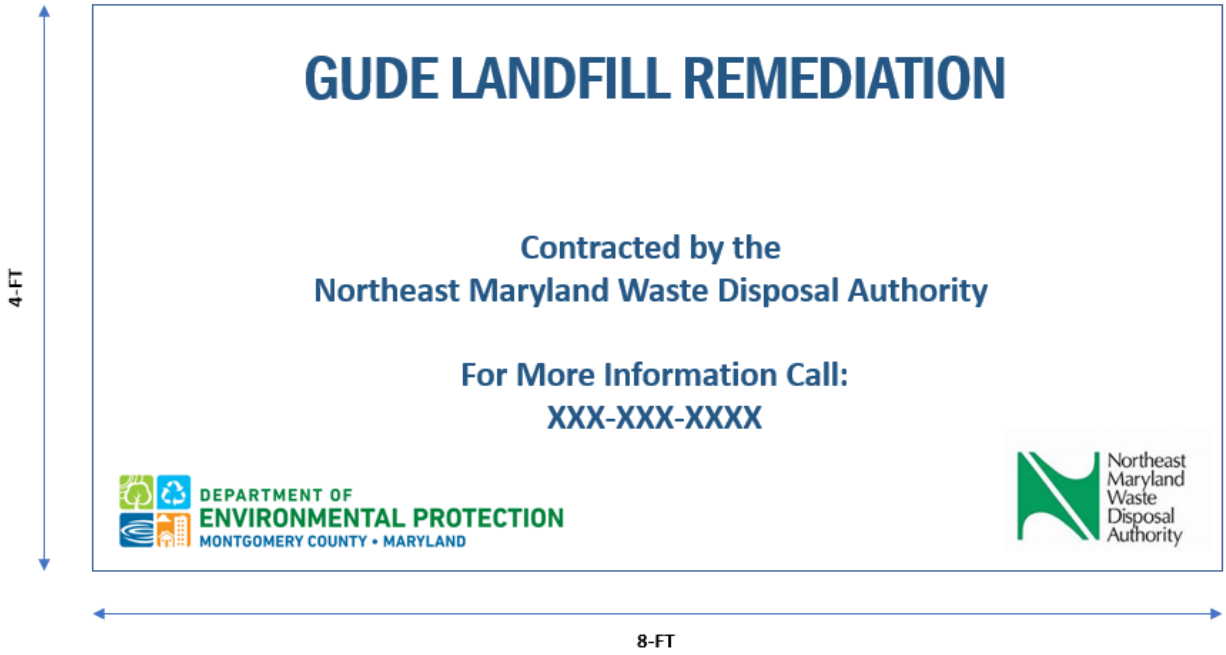
2.2 Fabrication

A. Use three-quarter (3/4)-inch Medium Density Overlay (MDO), unless shown otherwise.

B. Design signs and supports to withstand a seventy-five (75) mile per hour wind.

C. Paint with exterior gloss-finish enamel. Sign painter shall be a professional in the type work required.

FIGURE A



3. EXECUTION

3.1 Installation and Maintenance

A. Location of sign shall be as shown or directed by OWNER.

B. Maintain sign so it is clean, legible, and upright. Keep grass and weeds cut away from sign.

C. Repair and repaint damaged sign. Relocate sign as required by progress of the Work. Update information as conditions change, including, but not limited to change in County Executive administration.

D. Remove sign at time of final acceptance or when directed by OWNER.

-- End of Section --

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SECTION 01 59 00
TEMPORARY FACILITIES AND CONTROLS

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes the requirements for field office construction, maintenance, and removal. The CONTRACTOR shall provide field offices as specified herein at his own expense.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Field offices shall be ready for occupancy fifteen (15) days prior to groundbreaking on site.

B. Maintain storage areas and sheds until readiness for final payment, unless otherwise approved by OWNER.

2. MATERIALS

A. Materials, equipment, and furnishings shall be new or used, and adequate for the required purpose. The CONTRACTOR shall furnish and install all needed aggregate and piping for drainage, and maintain ingress and egress roadways for the designated field staging areas.

3. EXECUTION

3.1 Preparation

A. Fill grade sites for temporary structures to provide drainage away from buildings, and install office spaces ready for occupancy.

3.2 Construction

A. Construction specifications include the following:

1. Portable or mobile buildings/trailers, or buildings constructed with floors raised aboveground, securely fixed to foundations, with steps and landings at entrance doors.

2. Structurally sound foundation and superstructure.

3. Completely weathertight and insulated floors, walls, and ceilings.

4. Exterior finish acceptable to OWNER.

5. Interior materials in offices shall be sheet-type for walls and ceilings, finished or painted; resilient floors and bases in like new condition.

6. Size: minimum one hundred fifty (150) square feet floor area.

7. Windows: ten (10) percent of floor area with operable sash and screens. Windows shall be furnished with locks and exterior security bars approved by the OWNER.

8. Two (2) means of ingress and egress, each with landing, stairs, and handrails conforming to local building codes.

9. Interior materials in storage sheds will be as required to provide specified conditions for the storage of products.

3.3 Minimum Services

A. Provide the following for each office:

1. Electrical System:

   a. CONTRACTOR shall make all provisions for obtaining temporary electrical services for the office space. Cost of installation, maintenance, monthly charges, and removal shall be the responsibility of CONTRACTOR.

   b. Interior lighting of fifty (50) foot-candles at desktop height.

   c. Exterior light at entrance.

   d. Minimum four (4) one hundred twenty (120)-volt, wall-mounted, convenience electrical receptacles.

   e. No generators are permitted for offices.

2. Heating, Ventilating, and Air Conditioning System:

   a. Automatic heating to maintain minimum sixty-five (65) degrees Fahrenheit in the cold weather. Furnish and pay for all fuel and utility costs.

   b. Automatic cooling to maintain maximum seventy-five (75) degrees Fahrenheit in warm weather.

3. Telephone Service:

   a. Dedicated telephone service for each office, including payment of installation charges.

   b. Pay local and long distance charges for the duration of the Project.

4. Internet Service:

   a. Provide all equipment necessary for high speed internet service by 4G LTE wireless broadband with forty (40) gigabytes per month of data at a minimum.

   b. Pay all charges for internet service for the duration of the Project.

5. Water and Sewerage:

    a. Provide a suitably enclosed chemical or self-contained toilet located near field offices. Toilets shall be serviced, at minimum weekly, kept clean and supplied throughout course of work.

    b. Provide drinking water and dispenser. Dispenser shall have hot and cold taps and a cup dispenser. Supply refill water containers as necessary.

    c. Provide waterless hand sanitizer and paper towels. Keep adequate supplies throughout the course of work.

B. Should actions of utility companies delay the complete set up of the field office, CONTRACTOR shall provide temporary electricity, heat, water supply, and sanitary facilities as required at no additional cost to the OWNER.

C. No separate payment shall be made for the Inspector's office, facilities, and temporary power. All costs associated with providing and maintaining said facilities, including electric, shall be included in the price of mobilization.

3.4 CONTRACTOR'S Office and Facilities

A. CONTRACTOR shall provide a field office for use by CONTRACTOR with the minimum facilities specified. Provide required storage and work sheds.

B. Field Office and Furnishings:

1. Telephone, fax, and high speed internet service.

2. Six (6) safety vests and protective helmets for visitors' use.

3. Identifying exterior sign acceptable to the OWNER, at least twenty-four (24) inches by thirty-six (36) inches in size. Text shall be four (4) inches high, Arial font, unless otherwise approved by the OWNER. At minimum, the sign shall read "CONTRACTOR'S OFFICE."

4. Other furnishings at CONTRACTOR'S option.

C. Provide one (1) set of Contract Documents in the field office for ready reference by interested parties.

3.5 OWNER/CONSTRUCTION MANAGEMENT ENGINEER'S Office

A. CONTRACTOR shall provide and maintain one (1) separate trailer or structure for the sole use as a field office for the OWNER /CONSTRUCTION MANAGEMENT ENGINEER. Provide the office at a location approved by the OWNER.

B. Allocate five (5) reserved parking spaces for use by the OWNER in close proximity to the inspector's field office. Parking area shall be paved with asphalt concrete or crushed stone, and shall include a walkway of asphalt, concrete, crushed stone, or material acceptable to the OWNER, between the parking area and the field office.

C. The CONSTRUCTION MANAGEMENT ENGINEER will provide the following furnishings and equipment for the duration of the Work:

1. Desks: Two (2) five (5)-drawer desks, each sixty (60) inches by thirty (30) inches with at least one (1) eight and a half (8.5)-inch by eleven (11)-inch file drawer each.

2. Desk Chairs: Three (3) new or used (in good condition) five (5)-point, high backed, swivel chairs

3. One (1) four (4)-drawer file cabinets.

4. One (1) two (2)-door storage cabinet of locking closet.

5. Shelving or bookcase with a total of six (6) feet of shelf length at least twelve (12) inches deep.

6. Outdoor thermometer mounted in the shade and located for convenient reading from inside the field office.

7. One (1) multifunction (fax, copy, print, scan) laser printer and all cords necessary for fax and computer use. Multifunction laser printer shall have built in 10/100 Ethernet, wireless 802.11b/g/n, and USB 2.0 interfaces. Printer shall be capable of automatic duplexing and print speeds of at least twenty (20) pages per minute, Brother model MFCL8900CDW or equal.

D. CONTRACTOR shall provide the following furnishings and equipment for the duration of the Work:

1. One (1) thirty-five (35) gallon waste basket for mixed containers.

2. One (1) sixty-five (65) gallon waste basket for recyclable fiber.

3. Suitable mat or carpet at each doorway.

4. One (1) tack board thirty (30) inches by thirty-six (36) inches, with thumbtacks.

5. One (1) white board for use with dry markers, approximately four (4.0) feet by four (4.0) feet, with marker holding tray, installed by CONTRACTOR at a location

directed by CONSTRUCTION MANAGEMENT ENGINEER in the field. Provide a supply of colored markers and eraser for the white board.

6. Fire extinguishers and associated signage, and smoke detector, per local codes. At minimum provide two (2) wall-mounted fire extinguishers and one (1) battery operated ceiling-mounted smoke detector.

7. Identifying exterior sign acceptable to the OWNER, at least twenty-four (24) inches by thirty-six (36) inches in size. Text shall be four (4) inches high, Arial font, unless otherwise approved by the OWNER. At minimum, the sign shall read "CONSTRUCTION MANAGEMENT ENGINEER'S OFFICE."

8. First aid kit, by Zee Medical Service Co., Item 0125, "Kit, Utility, Metal, Full (ANSI)", (800) 225-5933), www.zeemedical.com, or equal.

9. Six (6) ANSI approved protective helmets for use by visitors—white with ratchet suspension.

10. One (1) battery powered, wall mount clock.

11. Six (6) safety vests—fluorescent lime with orange and silver stripes.

12. Six (6) safety glasses—clear poly carbonate lenses, ANSI Z87.1 compliant.

3.6 Storage Areas and Sheds

A. Size to storage requirements for products of individual sections. Allow for access, orderly provision for maintenance, and for inspection of products.

3.7 Maintenance and Cleaning

A. CONTRACTOR shall be responsible for janitorial, cleaning and maintenance services for both offices and the storage areas.

1. Provide toner or ink cartridges for printer, copier, and fax machine, as required.

2. Provide colored dry markers.

3. Provide bottled water and disposable cups.

4. Replenish contents of the first-aid kit as required.

5. Immediately repair malfunctioning, damaged, leaking, or defective field office systems and equipment.

6. Provide all supplies, including toner and paper, and pay for maintenance on the multifunction laser printer.

7. Promptly provide snow removal for the field office, including parking area, walkways, and stairs/landings.

8. Provide continuous maintenance and janitorial service of the field office and sanitary facilities. Clean the field offices at least once per week and properly dispose of trash.

9. Provide waterless soap, paper towels, cleansers, sanitary supplies, and janitorial implements in the OWNER/CONSTRUCTION MANAGEMENT ENGINEER's office.

3.8 Removal

A. Remove the field offices and furnishings when directed by the OWNER. Restore site to preconstruction conditions.

-- End of Section --

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SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Specification includes the execution and closeout procedures, including surveys, field engineering, and contract closeout.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Submit the following:

1. Submit resume of CONTRACTOR'S field engineer to CONSTRUCTION MANAGEMENT ENGINEER prior to the Preconstruction Meeting for approval.

2. Submit name and address of CONTRACTOR'S surveyor to CONSTRUCTION MANAGEMENT ENGINEER.

3. On request of CONSTRUCTION MANAGEMENT ENGINEER, submit documentation to verify accuracy of field engineering work.

4. Submit certificate signed by Maryland registered engineer or surveyor certifying that elevations (lines and grades) and locations of Work are in conformance with Contract Documents. Explain all deviations.

B. Submit copies of field notes to CONSTRUCTION MANAGEMENT ENGINEER.

C. Four (4) copies of each survey listed in Table 01 70 00 shall be submitted by the CONTRACTOR in reproducible drawings and one (1) portable document format (PDF) electronic version and one (1) AutoCAD electronic version in 2013 or newer format.

D. At the completion of the Contract, or at the CONSTRUCTION MANAGEMENT ENGINEER'S request and before final payment is made, the CONTRACTOR shall furnish the CONSTRUCTION MANAGEMENT ENGINEER four (4) sets of reproducible drawings and one (1) PDF electronic version and one (1) AutoCAD electronic version of the final record drawings (as-builts) reflecting all revisions herein described.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Surveying

A. Surveys shall be field run by an independent surveyor licensed in the State of Maryland.

B. The OWNER has established benchmarks with horizontal and vertical control as shown on the plans for use by the CONTRACTOR. Control datum for survey is indicated on the Drawings. Promptly notify CONSTRUCTION MANAGEMENT ENGINEER of any discrepancies discovered with the survey control.

C. CONTRACTOR shall establish, maintain, and protect new control points for this project. New control points shall be surveyed to at least second order accuracy (e.g. 1:10000) and tied into the existing network.

D. CONTRACTOR shall locate and protect survey control and reference points within the limit of Work. Existing property markers along the limit of the Work are located

where identified in Attachment D, Property Markers. Should any property markers and benchmarks be destroyed, the replacement cost shall be borne by the CONTRACTOR. The CONTRACTOR shall assume the entire expense of rectifying work improperly constructed due to failure to maintain and protect established survey points and benchmarks.

E. The CONTRACTOR shall be responsible for verification of the information provided by OWNER. The Contract Drawings provided to the CONTRACTOR consist of elevations and contours based on aerial topography combined with some areas of field run topography. Additionally, the Site is prone to settlement as a landfill, and as a result, all indicated elevations and contours are approximate. Accordingly, elevations shown on these plans are to be adjusted to reflect field conditions, relative dimensioning, and minimum or maximum grades where necessary and approved by the CONSTRUCTION MANAGEMENT ENGINEER.

F. Verify setbacks and easements; confirm Drawing dimensions and elevations.

G. Provide all surveying equipment required including transit, level, stakes, and required surveying accessories.

H. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.

I. Furnish all required lines and grades for construction of operations. Check all piping, other materials, and equipment.

J. Survey, locate, and record and redline Drawings to accurately represent all utilities and buried structures prior to backfilling.

K. CONTRACTOR shall develop and make all detail surveys and measurements needed for construction including slope stakes, batter boards, piping layouts, and all other working lines, elevations, and cut sheets.

L. As a minimum survey control requirement, maintain a transit and leveling instrument onsite at all times and a skilled instrument person employed or obtained whenever necessary for layout work.

M. CONTRACTOR shall keep neat, legible field notes of all measurements and calculations made by the CONTRACTOR while surveying and laying out the Work proposed in this Contract.

N. Surveys shall be performed at the milestones indicated in Table 01 70 00-1 as Work progresses through each phase. Surveys will be performed at these milestones only in areas where the milestone has been reached. Ultimately, the entire Limit of Disturbance shall be surveyed for each milestone. The as-built drawings shall include survey information presented as one complete survey.

TABLE 01 70 00-1
Required Surveys

Milestone	Required Survey
Existing Conditions after Clearing	Survey ground surface elevation immediately after mowing and clearing each phase and before existing cover soil removal.
Existing Cover Soil Removal	Survey ground surface elevation after existing cover soil has been stripped before any waste is excavated or placed. Existing cover soil stockpiles do not need to be surveyed.
Regraded Waste	Survey ground surface elevation after waste has been excavated and waste and soil have been placed, compacted, and finished to meet regraded waste elevation (bottom of subgrade elevation).
Closure Cap Subgrade	Survey ground surface elevation after Closure Cap Subgrade soil has been placed, compacted, and finished to meet subgrade elevation.
Geosynthetics	Survey ground surface elevation and areal extent of geosynthetics after placement and meet survey requirements noted in Section 31 05 19.16, Geomembrane.
Landfill Gas System	Survey elevation and horizontal location of top of pipes, valves, and condensate drains before completion of Vegetative Support Soil placement.
Vegetative Support Soil	Survey ground surface elevation after Vegetative Support Soil has been placed, compacted, and finished.
Topsoil	Survey ground surface elevation after Topsoil has been placed, compacted, and finished to meet final grade.
As-Built	Survey final site after removal of Sediment Basin No. 1 and installation of all drainage features and all recreational features. Survey: • Horizontal and vertical locations of storm drain pipes, manholes, and inlets (including invert elevations); • Access road locations; • Landfill gas extraction well locations; • Horizontal and vertical locations of groundwater monitoring wells (including top of casing elevation and ground surface elevation); • Horizontal and vertical locations of landfill gas monitoring probes (including top of casing elevation and ground surface elevation); • Horizontal and vertical locations of piezometers (including top of casing elevation and ground surface elevation); • Horizontal and vertical locations of condensate sumps; • Chain link fence and gate locations; • Recreational feature locations; • Horizontal and vertical locations of property corner monuments and line-of-site markers along the limit of new chain link fence installation along the Northwest Slope.

O. Surveys at a minimum shall include the following where applicable:

1. Horizontal and vertical location of any installed buried piping or utilities including but not limited to landfill gas, stormwater culverts, and electrical service.

2. Survey points shall include all slope features and grade breaks such that an accurate ground surface model can be generated from the survey data. The maximum spacing between survey points shall be twenty-five (25) feet and the survey tolerance shall be one-tenth (0.1) foot.

1.11 CONTRACTOR'S Field Engineer

A. CONTRACTOR shall employ and retain at the work site a full-time field engineer capable of performing all engineering tasks required of the CONTRACTOR. Tasks include, but are not limited to:

1. Daily reports of Project activity to be submitted to the CONSTRUCTION MANAGEMENT ENGINEER with all pertinent information pertaining to the Project as follows:

a. Numbers of employees onsite.

b. Subcontractor's employees onsite.

c. Breakdown of employees by trade.

d. Major equipment and materials installed.

e. Major construction equipment utilized.

f. Location of all areas in which construction was done.

g. Materials and equipment received.

h. Quantity of the items completed or in progress with daily as well as cumulative quantity of work done for each item.

i. Adherence to the construction schedule and construction sequencing.

j. Weather conditions.

k. Health and Safety.

l. Sign-in sheet for all visitors.

2. Submit two (2) copies of CONTRACTOR'S daily report to the CONSTRUCTION MANAGEMENT ENGINEER'S field office by 9:00 a.m. the next working day after the Work was performed. Daily reports shall be signed by a responsible member of CONTRACTOR'S staff.

3. Maintain field office files and drawings, record drawings, and coordinate engineering services with subcontractors. Prepare layout and coordination drawings for construction operations.

4. Check and coordinate Work for conflicts and interferences, and immediately advise CONSTRUCTION MANAGEMENT ENGINEER of all discrepancies noted.

5. Cooperate with CONSTRUCTION MANAGEMENT ENGINEER in field inspections as required.

6. Review and coordinate Shop Drawing and other submittals.

7. Attend all progress meetings.

1.12 Qualifications of Field Engineer

A. Qualified individual (engineer, experienced personnel, or Maryland registered land surveyor), having completed comparable projects to this Work and having a minimum of five (5) years' experience conducting similar functions and acceptable to CONSTRUCTION MANAGEMENT ENGINEER. Submit for OWNER'S approval.

1.13 Project Record As-Built Documents

A. Maintain onsite one (1) set of the following record documents; record actual revisions to the Work. Record documents include:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change Orders Change Orders, Work Change Directives, Field Orders and other modifications to the Contract.

5. Written interpretations and clarifications.

6. Approved Shop Drawings, product data, and Samples.

7. Inspection reports.

8. Laboratory test records.

9. Field test reports and records Factory test reports and records.

10. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by OWNER.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications—Legibly mark and record, at each product section, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates used.
3. Changes made by Addenda and modifications.

F. Record Drawings—Legibly mark each item to record actual construction as follows:

1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.

2. Include locations of concealed elements of the Work, such as anchor trench locations, limits of geosynthetic closure cap, weld locations, seam locations, below grade piping, and locations of samples taken of geosynthetic components for destructive and nondestructive testing.

3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.

4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.

5. Identify and locate existing buried or concealed items encountered during Project.

6. Measured depths of foundations in relation to ground elevation.

7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

9. Field changes of dimension and detail.

G. Where the Contract Drawings are not of sufficient size, scale, or detail, the CONTRACTOR shall furnish its own drawings for incorporation of details and dimensions using AutoCAD.

H. The final submittal of record ("as-built") drawings shall be stamped “Record Drawing,” signed and dated in blue ink by the CONTRACTOR and shall be delivered to the CONSTRUCTION MANAGEMENT ENGINEER.

1.14 Cleanup

A. Construction cleanup shall proceed as construction progresses and shall consist of the removal of all mud, dirt, trash, debris, and surplus excavated material. All cleaning materials and equipment used shall be selected and employed with care to avoid scratching, marring, defacing, staining, or discoloring the surfaces cleaned.

B. Immediately prior to the CONTRACTOR’S written request for a final inspection of the Contract Work, or any portion thereof, perform final cleanup.

C. In addition to the normal “broom clean” requirements, the exposed surfaces of the following materials shall be cleaned as listed herein:

1. Gravel roads—Remove mud, dirt, and redress.
2. Other surfaces—Remove all blemishes. Leave clean, uniform, and dust free.
3. Premises and site—Remove all trash, debris, and surplus excavated material.

D. No items shall remain on or be discarded on this site, or any other OWNER’S site. Items and excess materials that are to be discarded shall be removed to the active landfill. Leave premises orderly and “broom clean.”

1.15 Restoration and Restabilization

A. All areas disturbed by the CONTRACTOR’S operation shall be restored and restabilized as specified herein. This shall include, but not be limited to, staging and stockpiling areas, offsite borrow areas, construction strips, access to roads, and all areas within the Limit of Work.

B. Final restoration and restabilization shall proceed in accordance with the Construction Schedule. This shall include seeding and/or sodding of disturbed areas and outside slopes of landfill cells. Disassemble and removal all temporary construction facilities constructed by the CONTRACTOR and leave the Site in an orderly and restored condition as required by the Contract Documents.

C. Preserve signs, guard rails, property corner monuments, line-of-sight markers, groundwater monitoring wells, landfill gas monitoring probes, and fences, and maintain in their existing locations and condition unless written permission is obtained from the CONSTRUCTION MANAGEMENT ENGINEER for their removal and restoration or replacement. Remove such conflicting facilities when grading operations begin and store in a manner to keep them clean and in their existing condition. Restore to their locations before removal or such new locations as directed. Repair or replace damaged items when directed, at no cost to the OWNER.

D. Restabilization of turf areas shall be performed in accordance with Section 32 92 19, Upland Meadow Establishment.

E. Gravel surfaces and access roads shall be repaired and restored as near as practicable to "like new" condition.

1.16 Disposal of Waste and Excess Materials

A. Construction waste and excess construction materials shall be disposed by the CONTRACTOR at offsite locations in accordance with applicable local, state, and federal regulations.

B. Waste and excess material disposed of in an unauthorized area shall be removed by the CONTRACTOR and the area shall be restored as near as practicable to its condition before disturbance, at no cost to the OWNER.

1.17 Removal of Rejected Material

A. Material delivered to the Contract site by the CONTRACTOR, which has been determined by the CONSTRUCTION MANAGEMENT ENGINEER to be unsuitable or not in accordance with the Contract Documents, shall be removed from the Work site and disposed of in an approved area at no cost to the OWNER.

2. MATERIALS

A. Not used.

3. EXECUTION

3.1 Protection of Existing Infrastructure

A. The CONTRACTOR shall protect all existing infrastructure not to be demolished as identified in the Contract Documents. Damage by the CONTRACTOR to existing infrastructure will be repaired at the CONTRACTOR'S expense.

B. The CONTRACTOR shall provide for the protection and preservation of the existing monitoring wells located within the project area. Any damage to these items caused

by the CONTRACTOR'S activities shall be repaired by the CONTRACTOR at no additional expense to the OWNER.

C. The CONTRACTOR shall restore all roads, paved surface and access roads intended to remain that have been damaged during the construction of the landfill closure cap to their original condition.

3.2 Project Closeout

A. Upon receiving the CONTRACTOR'S written request for substantial completion inspection, the CONSTRUCTION MANAGEMENT ENGINEER will perform a walk-through of the Site area with the CONTRACTOR'S and the OWNER's representative(s). The CONSTRUCTION MANAGEMENT ENGINEER shall identify and document, via a punch list, the additional construction items required to declare "substantial completion" of the Contract. If, in the opinion of the CONSTRUCTION MANAGEMENT ENGINEER, the Site area can be fully utilized for purposes for which it was intended, a "Certificate of Substantial Completion" shall be issued. If, in the opinion of the CONSTRUCTION MANAGEMENT ENGINEER, the Site area cannot be fully utilized for purposes for which it was intended, no "Certificate of Substantial Completion" will be issued and another walk-through will be scheduled. All punch list items identified during the walk-throughs shall be addressed to the satisfaction of the CONSTRUCTION MANAGEMENT ENGINEER. Final payment will not be made until all of the punch list items are resolved to the satisfaction of the CONSTRUCTION MANAGEMENT ENGINEER.

B. Unless otherwise specified in the Contract Documents, the CONTRACTOR guarantees and warrants all materials, supplies, and equipment furnished and all work performed under the Contract for a period of twelve (12) months after the date of Substantial Completion as determined by the CONSTRUCTION MANAGEMENT ENGINEER.

-- End of Section –

SECTION 02 41 00
DEMOLITION

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. Demolition, removal, and disposal of selected structures shall be in accordance with Contract Drawings, and shall include, but is not limited to: gabion down chutes, stormdrains, stormdrain inlets and manholes, access roads, landfill gas piping, landfill gas extraction wells, and condensate sumps.

1.1.2 Related Work Specified Elsewhere

A. Section 01 20 00, Measurement and Payment.

B. Section 01 33 00, Submittals.

1.2 References

A. American National Standards Institute (ANSI).

B. American Society of Safety Engineers (ASSE).

C. ASTM International (ASTM).

D. National Fire Protection Agency (NFPA).

1.3 Definitions

A. Remove: Detach items from existing construction and legally dispose of them offsite unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to OWNER.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Field Conditions

A. Notify OWNER of discrepancies between existing conditions and Contract Drawings before proceeding with selective demolition.

B. Hazardous Materials—It is not expected that hazardous materials will be encountered in the Work. If suspected hazardous materials are encountered, do not disturb; immediately notify CONSTRUCTION MANAGEMENT ENGINEER and proceed as detailed in Paragraph "Unusual Waste" in Specification Section 02 61 13.13, Waste Excavation and Material Handling.

C. Storage or sale of removed items or materials onsite is not permitted.

D. Utility Service—Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.11 Warranty

A. Existing Warranties—Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

2. MATERIALS

2.1 Flowable Fill

A. Flowable fill materials shall be in accordance with Section 314 of the latest edition of the Maryland Department of Transportation (MDOT) State Highway Administration SHA Standard Specifications for Construction and Materials.

3. EXECUTION

3.1 General

A. Evaluate existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Demolish and remove existing construction only to the extent required by new construction and as indicated on Contract Drawings.

C. Existing Items to Remain—Protect construction indicated to remain against damage and soiling during selective demolition.

D. Verify that utilities have been disconnected and capped before starting selective demolition operations.

E. Comply with ANSI/ASSE A10.6 and NFPA 241.

3.2 Drainage Structure Demolition and Abandonment

A. Existing gabion downchutes, riprap, and drainage structures shall be removed incrementally during grading and excavation activities in those areas. Existing downchutes shall not be disturbed until necessary for cap construction.

B. CONTRACTOR must maintain erosion and sediment control and slope stability at all times.

C. Existing culverts and drainage structures shall be removed from excavation areas at the locations indicated on the Contract Drawings.

D. Existing culverts and drainage structures in waste placement areas shall be backfilled with flowable fill materials in accordance with Section 314 of the latest edition of the MDOT SHA Standard Specifications for Construction and Materials and left in place.

3.3 Landfill Gas Collection System Demolition and Abandonment

A. The existing landfill gas collection system demolition and abandonment is to be performed in accordance with the Landfill Gas Collection System Work Plan

prepared by the CONTRACTOR and approved by the CONSTRUCTION MANAGEMENT ENGINEER and Owner as identified on the Contract Drawings.

B. Demolish and remove existing above grade PVC pipe, supports, and stakes as work progresses across the site.

C. Existing landfill gas extraction wells are to be cut, the wellheads removed, and the existing casing capped a minimum of twelve (12) inches below the bottom of subgrade as shown on the Contract Drawings.

D. Existing condensate drains/traps are to be cut and the existing casing capped a minimum of twelve (12) inches below the bottom of subgrade.

E. Existing HDPE condensate sumps lids are to be removed and shall be broken/cut at least four (4) feet below grade or removed in their entirety and backfilled with No. 57 stone. No sharp points/edges are to remain along the broken/cut.

3.3 Disposal of Demolished Materials

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain OWNER'S property, CONTRACTOR must transport demolished materials for offsite disposal.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Do not burn demolished materials.

-- End of Section --

SECTION 02 61 13.13
WASTE EXCAVATION AND MATERIAL HANDLING

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The work shall consist of excavation, transportation, and placement of municipal solid waste for onsite waste relocation activities and the associated leachate management necessary to facilitate construction.

1.1.2 Related Work Specified Elsewhere

A. Section 01 45 00, Health and Safety.

B. Section 01 57 19, Temporary Environmental Controls.

C. Section 31 05 15, Earthwork.

D. Section 31 05 16, Aggregates.

E. Section 31 09 13, Settlement Plates.

F. Section 31 25 00, Erosion and Sediment Control.

1.2 References

A. Not used.

1.3 Definitions

A. Cover Soil—Existing soil that is to be removed prior to waste excavation and stockpiled for use as common borrow and/or subgrade material. Refer to Section 31 05 15, Earthwork.

B. Hazardous Waste—Any material that meets the definition of a solid waste and exhibits a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

C. Waste—Municipal solid waste, including incinerator ash, and residual existing cover soil that remains after cover soil removal requiring excavation and relocation under this contract.

D. Unusual Waste—Solid waste that may not be considered municipal, including: waste with oil like sheen and/or odor; drums or tanks containing waste or liquid (unless empty and flattened); tires; and any waste suspect of being hazardous in nature.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Not used.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

A. Daily Cover soil shall consist of General Fill or Closure Cap Subgrade as defined in Specification Section 31 05 15, Earthwork.

3. EXECUTION

3.1 Existing Structures and Utilities

A. Refer to Section 31 05 15, Earthwork, for excavation near existing environmental features such as monitoring wells, piezometers, and landfill gas extraction and monitoring wells.

3.2 Waste Relocation

A. The CONTRACTOR is responsible for excavating, transporting, placing, and compacting existing waste as required to achieve the design grades and address leachate seeps and ponded leachate encountered during construction.

B. While working in waste, equipment operators may be exposed to landfill gas or leachate. The CONTRACTOR is responsible for providing safe working conditions and proper equipment to handle the potential environment in accordance with Specification Section 01 45 00, Health and Safety.

C. Refer to Section 31 05 15, Earthwork, for requirements that relate to the removal of existing cover soil.

3.2.1 Excavation

A. Waste excavation and relocation is required to meet subgrade elevations as shown on the Contract Drawings.

B. Waste shall only be excavated in active phases as defined on the Contract Drawings.

C. Waste placement site shall be prepared to accept waste prior to beginning excavation.

D. Waste shall be excavated to the depth and extent shown on the Contract Drawings and in accordance with the details and sequence on the Contract Drawings.

E. No waste may be protruding from the finished surface. Any protruding waste must be removed, reincorporated into the fill, and recompacted to prevent potential damage to the geosynthetic closure cap.

F. Compact waste at bottom of excavation before filling on top of it. Waste shall be compacted by a minimum of three (3) passes of construction equipment with a minimum ground pressure of six (6) pounds per square inch.

G. Exposed waste shall be covered at the end of each day as described in paragraph "Daily Cover."

H. The CONTRACTOR shall be prepared for encountering unusual waste and leachate. The OWNER is not aware of any historical records indicating that unusual waste has been placed in the Landfill. The CONSTRUCTION MANAGEMENT ENGINEER shall be notified immediately if unusual waste is encountered. The CONTRACTOR shall record the incidents in their daily logs. The CONTRACTOR shall establish subcontracts and agreements to sample, analyze, characterize, transport, and dispose of hazardous waste before waste excavation begins to avoid delays in executing the Work if potentially hazardous waste is encountered. Unusual waste shall be managed as described in Paragraph "Unusual Waste."

3.2.2 Waste Transport

A. Waste material shall be transported in water-tight trucks or containers from location of excavation to location of placement. No interim stockpiling of waste material is allowed. Do not overfill trucks/containers to minimize spillage. Waste must be controlled so it does not blow from the trucks/containers. Truck/containers will need to be covered if waste is blowing from them.

B. No waste may be placed or transported over subgrade soils.

C. Waste must remain on the property during all construction activities.

D. The CONTRACTOR shall take measures to prevent windblown litter and debris and shall clean up litter and debris that results from handling waste.

3.2.3 Waste Placement

A. Waste shall be placed onsite in areas indicated on the Contract Drawings to achieve bottom of subgrade elevations.

B. Waste shall only be placed in active phases as defined on the Contract Drawings.

C. Waste is to be placed in maximum eight (8)-inch loose lifts and compacted by a minimum of three (3) passes of construction equipment with a minimum ground pressure of six (6) pounds per square inch. Compaction with a bulldozer (not low ground pressure) is acceptable. Landfill compactors or soil compactors are not required.

D. No waste may be protruding from the finished surface. Any protruding waste must be removed, reincorporated into the fill, and recompacted to prevent potential damage to the geosynthetic closure cap.

3.2.4 Daily Cover

A. All waste in excavation areas and placement areas must be covered at the end of each working day or before a precipitation event if more than 0.5 inches of rain is forecast by the National Oceanic and Atmospheric Administration. Options for covering include:

1. Tarps: Tarps must be free of holes or other damage to prevent precipitation from entering the waste. Tarps shall have a minimum thickness of ten (10) mils. The tarp shall be water resistant, seamed, and shed rainwater off the area preventing precipitation from infiltrating into the soils. The tarp shall be extended over the exposed waste and anchored at the perimeter and ballasted to prevent it from being removed or damaged by wind. The tarp interior shall be properly anchored

using ultraviolet (UV)-resistant sandbags as needed. Each sandbag shall be filled with sand or other ballast and secured with UV-resistant nylon rope. Sandbags and rope shall be UV-resistant for two (2) years of exposure.

2. Daily Cover: Daily cover soil shall be uniformly placed and compacted to a six (6)-inch thickness. Closure Cap Subgrade soil meets the requirements for daily cover. Waste placed to the bottom of subgrade elevation should be covered with Closure Cap Subgrade (specified in Specification Section 31 05 15, Earthwork).

3.2.5 Leachate Management

A. A minimum of 30 calendar days before waste excavation begins, CONTRACTOR shall pump any leachate from the six (6) existing Dewatering Sumps along the top of the Northwest Slope where shown on the Contract Drawings. Leachate shall be pumped into a tanker truck for transport offsite for treatment and disposal. The CONTRACTOR must provide pumps, a power source for operating the pumps, and tanker trucks.

B. The CONTRACTOR shall pump leachate continuously during working hours to remove as much leachate as possible before waste excavation begins. If the sumps run dry, the CONTRACTOR may cease pumping for 24 to 72 hours and then resume pumping. It is anticipated that the wells may run dry during pumping and ceasing pumping will allow leachate from the surrounding area to flow to the sumps.

C. Add requirements to have pumps available onsite and tanker trucks available within 4 hours.

D. The CONTRACTOR is responsible for the management of any leachate encountered and shall notify the CONSTRUCTION MANAGEMENT ENGINEER immediately upon encountering leachate. In case of encountering perched or ponded leachate during waste excavation, the CONTRACTOR shall excavate into the waste away from the perimeter of the Landfill to remove the barrier that is holding leachate until the leachate is redirected into the underlying waste mass and is no longer ponded.

E. If the ponded leachate is encountered at the bottom of subgrade elevation and it has been drained back into the Landfill through additional excavation, backfill the additional excavation with No. 2 stone as specified in Specification Section 31 05 16, Aggregates, and cover with twelve (12) inches of common borrow before placing Closure Cap Subgrade.

F. In the instance where leachate cannot be redirected into the underlying waste, the CONTRACTOR is to notify the CONSTRUCTION MANAGEMENT ENGINEER. If agreed to by the CONSTRUCTION MANAGEMENT ENGINEER, the CONTRACTOR must pump the leachate from the excavation area into tanker trucks and dispose of the leachate offsite. Up to six thousand (6,000) gallons per day of leachate may be hauled to Oaks Landfill with prior written approval from the

CONSTRUCTION MANAGEMENT ENGINEER. The CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER a minimum of twenty-four (24) hours prior to anticipated disposal. If not approved, the CONTRACTOR must dispose of leachate offsite at a third-party facility in accordance with regulatory requirements. Tickets for disposal of the leachate shall be provided to the CONSTRUCTION MANAGEMENT ENGINEER within twenty-four (24) hours of the disposal for records and payment purposes.

3.2.6 Unusual Waste

A. Tires: Tires encountered during waste excavation are to be managed by the CONTRACTOR in accordance with COMAR 26.04.08. They must be transported by a licensed hauler to a licensed collection facility. They may be stockpiled temporarily onsite until a full load is ready for transport and disposal.

B. Potentially Hazardous Waste: Potentially hazardous waste includes waste with oil like sheen and/or odor; drums or tanks containing waste or liquid (unless empty and flattened); and any waste suspect of being hazardous in nature.

1. Potentially hazardous waste shall not be disturbed until the CONSTRUCTION MANAGEMENT ENGINEER is notified and has approved a plan of action. The CONSTRUCTION MANAGEMENT ENGINEER will determine if the material can be excavated and placed back in the Landfill or if must be characterized.

2. The CONTRACTOR may move to a new location and continue waste excavation while the plan of action is being determined for managing the potentially hazardous waste.

3. If the CONSTRUCTION MANAGEMENT ENGINEER determines the material must be characterized, the CONTRACTOR shall characterize the waste in accordance with the requirements of 40 CFR 261 and submit a report summarizing and containing the results of the testing.

4. If the waste is determined to be hazardous, store hazardous waste onsite in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Provide the CONSTRUCTION MANAGEMENT ENGINEER with a copy of the signed hazardous waste manifests for review and approval before waste is transported offsite.

5. Hazardous waste shall be transported and disposed in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268 within sixty (60) days after the materials have been characterized.

3.2.7 Landfill Gas Wellfield Management

A. Manage temporary disconnection and reconnection of landfill gas wells in the active waste excavation and placement areas as detailed in Specification Section 33 51 10.

-- End of Section --

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SECTION 06 10 63
EXTERIOR ROUGH CARPENTRY

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 Summary

A. Section Includes:

1. Shade structure.
2. Signage.
3. Wood fence posts.
4. Wood guardrail.
5. Timber edging.
6. Disc golf tee box.

B. Related Requirements:

1. Section 03 30 53 "Miscellaneous Cast-in-Place Concrete" for cast-in-place concrete footings.

2. Section 32 31 13 “Chain Link Fences and Gates” for chain link fence enclosure.

3. Section 32 33 00 “Site Furnishings” for custom site furnishings.

1.3 Definitions

A. Boards: Lumber of less than 2 inches nominal (38 mm actual) in thickness and 2 inches nominal (38 mm actual) or greater in width.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 Action Submittals

A. Product Data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

1.5 Informational Submittals

A. Material Certificates:

1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

C. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

1.6 Delivery, Storage, and Handling

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 Lumber, General

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Factory mark each item with grade stamp of grading agency.

2. For items that are exposed to view in the completed Work, mark grade stamp on one end of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.

4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.

2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness.

3. Timber. 19 percent

2.2 Lumber

A. Hand select wood for signage and shade structure for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

B. Dimension Lumber:

1. Shade Structure: Select Structural No. 2 or better grade, Architectural Tight-Knot R/S, Western Red Cedar
2. Signage: Grade C and better clear, Western Red Cedar.
3. Fence Posts: Grade C and better clear, Western Red Cedar.
4. Guardrail: Grade C and better clear, Western Red Cedar.
5. Cedar Edging: No. 2 Common, Northern White Cedar.
6. Disc Golf Tee Box: No. 2 Common, Northern White Cedar.

C. Boards:

1. Western red cedar, Grade B; NLGA, WCLIB, or WWPA.
2. Northern white cedar, No. 2 Common; NeLMA or NLGA.

2.3 Posts

A. Dimension Lumber Posts: No. 2 grade:

1. Northern species; NLGA.

2. Western woods; WCLIB or WWPA.

2.4 Fasteners

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

B. Nails: ASTM F1667.

C. Power-Driven Fasteners: ICC-ES AC70.

D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon-Steel Bolts: ASTM A307 (ASTM F568M) with ASTM A563 (ASTM A563M) hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless-Steel Bolts: ASTM F593, Alloy Group 1 or 2 (ASTM F738M, Grade A1 or Grade A4); with ASTM F594, Alloy Group 1 or 2 (ASTM F836M, Grade A1 or Grade A4) hex nuts and, where indicated, flat washers.

G. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488, conducted by a qualified independent testing and inspecting agency.

1. Stainless-steel bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or Grade A4).

2.5 Metal Accessories

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G90 (Z270) coating designation.

B. Stainless-Steel Sheet: ASTM A666, Type 316.

PART 3 - EXECUTION

3.1 Installation, General

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

C. Install metal framing anchors to comply with manufacturer's written instructions.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

   1. ICC-ES AC70 for power-driven fasteners.
   2. "Fastening Schedule" in ICC's International Building Code.
   3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.

H. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

I. Indicate locations of other fasteners, such as wood screws, bolts, and lag screws, on Contract Documents.

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SECTION 31 05 15
EARTHWORK

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes requirements for identifying acceptable onsite and/or offsite borrow material and for the installation of these materials. This includes preparation, transportation, placement, compaction, backfilling, testing, grading, waste excavation, and related items as indicated in the Contract Documents. Materials specified in this Specification Section shall be installed as shown on the Contract Drawings and as noted in Table 31 05 15-1 below.

TABLE 31 05 15-1
Location of Specified Materials

Specified Material	Location
Common Borrow	General fill areas outside the closure cap, daily cover over waste, and beneath Closure Cap Subgrade to meet grade
Closure Cap Subgrade	Soil layer below geosynthetics
Vegetative Support Soil	Soil layer over geosynthetics
Low Permeability Soil	Earth Closure Cap in Sediment Basin
Pond Embankment Soil	Sediment Basin Embankment
Clay Core Trench	Sediment Basin Core Trench

1.1.2 Related Work Specified Elsewhere

A. Section 01 40 00, Quality Control.

B. Section 01 45 00, Health and Safety.

C. Section 01 57 19, Temporary Environmental Controls.

D. Section 01 70 00, Execution and Closeout Requirements.

E. Section 02 61 13.13, Waste Excavation and Material Handling.

F. Section 31 05 16, Aggregates.

G. Section 31 05 19.13, Geotextiles.

H. Section 31 05 19.16, Geomembrane.

I. Section 31 25 00, Erosion and Sediment Control.

1.2 References

A. Not used.

1.3 Definitions

A. Borrow material is defined as soil material transferred from one (1) location to another and shall be inclusive of onsite or offsite sources unless explicitly identified herein.

1.4 Qualifications

A. The Geotechnical Testing Laboratory is defined and shall meet the qualifications in Specification Section 01 40 00, Quality Control.

1.5 Submittals

1.5.1 Delivery Tickets

A. The CONTRACTOR shall submit delivery tickets to the CONSTRUCTION MANAGEMENT ENGINEER for offsite materials and a load count for onsite materials. The delivery ticket for offsite material shall include:

1. Name and location of supplier.
2. Type and amount (weight) of material delivered.

B. The load count for onsite material shall include:

1. Number of loads of onsite material.
2. Estimated volume (cubic yards) of each load.

1.5.2 Certified Test Reports

A. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER certified test reports, prepared by the Geotechnical Testing Laboratory, which present the results of preconstruction testing for each proposed offsite borrow material. If the test results show that the required properties, as outlined in this Specification Section, are not met, the CONSTRUCTION MANAGEMENT ENGINEER will require the CONTRACTOR to retest the material or to identify another offsite borrow material. Submit the reports a minimum of seven (7) days before delivery of any materials to the site.

B. The CONTRACTOR shall also submit to the CONSTRUCTION MANAGEMENT ENGINEER one (1) copy of certified reports, prepared by the Geotechnical Testing Laboratory, which present the results of construction frequency and field permeability

tests. These reports shall also be submitted within fourteen (14) days of the date that the respective samples were collected in the field.

1.6 Safety

A. Not used.

1.7 Quality Assurance

1.7.1 General

A. The CONTRACTOR shall test materials to determine acceptability. Unless otherwise indicated, all testing shall be performed by the Geotechnical Testing Laboratory, approved by the CONSTRUCTION MANAGEMENT ENGINEER, with samples furnished by and at the expense of the CONTRACTOR.

B. Placement and compaction of the borrow materials and performance of associated earthwork shall be subject to continuous inspection by the CONSTRUCTION MANAGEMENT ENGINEER. As the various earthwork is conducted, the CONSTRUCTION MANAGEMENT ENGINEER may monitor the lift thickness and compacted conditions of soil materials to verify compliance with the requirements specified herein. The CONSTRUCTION MANAGEMENT ENGINEER may periodically perform in-place field density tests of selected compacted lifts in accordance with the approved methods stated herein.

1.7.2 Preconstruction Testing

A. The CONTRACTOR shall request of the CONSTRUCTION MANAGEMENT ENGINEER and arrange for a site inspection for each proposed soil borrow source prior to the commencement of material placement. For each borrow source inspection, the CONTRACTOR shall provide any equipment necessary to excavate test pits throughout the limits of the proposed source to provide the CONSTRUCTION MANAGEMENT ENGINEER with a thorough inspection of the type(s) and uniformity of materials encountered throughout the proposed source. Upon the CONSTRUCTION MANAGEMENT ENGINEER'S visual inspection of a proposed borrow source material(s), but prior to acceptance and delivery of said materials, preconstruction geotechnical testing of the materials from each proposed borrow source shall be performed by the CONTRACTOR to verify that the properties of the proposed borrow material(s) are in conformance with this Specification. The testing shall be performed on samples collected by the CONTRACTOR at locations determined by the CONSTRUCTION MANAGEMENT ENGINEER during the site inspection. The number of preconstruction tests to be performed by the Geotechnical Testing Laboratory at the expense of the CONTRACTOR is listed in Table 31 05 15-2.

TABLE 31 05 15-2
Testing for Borrow Materials

Applicability	Laboratory Tests	ASTM Test Method	No. of Acceptance Tests per Proposed Borrow Material	Frequency of One (1) Test Per Volume (cubic yard) for Each Approved Borrow Material
Closure Cap Subgrade, Vegetative Support Soil, Low Permeability Soil	Natural Moisture Content	ASTM D2216	3	5,000
Closure Cap Subgrade, Vegetative Support Soil, Low Permeability Soil	Particle Size Analysis (sieve)	ASTM D421	3	5,000
Closure Cap Subgrade, Vegetative Support Soil, Low Permeability Soil	Atterberg Limits	ASTM D4318	3	5,000
Closure Cap Subgrade, Vegetative Support Soil, Low Permeability Soil	Standard Proctor Compaction	ASTM D698	2	5,000
Vegetative Support Soil, Low Permeability Soil, Clay Core Trench	Flexible-Wall Permeameter	ASTM D5084	3	3,000 (initial) 10,000 (maximum)
Pond Embankment Soil	Standard Proctor Compaction	ASTM D698	2	N/A
Vegetative Support Soil	Direct Shear	ASTM D5321	3	5,000

B. If CONTRACTOR uses onsite material, preconstruction testing is also required.

C. Based upon the results of each required Standard Proctor compaction test (ASTM D698), a remolded sample shall be prepared for permeability testing at a moisture content greater than +two (2.0) percent of the optimum moisture content and at a dry density value equal to ninety (90) percent of the soil's maximum dry density for each borrow source, and at a dry density value equal to ninety-five (95) percent of the soil's maximum dry density for the Low Permeability Soil Layer. Each of the remolded samples shall then be subjected to flexible-wall permeability testing in accordance with EPA SW-846 Method 9100. Distilled water may be used as the permeant.

D. If preconstruction test results indicate that permeability of each borrow material may not consistently satisfy the Specifications, the CONSTRUCTION MANAGEMENT ENGINEER will decide whether to require the CONTRACTOR to retest the material at a greater degree of compaction, to obtain additional samples from the proposed material source, or to reject the borrow source. Should a greater degree of compaction be required by the CONSTRUCTION MANAGEMENT ENGINEER, the field density shall increase to match the densities used in the preconstruction tests at no cost to the OWNER. The CONSTRUCTION MANAGEMENT ENGINEER has the authority to reject any proposed borrow material that he believes is not suitable for

construction based upon the results of the site inspection and/or preconstruction testing.

E. Interface Friction Angle Testing—Prior to the placement of overlying materials, the CONTRACTOR shall provide Geotechnical Testing Laboratory test results verifying the shear strength of all material interfaces. Geotechnical Testing Laboratory tests shall be based on actual materials, including actual geosynthetics and soils. Construction materials shall meet the minimum interface friction angles specified in Specification Section 31 05 19.16, Geomembrane. Test results indicating differing friction angles and/or cohesion values for materials meeting the required shear strength may be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. Borrow materials with unacceptable results shall be retested at no additional cost to the OWNER.

1.7.3 Construction Testing Frequency

A. The CONTRACTOR shall test representative samples from each approved borrow source at the frequency specified in Table 31 05 15-2 as the approved materials are delivered to the site. The samples shall be submitted to the Geotechnical Testing Laboratory by and at the expense of the CONTRACTOR for the required geotechnical testing to ensure that the physical and engineering properties of the materials remain consistent for the duration of the construction.

B. Flexible-wall permeameter tests shall be performed on samples remolded in the Geotechnical Testing Laboratory from approved borrow material delivered to the site at an initial frequency of one (1) test per three thousand (3,000) cubic yards delivered. The frequency of permeability tests will decrease to one (1) test per ten thousand (10,000) cubic yards if three (3) consecutive tests meet the permeability requirement for a borrow material. The frequency of testing will return to one (1) test per three thousand (3,000) cubic yards if a different borrow source is used, if the grain-size distribution falls outside the range of previously approved samples as determined by the CONSTRUCTION MANAGEMENT ENGINEER, or at the CONSTRUCTION MANAGEMENT ENGINEER'S direction.

1.7.4 Field Density Testing

A. As borrow materials are placed and compacted, material shall be tested by the Geotechnical Testing Laboratory to ensure that at least ninety (90) percent of the material's maximum dry density for each borrow source, as determined by the Standard Proctor compaction test (ASTM D698), has been achieved. Compaction for the materials associated with Sediment Basin embankment and clay core trench shall be determined by the Standard Proctor compaction test (ASTM D698) and be ninety-five (95) percent of the material's maximum dry density.

B. Lift thickness and the initial (before compaction) moisture content of the delivered material shall be monitored by the Geotechnical Testing Laboratory to

ensure conformance with the requirements specified herein. One (1) field moisture/density test shall be performed for each lift placed, for every 10,000 square feet of borrow material placed and for every fifty (50) linear feet of trench backfilled. Testing shall occur more frequently if so directed by the CONSTRUCTION MANAGEMENT ENGINEER. A Troxler 3401 series nuclear moisture-density gauge (or approved equal) shall be used in conjunction with ASTM D6938.

1.7.5 Quality Control Laboratory

A. The Geotechnical Testing Laboratory shall serve as the Quality Control Laboratory and shall meet the qualifications in Specification Section 01 40 00, Quality Control.

1.7.6 Dust Control

A. CONTRACTOR shall be responsible for all aspects of dust control as detailed in Specification Section 01 57 19, Temporary Environmental Controls.

1.8 Product Delivery, Handling, and Storage

A. CONTRACTOR shall maintain proper access and appropriate drainage and erosion and sediment controls for all material stored, whether generated onsite or furnished from an offsite source.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Common Borrow

A. Common Borrow shall meet the requirements in Section 916 of the latest version of the Maryland Department of Transportation State Highway Administration Standard Specifications for Construction and Materials.

2.2 Closure Cap Subgrade

A. The CONTRACTOR shall obtain borrow materials from onsite sources first and shall use these borrow materials for onsite applications until exhausted or deemed unacceptable based on testing. Onsite materials shall only be used if these materials comply with the Contract Specifications or if they can be screened to meet the Contract Specifications. It is the responsibility of the CONTRACTOR to confirm if onsite materials meet the Specifications. Verification must be submitted to the CONSTRUCTION MANAGEMENT ENGINEER as required per the Specifications for both onsite and offsite borrow sources.

B. This material shall be placed where indicated on the Contract Drawings. If the onsite borrow materials have been exhausted, the CONTRACTOR shall obtain offsite borrow material from approved sources.

C. Material shall have a maximum dry density of at least one hundred (100) pounds per cubic foot as determined by the Standard Proctor test (ASTM D698), and shall be free of excess organic material, boulders, sharp stones, and stones larger than two (2) inches in their longest dimension.

D. Material shall meet ASTM D2487, classification CL, CL-ML, SC, SM, SW, SP, GC, or GM or combinations thereof.

2.3 Vegetative Support Soil

A. Material shall meet ASTM D2487, classification CL, CL-ML, SC, SM, SP, GC, or GM or combinations thereof.

B. Vegetative Support Soil shall have a maximum permeability of 1×10^{-4} centimeters per second (cm/sec) when compacted to ninety (90) percent of the maximum dry density.

C. D_{85} of the material shall be greater than 0.089 millimeter.

D. Material shall have a minimum internal friction angle of thirty (30) degrees.

2.4 Topsoil

A. Topsoil is specified in Specification Section 32 92 19, Upland Meadow Establishment.

2.5 Low Permeability Soil

A. Low Permeability Soil Layer soils shall be from the approved offsite borrow source(s) or cut to fill and shall be naturally occurring, environmentally clean, inert, free of organics, waste, excess moisture, and miscellaneous or deleterious material, and shall not contain particles larger than one-half (0.5)-inch diameter. The maximum allowable clod size of the material is two (2) inches. Low Permeability Soil Layer material shall classify as ML, MH, CL-ML, CL, or CH according to the Unified Soil Classification System, unless otherwise approved by the CONSTRUCTION MANAGEMENT ENGINEER.

B. Material shall have clod size less than six (6) inches, and permeability, when compacted to ninety (90) percent of Standard Proctor, of 1×10^{-5} cm/sec or less.

2.6 Sediment Basin Embankment Soil

A. Material shall consist of Common Borrow.

B. The material shall be free of roots, stumps, wood, rubbish, stones greater than four (4) inches, frozen, or other objectionable materials.

2.7 Sediment Basin Impervious Material

A. Material shall consist of soils classified as CL, GC, SC or CH according to the Unified Soil Classification System and must have at least thirty (30) percent passing the #200 sieve.

B. The material shall be free of roots, stumps, wood, rubbish, stones greater than four (4) inches, frozen, or other objectionable materials.

3. EXECUTION

3.1 General

A. Do not place, spread, or compact acceptable fill material while it is frozen or thawing, or place upon muddy, frozen or thawing ground, while the soil underneath is frozen or thawing, or during unfavorable weather conditions. When the Work is interrupted by rain, Work shall not be resumed until field tests indicate that the moisture content and density of the placement material are within the limits specified. A compacted layer that has been frozen shall be reworked, recompacted, and approved in accordance with the requirements specified herein, after thawing before the next lift is placed thereon.

B. Thoroughly mix each lift before compaction to ensure uniform distribution of water content. Distribute rocks of permissible sizes throughout the fill material.

C. Backfill around a structure or pipe shall be brought up evenly on all sides so that no unbalanced pressure will be imposed on the structure or pipe.

D. Perform grading operations as shown on the Contract Drawings so that the ground surface will be well-drained at all times. Maintain benching and drainage ditches and keep them open and free from soil, debris, and leaves until final acceptance of the Work. Finish all grading on neat, regular lines conforming to the sections, lines, grades, and contours shown on the Contract Drawings, or if not shown, in accordance with the criteria set forth herein. Perform the grading work in proper sequence with all other associated operations.

3.2 Existing Cover Soil Excavation

A. Existing cover soil thickness is generally two (2) feet. Test pit information identifying existing cover soil thickness is included in Attachment A.

B. In areas of waste excavation, remove eighteen (18) inches of existing cover soil and stockpile in the active phase for use as common borrow and/or subgrade material.

C. In areas of waste placement, remove twelve (12) inches of existing cover soil and stockpile in the active phase for use as common borrow and/or subgrade material.

D. No waste or woody vegetation may be present in stockpiled material. Visual inspection will be required to determine the presence of waste.

3.3 Waste Relocation

A. Relocate waste as described in Specification Section 02 61 13.13, Waste Excavation and Material Handling.

3.4 Closure Cap Subgrade

A. Closure Cap Subgrade shall be placed to the lines and grades shown on the Contract Drawings, to provide a stable base for the cap.

B. The surface shall provide a smooth, firm, unyielding foundation for the geosynthetics, with no sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed. The CONSTRUCTION MANAGEMENT ENGINEER shall have reviewed and accepted the subgrade immediately prior to covering.

C. No protruding stones shall be on the subgrade surface, The CONTRACTOR shall employ inspection staff to ensure the subgrade is free of objects that may damage the geosynthetic closure cap.

3.5 Placement of Vegetative Support Soil

A. Vegetative Support Soil shall be placed on top of the cap geosynthetics after their installation is approved by the CONSTRUCTION MANAGEMENT ENGINEER.

B. All material shall be back-dumped and spread over the cap geosynthetics. No construction equipment will be allowed to travel directly on the geosynthetics.

C. Install settlement plates in accordance with Section 31 09 13, Settlement Plates.

D. Only the equipment used to spread the Vegetative Support Soil shall be allowed on the Vegetative Support Soil until the material is compacted to the design depth in

accordance with these Specifications. A minimum fourteen (14)-inch loose lift shall be placed over the cap geosynthetics before equipment traverses the Vegetative Support Soil.

E. The CONTRACTOR shall place the Vegetative Support Soil over the cap geosynthetics to the lines and grades as shown on the Contract Drawings. The material shall be placed in two (2) lifts and graded to the thickness shown on the Contract Drawings.

F. The Vegetative Support Soil must be placed with low ground pressure track equipment as approved by the CONSTRUCTION MANAGEMENT ENGINEER, with a maximum ground pressure of five (5) pounds per square inch. The soil material must be pushed into place and tracked-in a minimum of four (4) passes without rutting, settlement, or damage to the cap geosynthetics. Soil shall not be dropped on slopes. On slopes, Vegetative Support Soil shall be placed starting at the toe and proceeding up the slope. CONSTRUCTION MANAGEMENT ENGINEER shall verify that the Vegetative Support Soil has been tracked sufficiently. No compaction tests are required for the Vegetative Support Soil.

G. Cover shall be placed such that no stretching, folding, or bridging of the cap geosynthetics occurs. Equipment shall be operated to avoid abrupt starts, stops, and turns.

H. Grading operations around landfill gas wells and piping shall be done with great care. Damage to any wells, piping, or other structures during grading shall be repaired by the CONTRACTOR at no additional cost to the OWNER. Compaction within three (3) feet of all such structures shall be done with small equipment (such as jumping jack, plate compactor, or walk-behind compactor) under close supervision by the CONSTRUCTION MANAGEMENT ENGINEER.

I. The CONTRACTOR shall protect the Vegetative Support Soil until Topsoil placement.

J. Material placed beyond the limits of the lines and grades shown on the Contract Drawings will not be accepted and shall be removed at the CONTRACTOR'S expense.

K. The CONTRACTOR shall place a maximum of five (5) acres of Vegetative Support Soil prior to topsoil placement. Seed and mulch immediately after topsoil placement and before moving to the next section of vegetative soil placement.

L. After precipitation events, the CONTRACTOR shall repair washouts, repair erosion damage, and place displaced soil back on the landfill cap in accordance with the Contract Drawings, at no cost to the OWNER.

M. The grading tolerance for the Vegetative Support Soil over the cap geosynthetics shall be -zero (0.0) foot, +one-tenth (0.1) foot, from required grade.

3.6 Low Permeability Soil Placement

A. The CONTRACTOR shall not place, spread, or compact the Low Permeability Soil Layer material while it is frozen or thawing, while the soil underneath it is frozen or thawing, or during unfavorable weather conditions. When the work is interrupted by rain or excessively cold weather, Low Permeability Soil Layer placement operations shall not be resumed until field tests indicate that the moisture content and dry density of the in-place Low Permeability Soil Layer material are within the limits specified. A compacted layer that has been frozen shall be reworked and recompacted after thawing before the next layer is placed on it.

B. The Low Permeability Soil Layer shall be two (2) feet in compacted thickness. The finished surface of the Low Permeability Soil Layer shall conform to the lines and grades shown on the Contract Drawings. The Low Permeability Soil Layer shall be constructed in six (6)-inch lifts (maximum loose thickness) and compacted to a minimum of ninety (90) percent of its maximum dry density as determined by the Standard Proctor test (ASTM D698) or to the degree of compaction required to achieve an in-place permeability of no greater than 1.0×10^{-5} cm/sec.

C. The CONTRACTOR shall thoroughly mix each loose lift before compaction to ensure uniform distribution of moisture and coarse fragments of permissible sizes throughout the fill material.

D. The finished surface of the Low Permeability Soil Layer shall be smooth, uniform, free of any objects larger than one-half (0.5) inch in diameter, and free of desiccation cracking. A smooth-drum roller (minimum ten [10]-ton static load) shall be used to roll the Low Permeability Soil Layer surface prior to field survey for acceptance by the CONSTRUCTION MANAGEMENT ENGINEER. The final grades shall deviate no more than -zero (0.0) foot, +one-tenth (0.1) foot from the Contract Drawings. All minimum slopes shall be achieved unless prior approval is provided by the CONSTRUCTION MANAGEMENT ENGINEER. Final acceptance of the Low Permeability Soil Layer will be provided by the CONSTRUCTION MANAGEMENT ENGINEER only after all required geotechnical testing results and "As-Built" Surveys have been reviewed and approved by the CONSTRUCTION MANAGEMENT ENGINEER.

3.7 Anchor Trench Backfill

A. Soils backfilled in and around the anchor trench shall be placed in eight (8)-inch lifts (maximum loose thickness) and compacted utilizing hand-held mechanical equipment to achieve the degree-of-compaction required. The soil in and around the anchor trench shall be compacted to a minimum of eighty-five (85) percent of maximum dry density as determined by the Standard Proctor test (ASTM D698).

B. The in-place dry density and moisture content of the anchor trench backfill shall be determined at one hundred (100)-foot intervals within the anchor trench for each lift. The CONTRACTOR shall ensure the anchor trench is drained of water at all times. The CONTRACTOR shall submit his proposed anchor trench dewatering methods to the CONSTRUCTION MANAGEMENT ENGINEER prior to constructing the anchor trench.

C. Any anchor trench material which becomes saturated, frozen, or is otherwise unacceptable as determined by the CONSTRUCTION MANAGEMENT ENGINEER shall be excavated, dried, and reworked accordingly, by and at the expense of the CONTRACTOR.

3.8 Excavation Near Existing Environmental Features

A. Existing groundwater monitoring wells, piezometers, and landfill gas extraction and monitoring wells shall be protected during construction to maintain their integrity. If the CONTRACTOR damages or displaces groundwater monitoring wells, piezometers, or landfill gas extraction or monitoring wells, the CONTRACTOR must repair or replace them at their own expense as required by the CONSTRUCTION MANGEMENT ENGINEER.

B. Landfill gas extraction wells that will be removed as part of this project do not require protection, repair, or replacement.

C. The CONTRACTOR shall not use machinery to excavate within two (2) feet of existing groundwater monitoring wells, piezometers, landfill gas extraction or monitoring wells, or any concrete or gravel pads surrounding them.

3.9 Sediment Basins

A. The embankment for Sediment Basin shall be constructed as shown on the Contract Drawings.

B. Fill materials shall be placed in maximum eight (8)-inch loose lifts (before compaction) which are continuous over the entire length of fill.

C. The in-place dry density shall not be less than ninety-five (95) percent of the maximum dry density with moisture content within ±two (2) percent of optimum. All compaction is to be determined by Standard Proctor test (ASTM D698).

3.10 Material Storage

A. All stockpiled soils shall be stored in active phases in a manner that will not erode and cause sedimentation. Establish adequate erosion and sediment controls according to Specification Section 31 25 00, Erosion and Sediment Control.

3.11 Dewatering and Drainage

A. The CONTRACTOR is responsible for managing groundwater, perched water, leachate, and runoff during excavation and subsequent fill placement activities. The presence or absence of water or leachate shall not entitle the CONTRACTOR to additional compensation. Excavation is not expected below the groundwater table although there is potential to encounter perched water or leachate.

B. Any liquids encountered during waste excavation shall be considered leachate. Stormwater runoff that has been in contact with waste shall be considered leachate. Leachate shall be managed as required in Specification Section 02 61 13.13, Waste Excavation and Material Handling.

3.12 Maintenance

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density and moisture range prior to further construction.

3.13 Finishing Work

A. After earthwork is completed, the disturbed areas shall be finish graded. Any roots, sharp, angular stones larger than two (2) inches or rounded stones in excess of two (2) inches in their longest dimension, or other undesirable material shall be removed from the surface immediately and the surface shall be prepared for vegetative stabilization.

B. Unless otherwise specified by the CONSTRUCTION MANAGEMENT ENGINEER, the elevation of all drainage features and structures shall be within ±one-tenth (0.1) foot of those shown on the Contract Drawings.

C. After the Closure Cap has been installed, the CONTRACTOR shall maintain the surface free of ruts, depressions, and damage resulting from the hauling and handling of any material, equipment, tools, etc. Damage shall be repaired by the CONTRACTOR as indicated on the Contract Drawings and/or specified in the Specifications.

3.14 Surveying

A. Surveying shall be in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

-- End of Section --

SECTION 31 05 16
AGGREGATES

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The Work includes, but is not limited to, furnishing all materials, tools, equipment, labor and supervision for aggregates. Materials specified in this Specification Section shall be installed as shown on the Contract Drawings and as noted in Table 31 05 16-1 below.

TABLE 31 05 16-1
Location of Specified Materials

Specified Material	Location
Granular Fill	Landfill Gas Vertical Wells
Crusher Run	Access Roads
No. 2 Stone	Leachate Seep Repairs
Class 0 Riprap	Erosion and Sediment Control Devices
Class 1 Riprap	Closure Cap Tie-in
Gabion Stone	Downchutes. Temporary Gabion Outlet Structures

1.1.2 Related Work Specified Elsewhere

A. Section 01 70 00, Execution and Closeout Requirements.

B. Section 31 05 15, Earthwork.

C. Section 32 15 00, Aggregate Surfacing.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

1.5.1 Delivery Tickets

A. CONTRACTOR shall submit delivery tickets to the CONSTRUCTION MANAGEMENT ENGINEER. The delivery ticket for offsite materials shall include, for each load of approved material:

1. Name and location of supplier.
2. Type and amount of material delivered.

1.5.2 Certified Test Reports

A. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER required certified reports for each proposed borrow material. If the test results show that the material is not consistent in its physical properties, the CONSTRUCTION MANAGEMENT ENGINEER will require the CONTRACTOR to retest the material or to identify another borrow source. The CONTRACTOR shall submit the reports before delivery of any materials to the site.

B. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER certified reports, prepared by the Geotechnical Testing Laboratory, which present the results of construction frequency and field permeability tests. These reports shall be submitted within fourteen (14) days of the date that the respective samples were collected in the field.

C. Certified Test Reports are required for material sourced from offsite and onsite locations.

1.6 Safety

A. Not used.

1.7 Quality Assurance

1.7.1 General

A. The CONTRACTOR shall test materials as set forth in the applicable reference specifications and as required herein. Testing shall be performed by the Geotechnical Testing Laboratory or test results provided by the material supplier, approved by the CONSTRUCTION MANAGEMENT ENGINEER, with samples furnished by and at the expense of the CONTRACTOR. Testing is required of both onsite and offsite materials used to meet the Contract Specifications.

1.7.2 Preconstruction Testing

A. Prior to delivery of any aggregate material, the CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER in writing of the location of proposed aggregate borrow source(s). The CONSTRUCTION MANAGEMENT ENGINEER has the option to visit and inspect each proposed borrow source. During said inspection, the CONTRACTOR shall provide any equipment necessary to excavate test pits throughout the limits of the proposed source to assure the CONSTRUCTION MANAGEMENT ENGINEER of the material's uniformity. Upon visual acceptance by the CONSTRUCTION MANAGEMENT ENGINEER, material from each borrow source shall be obtained by the CONTRACTOR and transported to the Geotechnical Testing Laboratory to confirm that the proposed materials are in conformance with these Specifications.

1.7.3 Construction Frequency Testing

A. Laboratory Testing—Throughout the construction, one (1) sample for every five hundred (500) tons of material from each approved aggregate borrow source shall be supplied to the Geotechnical Testing Laboratory by and at the expense of the CONTRACTOR to confirm the materials being delivered to the site are in conformance with these Specifications.

B. In addition, testing shall be performed by the CONTRACTOR as directed by the CONSTRUCTION MANAGEMENT ENGINEER when visual observations by the CONSTRUCTION MANAGEMENT ENGINEER of construction performance indicate a potential problem or significant deviation from required material properties.

C. The CONSTRUCTION MANAGEMENT ENGINEER may examine each delivered load of material prior to placement. Any material containing organics, trash, or excessive fines or moisture, at the discretion of the CONSTRUCTION MANAGEMENT ENGINEER, will be classified as unsuitable and shall not be used for construction. The CONTRACTOR shall remove and properly dispose of all rejected material at no additional cost to the OWNER.

D. The CONSTRUCTION MANAGEMENT ENGINEER may inspect and test any component of the aggregate placement at any time. Unless otherwise indicated, testing shall be performed by the Geotechnical Testing Laboratory with materials furnished by the CONTRACTOR at the expense of the CONTRACTOR.

1.7.4 Quality Control (QC) Laboratory

A. The Geotechnical Testing Laboratory shall serve as the QC Laboratory and shall meet the qualifications in Specification Section 01 40 00, Quality Control.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Granular Fill

A. Granular Fill shall be No. 57 stone.

B. Material shall be free of limestone and have less than two (2) percent fines.

2.2 Crusher Run

A. Crusher Run material shall conform to the requirements for CR-6 in accordance with Section 901 of the most recent edition of the Maryland Department of Transportation (MDOT) State Highway Administration (SHA) Standard Specifications for Construction and Materials.

2.3 No. 2 Stone

A. No. 2 Stone shall meet the gradations of No. 2 stone in accordance with AASHTO M43-05 and the physical property requirement for Coarse Aggregate in accordance with Section 901 of the most recent edition of the MDOT SHA Standard Specifications for Construction and Materials.

2.4 Riprap

A. Riprap shall be in accordance with Section 901 of the most recent edition of the MDOT SHA Standard Specifications for Construction and Materials.

2.5 Gabion Stone

A. Gabion stone shall be in accordance with Section 901 of the most recent edition of the MDOT SHA Standard Specifications for Construction and Materials.

3. EXECUTION

3.1 Installation of Aggregate

A. Installation and type of aggregate shall be in accordance with Contract Drawings.

B. Installation of crusher run for roadways shall be in accordance with the Contract Drawings and Specification Section 32 15 00, Aggregate Surfacing.

C. The CONTRACTOR shall measure placement thickness periodically throughout each day of construction to verify that the design thickness required on the Contract Drawings is met. The CONTRACTOR shall maintain a written log of these field measurements and their locations and provide them to the CONSTRUCTION MANAGEMENT ENGINEER on a daily basis and to the OWNER at project close-out. The CONSTRUCTION MANAGEMENT ENGINEER may make independent measurements of thicknesses, as necessary

3.2 As-Built Survey

A. Survey shall be in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

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SECTION 31 05 19.13
GEOTEXTILES

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The Work includes the manufacture, supply, delivery, storage, and installation of geotextile fabrics. Materials specified in this Specification Section shall be installed as shown on the Contract Drawings and as noted in Table 31 05 19.13-1 below.

TABLE 31 05 19.13-1
Location of Specified Materials

Specified Material	Location
Separation Non-woven Geotextile (8 oz.)	Closure Cap
Stabilization Geotextile	As needed for Subgrade Stabilization
Erosion and Sediment Control Geotextiles	As shown on Contract Drawings

1.1.2 Related Work Specified Elsewhere

A. Section 01 33 00, Submittals.

B. Section 01 40 00, Quality Control.

C. Section 31 05 15, Earthwork.

D. Section 31 05 19.16, Geomembrane.

E. Section 31 05 19.26, Geocomposite.

1.2 References

A. Not used.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. The geotextile manufacturer(s) shall be a specialist(s) in the manufacture of polyester and/or polypropylene geotextile, and have produced and manufactured a minimum of

five (5) million square feet of said geotextile fabric that was used in successful installations.

B. The geotextile shall be installed by a Geosynthetics Installer meeting the qualifications in Specification Section 01 40 00, Quality Control.

1.5 Submittals

A. A Statement of Qualifications for the Geosynthetics Installer meeting the requirements of Geosynthetic Installer qualifications noted in Specification Section 01 40 00, Quality Control, shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval four (4) weeks prior to installation. No geotextile installation shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved the items as identified.

B. A Statement of Qualifications for the geotextile Manufacturer shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. The following information regarding the manufacturer's geosynthetics shall be submitted by the CONTRACTOR to the CONSTRUCTION MANAGEMENT ENGINEER for approval four (4) weeks prior to installation. No geotextile installation shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved the items as identified in this submittal.

1.5.1 Certified Test Reports

A. The CONTRACTOR shall submit in writing to the CONSTRUCTION MANAGEMENT ENGINEER for approval the manufacturers' names and the materials intended for use for each geotextile. Certified test reports for the material that is to be delivered to the site conforming to the requirements of standards and testing methods specified herein shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval prior to delivery of geotextile. The material manufacturer and the CONTRACTOR must satisfy the CONSTRUCTION MANAGEMENT ENGINEER that the material will meet the requirements listed in Tables 31 05 19.13-2 and 31 05 19.13-3. The CONTRACTOR shall transmit to the CONSTRUCTION MANAGEMENT ENGINEER all information provided by the manufacturers or suppliers, prior to approval for furnishing and installing any such materials.

1.5.2 Installation and Repair Procedures

A. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER for approval four (4) weeks prior to installation, the geotextile manufacturer's recommended installation procedures, including placement and joining, and the manufacturers recommended procedures for repairing or replacing damaged or defective geotextile material.

B. The CONTRACTOR shall also submit Geosynthetic Installer's Installation Plan for geotextile in accordance with Specification Section 01 40 00, Quality Control.

1.6 Safety

A. Not used.

1.7 Quality Assurance

1.7.1 Material Testing

1.7.1.1 Material Testing by Manufacturer

A. Geotextiles shall be tested by the respective manufacturer(s) prior to shipment to ensure that the physical and mechanical properties of the finished products are in accordance with this Specification. The required material properties, test methods, values, and units are presented in Table 31 05 19.13-2 and Table 31 05 19.13-3. Test frequencies shall be in accordance with Manufacturer's Quality Control frequencies from ASTM D4354.

B. Compatibility testing shall be performed to verify the chemical and physical resistance of the nonwoven, needle-punched geotextile. Manufacturer(s) shall submit test data based on EPA's Method 9090, Compatibility Test for Wastes and Membrane Liners, using the geotextile material to be furnished and typical solid municipal waste sanitary landfill leachate.

1.7.1.2 Material Testing by Contractor

A. Samples of the Separation Geotextile and Stabilization Geotextile (if required) shall be obtained by the CONTRACTOR (for testing at a Geosynthetics Testing Laboratory) at a frequency of one (1) sample (at least four [4] feet by four [4] feet) for every two (2) acres of material installed. The geotextiles shall be tested for the properties listed in Tables 31 05 19.13-2 and 31 05 19.13-3. Each sample collected shall have the roll, lot, and manufacturer clearly marked on or attached to the sample. Sample shipping and testing shall be the responsibility of the CONTRACTOR. All samples not submitted for testing shall be properly stored onsite during construction and submitted to the CONSTRUCTION MANAGEMENT ENGINEER at the completion of the project.

TABLE 31 05 19.13-2
Physical Properties of Nonwoven Needle-Punched Separation Geotextile

Property	Test Method	Minimum Average Roll Values (MARV)	Unit
Unit Weight	ASTM D5261	8	oz/yd^2
Grab Tensile Strength	ASTM D4632	205	lb
Grab Elongation	ASTM D4632	50	%
Puncture Strength	ASTM D4833	500	lb
Permittivity	ASTM D4491	1.1	sec^{-1}
AOS	ASTM D4751	80	Sieve no.
UV Resistance	ASTM D4355	70	% retained at 500 hours

TABLE 31 05 19.13-3
Physical Properties of Woven Stabilization Geotextile

Property	Test Method	Minimum Average Roll Values (MARV)	Unit
Grab Tensile Strength	ASTM D4632	315	lb
Grab Elongation	ASTM D4632	15	%
Mullen Burst	ASTM D3786	675	psi
Puncture Strength	ASTM D4833	150	lb
Trapezoid Tear Strength	ASTM D4533	120	lb
AOS	ASTM D4751	40	Sieve no.

Notes:
% = Percent.
AOS = Apparent Opening Size.
lb = Pound(s)
gpm/sf = Gallon(s) per minute per square foot.
oz/yd^2 = Ounce(s) per square yard.
psi = Pound(s) per square inch.
sec = Second.

1.7.2 Daily Quality Control (QC) Log

A. The Geosynthetic Installer's field superintendent shall maintain a daily QC log during all phases of geotextile installation. This log shall document the daily progression of the geotextile installation from delivery of the material to final acceptance. The daily log shall designate those construction activities that influence the integrity of the geotextile material during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

1. Weather, i.e., temperature, winds, precipitation.

2. Site preparation activities, including removal of water, sediment, and any cleaning, smoothing and/or repair to materials underlying the geotextile.

3. Roll and panel number of each sheet that is deployed on a daily basis.

4. Repairs and replacements.

5. Seaming activities, including name of welder or seamer, as applicable.

6. Inspection of geotextile material delivered to the site.

7. Calibration dates of each piece of seaming equipment and seam test equipment.

8. Photo documentation to accompany the log with reference to the date, location, and a general description of the photo.

B. The Geosynthetic Installer's field superintendent shall submit the required daily QC logs to the CONSTRUCTION MANAGEMENT ENGINEER for review within two (2) calendar days of the activities documented. At any point during the Work, if the daily QC log has not been submitted, the CONSTRUCTION MANAGEMENT ENGINEER has the right to stop the geotextile installation activities at no cost to the OWNER. Upon receiving the required daily QC logs, Work may resume.

1.7.3 Visual Inspection

A. During deployment of the various geotextiles, the Geosynthetic Installer and CONSTRUCTION MANAGEMENT ENGINEER shall carry out visual inspections of the material surfaces. Any faulty areas relating to fabric integrity, uniformity, rips or tears, sewing completeness, or seam overlap shall be repaired by the Geosynthetic Installer using techniques pre-approved by the CONSTRUCTION MANAGEMENT ENGINEER. Such repairs shall be reported to the CONSTRUCTION MANAGEMENT ENGINEER by means of the daily QC log.

1.7.4 QC Laboratory

A. The Geosynthetics Testing Laboratory shall serve as the QC Laboratory for geotextile testing, and shall meet the qualifications in Specification Section 01 40 00, Quality Control.

1.8 Delivery, Storage, and Handling

A. Materials shall be delivered to the site only after the required submittals have been approved by the CONSTRUCTION MANAGEMENT ENGINEER. Storage and handling of the materials shall conform to the manufacturer's recommendations and shall be done in such a manner as to prevent damage to any part of the work. The CONTRACTOR shall provide sufficient labor and equipment to properly unload material upon delivery to the site. The material shall be stored in a reasonably smooth, well-drained, level area, away from sharp objects or rocks that may puncture the fabric; away from brush, poison oak or ivy; oil, grease, or fuels; and in an area accessible for inspection. Individual pieces or bundles shall be stored with safe walking space and clearance between them to allow full view for inspection purposes. To prevent ultraviolet degradation of the materials, the protective wrapper on each geotextile roll shall not be removed until the material is ready for deployment. Identification tags attached to the rolls of geotextiles delivered to the site shall not be removed until the material is installed. Any roll not properly identified prior to deployment activities may be deemed unacceptable for use by the CONSTRUCTION MANAGEMENT ENGINEER and replaced at the expense of the CONTRACTOR.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 General

A. Nonwoven and woven geotextile fabrics shall be manufactured from polypropylene resin and polymeric yarn or fiber, respectively, and provide the minimum physical properties outlined in Tables 31 05 19.13-2 and 31 05 19.13-3. The properties shown represent the minimum-acceptable minimum average roll values (MARV) for the installed materials.

B. End uses for the Separation Geotextile and Stabilization Geotextile fabrics to be installed for the project are shown on the Contract Drawings.

C. Specifications for Erosion and Sediment Control geotextiles shall be in accordance with Contract Drawings.

3. EXECUTION

3.1 Geotextile Placement

A. Nonwoven, needle-punched Separation Geotextile shall be placed by the Geosynthetic Installer at the locations shown on the Contract Drawings. All geotextile panels shall have their seams overlapped a minimum of four (4) inches and securely fastened according to seaming procedures as approved by the CONSTRUCTION MANAGEMENT ENGINEER. On the slopes, seams shall be sewn securely using polymeric thread with a "prayer" stitch and shall be oriented up and down the slope. In wet weather geotextile must be sewn.

B. Geotextile that has soil or stone placed upon it shall have eighteen (18) inches (minimum) of the material placed onto the fabric in advance of either tracked or rubber-tired construction equipment. The material shall be placed in the same direction as the fabric seam. Extreme care is required by the CONTRACTOR so that the equipment operator does not cause damage to the geotextiles. At no time will construction equipment be permitted to track directly on fabric. Any damage to the geotextile fabrics or underlying materials shall be repaired by the Geosynthetic Installer (using approved methods) at no additional expense to the OWNER.

C. Erosion and Sediment Control Geotextile shall be placed in accordance with Contract Drawings.

3.2 Subgrade Stabilization

A. Where determined by the CONSTRUCTION MANAGEMENT ENGINEER as noted in Specification Section 31 05 15, Earthwork, reinforcement shall be performed by deploying the woven, slit-film Stabilization Geotextile to at least ten (10) feet beyond the CONSTRUCTION MANAGEMENT ENGINEER-delineated limits of the unstable area in all directions. Panel overlaps shall be a minimum of six (6) feet for both panel edges and end-of-roll edges where required. The CONTRACTOR shall provide any and all measures necessary to anchor the geotextile against wind uplift or drag until Vegetative Support Soil is placed atop the geotextile, in accordance with Specification Section 31 05 15, Earthwork. Under no circumstances shall construction equipment traverse directly on the geotextile.

3.3 Geosynthetic Deployment

A. All-terrain vehicles (ATVs) may be used in the deployment of geosynthetic materials provided the following conditions are adhered to:

1. ATVs shall not be permitted to operate directly on the geosynthetic material unless written approval is given by the CONSTRUCTION MANAGEMENT ENGINEER.

2. The use of ATVs is considered to be at the CONTRACTOR's risk.

3. Any damage resulting from the use of ATVs, as determined by the CONSTRUCTION MANAGEMENT ENGINEER, will be repaired to the satisfaction of the CONSTRUCTION MANAGEMENT ENGINEER at no additional cost to the OWNER. If three (3) repairs are required as a result of using ATVs, further use of ATVs on the project will be prohibited.

4. ATVs shall be inspected by the CONSTRUCTION MANAGEMENT ENGINEER prior to use for leakage or other potential risks to the geosynthetics.

5. ATVs that leak fuel and/or oil shall not be permitted to operate over the geosynthetics.

6. Any fuel which leaks onto the geosynthetic shall be thoroughly removed (cleaned) by the CONTRACTOR or have the geosynthetic material replaced at the discretion of the CONSTRUCTION MANAGEMENT ENGINEER at no additional cost to the OWNER.

7. ATVs shall not be refueled on the geosynthetic.

8. ATVs shall have tires with low ground pressure, less than five (5) pounds per square inch, and shall have shallow treads.

9. ATVs shall be operated by a single operator at speeds less than five (5) miles per hour.

10. Quick starts, stops, and sharp turns shall not be permitted.

11. Pulling material up slopes greater than five (5) percent shall not be permitted.

3.4 Temporary Securement of Geotextiles

A. CONTRACTOR shall secure any exposed geotextiles in place from wind uplift or drag. The amount of sandbags or extent of other methods approved by the manufacturer needed to secure geotextiles shall be determined by and at the expense of the CONTRACTOR.

3.5 Placement of Cover Materials

A. All geotextile fabrics shall be covered with overlying materials as specified in the Contract Documents, within fourteen (14) calendar days following removal of their protective wrapping and their placement in the field, in order to protect them from ultraviolet light degradation, unless a longer period is documented by the manufacturer and approved by the CONSTRUCTION MANAGEMENT ENGINEER. The CONTRACTOR shall stage his activities to accomplish this

requirement and maintain the construction schedule. Any geotextiles left exposed longer than the fourteen (14) calendar days shall, at the CONSTRUCTION MANAGEMENT ENGINEER'S direction, be removed for suitable disposal and replaced with new material by the Geosynthetic Installer at no cost to the OWNER.

B. CONTRACTOR shall place all cover materials in such a manner to ensure geotextiles are not damaged, slippage of underlying materials is minimized, and no excessive wrinkling or tensile stresses in the geotextiles develop.

3.6 As-Built Survey

A. Not used.

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SECTION 31 05 19.16
GEOMEMBRANE

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The Work includes the manufacture, supply, delivery, storage, installation, and testing of textured linear-low-density polyethylene (LLDPE) geomembrane materials. Materials specified in this Specification Section shall be installed as shown on the Contract Drawings.

B. The CONTRACTOR shall furnish all labor, materials, supplies, supervision, equipment, construction machinery, and incidentals that may be necessary to construct the project as described in these Specifications and as shown on the Contract Drawings.

C. The CONTRACTOR is responsible for inspecting the site conditions and existing tie-in requirements prior to bidding.

1.1.2 Related Work Specified Elsewhere

A. Section 01 33 00, Submittals.

B. Section 01 40 00, Quality Control.

C. Section 01 70 00, Execution and Closeout Requirements.

D. Section 31 05 19.13, Geotextiles.

E. Section 31 05 19.26, Geocomposite.

1.2 References

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1.2.1 Geosynthetic Research Institute (GRI)

A. (2019) Test Methods, Test Properties and Testing Frequency for LLDPE Smooth and Textured Geomembranes. GRI GM17.

B. (2017) Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembrane. GRI GM19a.

C. (2013) Cold Weather Seaming of Geomembranes. GRI GM9.

1.2.2 U.S. Environmental Protection Agency (USEPA)

A. (1991) Inspection Techniques for the Fabrication of Geomembrane Field Seams. EPA-530-SW-91-051.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Each Geomembrane manufacturer shall be a specialist in the manufacture of the same type of geomembrane to be installed and have at least five (5) years' experience in the manufacture of and have manufactured at least an annual production of thirty (30) million square feet during the last five (5) years that were used in successful similar installations.

B. Geomembrane shall be installed by a Geosynthetics Installer meeting the qualifications included in Paragraph 1.4.1.

1.4.1 Geosynthetics Installer's Qualifications and Experience

A. The CONTRACTOR shall retain the services of a Geosynthetics Installer. The CONTRACTOR shall be responsible for the performance of the Geosynthetics Installer. The Geosynthetics Installer shall:

1. Be a specialist in the installation of the same type of geomembrane being installed (textured LLDPE).

2. Have at least five (5) continuous years of experience in the installation of the same type of geomembrane being installed.

3. Have installed at least twenty-five (25) million square feet of the same type of geomembrane being installed during the last five (5) years, as applicable.

4. Be documented by the manufacturer as an "Approved Installer" of the geomembrane manufacturer for the same type of geomembrane being installed.

1.5 Submittals

A. A Statement of Qualifications for the Geosynthetics Installer meeting the requirements of Geosynthetic Installer qualifications and submittal requirements noted in Specification Section 01 40 00, Quality Control, shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. No geomembrane installation shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved in writing the items as identified.

B. Geosynthetics Installer's Installation Plan in accordance with Specification Section 01 40 00, Quality Control, Paragraph 1.5.D.

C. A Statement of Qualifications for the Geomembrane Manufacturer shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. The following information regarding the manufacturer's geomembrane shall be submitted by the CONTRACTOR to the CONSTRUCTION MANAGEMENT ENGINEER for approval four (4) weeks prior to installation. No geomembrane installation shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved in writing the items as identified in this submittal.

1. Manufacturer's quality control program and/or manual that outlines the factory and field quality control procedures to be utilized for both the manufacturing process and installation of the geomembrane system. This shall address, at a minimum, delivery and use of raw materials, geomembrane roll production, installation (including cold weather installation), and quality assurance (QA)/quality control (QC) of these activities.

2. Manufacturer's certificate of compliance to this Specification. Certificate of compliance shall be notarized certifying that each type of geomembrane material furnished for this project (reference project title and number) complies with all requirements specified in the Contract Documents prior to delivery of geomembrane materials. No geomembrane shall be shipped until the manufacturer's certificate of compliance has been received by the CONTRACTOR and approved in writing by the CONSTRUCTION MANAGEMENT ENGINEER.

3. Manufacturer's warranty for the geomembrane to be installed, including pipe penetration seals and field seams as applicable, prior to delivery of material.

4. Name and location of manufacturer's QA/QC facility where laboratory testing will be conducted for the CONTRACTOR.

5. Manufacturer's proposed product defect repair procedures.

1.5.1 Installation

A. Geosynthetic Installer's daily QC log, in accordance with Paragraph 1.7.2 of this Section.

1.5.2 Post-Installation

A. At the completion of the geomembrane installation activities, the Geosynthetic Installer shall submit to the CONSTRUCTION MANAGEMENT ENGINEER:

1. Post-construction As-Built Drawing of the geomembrane showing all numbered geomembrane panels with their associated roll numbers, location and types of all welded seams, destructive coupon test locations, location and reason for construction repairs and patches, repaired factory defects, surveyed location of anchor trench, and pipe penetrations, surveyed location of landfill gas well penetrations, and limit of closure cap liner. The As-Built Drawings shall identify the panel and roll numbers from which the archive coupons were taken for future physical and chemical characteristics testing, if required. As-Built Drawing shall be submitted in AutoCAD version 2013 or newer and in PDF format.

2. Reports with field quality test reports, daily acceptance certificates, daily seaming reports, daily QC logs, Geosynthetic Installer's completion report, and written certification from the Geosynthetic Installer that the geomembrane has been installed in accordance with the installation and testing requirements established by both the manufacturer and the Geosynthetic Installer, and these Specifications.

3. Geosynthetic Installer's warranty within ten (10) days of final completion.

1.6 Safety

A. Not used.

1.7 Quality Assurance

1.7.1 Single Source

A. All material must be obtained from a single material supplier and shall be manufactured by a single manufacturer. If a second supplier for the geomembrane is proposed, separate Pre-Installation submittals shall be submitted to CONSTRUCTION MANAGEMENT ENGINEER for approval. Additionally, it must be certified that the new material is compatible and will effectively interface with existing material and meet all pertinent Contract Specifications. The CONTRACTOR shall be solely responsible for additional testing costs associated with the acceptance of the new supplier or manufacturer.

1.7.2 Daily QC Log

A. The Geosynthetic Installer's field superintendent shall maintain a daily QC log during all phases of the complete geomembrane installation. This log shall document the daily progression of the geomembrane installation from delivery of the geomembrane to final acceptance. The daily log shall designate those construction activities that influence the integrity of the geomembrane during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

1. Weather, i.e., temperature, winds, precipitation.

2. Required calculations of geomembrane expansion/contraction.

3. Written acceptance of the prepared subgrade surface by the CONSTRUCTION MANAGEMENT ENGINEER and Geosynthetic Installer.

4. Record the roll and panel number of each sheet that is deployed on a daily basis.

5. Repairs and replacements.

6. Document seaming activities, including name of welder(s) for each seam and any failures resulting from testing of the seams.

7. Results and locations of destructive and nondestructive testing performed as part of geomembrane installation, including corrective action taken.

8. Inspection of geosynthetic material delivered to the site.

9. Calibration dates of each piece of seaming equipment and seam test equipment.

10. Photo documentation to accompany the log with reference to the date, location, and a general description of the photo.

B. The Geosynthetic Installer's field superintendent shall submit the required daily QC logs to the CONSTRUCTION MANAGEMENT ENGINEER for review within two (2) calendar days of the activities documented. At any point during the Work, if the daily QC log has not been submitted, the CONSTRUCTION MANAGEMENT ENGINEER has the right to stop the geomembrane system installation activities at no cost to the OWNER. Upon receiving the required daily QC logs, Work will resume.

1.7.3 Material Testing by Manufacturer

A. The Manufacturer shall test materials as set forth in the applicable referenced Specifications and as required herein. Requirements for inspection and testing for each type of the geomembrane to be installed are:

1. Plant Testing of Raw Materials—Compounded resin to be used for production shall be tested by the geomembrane manufacturer. At a minimum, one (1) sample shall be obtained from each shipping container (typically a railcar) compartment. Two (2) tests for each of the listed properties in Table 31 05 19.16-1 shall be performed on each textured LLDPE compartment sample. The material will be accepted for production use if all test results conform to the material requirements and results between the various shipment compartments are comparable. Variations are indicative of poor quality and/or inconsistent materials and may be cause for rejection by the CONSTRUCTION MANAGEMENT ENGINEER. ASTM standard test numbers and the range of acceptable results are shown in Tables 31 05 19.16-2a/b and 31 05 19.16-3 are from Geosynthetic Research Institutes Test Methods GRI GM17 for LLDPE. In the event of a conflict, the latest edition of GRI GM17 for LLDPE shall govern.

TABLE 31 05 19.16-1
Physical Properties of Compounded Resin for LLDPE Geomembrane Liner and Extrudate Welding Rod

Property	Test Method	Required Value	Unit	Sample Frequency*
Specific Gravity	ASTM D792 or ASTM D1505	≤0.939 max. avg.	g/mL	1/200,000 pounds
Melt Index	ASTM D1238 (190°/2.16 kg)	<1.0	g/10 min	One (1) per shipping container
* In addition, the CONSTRUCTION MANAGEMENT ENGINEER at his discretion may select up to ten (10) samples of extrudate welding rod delivered to the site to be tested for these properties.				

2. Plant Testing of Geomembrane—The textured LLDPE geomembranes shall be tested by the manufacturer(s) prior to shipment to ensure that the physical and chemical properties of the finished product(s) are in conformance with the Specifications. The required conformance and testing frequencies of geomembranes as well as required values are presented in Table 31 05 19.16-2a/b. Required values listed are minimum average roll values unless otherwise stated. The manufacturer shall provide individual roll test results to prove statistically that the geomembrane maximum meets the minimum average roll values required in Table 31 05 19.16-2a/b and the Test Methods GRI GM 17 for LLDPE. In the event of conflict, the Test Methods in the latest edition of GRI GM 17 shall be the ruling documents.

1.7.4 Material Testing by CONTRACTOR

A. The CONTRACTOR shall test materials as set forth in the applicable referenced Specifications and as required herein. Requirements for inspection and testing of the textured LLDPE geomembrane are:

1. Archive Field Samples—Five (5) samples of each type of geomembrane installed one (1)-square-foot (minimum) coupon produced and installed shall be retained intact by the field crew foreman as an archive sample. These coupons shall be labeled by the field crew foreman with the appropriate roll numbers and panel

numbers of the geomembrane material from which they are obtained and shall be properly stored onsite for the duration of construction and delivered to CONSTRUCTION MANAGEMENT ENGINEER at the end of construction.

2. Destructive and Nondestructive Weld Testing—Geomembrane seam welding and random destructive and nondestructive testing shall be in accordance with procedures outlined in Paragraphs 3.6 and 3.7 of this Section. The CONTRACTOR shall provide test results to prove that the field seam tests meets the minimum average roll values required in Table 31 05 19.16-2a/b or GRI Test Method-GM 19. In the event of conflict between the tables and the GRI Test Method, GRI-GM 19 shall be the ruling document.

3. Conformance Testing of Geomembrane—Upon delivery of the material to the project site, samples of the geomembrane to be installed shall be collected by the CONTRACTOR at locations selected by the CONSTRUCTION MANAGEMENT ENGINEER and submitted to the Geosynthetics Testing Laboratory to ensure that the physical and chemical properties of the product are in conformance with the Specifications. Conformance Testing shall be conducted prior to the installation of the geomembrane. The required Conformance Testing and required values are presented in Table 31 05 19.16-2a/b. Test frequencies shall be eight (8) samples minimum. Additional samples may be required, as directed by the CONSTRUCTION MANAGEMENT ENGINEER, if failing results are reported. Conformance testing shall be coordinated by and conducted at the expense of the CONTRACTOR. Results of the conformance testing shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval prior to material installation

4. Interface Friction Angle Testing—A minimum of thirty (30) days prior to the placement of the cap geosynthetics, the CONTRACTOR shall provide lab test results verifying the shear strength of the interfaces with testing conducted according to direct shear methods as specified by ASTM D5321. Lab tests shall be performed with actual geosynthetics and soils to be used in the project. Materials shall meet the minimum interface friction angles specified in Table 31 05 19.16-3. Test results demonstrating adherence to minimum shear strength with differing friction angles and/or cohesion values may be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. Materials with unacceptable results shall be retested at no additional cost to the OWNER. Tests shall be performed with the following parameters:

    a. Shear rate: one (1) millimeter per minute.

    b. Seating time: twenty-four (24) hours in fully hydrated condition.

    c. Normal stress: one hundred (100)/two hundred (200)/four hundred (400) pounds per square foot.

1.7.5 QC Laboratory

A. The Geosynthetics Testing Laboratory shall serve as the QC Laboratory for geomembrane testing, and shall meet the qualifications in Specification Section 01 40 00, Quality Control.

1.8 Delivery, Storage, and Handling

B. Materials shall be delivered to the site only after the required submittals have been furnished by the CONTRACTOR and approved by the CONSTRUCTION MANAGEMENT ENGINEER. Storage and handling of the materials shall conform to the manufacturer's recommendations and shall be done in such a manner as to prevent damage to any part of the Work. Materials shall be labeled for easy identification and comparison to bills of lading and QC test results.

C. The CONTRACTOR shall provide labor and equipment to properly unload material upon arrival at the site. Any damage (i.e., tears, creases, or punctures) to the geomembrane material caused by transportation, unloading, storage, or placement of the material shall be repaired according to the manufacturer's recommendations, as approved by the CONSTRUCTION MANAGEMENT ENGINEER, at no additional cost to the OWNER. CONTRACTOR shall be responsible for replacing all unacceptable or damaged material at no additional cost to the OWNER.

D. The geomembrane shall be stored under the responsibility of the CONTRACTOR. The material shall be stored in a reasonably level area, well-drained, away from oils/fuels, brush, poison oak or ivy, in an accessible area for inspection, and on a smooth surface so that the material is well supported and not resting on sharp objects that could damage it. Individual rolls shall be stored with safe walking space and clearance between them to allow full view for inspection purposes. If the geomembrane material is delivered with protective roll covers, these covers shall not be removed until immediately before the material is to be installed. Rolls of geomembrane shall not be stacked more than two (2) rolls high. In addition, the CONTRACTOR shall cover the stored geomembrane materials onsite with plastic so as to protect the geomembrane from the elements for the entire time the geomembrane is stored onsite.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Compounded Resin

A. The geomembrane shall be manufactured of new, first-quality low-density polyethylene (compounded) resin conforming to the material properties listed in

Table 31 05 19.16-2a/b for LLDPE. No post-consumer resin of any type shall be added to the formulation.

2.2 Geomembrane

A. A 40-mil textured LLDPE geomembrane is proposed, with an alternate 50-mil textured LLDPE structured geomembrane (Agru MicroDrain, or approved equal).

B. The minimum acceptable physical, mechanical, and hydraulic properties are outlined in Table 31 05 19.16-2a, Textured 40-Mil LLDPE Geomembrane, and b, Textured 50-Mil LLDPE structured geomembrane (if alternate is approved by the OWNER).

C. All geomembrane material used for construction shall be textured material. Textured geomembrane shall generally have uniform texturing appearance. It shall be free from such defects that would affect the specified properties and hydraulic integrity of the geomembrane.

2.3 Extrudate Welding Rod

A. Resin used for extrudate welding rod shall have the same material properties as those in the compounded resin used in the manufacture of the geomembrane. These properties are outlined in Table 31 05 19.16-2a/b.

TABLE 31 05 19.16-2a
Physical Properties of Geomembrane Liner – Textured 40-Mil LLDPE
(Minimum Average Roll Values)

Property	Test Method	Required Value	Unit	Sample Frequency
Thickness mils (min. avg.) • Lowest 8 of 10 (and per GRI-17)	ASTM D5994	-10%	%	Per roll
Asperity Height mils (min. avg.)(1)	ASTM D7466	16	mil	Every 2nd roll(2)
Density (min. avg.)	ASTM D1505 ASTM D792	0.939	g/cc	200,000 lb
Tensile Properties (min. avg.)(3) • Tensile Strength to Yield • Tensile Strength to Break • Elongation at Yield • Elongation at Break	ASTM D6693 Type IV	 126 60 12 250	 lb/inch width lb/inch width % %	20,000 lb
2% Modulus (max)	ASTM D5323	2400	lb/in.	Per Formulation
Tear Resistance (min. avg.)	ASTM D1004	22	lb	45,000 lb
Puncture Resistance	ASTM D4833	44	lb	45,000 lb
Axi-Symmetric Break Resistance Strain	ASTM D5617	30	min	Per Formulation
Carbon Black Content (range)	ASTM D4218(4)	2-3	%	45,000 lb
Carbon Black Dispersion	ASTM D5596	Note (5)	----	45,000 lb
Oxidative Induction Time (OIT) (a) Standard OIT -- or -- (b) High Pressure OIT	 ASTM D 3895 ASTM D 5885	 100 400	 min min	200,000 lb

TABLE 31 05 19.16-2a
Physical Properties of Geomembrane Liner – Textured 40-Mil LLDPE
(Minimum Average Roll Values)

Property	Test Method	Required Value	Unit	Sample Frequency
Oven Aging at 85°C[6][7] (a) Standard OIT (min. avg.) -- % retained after 90 days -- or -- (b) High Pressure OIT (min. avg.) -- % retained after 90 days	ASTM D 5721 ASTM D 3895 ASTM D 5885	 35 60	 % %	Per Formulation
UV Resistance[8] High Pressure OIT (min. avg.) -- % retained after 1600 hrs[9]	ASTM D7238 ASTM D 5885	35	%	Per Formulation
Hot Wedge Seams[10] • Shear Strength[11] • Peel Strength [11] • Peel Separation	GRI GM19	 60 50 25	 lb/in. lb/in. lb/in.	-
Extrusion Fillet Seams • Shear Strength[11] • Peel Strength [11] • Peel Separation	GRI GM19	 60 44 25	 lb/in. lb/in. lb/in.	-

(1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be ≥ 5 mils.
(2) Alternate the measurement side for double sided textured sheet.
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gage length of 1.3 inches. Break elongation is calculated using a gage length of 2.0 inches.
(4) Other methods such as D1603 (tube furnace) or D6370 (TGA) are acceptable if an appropriate correlation to D4218 (muffle furnace) can be established.
(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3
(6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(8) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.
(10) Value listed for shear and peal strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values.
(11) Also for hot air and ultrasonic seaming methods.

TABLE 31 05 19.16-2b
Physical Properties of Structured Geomembrane Liner – Textured 50-Mil LLDPE
(Minimum Average Roll Values)

Property	Test Method	Required Value	Unit	Sample Frequency
All physical properties are the same as Table 31 05 19.16-2a with the exceptions below.				
Tensile Properties (min. avg.)[1] • Tensile Strength to Break	ASTM D6693 Type IV	75	lb/inch width	20,000 lb
2% Modulus (max)	ASTM D5323	3000	lb/in.	Per Formulation
Tear Resistance (min. avg.)	ASTM D1004	27	lb	45,000 lb
Puncture Resistance	ASTM D4833	55	lb	45,000 lb
Axi-Symmetric Break Resistance Strain	ASTM D5617	30	min	Per Formulation
Drainage Stud Height (min. avg.)	ASTM D7466	130	mil	Every 2nd Roll
Spike Asperity Height (min. avg.)	ASTM D7466	20	Mil	Every 2nd Roll
Hot Wedge Seams[2] • Shear Strength[3] • Peel Strength [3] • Peel Separation	GRI GM19	 75 63 25	 lb/in. lb/in. %	-

TABLE 31 05 19.16-2b
Physical Properties of Structured Geomembrane Liner – Textured 50-Mil LLDPE
(Minimum Average Roll Values)

Property	Test Method	Required Value	Unit	Sample Frequency
Extrusion Fillet Seams • Shear Strength(3) • Peel Strength (3) • Peel Separation	GRI GM19	 75 57 25	 lb/in. lb/in. %	-

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gage length of 1.3 inches. Break elongation is calculated using a gage length of 2.0 inches.
(2) Value listed for shear and peal strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values.
(3) Also for hot air and ultrasonic seaming methods.

TABLE 31 05 19.16-3
Interface Friction Angles

Interface 1	Interface 2	Minimum Interface Friction Angle (degrees)[1]
Vegetative Support Soil	Geocomposite	27
Geocomposite	Textured LLDPE	27
Textured LLDPE	Geotextile	27
Geotextile	Closure Cap Subgrade	27

[1]Required interface shear strength may be met through adhesion and the interface friction angle.

3. EXECUTION

3.1 Inspection of Sheet Liner at Job Site

A. The Geosynthetic Installer and CONSTRUCTION MANAGEMENT ENGINEER shall be responsible for the inspection of the rolls of geomembrane material upon delivery to the job site. CONTRACTOR shall provide all labor and equipment required to assist CONSTRUCTION MANAGEMENT ENGINEER and Geosynthetic Installer in inspection of geomembrane materials upon delivery to the site. Should rolls show damage from transit, they will be so identified and set aside for return to manufacturer at no additional cost to the OWNER.

B. During deployment of the geomembrane material, the Geosynthetic Installer and the CONSTRUCTION MANAGEMENT ENGINEER will carry out a visual inspection of the geomembrane sheet surface. Any detected flaws or damage shall be repaired by the Geosynthetic Installer using the pre-approved techniques. Such repairs shall be recorded on the As-Built Drawings and documented on the field superintendent's daily QC log.

3.2 Geomembrane Liner Termination

A. Cell Cap

1. The textured LLDPE Geomembrane shall extend to the limit of liner as shown on the Contract Drawings.

3.3 Installation

3.3.1 General

A. The geomembrane shall be laid out and installed by trained technicians in accordance with the applicable CONSTRUCTION MANAGEMENT ENGINEER-approved proposed panel layout drawing. The geomembrane shall be installed by the Geosynthetic Installer. The CONSTRUCTION MANAGEMENT ENGINEER'S approval of a proposed panel layout drawing does not relieve the manufacturer or approved Geosynthetic Installer of the responsibility to properly deploy and weld the geomembrane material to best accommodate prepared site conditions.

B. After the panels of geomembrane are deployed and properly positioned, the pre-approved welding technicians shall then weld the geomembrane using the approved welding methods. No geomembrane installation activity shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received, reviewed, and approved the required qualifications for the manufacturer's or Geosynthetic Installer's field superintendent, field crew foreman, and welding technicians.

C. Power supply equipment required for seaming of the geomembrane panels shall be in good working order and be able to continuously supply power. Each generator shall be placed on a scrub sheet consisting of two (2) layers of geomembrane material if located within the limits of the Work previously covered with geomembrane. Oil and gas to power the generators shall not be stored within the active limits of Work. The CONTRACTOR shall mobilize and position power supply equipment in a manner that prevents damage to installed geomembrane material. Any geomembrane material repairs required due to damage by the CONTRACTOR shall be performed by the CONTRACTOR at no cost to the OWNER. Such action will not be grounds for a contract extension.

D. The CONTRACTOR shall maintain temporary anchorage of the geomembrane panels against wind uplift damage throughout the entire geomembrane installation process. Geomembrane materials damaged by wind uplift shall be repaired according to the manufacturer's recommended repair procedures by the manufacturer or Geosynthetic Installer at no additional cost to the OWNER. If damage incurred to any geomembrane material is deemed irreparable by the CONSTRUCTION MANAGEMENT ENGINEER, the geomembrane materials shall be removed and properly disposed of by the CONTRACTOR at no additional cost to the OWNER.

E. All personnel working directly on the geomembrane material shall wear rubber-soled shoes so as not to damage the material. Any damage incurred to the geomembrane material resulting from adverse activities of the manufacturer's or Geosynthetic Installer's personnel shall be repaired according to the recommended repair procedures by the CONTRACTOR at the expense of the CONTRACTOR.

F. Hand-held or hand-operated equipment (e.g., shovels) used to remove sediment, debris, etc. from the geomembrane shall be plastic or be manufactured from a material which will not cause damage to the geomembrane surface. Damage incurred to the geomembrane material caused by equipment not approved for its intended use as specified herein as witnessed by the CONSTRUCTION MANAGEMENT ENGINEER, OWNER, Northeast Maryland Waste Disposal Authority, or regulator will be repaired by the CONTRACTOR at the expense of the CONTRACTOR.

G. The manufacturer's or Geosynthetic Installer's field superintendent shall be present during all activities related to the installation, welding, and repair of the geomembrane material.

3.3.2 Field Panel Placement

A. As specified in Paragraph 1.5, prior to commencement of geomembrane installation activities, the CONTRACTOR shall provide the CONSTRUCTION MANAGEMENT ENGINEER with a proposed panel layout drawing, which details the placement of geomembrane panels throughout the entire limits of the Work area. The proposed panel layout drawings are tentative and may be modified with the CONSTRUCTION MANAGEMENT ENGINEER'S written approval to accommodate site conditions. Any approved variation shall be noted on the As-Built Drawings.

B. The field panel layout shall minimize the length of field seaming required to locate seams where applied stresses will be minimal. Sheet panel layout shall take into consideration any expansion and contraction anticipated due to ambient temperature variations.

C. The geomembrane panels shall be oriented parallel to the line of maximum slope, i.e., up and down, not across, the slope. Panels shall be shingled to promote positive drainage. In corners and odd-shaped locations, the number of extrusion welded seams shall be minimized. Extrusion welded seams shall not be permitted within five (5) feet of the toe of the slope, the top of the berm, or areas of stress concentration (e.g., cell corners) within the entire limits of the Work area.

D. The CONTRACTOR shall avoid the use of horizontal seams. Horizontal seams shall be considered as any seam having an alignment exceeding 20 degrees from being perpendicular to the slope contour lines. In the event that horizontal seams are necessary and approved by the CONSTRUCTION MANAGEMENT ENGINEER, no two (2) adjacent panels/sheets shall be placed such that their horizontal seams are

continuous. All panel/sheets that require horizontal seams must be staggered a minimum distance of fifteen (15) feet above or below the location of the horizontal seam of the adjacent panel/sheet.

E. Placement of panels/sheets shall result in a good fit in all corners and grade changes. No bridging of the geomembrane at any change in grade or at penetrations will be accepted. Excessive slack shall be avoided to minimize rippling of the geomembrane during placement geocomposite and vegetative support soil.

F. Placement of geomembrane shall not proceed under interfering conditions including, but not limited to, wind in excess of twenty (20) miles per hour, precipitation, ambient temperatures below thirty-two (32) degrees Fahrenheit or above one hundred four (104) degrees Fahrenheit, high humidity, fog, dew, ponded water, and blowing dust or snow. CONTRACTOR shall be responsible for monitoring working conditions and suspend geomembrane installation as conditions warrant. The CONTRACTOR may propose methods for placement and seaming of geomembrane below thirty-two (32) degrees Fahrenheit in accordance with GRI GM9 and manufacturer's requirements for review and written approval by the CONSTRUCTION MANAGEMENT ENGINEER. For cold weather, additional trial seams and destructive tests are to be taken at the discretion of the CONSTRUCTION MANAGEMENT ENGINEER as recommended in GRI GM9.

G. The amount of material unrolled and placed daily, shall be limited to the amount of material that can be properly seamed during a one (1)-day operation. Tack or spot welding does not constitute a completed seam.

H. Damage to the approved subgrade surface during geomembrane placement shall be repaired to its approved condition by the CONTRACTOR at the expense of the CONTRACTOR. Furthermore, any damage incurred to the geomembrane panels during deployment activities (e.g., creases, crimping, scratches, etc.) shall be repaired by the Geosynthetic Installer according to the approved repair procedures at the expense of the CONTRACTOR.

I. Adjacent geomembrane panels shall be properly positioned in order to provide a sufficient overlap, as indicated in the approved manufacturer's or Geosynthetic Installer's installation plan, of the panels to facilitate welding of the seams. The Geosynthetic Installer shall label each panel of geomembrane immediately upon its deployment with a panel number and corresponding roll number. All panel numbers and corresponding roll numbers of the installed geomembrane material shall be labeled and accurately represented on the As-Built Drawings upon completion of all geomembrane installation activities.

J. All-terrain vehicles may be used in the deployment of geosynthetic materials provided conditions listed in Specification Section 31 05 19.13, Geotextiles, are adhered to.

K. Slip sheet shall be used in the deployment of textured geomembrane. CONTRACTOR may submit to the CONSTRUCTION MANAGEMENT ENGINEER for approval in the Pre-Installation submittal, or a proposed alternative method for textured geomembrane deployment.

3.3.3 Seam Preparation

A. Prior to seaming operations, the seam area shall be kept thoroughly dry and clean. All seam interfaces shall be visually examined by the Geosynthetic Installer for scratches, blemishes, flaws, and texture. All geomembrane panel/sheet surfaces to be seamed shall be free of dust, dirt, and moisture. Water shall be prevented from ponding on the liner material. Any detected damage to the area prepared for seaming operations shall be repaired at no additional cost to the OWNER, including any repairs necessary to the existing geomembrane.

B. Seams shall be aligned to create the fewest possible number of wrinkles and fishmouths. If panel overlap exceeds what is noted in the installation plan, it shall be removed by trimming the lower sheet. Trimming of excessive panel overlap shall be accomplished using a shielded blade or hook knife. Whenever possible, the cutting of the geomembrane should be from the underside of the geomembrane in an upward motion. All trimming of excessive panel overlap should be completed at least fifty (50) feet ahead of seaming operations. Any damage caused to the geomembrane during this trimming operation shall be repaired at no additional cost to the OWNER.

C. For extrusion-welded seams, a small hand-held electric rotary grinder with circular disc grit grinding paper shall be used to remove oxidation from the surface of the geomembrane material for the entire length of the prepared seam. The grinding plate shall be approximately four (4) inches in diameter and No. 80 or 100 grit paper shall be used. The depth of the grinding shall be less than ten (10) percent of the sheet thickness, but generally be only five (5) percent of the sheet thickness. Prior to tacking the overlapped geomembrane panels together, the leading edge of the upper panel shall be ground to a forty-five (45)-degree bevel with the electric rotary grinder while this panel is lifted up off of the lower panel. Grinding should proceed welding by approximately five (5) minutes and the grinding operation shall be oriented perpendicular to the seam direction, and extend approximately one-quarter (0.25) inch beyond the limit of extrudate after it is placed.

3.3.4 Seaming

A. The approved seaming techniques for this project are the dual-tract hot-wedge and extrusion fillet welding. The hot-wedge technique should be used for panel seams in open areas that can effectively accommodate the seaming equipment. The use of extrusion welding techniques shall only be used on panel seams in limited work space areas, for welding of geomembrane materials to geomembrane appurtenances, for the patching of liner coupons removed for destructive testing purposes, and minor repair procedures (e.g., patching small holes, tears, etc.).

B. Field seaming operations are prohibited when the ambient air temperature approximately two (2) feet above the geomembrane surface is below forty (40) degrees Fahrenheit or above one hundred four (104) degrees Fahrenheit, during precipitation, or when winds are in excess of twenty (20) miles per hour.

C. Dual-Tract Hot-Wedge Welding

1. Techniques for dual-tract hot-wedge seaming differ. Prior to initial production welding, the temperature of the wedge and speed of the nip rollers required for adequate seaming shall be determined from trial seam test strips performed throughout the daily welding operations.

2. A slight amount of "squeeze-out" or "flashing" is a good indicator that proper welds are achieved. Also, the depth of the nip rollers marks should be just barely evident to the touch.

3. The operator shall keep constant visual contact with the seam, occasionally adjusting the temperature or speed as necessary to maintain a consistent weld.

4. Damage caused to the geomembrane during the welding operations as detected by the Geosynthetic Installer's field superintendent or the CONSTRUCTION MANAGEMENT ENGINEER shall be patched according to the Specifications herein at no additional cost to the OWNER. Such action will not be grounds for a contract time extension.

5. Adjustment of the hot-wedge device shall be made regularly as needed, and the device shall be cleaned at least daily.

D. Extrusion Welding

1. For the preparation of extrusion fillet seams, a hot-air gun shall be used to leister-weld the overlapped geomembrane panels together to hold them in proper position for extrusion welding once the leading edge of the upper panel is properly beveled.

2. The extrusion welder is to be purged of all heat-degraded extrudate in its barrel prior to welding operations. This must be done every time the extrusion welder is restarted after a one (1)-minute or longer downtime. The purged extrudate shall not be discharged onto the surface of the low permeability soil where it would eventually form a hard object under the geomembrane.

3. Extrudate in the form of a molten, viscous bead shall be deposited over the overlapped seam upon the conclusion of the grinding operation. The center of the extrudate shall be directly over the leading edge of the upper geomembrane. The

extrudate should cover the grind marks on each side of the upper geomembrane to within one-quarter (0.25)-inch of the perimeter of these marks.

4. Liner sheet edges to be seemed shall lay flat against each other during seaming until the seam has reached specified strength.

5. The thickness of the applied extrudate should be approximately two (2) times the specified sheet thickness as measured from the top of the bottom sheet to the top or crown of the applied extrudate bead.

6. Following completion of the seaming operations, visual inspection of the applied extrudate bead shall be made by the field superintendent and CONSTRUCTION MANAGEMENT ENGINEER, particularly for straight line alignment, height, and uniformity of surface texture. There should be no bubbles or pock marks in the extrudate weld.

7. Seam welding operations shall gradually terminate at the end of a panel, rather than abruptly terminate with a large mass of solidified extrudate. Where extrusion fillet welds are temporarily terminated during a seaming operation and the seams have had sufficient time to cool, the applied extrudate shall be ground prior to applying new extrudate over the existing seam.

E. All "T" or "Y" seams created during the installation of the geomembrane (i.e., where more than two [2] panels form a seam) shall be capped with an extrusion welded patch according to these Specifications.

3.4 Production Trial Seams

A. Trial seams shall be made on surplus pieces of geomembrane material to verify that seam welding conditions and equipment operation are adequate. These seams shall be completed for both extrusion fillet and dual-tract hot-wedge seam welding operations for textured LLDPE. Trial seams shall be made under the same conditions as the actual production seam welding conditions.

B. Trial field testing results as detailed in these Specifications shall be accurately documented by the Geosynthetic Installer's field superintendent on the required daily QC logs (Paragraph 1.7.2). The date and time along with the ambient temperature, welding apparatus identification number, and name of welding technician shall be documented on said logs for each constructed trial field seam. Peel and shear test results of each trial field seam, along with subsequent coupon specimen testing required for failing post-weld trial seams, shall be recorded on the daily QC logs.

3.4.1 Pre-Weld Trial Seams

A. Pre-weld trial seams shall be made for each welding apparatus (operated by an approved welding technician) at the beginning of each production seam welding

period (i.e., at the start of the day and the start of the afternoon seam welding session) and at any time that a machine is turned off for more than five (5) minutes or following repair of a broken machine. The pre-weld trial seam sample shall be at least three (3) feet long by two (2) feet wide with the seam centered lengthwise. Four (4) adjoining coupon specimens, each one (1) inch wide, shall be cut from the pre-weld trial seam sample and tested in peel (two [2]) and shear (two [2]) using a Columbine International, Ltd. portable electronic tensile tester (tensiometer), or an approved equivalent set to a strain rate of two (2) inches per minute. The coupon specimen shall sustain sufficient tensile loading before subsequently failing outside of the seam area (i.e., Film Tear Bond [FTB] failure required at a minimum tensile loading as specified for peel and shear in Table 31 05 19.16-2a/b for LLDPE. The coupon specimen shall not fail in the welded seam. If FTB occurs when a coupon specimen is tested in shear or peel at a tensile loading less than that specified, the pre-weld trial seam is considered a failure. If one (1) coupon specimen fails, the entire pre-weld trial seam operation shall be repeated. If any additional coupon specimen fails from the second pre-weld trial seam, the welding apparatus and welding technician shall not be used for seam welding operations until the deficiencies of the welding apparatus are corrected by the field superintendent and two (2) consecutive successful pre-weld trial seams are achieved.

3.4.2 Post-Weld Trial Seams

A. Post-weld trial seams shall be made for each welding apparatus at the conclusion of each production seam welding period (i.e., at the conclusion of the morning seam welding and at the end of the day). The post-weld trial seam shall be constructed and tested in the same manner as specified for the pre-weld trial seam in Paragraph 3.4.1. Should FTB occur when a coupon specimen is tested in shear or peel at a tensile loading less than that specified, the remaining portion of the failing post-weld trial seam material shall be properly labeled by the Geosynthetic Installer's field superintendent with the date, time of post-weld trial seaming operation, ambient temperature, welding apparatus identification number, and name of the welding technician. This specimen shall subsequently be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for immediate storage in an attempt to lower the temperature of this material as compared with the current ambient temperature. Upon sufficient cooling of this material (e.g., typically one [1] hour), the CONSTRUCTION MANAGEMENT ENGINEER will submit the remaining portion of the failing post-weld trial seam to the Geosynthetic Installer's field superintendent for the required test procedure. FTB occurs when a coupon specimen is tested in shear or peel at a tensile loading less than that specified, the post-weld trial seam is, again, considered a failure. All previous production seams welded by the welding apparatus/welding technician responsible for the failing post-weld trial seam shall be evaluated by the Geosynthetic Installer's superintendent. The evaluation shall consist of the Geosynthetic Installer cutting one (1)-inch-wide and twelve (12)-inch-long samples perpendicular to the suspect deficient welded seams. These samples shall be taken at locations directed by the CONSTRUCTION MANAGEMENT ENGINEER, and shall adequately represent the extent of welded seams constructed by the welding

apparatus/welding technician responsible for the failed post-weld trial seam. Each of the samples obtained shall be tested. If any of the one (1)-inch-wide coupons tested from the samples obtained fail the specified criteria, the seam length of deficient welding as determined by the CONSTRUCTION MANAGEMENT ENGINEER shall be repaired at no additional cost to the OWNER. Required repair shall consist of placing an extrusion-welded cap strip over the deficient welded seam(s). The cap strip repair installation shall be in accordance with this Specification and shall extend a minimum of six (6) inches from the centerline of the deficient welded seams in all directions. If, however, each of the samples obtained passes the required testing, only the locations of the samples obtained shall be patched in accordance with these Specifications at no additional cost to the OWNER.

B. Subsequent production seam welding performed by the welding apparatus/welding technician responsible for the post-weld trial seam failure prior to the retesting of the failed post-weld trial seam shall be at the complete risk of the Geosynthetic Installer. Should the failed post-weld trial seam be deemed unacceptable based on the intermittent cooling and retesting procedures specified herein, all production seam welding performed at risk will be deemed unacceptable and repaired by the Geosynthetic Installer according to the repair procedures required in this Specification at no additional cost to the OWNER.

3.5 Nondestructive Seam Continuity Testing

A. The Geosynthetic Installer shall nondestructively test all welded seams over their full length using a vacuum test unit, air pressure testing, or other method approved by the CONSTRUCTION MANAGEMENT ENGINEER. The purpose of the nondestructive test is to check the continuity of the welded seams. Nondestructive tests shall be performed by experienced personnel thoroughly familiar with the specified test methods and equipment to be used. Nondestructive testing procedures cannot be correlated to the shear and peel strength of the welded seam. Nondestructive seam continuity testing shall be carried out as the seam welding operations progress, not at the completion of all field seam welding operations.

3.5.1 Vacuum Box Testing

A. Extrusion fillet-welded seams shall be nondestructively tested with a pressurized vacuum box. For vacuum testing, the equipment shall be comprised of the following:

1. A vacuum box assembly consisting of a rigid housing, a clean transparent viewing window, a soft leak-proof neoprene gasket, which is not cracked or otherwise deteriorated in any way, attached to the bottom, port hole of valve assembly, and a gauge to indicate chamber vacuum. Vacuum box assemblies shall be adequately sized to properly test welded seams surrounding and adjoining designed appurtenances.

2. A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections.

3. A rubber pressure/vacuum hose with fittings and connections.

4. A bucket and wide brush or spray assembly.

5. A soapy water solution.

6. Testing equipment which is not properly maintained will be rejected at the discretion of the CONSTRUCTION MANAGEMENT ENGINEER. Unusable equipment shall be promptly repaired or replaced at no expense to the OWNER with no delay to the Contract Schedule.

3.5.2 Testing fillet welded seams

A. The following procedures shall be followed when nondestructively testing extrusion fillet welded seams:

1. Energize the vacuum pump and reduce the tank pressure to a minimum five (5) pounds per square inch (ten [10] inches of mercury) gauge.

2. Adequately wet a section of welded seam with the soapy water solution.

3. Place the vacuum box over the wetted area.

4. Close the bleed valve and open the vacuum valve.

5. Ensure that a leak tight seal is created.

6. For a period of approximately ten (10) seconds, examine the extrusion fillet-welded seam through the viewing window for the presence of soap bubbles along the edges of the welded seam or within the extrusion fillet bead.

7. If no bubble appears after ten (10) seconds, close the vacuum valve and open the bleed valve, move the vacuum box over the next adjoining welded seam area with a minimum three (3)-inch (seventy-five [75]-millimeter) overlap from the previously tested area, and repeat the process.

8. All areas where soap bubbles appear shall be adequately marked and repaired according to the recommended repair procedures.

9. Vacuum-tested, extrusion fillet-welded seam results shall be recorded on the Geosynthetic Installer's daily QC log.

3.5.3 Air-Pressure Testing Welded Seams

A. Dual-tract hot-wedge welded seams shall be nondestructively tested with an approved air-pressure device. Equipment for air-pressure testing welded seams shall be comprised of the following:

1. An air pump (manual or motor driven) equipped with pressure gauge capable of generating and sustaining a pressure of between twenty-five (25) and thirty-five (35) pounds per square inch (one hundred sixty [160] and two hundred [200] kilo-Pascals). The Geosynthetic Installer shall not use freon gas to pressurize the welded seam.

2. A rubber hose with appropriate fittings and connections.

3. A sharp, hollow needle, or other approved pressure feed device.

B. The following procedures shall be followed when nondestructively testing dual-tract, hot-wedge welded seams:

1. Adequately seal both ends of the welded seam to be tested with vice grip clamps or by heating and melting the air channel shut so as to prevent air from leaking from either end of the welded seam.

2. Insert needle or other approved pressure feed device into the air channel created by the dual-tract, hot-wedge at one (1) end of the welded seam.

3. Energize the air pump to a minimum pressure of thirty (30) pounds per square inch (two hundred [200] kilo-Pascals), close valve, and sustain pressure for a minimum of five (5) minutes.

4. Once the air pressure is maintained for the five (5)-minute test period, the Geosynthetic Installer shall then cut the air channel at the opposite end of the tested span from where the pressure feed device is inserted. The entire seam length shall be accepted upon the CONSTRUCTION MANAGEMENT ENGINEER'S visual and audible observation of air pressure being released from this cut. The cut in the air channel shall subsequently be repaired with an extrusion bead and nondestructively tested by the Geosynthetic Installer.

5. If loss of pressure exceeds three (3) pounds per square inch or pressure does not stabilize, or failure of alternate seam test approved in the installation plan, the dual-tract weld shall be considered failed, and the faulty area of the welded seam shall be located as follows:

a. The entire welded seam length shall be divided in half and both halves shall be retested (i.e., the air channel shall be sealed, by appropriate means, at the location of half its original length, and both halves shall be tested as separate

seams). The air channel of the welded seam shall be repeatedly divided in this manner until the faulty portion of the welded seam is isolated for repair according to the above Specifications or until the CONSTRUCTION MANAGEMENT ENGINEER directs the Geosynthetic Installer to cap strip the entire faulty length of welded seam with an extrusion-welded patch at no additional cost to the OWNER. All punctures within the air channel made by either the pressure feed device, air-pressure release cut, or melting of the air channel itself shall be properly repaired by an extrudate bead and nondestructively tested at the expense of the CONTRACTOR. Such corrective action will not constitute grounds for a Contract time extension.

3.6 Random Weld Destructive Samples

A. In the event of a conflict, GRI-GM19 shall govern testing parameters. Random weld destructive samples shall be cut by the Geosynthetic Installer from the installed welded geomembrane at a minimum frequency of one (1) sample for every five hundred (500) feet of welded seam. Additional locations shall be determined during the seam welding operations at the CONSTRUCTION MANAGEMENT ENGINEER'S discretion. In order to obtain destructive sample test results prior to completion of geomembrane installation activities, destructive samples shall be cut by the Geosynthetic Installer's field superintendent as the seam welding operations progress. Sampling locations shall be determined by the CONSTRUCTION MANAGEMENT ENGINEER based upon visual observation and experience. The CONSTRUCTION MANAGEMENT ENGINEER must witness the cutting of all destructive samples and the Geosynthetic Installer shall promptly mark all samples obtained with their welded seam number and welding technician. The field superintendent shall also record on the daily QC logs the date and time the welding operation occurred, ambient temperature, and field test results for both peel and shear. All holes in the geomembrane resulting from obtaining the seam samples shall be immediately repaired.

3.6.1 Field Testing of Random Weld Destructive Samples

A. The Geosynthetic Installer shall cut a twelve (12)-inch-wide by forty (40)-inch-long destructive sample, or as required by Geosynthetics Testing Laboratory, with the welded seam centered lengthwise for each destructive sample. Two (2) one (1)-inch-wide specimens shall be cut from each end of the destructive sample. With the field tensiometer, the Geosynthetic Installer shall test the two (2) specimens from each end (total of four [4]) for shear strength and for peel adhesion using a two (2)-inch strain rate. For the destructive sample to be acceptable, all four (4) test specimens must fail in FTB at a minimum tensile value for peel and shear as specified in Table 31 05 19.16-2a/b. Any specimen that fails either through the weld, or in FTB at a tensile value less than the minimum specified values, is considered a failure.

B. Should the destructive sample fail the field testing requirements, the Geosynthetic Installer shall remediate the deficient welded seam(s) from which the destructive

sample was obtained as detailed in the subsequent Paragraph 3.6.2. Should the destructive sample pass the field testing requirements and be deemed acceptable to the CONSTRUCTION MANAGEMENT ENGINEER, the Geosynthetic Installer shall prepare and submit the remaining portion of the destructive sample for laboratory testing as discussed below.

3.6.2 Laboratory Testing of Random Weld Destructive Samples

A. The remaining portion of the destructive sample shall be cut into three (3) parts, each a twelve (12)-inch by twelve (12)-inch "coupon," and distributed by the Geosynthetic Installer and at the expense of the CONTRACTOR as follows:

   1. One (1) coupon to an approved independent Geosynthetics Testing Laboratory.

   2. One (1) coupon to the CONSTRUCTION MANAGEMENT ENGINEER for archive storage.

B. The CONTRACTOR, or the Geosynthetic Installer, shall package and ship the destructive samples to the approved Geosynthetics Testing Laboratory for determination of both shear and peel strengths. The test method and procedures to be used by the Geosynthetics Testing Laboratory shall be the same as used in field testing, where welded seam specimens are one (1) inch wide, and the strain rate is two (2) inches per minute. Four (4) of the five (5) specimens per twelve (12)-inch by twelve (12)-inch coupon shall pass both shear strength and peel adhesion tests by exhibiting FTB failure at or above the specified minimum tensile values. Lab results shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER as soon as they become available for evaluation and possible remedial actions. Electronic lab testing results will be accepted by the CONSTRUCTION MANAGEMENT ENGINEER so as not to impede subsequent construction activities. Hard copy lab testing results shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER within twelve (12) calendar days of the sampling date.

C. The following investigation and repair procedure will apply whenever a destructive sample fails the field or laboratory testing requirements:

   1. The Geosynthetic Installer shall retrace the seam welding path in both directions from the failed destructive sample test location (ten [10]-foot distance minimum) and take two (2) twelve (12)-inch by twelve (12)-inch coupons for additional shear strength and peel strength field testing according to the procedure specified in Paragraph 3.6. If both coupons are acceptable according to the previously discussed testing requirements, then the faulty welded seam shall be cap-stripped according to the Specifications herein between the locations of the two (2) acceptable twelve (12)-inch by twelve (12)-inch coupons so as to cover the failed destructive sample test location. If either or both of the coupons are considered unacceptable, then the investigation process is repeated until the failed coupons are bounded by two (2) passing coupon test locations. The extrusion-welded cap

strip shall extend to at least six (6) inches beyond the entire length of faulty welded seam on all sides and be nondestructively tested according to the procedures specified herein at no additional cost to the OWNER.

3.6.3 Laboratory Procedures for Testing Welded Seams

A. Laboratory testing of requirements for field-welded seam coupon specimens are listed below:

1. Thickness (ASTM D5594).
2. Field Seam Peel Strength (hot wedge and extrusion fillet) (ASTM D6392).
3. Field Seam Shear Strength (ASTM D6392).

B. Acceptable values for the thickness test are one hundred (100) percent or more of the values for the parent material. Acceptable peel and shear test results will be FTB at a minimum tensile value as specified in Table 31 05 19.16-2a/b. Any specimens which fail in the weld during either peel or shear tests or result in FTB but at tensile values lower than the specified minimum values will be considered failures. At least four (4) of five (5) specimens tested in shear and peel shall exhibit an FTB value not in the seam area.

3.7 Liner Penetration

A. CONTRACTOR may elect to use manufactured or field fabricated liner boots. CONTRACTOR shall submit construction and installation procedure for field fabricated liner penetration boots to the CONSTRUCTION MANAGEMENT ENGINEER for approval. Boots attached to landfill gas extraction wells and leachate cleanouts penetrating the cap shall be attached per geomembrane manufacturer's specifications. Shop fabricated liner penetration boots shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval.

B. Provide booted geomembrane penetration as shown on the Contract Drawings, manufacturer's specifications and specified herein. Include item penetrating cap, neoprene sponge, steel band clamp, and other miscellaneous items as required.

C. Liner penetration shall be constructed with liner material of the same type and thickness as the Closure cap (forty [40]-mil textured LLDPE).

D. Seal booted penetration of textured LLDPE using an extrusion welder. Clamp liner boot to well casing using neoprene sponge and stainless-steel band clamps, as shown on the Contract Drawings.

E. Upon installation of booted liner penetration, CONTRACTOR shall Vacuum Box test extrusion fillet-welded seams as outlined in Paragraphs 3.5.1 and 3.5.2.

F. CONTRACTOR shall not weld textured LLDPE liner directly to pipe penetrations.

3.8 Defects and Repairs

3.8.1 Identification

A. All welded seams and non-seam areas of the geomembrane shall be evaluated by the Geosynthetic Installer's field superintendent and the CONSTRUCTION MANAGEMENT ENGINEER for identification of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane aids in the detection of defects, the surface of the geomembrane shall be kept clean at the time of inspection. The geomembrane surface shall be broomed or washed as necessary by the Geosynthetic Installer if the amount of dust or mud inhibits inspection.

3.8.2 Evaluation

A. Each suspect location as noted by either the Geosynthetic Installer's field superintendent or CONSTRUCTION MANAGEMENT ENGINEER, both in seam and non-seam areas, shall be nondestructively tested using the methods described in these Specifications. Each location that fails the nondestructive testing will be marked by the CONSTRUCTION MANAGEMENT ENGINEER and repaired by the Geosynthetic Installer.

B. Upon inspecting the wrinkles within the geomembrane material during the installation of overlying materials, the CONSTRUCTION MANAGEMENT ENGINEER will decide which wrinkles shall be repaired by the Geosynthetic Installer at the expense of the CONTRACTOR. Any wrinkle which could potentially disrupt the flow of leachate or water along the floor of the containment cell or closure cap will be evaluated by the CONSTRUCTION MANAGEMENT ENGINEER for potential repair.

3.8.3 Repair Procedures

A. Repair procedures shall be agreed upon between the CONSTRUCTION MANAGEMENT ENGINEER and Geosynthetic Installer prior to geomembrane installation. Unless otherwise agreed upon the required repair procedures shall be as follows:

1. Faulty Extrusion Fillet-Welded Seams—Minor defects detected during the nondestructive vacuum box testing procedures shall be adequately covered with an extrusion fillet bead which shall cover the entire length of faulty weld. If, based on the CONSTRUCTION MANAGEMENT ENGINEER'S evaluation, the number of welded seam defects or an individual defect is extensive, the entire length of welded seam shall be cap stripped with a patch extrusion-welded completely around its perimeter at no additional cost to the OWNER. The patch shall extend a minimum of six (6) inches beyond the centerline of the faulty weld

in all directions for its entire length and be nondestructively tested according to the procedures specified herein.

2. Faulty Dual-Tract, Hot-Wedge Welded Seams—Defects detected on the outer tract (i.e., that tract weld which is visible) during the air pressure testing procedures shall be adequately covered with an extrusion fillet bead for the entire length of faulty weld. If the leak cannot be detected along the outer tract, therefore concluding that the failed weld exists along the inner tract (i.e., that tract weld which is not visible from the upper surface of the welded geomembrane), the Geosynthetic Installer shall cover the entire width of the failed dual-tract weld along its entire length with an extrusion-welded cap strip. The extrusion cap strip shall be placed to at least six (6) inches beyond the edges of the dual-tract weld and nondestructively tested at no additional cost to the OWNER.

3. Wrinkles and Fishmouths—Wrinkles or fishmouths created within the textured LLDPE geomembrane shall be repaired by cutting their entire length along their maximum height. A "stress-relief" circle (approximately six (6) inches in diameter) shall be cut at the end of a fish mouth or at both ends of a wrinkle. The resulting excess geomembrane shall then be overlapped in the downgradient direction and extrusion fillet welded for its entire length. An extrusion welded patch shall then be placed over each "stress-relief" circle and the entire welded repair shall be nondestructively testing by the Geosynthetic Installer.

4. Geomembrane Defects—Pinholes detected within the geomembrane material shall be covered with an extrusion fillet bead. Blisters, larger holes, undispersed raw materials, tears, and contamination by foreign matter shall be capped with an extrusion welded patch. Each welded patch shall have its corners rounded and shall extend a minimum of six (6) inches beyond the extent of the underlying defect in all directions. All welded repairs shall be nondestructively tested by the Geosynthetic Installer.

5. Wind Damage—Textured LLDPE geomembrane panels that suffer wind-blown or wind uplift damage (e.g., severe creases, crimping, tears) either during deployment activities or while temporarily anchored shall be replaced and properly disposed of by the Geosynthetic Installer at the expense of the CONTRACTOR. If damage incurred to the geomembrane is deemed repairable by the CONSTRUCTION MANAGEMENT ENGINEER, the entire limits of damaged material shall be cap stripped with an extrusion welded patch and nondestructively tested accordingly at the expense of the CONTRACTOR.

6. The time incurred repairing defects which occur as a result of faulty material, repair equipment, or workmanship will not be considered for a contract time extension.

3.8.4 Verification of Repairs

A. Each repair will be nondestructively tested using the methods described in this Section, as appropriate. Repairs which pass the nondestructive test will be considered an adequate repair. Repairs which fail will be repeated and retested by the Geosynthetic Installer at the expense of the CONTRACTOR until a passing test results. The CONSTRUCTION MANAGEMENT ENGINEER will observe all nondestructive testing of repairs.

B. The location and associated repair work of each patch installed on the geomembrane must be documented in the Geosynthetic Installer's daily QC log.

3.9 As-Built Survey

A. As-Built Survey shall be completed after geomembrane installation shall designate locations of all field welded seams, repair patches, extrusion fillet beads, and geomembrane panel numbers with associated roll numbers, location of each random weld destructive sample, and those samples obtained for plant physical property testing as required in these Specifications. Survey shall be in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

3.10 Warranty

A. The CONTRACTOR shall warranty the geomembrane material free from defects for ten (10) years from the date of final acceptance and provide a one (1)-year warranty on workmanship.

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SECTION 31 05 19.26
GEOCOMPOSITE

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The Work covers the manufacture, supply, delivery, storage, and installation of the geocomposite drainage net. Materials specified in this Specification Section shall be installed as shown on the Contract Drawings.

1.1.2 Related Work Specified Elsewhere

A. Section 01 33 00, Submittals.

B. Section 01 40 00, Quality Control.

C. Section 31 05 19.13, Geotextiles.

D. Section 31 05 19.16, Geomembrane.

1.2 References

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1.2.1 ASTM International (ASTM)

A. ASTM D1505 (2010) Density of Plastics by the Density-Gradient technique.

B. ASTM D1603 (2011) Carbon Black Content in Olefin Plastics.

C. ASTM D4218 (1996; R 2008) Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

D. ASTM D4355 (2007) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus.

E. ASTM D4491 (1999a; R 2009) Water Permeability of Geotextiles by Permittivity.

F. ASTM D4533 (2011) Trapezoid Tearing Strength of Geotextiles.

G. ASTM D4632 (2008) Grab Breaking Load and Elongation of Geotextiles.

H. ASTM D4716 (2008) Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using Constant Head.

I. ASTM D4751 (2004) Determining Apparent Opening Size of a Geotextile.

J. ASTM D4833 (2007) Index Puncture Resistance of Geotextiles, Geomembrane, and Related Products.

K. ASTM D5035 (2011) Breaking Force and Elongation of Textile Fabrics (Strip Method).

L. ASTM D5199 (2012) Measuring Nominal Thickness of Geosynthetics.

M. ASTM D5261 (2010) Measuring Mass Per Unit Area of Geotextiles.

N. ASTM D5321 (2012) Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.

O. ASTM D7005 (2003; R 2008) Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. The Geocomposite Manufacturer shall be a specialist in the manufacture of geocomposite and shall have produced and manufactured a minimum of five (5) million square feet (ft^2) of geocomposite that has been used in successful installations.

B. The geocomposite shall be installed by a Geosynthetics Installer meeting the qualifications in Specification Section 01 40 00, Quality Control.

1.5 Submittals

A. A Statement of Qualifications for the Geosynthetics Installer meeting the requirements of Geosynthetic Installer qualifications noted in Specification Section 01 40 00, Quality Control, shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. No geocomposite installation shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved in writing the items as identified.

B. A Statement of Qualifications for the geocomposite Manufacturer shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval. The following information regarding the geocomposite shall be submitted by the CONTRACTOR to the CONSTRUCTION MANAGEMENT ENGINEER for approval four (4) weeks prior to installation. No geocomposite installation shall begin until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved the items as identified in this submittal.

1.5.1 Certified Test Reports

A. The Geosynthetics Installer shall submit in writing to the CONSTRUCTION MANAGEMENT ENGINEER for approval within two (2) weeks after award of Contract the manufacturer's name along with the product name and certification of the material intended for use as geocomposite for the closure cap. Certified test reports conforming to the requirements of standards and testing methods specified herein shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval prior to delivery of geocomposite. The material manufacturer and CONTRACTOR must satisfy the CONSTRUCTION MANAGEMENT ENGINEER that the material to be furnished and installed will meet in every aspect the requirements set forth in this Specification. The CONTRACTOR shall transmit to the CONSTRUCTION MANAGEMENT ENGINEER all information provided by the manufacturer or supplier prior to obtaining approval for furnishing and installing any such material.

B. The CONTRACTOR shall obtain samples of the geocomposite material from the geocomposite manufacturer and submit these samples to the CONSTRUCTION MANAGEMENT ENGINEER for approval prior to geocomposite manufacturer's delivery.

1.5.2 Installation and Repair Procedures

A. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER for approval four (4) weeks prior to installation, the geocomposite manufacturer's recommended installation procedures, including placement and joining, and the manufacturers recommended procedures for repairing or replacing damaged or defective geocomposite material.

B. The CONTRACTOR shall also submit Geosynthetic Installer's Installation Plan for geocomposite in accordance with Specification Section 01 40 00, Quality Control.

1.6 Safety

A. Not used.

1.7 Quality Assurance

1.7.1 Single Source

A. All geocomposite must be obtained from a single material supplier and all geocomposite rolls used in construction shall be manufactured by a single manufacturer.

1.7.2 Material Testing

1.7.2.1 Material Testing by Manufacturer

A. Geocomposite shall be tested by the manufacturer(s) prior to delivery to the project site to ensure that the physical and hydraulic properties of the finished products are in accordance with this Specification. Required physical properties, test methods, and values are presented in Table 31 05 19.26-1. With exception of transmissivity, test frequency shall be one (1) of each test in Table 31 05 19.26-1 for every fifty thousand (50,000) ft^2 of net produced. In addition, one (1) three (3)-foot (ft) × roll width coupon of net produced for this installation shall be retained by the manufacturer until construction of the cells closure cap has been completed. Regarding planar transmissivity, a test shall be conducted on a sample of the following geosynthetic system for every two hundred thousand (200,000) ft^2 of net produced:

1. Steel plate (top).

2. Proposed Vegetative Support Soil (three [3]-inch minimum thickness).

3. Proposed eight (8)-ounce (oz), three hundred (300) mil double-sided Geocomposite.

4. Proposed forty (40)-mil textured linear low-density polyethylene (LLDPE) geomembrane or alternate fifty (50)-mil textured LLDPE structured geomembrane.

5. Proposed eight (8)-oz non-woven needle-punched geotextile.

6. Steel plate (bottom).

B. In addition to the results of testing required in Table 31 05 19.26-1, the manufacturer of the geocomposite shall submit a written certification stating that all geocomposite produced for the project meets or exceeds the minimum values of the respective physical properties and transmissivity listed in Table 31 05 19.26-1.

C. The CONTRACTOR shall be solely responsible for the quality of the material provided. Should any of the tests performed on the material yield unsatisfactory results, the CONTRACTOR will be responsible for replacing the material with

satisfactory material without delaying the total project time and without any additional cost to the OWNER.

1.7.2.2 Material Testing by Contractor

A. The CONTRACTOR shall test geocomposite for physical and hydraulic properties as set forth herein:

1. Interface Friction Angle Testing—The CONTRACTOR shall test geocomposite for adherence to minimum acceptable interface friction angles as listed in Specification Section 31 05 19.16, Geomembrane, in accordance with direct shear testing as specified in ASTM D5321.

2. Field Sampling—Four (4) samples of geocomposite shall be obtained by the CONTRACTOR for possible testing (at least four [4] ft by four [4] ft). Each sample shall be tagged with the numbers of the panel and roll from which it was collected. All collected samples shall be stored onsite at a location approved by the CONSTRUCTION MANAGEMENT ENGINEER. If testing is deemed necessary by the CONSTRUCTION MANAGEMENT ENGINEER, the collected geocomposite samples shall be tested by the Geosynthetics Testing Laboratory to determine density, carbon content, thickness, and/or transmissivity according to the methods listed in Table 31 05 19.26-1. Sample shipping and testing shall be the responsibility of the CONTRACTOR and at the expense of the CONTRACTOR. All samples not submitted for testing shall be properly stored onsite during construction and submitted to the CONSTRUCTION MANAGEMENT ENGINEER upon conclusion of the project.

1.7.3 Daily Quality Control (QC) Log

A. The Geosynthetics Installer's field superintendent shall maintain a daily QC log during all phases of the geocomposite installation. This log shall document the daily progression of the geocomposite installation from delivery of material to final acceptance of the complete cap system. The daily log shall designate those construction activities that influence the integrity of the geocomposite during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

1. Weather, i.e., temperature, winds, precipitation.

2. Site preparation activities, including removal of water, sediment, or geomembrane liner cleaning.

3. Roll and panel number of each sheet that is deployed on a daily basis.

4. Repairs and replacements.

5. Seaming activities.

6. Inspection of geocomposite material delivered to the site.

7. Calibration dates of each piece of seaming equipment and seam test equipment.

8. Photo documentation to accompany the log with reference to the date, location, and a general description of the photo.

B. The Geosynthetics Installer's field superintendent shall submit the required daily QC logs to the CONSTRUCTION MANAGEMENT ENGINEER for review within two (2) calendar days of the activities documented. At any point during the Work, if the daily QC log has not been submitted, the CONSTRUCTION MANAGEMENT ENGINEER has the right to stop the geocomposite installation activities at no cost to the OWNER. Upon receiving the required daily QC logs, Work may resume.

1.7.4 Visual Inspection

A. During deployment of the geocomposite, the Geosynthetics Installer and the CONSTRUCTION MANAGEMENT ENGINEER shall carry out daily visual inspections of the material surface. Any faulty areas identified relating to drainage net integrity (e.g., flattening of geocomposite ribs) shall be repaired by the Geosynthetics Installer using approved repair procedures and shall be reported in the daily QC log.

1.7.5 QC Laboratory

A. The Geosynthetics Testing Laboratory shall serve as the QC Laboratory for geocomposite testing, and shall meet the qualifications in Specification Section 01 40 00, Quality Control.

1.8 Product Delivery, Storage, and Handling

A. Materials shall be delivered to the site only after the required submittals have been approved by the CONSTRUCTION MANAGEMENT ENGINEER. Storage and handling of the materials shall conform to the manufacturer's recommendations and shall be done in such a manner as to prevent damage to any part of the work or the material itself.

B. The CONTRACTOR shall provide necessary labor and equipment to properly unload material upon arrival at site. The Geosynthetics Installer's field superintendent shall be present during the delivery and unloading of the geocomposite and shall ensure the geocomposite material has not been damaged during shipping, storage, or handling. The material shall be stored in a reasonably level and smooth area that is well drained, away from brush, poison oak or ivy; away from oil, grease, or fuels; and in an accessible area for inspection. Individual pieces or bundles shall be stored with safe walking space and clearance between them to allow full view for inspection

purposes. To prevent ultraviolet degradation, the protective wrapper on each geocomposite roll shall not be removed until the material is ready for use. Additionally, tarping may also be used to protect geocomposite during storage. Identification tags attached to the rolls of geocomposite delivered to the site shall not be removed until the material is installed.

C. Each roll shall be labeled with the manufacturer's name, product identification, lot number, roll number, and roll dimensions. Any roll not properly identified immediately prior to deployment activities may be deemed unacceptable for use by the CONSTRUCTION MANAGEMENT ENGINEER at the expense of the CONTRACTOR.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Geocomposite

A. The geocomposite drainage net shall be high density polyethylene. The geocomposite shall be manufactured from three (3) sets of parallel, extruded polymer strands. Strands of one (1) set shall lie on top of strands of the other set, and the two (2) sets shall be bonded at the intersection. Strands shall be heat bonded on both sides to eight (8) oz per square yard nonwoven needle-punched geotextile. The material shall have the minimum physical properties specified in Table 31 05 19.26-1.

2.2 Geocomposite Ties

A. The geocomposite ties shall be heavy-duty, high-strength polymer braid ties. Ties shall be brightly-colored for easy inspection.

TABLE 31 05 19.26-1
Physical Properties of Geocomposite

Tested Property	Test Method	Frequency	Minimum Average Roll Value[(c)]
Geocomposite			
Transmissivity[(a)], gal/min/ft (m^2/sec)	ASTM D4716	1/200,000 ft^2	3.5 (7.5×10^{-4})
Ply Adhesion, lb/in	ASTM D7005	1/50,000 ft^2	1.0
Drainage net[(b)]			
Transmissivity[(a)], gal/min/ft (m^2/sec)	ASTM D4716		38.6 (8×10^{-3})
Thickness, mil	ASTM D5199	1/50,000 ft^2	300
Density, g/cm^3	ASTM D1505	1/50,000 ft^2	0.94
Tensile Strength (MD), lb/in	ASTM D5035	1/50,000 ft^2	75
Carbon Black Content, %	Modified ASTM D1603 ASTM D4218	1/50,000 ft^2	2.0
Geotextile[(b)]			
Mass per Unit Area, oz/yd^2	ASTM D5261	1/90,000 ft^2	8
Grab Tensile, lb	ASTM D4632	1/90,000 ft^2	220
Puncture Strength, lb	ASTM D4833	1/90,000 ft^2	120
AOS, US Sieve (mm)	ASTM D4751	1/540,000 ft^2	80 (0.180)
Permittivity, sec^{-1}	ASTM D4491	1/540,000 ft^2	1.3
Flow Rate, gpm/ft^2	ASTM D4491	1/540,000 ft^2	95
UV Resistance, % Retained	ASTM D4355 (after 500 hours)	Once per formulation	70

(a) Gradient of 0.1, normal load of 10,000 pounds per square foot, water at 70 degrees Fahrenheit between stainless steel plates for 15 minutes.
(b) Component properties prior to lamination.
(c) These are minimum average roll values (MARV) and are based on the cumulative results of specimens tested.
(d) The diameter of the presser foot shall be 2.22 inches and the pressure shall be 2.9 pounds per square inch. For other thickness options, see manufacturer's literature.
(e) This is the average peak value for five (5) equally spaced machine direction tests across the roll width.
(f) Average of five (5) tests across the roll width. Discounting the outer 305 millimeters of each side of the roll, collect samples at the 10, 30, 50, 70, and 90 percent positions across the roll width. Test both sides for double sided geocomposites.
(g) At a minimum, one (1) sample shall be taken every production run or at the frequency specified.
Note: No foaming agents shall be used in the manufacturing process of the geocomposite.

3. EXECUTION

3.1 Installation

A. The geocomposite shall be laid out and installed by the Geosynthetics Installer in accordance with the applicable CONSTRUCTION MANAGEMENT ENGINEER-approved installation procedures. The CONSTRUCTION MANAGEMENT ENGINEER'S approval of the installation procedures does not relieve the CONTRACTOR of his responsibility to properly install the geocomposite. The geocomposite shall be installed only after the underlying linear low-density polyethylene geomembrane liner has been tested and accepted by the CONSTRUCTION MANAGEMENT ENGINEER. The geocomposite shall be rolled down (machine direction parallel to slope) the side slope, keeping the geocomposite

flat against the liner to minimize wrinkles and folds. Rolling and joining of geocomposite across slopes is not permitted. Place adequate ballast (e.g., sandbags) to prevent uplift by wind prior to covering.

B. Care shall be taken not to entrap small stones when unrolling a geocomposite from the top of a geomembrane lined slope.

3.2 Seams and Overlaps

A. Geocomposite side seams shall be overlapped a minimum of six (6) inches. Plastic fastener spacing along side seams shall be a maximum of five (5) ft.

B. Overlap geocomposite end seams a minimum of one (1) ft and offset geocomposite end seams a minimum of five (5) ft between adjacent roll ends. End seam plastic fastener spacing shall be a maximum of one (1) ft. The overlaps shall be in the direction of flow.

C. Tie geocomposite rolls together with plastic fasteners. The fasteners shall be a contrasting color from the geonet and attached geotextiles. Metallic fasteners will not be allowed. The geotextile component of the geocomposite shall be eight (8)-oz nonwoven needle-punched geotextile and shall be overlapped in the direction of flow and shall have seams sewn using approved methods.

D. Place geotextile cap strips over any exposed edges of geocomposite. Cap strips shall be a minimum of two (2) ft in width and shall be thermally bonded to the geotextile component of the geocomposite.

3.3 Penetrations

A. Submit penetration details to the CONSTRUCTION MANAGEMENT ENGINEER for approval. No penetrations are to be completed until the CONSTRUCTION MANAGEMENT ENGINEER has received and approved in writing the details submitted. Mechanically attach a geotextile apron to the pipes and other appurtenances penetrating through the closure cap so that soil is prevented from getting into the geocomposite. The apron of the attached geotextile shall extend out from the pipe or appurtenance a minimum of two (2) ft. The apron geotextile shall be thermally bonded to the geotextile component of the geocomposite.

3.4 Repairs

3.4.1 Drainage Net Damage

A. Make repairs by placing a patch of the geocomposite over the damaged area. Extend the patch a minimum of two (2) ft beyond the edge of the damage. Use approved fasteners, spaced every six (6) inches around the patch, to hold the patch in place. If more than twenty-five (25) percent of the roll width is damaged, approval must be

obtained from the CONSTRUCTION MANAGEMENT ENGINEER to repair or replace the damaged roll.

3.4.2 Geotextile Damage

A. Repair damaged geotextile by placing a patch of eight (8)-oz geotextile over the damaged area with a minimum of twelve (12) inches of overlap in all directions. The geotextile patch shall be thermally bonded in place.

3.4.3 Protection and Backfilling

A. Cover the geocomposite with the specified materials within fourteen (14) days of acceptance. Vegetative Support Soil shall be placed from the bottom of the slope upward and shall not be dropped directly onto the geocomposite from a height greater than three (3) ft. The Vegetative Support Soil shall be pushed out over the geocomposite in an upward tumbling motion so that the wrinkles in the geocomposite do not fold over. No equipment shall be operated on the top surface of the geocomposite without permission from the CONSTRUCTION MANAGEMENT ENGINEER. The initial loose soil lift thickness shall be twelve (12) inches. Use equipment with ground pressures no greater than five (5) pounds per square inch to place the first lift of soil.

3.5 As-Built Surveys

A. Not used.

-- End of Section --

SECTION 31 09 13
SETTLEMENT PLATES

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The Work covered by this Section consists of the fabrication, furnishing, installation, protection, maintenance, and surveying of settlement plates and includes the furnishing of all labor, materials and equipment required.

B. The CONTRACTOR shall monitor the settlement plates and provide the data to the CONSTRUCTION MANAGEMENT ENGINEER.

1.1.2 Related Work Specified Elsewhere

A. Not used.

1.2 References

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise indicated the most recent edition of the publication, including any revisions, shall be used.

1.2.1 ASTM International (ASTM)

A. ASTM A36: Standard Specification for Carbon Structural Steel.

B. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

1.3 Definitions

A. Instrument – Settlement plates are instruments.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Product data cut sheets.

B. Example layout indicating size and information to be included on plate labels.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

1.10 Instrument Protection, Maintenance and Replacement

A. The CONTRACTOR shall protect all instruments from damage due to construction operations, weather, traffic, and vandalism.

B. If an instrument is damaged or becomes inoperative due to inadequate protection by the CONTRACTOR, or due to CONTRACTOR's operations, the CONTRACTOR shall replace the damaged instrument within seventy-two (72) hours at no additional cost to the OWNER.

C. Extreme care shall be exercised by the CONTRACTOR when filling near and around the settlement plates and risers.

2. MATERIALS

2.1 General

A. All settlement plates materials shall be new.

2.2 Monitoring Instruments

2.2.1 Instruments

A. Settlement Plates:

1. Provide settlement plate and complete assembly in accordance with the standard details shown on the Contract Drawings.

2. Steel plate shall conform to ASTM A36.

3. Steel pipe shall be Schedule 40 ASTM A53 Grade A.

4. All PVC pipe and fittings shall be Schedule 40.

5. Plate labels and band clamps shall be stainless steel.

3. EXECUTION

3.1 Pre-Installation Activities

A. When settlement plates are received at the site, the CONTRACTOR shall perform the following tests:

1. Check, by comparing with procurement document that dimensions and materials are correct.

2. Verify that all components fit together in the correct configuration.

3. Check all components for signs of damage in transit.

4. Check that quantities received correspond to quantities ordered.

3.2 General

A. The CONTRACTOR shall install instruments that remain fully functional for a minimum of ten (10) years.

B. The CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER at least twenty-four (24) hours prior to installing each settlement plate.

C. As each settlement plate is installed, an installation record sheet shall be prepared, including appropriate items from the following list:

1. Project name.

2. Planned location in horizontal position and elevation.

3. Personnel responsible for installation.

4. Date and time of start and completion.

5. Type of backfill used.

6. As-built location in horizontal position and elevation.

7. Weather conditions at the time of installation.

8. A space on record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior.

3.3 Installation of Settlement Plates

A. The settlement plates shall be installed in pits, one (1) foot above the geosynthetic cap components in the Vegetative Support Soil at the locations shown on the Contract Drawings. The bottom of plate shall be level and the plate shall be installed with a section of marker pipe plumb before proceeding with stem assembly.

B. The elevation of the top of the plate shall be surveyed. With plate and marker pipe and casing centered with respect to each other and maintained in a vertical position, the pit shall be backfilled in layers by hand and thoroughly compacted with a jumping jack, plate compactor, or similar equipment.

C. When the installation of the settlement plate is complete, the CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER so that the elevation of the top of the marker pipe at that time can be determined; and no fill shall be placed until this elevation has been determined.

D. The settlement plate stem shall be flagged and protected from construction equipment and vehicles. If the settlement plate assembly is disturbed such that is more than ten (10) degrees from vertical, it shall be replaced in kind within twenty-four (24) hours, unless otherwise directed in writing by the CONSTRUCTION MANAGEMENT ENGINEER. The settlement plate will be replaced completely, including reconstruction of the settlement plate, base, and risers at the adjacent grade of fill when disturbance or damage occurs. The CONTRACTOR shall resurvey the new settlement plate immediately upon completing the installation. All settlement plate replacement activity will be performed by the CONTRACTOR at no additional cost to the OWNER.

E. During filling activities, the fill placed within five (5) ft of the settlement plates shall be placed extremely carefully to avoid moving or damaging the plates and pipes. Fill placement could be performed with small equipment or by hand.

F. Affix stainless steel plate labels to the top of the pipe for each settlement plate with stainless steel band clamps. Labels shall be engraved with the settlement plate identifier and the date of installation.

G. Settlement plate assemblies shall remain in place at the end of construction and become the property of the OWNER.

H. The CONTRACTOR shall obtain and record all measurements and elevations necessary for accurate determination of settlement data during construction.

3.4 Data Monitoring, Recording, and Submission

A. The CONTRACTOR shall monitor the settlement plates until Final Acceptance of the project.

B. The elevations must be established based on a fixed datum or benchmark located outside the limit of work.

C. Extreme events such as rainstorms, flooding, or seismic activity shall be recorded. Any damage, repair, or relocation of the settlement plates shall be recorded.

D. Monitoring data from settlement plates shall be recorded on the CONTRACTOR'S daily reports and tabulated in a tracking spreadsheet that shall be maintained over the entire project. At a minimum, data shall include the date and time of each elevation measurement, weather conditions, the elevation, physical condition of the settlement plate, and any issues encountered. The tracking spreadsheet shall be organized by settlement plate and dates/times. The tracking spreadsheet shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER every two (2) weeks or when requested.

E. At a minimum, monitoring shall include the data listed in Table 31 09 13-1 at the frequencies specified.

TABLE 31 09 13-1
Geotechnical Monitoring Requirements

Data to be Monitored	Monitoring Timing/Frequency
Settlement plate elevation	• At time of initial installation
Settlement plate top of rod elevation and elevation of ground surface adjacent to settlement plate	• At time of initial installation • Every 2 weeks for the first two months • Every month after that until Final Acceptance

-- End of Section --

SECTION 31 11 00
CLEARING AND GRUBBING

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes requirements for the clearing and grubbing of all areas of Work for the construction of the closure cap, and other areas indicated, including work designated in permits and other agreements, in accordance with the Contract Documents.

B. Clearing and grubbing shall be limited to only those areas required to perform the work associated with this project. Limits of actual clearing and grubbing shall be coordinated with the CONSTRUCTION MANAGEMENT ENGINEER. CONTRACTOR shall not clear and grub beyond perimeter erosion and sediment control devices.

1.1.2 Related Work Specified Elsewhere

A. Section 01 70 00, Execution and Closeout Requirements.

B. Section 31 25 00, Erosion and Sediment Control.

1.2 References

A. Not used.

1.3 Definitions

A. Clearing is the removal from the ground surface and disposal of trees, brush, shrubs, down timber, decayed wood, other vegetation, concrete, rubbish, and debris, as well as the removal of fences, stockpiled materials, and incidental structures.

B. Grubbing is the removal and disposal of all stumps, buried logs, roots, matted roots, and organic materials.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Prior to initiating clearing and grubbing activities, CONTRACTOR shall submit a site plan with the specific areas within the Limit of Disturbance that will require Clearing and Grubbing to execute the work for review and approval by the CONSTRUCTION MANAGEMENT ENGINEER.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Not used.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

A. Not used.

3. EXECUTION

3.1 Disposition of Trees

A. Trees and shrubs within the limits of Work shall be removed unless otherwise indicated in the Contract Documents. Do not cut or damage trees outside the limits of Work unless so indicated or unless written permission has been obtained from the OWNER. Written permission shall be furnished to the CONSTRUCTION MANAGEMENT ENGINEER before removal operations commence.

B. CONTRACTOR shall remove from the site and satisfactorily dispose of all trees, shrubs, stumps, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences and miscellaneous other structures not covered under other sections as shown, specified, or otherwise required to permit construction of the Work.

C. Unless otherwise directed by OWNER, trees, stumps and other cleared and grubbed material shall be transported offsite by the CONTRACTOR. No cleared or grubbed material may be used in backfill or structural embankments.

D. Cleared and grubbed material may be ground or chipped onsite to ease in transportation to offsite locations. CONTRACTOR may reuse material onsite as approved in writing by the CONSTRUCTION MANAGEMENT ENGINEER and OWNER.

E. Burning onsite is prohibited.

F. Trees and shrubs intended to remain, that are damaged beyond repair, or removed shall be replaced by CONTRACTOR at no additional cost to the OWNER.

3.2 Clearing and Grubbing

A. CONTRACTOR shall clear and grub items indicated on the Contract Drawings and remove cleared and grubbed material from the site. The CONTRACTOR shall mow existing grass to a height of one (1) inch or less. Vegetative debris must be disposed offsite.

B. Earthwork operations shall not be started in areas where clearing and grubbing is not complete, with the exception that stumps and large roots may be removed concurrent with excavation and grading. Comply with erosion and sediment control measures in accordance with Specification Section 31 25 00, Erosion and Sediment Control.

C. Clear and grub areas to be excavated, areas to receive fill, and areas upon which structures are to be constructed. Depressions made by the removal of stumps or roots shall be filled with suitable fill, as determined by the CONSTRUCTION MANAGEMENT ENGINEER. Care is to be taken while grubbing over areas of known waste, not to spread waste beyond the existing limit of waste.

D. The CONTRACTOR shall clear, grub, and strip the site area as shown on the Contract Drawings. Clearing and grubbing shall be performed in accordance with the sequence of construction as defined on the Contract Drawings.

E. Contractor shall take care to protect existing landfill gas extraction wells, utilities, and other items marked to remain.

3.3 Surveying

A. Surveying shall be in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

-- End of Section --

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SECTION 31 25 00
EROSION AND SEDIMENT CONTROL

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes requirements related to the CONTRACTOR'S responsibility to furnish all labor, equipment, and materials associated with erosion and sediment control required to complete the Work as shown on the Contract Drawings and specified herein.

1.1.2 Related Work Specified Elsewhere

A. Section 01 70 00, Execution and Closeout Requirements.

B. Section 31 05 16, Aggregates.

C. Section 32 92 19, Upland Meadow Establishment.

1.2 References

A. Maryland Department of the Environment (MDE). Maryland Standards and Specifications for Soil Erosion and Sediment Control (2011).

B. Maryland Department of Transportation (MDOT). State Highway Administration (SHA) Standard Specifications for Construction and Materials (2019).

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Product data, source information, and manufacturer's instructions for all materials to be used.

B. Certificate of training for responsible personnel who will perform inspections required by the General Permit for Discharges of Stormwater Associated with Construction Activity.

C. Inspection logs as required by the General Permit for Discharges of Stormwater Associated with Construction Activity.

D. Notice of Termination for the General Permit for Discharges of Stormwater Associated with Construction Activity.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. All erosion and sediment control work shall comply with applicable requirements of governing authorities having jurisdiction. The Specifications and Contract Drawings are not comprehensive, but rather convey the intent to provide complete erosion and sediment control for the project.

B. Erosion and sediment control measures shall be established at the beginning of construction and maintained during the entire period of construction. Onsite areas that are subject to severe erosion, and offsite areas that are especially vulnerable to damage from erosion and/or sedimentation, shall be identified and receive special attention.

C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and the length of the time of exposure.

D. Surface water runoff originating upgrade of exposed areas shall be controlled to reduce erosion and sediment loss during the period of exposure.

E. All land-disturbing activities shall be planned and conducted so as to minimize offsite sedimentation.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 General

A. All erosion and sediment control materials shall conform to the requirements of the MDE Water Management Administration, 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and subsequent updates, the MDOT SHA Standard Specifications for Construction and Materials, and the Contract Drawings.

2.2 Gabion

A. Gabion wire shall be galvanized and PVC coated and comply with the requirements of Section 906 of the latest version of the MDOT SHA Standard Specifications for Construction and Materials.

B. Stone Fill for gabions shall comply with requirements of the project Specifications, Section 31 05 16, Aggregates, Paragraph 2.7, Gabion Stone.

3. EXECUTION

3.1 General Permit for Discharges of Stormwater Associated with Construction Activity

A. The OWNER has obtained coverage under the Maryland Department of the Environment's General Permit for Discharges of Stormwater Associated with Construction Activity, State Discharge Permit Number 14GP.

B. Upon award of this contract, the permit will be transferred to the CONTRACTOR and the CONTRACTOR will be solely responsible for meeting the requirements of the permit.

C. The CONTRACTOR must submit a copy of all inspection reports to the CONSTRUCTION MANAGEMENT ENGINEER on a weekly basis.

D. The permit is included in Attachment B.

E. Submit a Notice of Termination to the CONSTRUCTION MANAGEMENT ENGINEER for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the CONTRACTOR is responsible. Once approved, submit the Notice of Termination to the Maryland Department of the Environment.

3.2 Extent of Work

A. CONTRACTOR shall implement additional erosion and sediment controls as required by the sediment control inspector, Montgomery County Department of Permitting Services, or CONSTRUCTION MANAGEMENT ENGINEER to remain in compliance with applicable local and state regulations. Field changes and minor adjustments from the Contract Drawings are permissible as long as the installation functions and conforms to the Contract Documents.

3.3 General

A. The CONTRACTOR shall install new erosion and sediment control measures in accordance with the manufacturer's recommendations, the Contract Drawings, the MDE Water Management Administration, 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and subsequent updates, and the MDOT SHA Standard Specifications for Construction and Materials.

B. Sediment removed from erosion and sediment controls shall be placed onsite beneath the geosynthetic closure cap.

3.3.1 Stabilized Construction Entrances (SCE)

A. Install stabilized construction entrances in accordance with the details shown on the Contract Drawings. Other perimeter erosion and sediment controls that extend to the SCE shall tie into the mountable berm portion of the SCE as appropriate. SCE's shall be replenished as necessary throughout construction.

3.3.2 Earth Dikes

A. Install earth dikes as indicated on the Contract Drawings. Accumulated sediment and debris shall be removed to maintain positive drainage as needed.

3.3.3 Soil Stabilization Matting

A. Install soil stabilization matting as indicated on the Contract Drawings. Material should not be installed if surface condition is unsuitable due to frost, excessive moisture or other condition.

3.3.4 Pipe Slope Drains

A. Install pipe slope drains as indicated on the Contract Drawings. Points of inflow and outflow shall be maintained free of erosion. Accumulated sediment and debris shall be removed to maintain positive drainage as needed.

3.3.5 Clear Water Diversions

A. Install clear water diversions as indicated on the Contract Drawings. Points of inflow and outflow shall be maintained free of erosion. Accumulated sediment and debris shall be removed to maintain positive drainage as needed.

3.3.6 Super Silt Fence

A. Install super silt fence as indicated on the Contract Drawings. Any repairs to fencing material shall be made promptly for any super silt fence that is damaged, decomposed, or ineffective. Sediment deposits along fencing shall be removed before deposits reach one-third (1/3) of the height of the barrier. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade.

3.3.7 Filter Logs

A. Install filter logs as indicated on the Contract Drawings. Any repairs to filter logs shall be made promptly for any filter logs that are damaged, decomposed, or ineffective. Sediment deposits along filter logs shall be removed before deposits reach one-half (1/2) of the height of the barrier. The immediate area occupied by the filter logs and any sediment deposits shall be shaped to an acceptable grade.

3.3.8 Inlet Protection

A. Install inlet protection as indicated on the Contract Drawings. Accumulated sediment and debris shall be removed to maintain positive drainage as needed.

3.3.9 Temporary Stone Outlet Structure

A. Install temporary stone outlet structures as indicated on the Contract Drawings. Accumulated sediment and debris shall be removed before deposits reach within six (6) inches of the weir crest to maintain positive drainage as needed.

3.3.10 Temporary Gabion Outlet Structure

A. Install temporary gabion outlet structures as indicated on the Contract Drawings. Accumulated sediment and debris shall be removed before deposits reach within twelve (12) inches of the weir crest to maintain positive drainage as needed.

3.3.11 Sump Pit

A. Install and maintain sump pits as indicated on the Contract Drawings.

3.3.12 Filter Bag

A. Install filter bags as indicated on the Contract Drawings. Replace as needed when the bag clogs, rips, tears, or punctures.

3.3.13 Sediment Basin No. 1

A. CONTRACTOR shall regularly clean the surface of the filter fabric on the dewatering device and replace as necessary to maintain flow.

B. CONTRACTOR shall remove and replace or otherwise clean the stone cone around the dewatering device as necessary to maintain flow.

3.3.14 Vegetative Stabilization

A. All areas of disturbance related to construction shall be temporarily or permanently stabilized in accordance with the Contract Drawings and Specification Section 32 92 19, Upland Meadow Establishment.

3.4 Erosion and Sediment Control Inspections

A. The CONTRACTOR is responsible for inspecting the erosion and sediment control measures on a regular basis in order to maintain them in good working order and to comply with local, state and federal requirements. The inspection frequency shall be at least weekly and no less than the more restrictive of the requirements of the National Pollutant Discharge Elimination System General Permit for Stormwater Discharge Associated with Construction Activities or the requirements of the local sediment control inspector.

3.5 Removal of Erosion and Sediment Controls

A. Erosion and sediment controls may not be removed until the site is adequately stabilized, approval is received by the sediment control inspector and approval is received from the CONSTRUCTION MANAGEMENT ENGINEER. Upon receiving the necessary approvals, all erosion and sediment control measures are to be removed and any areas of redisturbance are to be permanently stabilized, unless otherwise noted on Contract Drawings.

-- End of Section --

SECTION 32 15 00
AGGREGATE SURFACING

1. GENERAL

1.1 Description

A. The Work covered by this Section consists of the furnishing, installation, protection, maintenance, and surveying of access roads and includes the furnishing of all labor, materials and equipment required.

1.1.1 Related Work Specified Elsewhere

A. Section 31 05 16, Aggregates.

B. Section 31 05 19.13, Geotextiles.

1.2 References

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1.2.1 ASTM International (ASTM)

A. ASTM D1557 (2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3).

1.3 Definitions

A. Not used.

1.4 Qualifications

A. Not used.

1.5 Submittals

A. Material submittals shall be as required in Specification Section 31 05 16, Aggregates.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. Sampling and testing shall meet the requirements of Specification Section 31 05 16, Aggregates.

1.8 Product Delivery, Handling, and Storage

A. Not used.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Crusher Run

A. Crusher run shall meet the requirements of Specification Section 31 05 16, Aggregates.

2.2 Geotextile

A. Geotextile shall meet the requirements of Specification Section 31 05 19.13, Geotextiles.

3. EXECUTION

3.1 General

A. Perform construction when the atmospheric temperature is above 35 degrees Fahrenheit.

B. It is the responsibility of the CONTRACTOR to protect, by approved method or methods, all areas of surfacing that have not been accepted by the CONSTRUCTION MANAGEMENT ENGINEER. Bring surfaces damaged by freeze, rainfall, or other weather conditions to a satisfactory condition.

3.2 Subgrade Preparation

A. Do not place, spread, or compact acceptable fill material while it is frozen or thawing, or place upon muddy, frozen or thawing ground, while the soil underneath is frozen or thawing, or during unfavorable weather conditions. A compacted layer that has been frozen shall be reworked, recompacted, and approved in accordance with the requirements specified herein, after thawing before the next lift is placed thereon.

B. Place geotextile over the prepared subgrade before placing crusher run.

3.3 Layer Thickness

A. Place the aggregate material in two (2) layers of equal thickness. Compact the completed aggregate surface course to the thickness indicated. No individual layer may be thicker than six (6) inches nor be thinner than three (3) inches in compacted thickness. Compact the aggregate surface course to a total thickness that is within one-half (1/2) inch of the thickness indicated. Where the measured thickness is more than one-half (1/2) inch deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than one-half (1/2) inch thicker than indicated, the course will be considered as conforming to the specified thickness requirements. Measure the total thickness of the aggregate surface course at intervals of one measurement for each five hundred (500) square yards of surface course. Measure total thickness using three (3)-inch diameter test holes penetrating the aggregate surface course.

3.4 Compaction

A. Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D698 abbreviated herein as percent laboratory maximum density. Compact each layer of the aggregate surface course with approved compaction equipment, as required in the following paragraphs. Maintain the water content during the compaction procedure at optimum. Compact the mixture with mechanical tampers in locations not accessible to rollers. Continue compaction until each layer through the full depth is compacted to at least ninety (90) percent of laboratory maximum density. Remove any materials that are found to be unsatisfactory and replace them with satisfactory material or rework them to produce a satisfactory material.

3.5 Grade Control

A. During construction, maintain the lines and grades including crown and cross slope indicated on the Contract Drawings.

3.6 Smoothness Test

A. Construct each layer so that the surface shows no deviations in excess of three-eighths (3/8) inch when tested with a ten (10)-foot straightedge applied both parallel with and at right angles to the centerline of the area to be paved. Correct deviations exceeding this amount by removing material, replacing with new material, or reworking existing material and compacting, as directed.

3.7 Quality Control

A. Perform each of the following tests on samples taken from the placed and compacted aggregate surface course. Take samples and test at the rates indicated.

1. Perform density tests on every lift of material placed and at a frequency of one (1) set of tests for every two hundred fifty (250) square yards, or portion thereof, of completed area.

2. Measure the thickness of the aggregate surface course at intervals providing at least one (1) measurement for each five hundred (500) square yards of base course or part thereof. Measure the thickness using test holes, at least three (3) inches in diameter through the aggregate surface course.

3.8 Maintenance

A. Maintain the aggregate surface course in a condition that will meet all specification requirements until accepted.

-- End of Section --

SECTION 32 31 13.16
DOG PLAY AREA CHAIN LINK FENCE ENCLOSURE

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 Summary

A. Section Includes:

1. Chain-link fence enclosure.

B. Related Requirements:

1. Section 03 30 53 "Miscellaneous Cast-in-Place Concrete" for cast-in-place concrete footings.

2. Section 06 10 63 “Exterior Rough Carpentry” for posts.

1.3 Action Submittals

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.
b. Chain-link fabric, reinforcements, and attachments.
c. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, and details.
2. Include hardware and operational clearances.

1.4 Informational Submittals

A. Product Certificates: For each type of chain-link fence and gate.

B. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1.5 Quality Assurance

A. Testing Agency Qualifications: For testing fence grounding; member company of International Electrical Testing Agency (NETA) or a National Recognized Testing Laboratory (NRTL).

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 Field Conditions

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.7 Warranty

A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Performance Requirements

A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

1. Design Wind Load: 139.62 lb.

a. Minimum Post Size: Determine according to ASTM F1043 for post spacing not to exceed 10 feet (3 m) for Material Group IA, ASTM F1043, Schedule 40 steel pipe.

b. Minimum Post Size and Maximum Spacing: Determine according to Chain Link Fence Manufacturer's Institute (CLFMI) Wind Load Guide (WLG) 2445, based on mesh size and pattern specified.

B. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

2.2 Chain-Link Fence Fabric

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on drawings.

2. Steel Wire for Fabric: Wire diameter of 0.148 inch (3.76 mm)].

a. Mesh Size: 2 inches (50 mm).

b. Polymer-Coated Fabric: ASTM F668, Class 2a over zinc coated steel wire.

1) Color: Black, according to ASTM F934.

c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.

3. Selvage: Knuckled at both selvages.

2.3 Fence Framework

A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043based on the following:

1. Fence Height: As indicated on Drawings.

2. Light-Industrial-Strength Material: Group IC-L, round steel pipe, electric-resistance-welded pipe.

a. End, Corner, and Pull Posts: 2.375 inches (60 mm).

3. Horizontal Framework Members: Top and bottom rails according to ASTM F1043.

a. Top Rail: 1.66 inches (42 mm) in diameter.

4. Brace Rails: ASTM F1043.

5. Metallic Coating for Steel Framework:

a. Type A: Not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating according to ASTM A123/A123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating according to ASTM A653/A653M.

6. Polymer coating over metallic coating.

a. Color: Black, according to ASTM F934.

2.4 Tension Wire

A. Polymer-Coated Steel Wire: 0.148-inch- (3.8-mm-) diameter, tension wire according to ASTM F1664, Class 2a over zinc-coated steel wire.

1. Color: Black, according to ASTM F934.

2.5 Swing Gates

A. General: ASTM F900 for gate posts and single swing gate types.

1. Gate Leaf Width: 60 inches (1524 mm).

2. Framework Member Sizes and Strength: Based on gate fabric height of 72 inches (1830 mm) or less.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.

2. Gate Posts: Round tubular steel.

3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Assembled with corner fittings.

D. Hardware:

1. Hinges: 180-degree inward swing.
2. Latch: Permitting operation from both sides of gate.
3. Closer: Manufacturer's standard.

2.6 Fittings

A. Provide fittings according to ASTM F626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top and Bottom Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Tie Wires, Clips, and Fasteners: According to ASTM F626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:

a. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

H. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of zinc.

a. Polymer coating over metallic coating.

2.7 Grout and Anchoring Cement

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

2.8 Grounding Materials

A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.

1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches (16 by 2440 mm).

PART 3 - EXECUTION

3.1 Examination

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by CONSTRUCTION MANAGEMENT ENGINEER.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152 m) or line of sight between stakes. Indicate locations of utilities, landfill gas extraction wells or other surface and underground infrastructure, underground structures, and benchmarks.

3.3 Chain-Link Fence Installation

A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.

1. Install fencing per contract documents.

B. Footer Excavation: Excavate for concrete footers to dimensions and spacings indicated on contract documents.

C. Post Setting: Set wooden posts, predrilled as required, in concrete footers per contract documents at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

   a. Exposed Concrete: Extend 2 inches (50 mm) above grade; shape and smooth to shed water.

   b. Posts Set into Sleeves in Concrete: Use MPBZ post base sleeves preset and anchored into concrete for installing posts. Finish anchorage joint to slope away from post to drain water.

D. Top and Bottom Rails: Secure to posts with fittings.

E. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 3-inch (76-mm) bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension bars. Anchor to framework so fabric remains under tension after pulling force is released.

F. Tension Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches (380 mm) o.c.

G. Tie Wires: Use wire of proper length to firmly secure fabric to rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.

   1. Maximum Spacing: Tie fabric to posts at 12 inches (300 mm) o.c..

H. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.4 Gate Installation

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 Adjusting

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

-- End of Section –

SECTION 32 33 00
SITE FURNISHINGS

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 Summary

A. Section Includes:

1. Sloped chaise lounge chair.
2. Park bench.
3. Trash receptacles.
4. Butterfly box.
5. Magnifying lens post.
6. Stump climb.
7. Balance star.
8. Tic tac toe.
9. Boulder.
10. Tunnel.
11. Teeter Totter.
12. Boulder terrace.
13. Owl nesting box.
14. Disc golf basket target.
15. Disc golf tee post.
16. Disc golf tee box.
17. Shade structure.
18. Weather Station

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for concrete footings.
2. Section 31 05 15 "Earthwork" for excavation for installing concrete footings.
3. Section 01 33 00 “Submittals” for product approval.

1.3 Action Submittals

A. Product Data: For each type of product submit manufacturer’s product data.

B. Shop Drawings: For custom site furnishings, submit shop drawings including plans and elevations indicating dimensions, details of reinforcement, anchorages, and indication of exposed finished surfaces.

C. Samples: For each exposed product and for each color and texture specified.

D. Product Schedule: For site furnishings. Use same designations indicated on Contract Drawings.

1.4 Closeout Submittals

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 Sloped Chaise Lounge Chair

A. Subject to compliance with requirements, provide the following product or approved equivalent:

1. Basis of design product: Streetlife, Rough & Ready Lounger (R&R-LNG-230).

2. Comparable products submitted and approved in accordance with requirements of Section 01 33 00 “Submittals”.

B. Construction:

1. Materials:

a. Seat: Untreated FSC 100% certified Louro Gamela hardwood
b. Support and mounting comb: Hot dip galvanized steel.

2. Dimensions:

a. Overall Seat: 91” x 35” x 18”/46” (l x w x h1/h2)
b. Wood Slats: 35” x 6” x 3” (l x w x depth)
c. Support: 24” x 8” x 10” (l x w x depth)

3. Mounting: Surface mount to concrete footer.

2.2 Park Bench

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials:

a. Seat: Untreated Northern white cedar.
b. Support: Hardwood trunk section.

2. Dimensions:

a. Seat: 90” x 12” x 3” (l x w x h)
b. Support: 33” x 18” (ht x dia.)

3. Mounting: Secure seat to support using 6” hex washerhead stainless steel screw, 2 each side of support, countersink ½” below surface of support.

2.3 Trash Receptacle

A. Subject to compliance with requirements, provide the following product or approved equivalent:

1. Basis of design product: Victor Stanley, Model SD-42.

2. Comparable products submitted and approved in accordance with requirements of Section 01 33 00 “Submittals”.

B. Construction:

1. Materials:

a. Exterior: 3/8” vertical solid steel bars; ¼” x 2 ½” horizontal solid steel bands;
¼” x 2” upper steel support bars, 3/8” x 3” lower steel support bars; 5/8” solid steel top ring; leveling feet with a 3/8” diameter threaded steel shaft. Stainless steel pivot pins for door movement, 3/16” solid steel latch assembly.

b. Liner: 36-gallon capacity high density plastic.

2. Mounting: Surface mount to concrete footer with manufacturer supplied mounting plate.

3. Options: Rain bonnet lid.

4. Color: Gray

5. Finish: Polyester powder-coated.

2.4 Butterfly Box

A. Subject to compliance with requirements, provide the following product or approved equivalent:

1. Basis of design product: Gardener's Supply Company, Butterfly Townhouse Shelter.

2. Comparable products submitted and approved in accordance with requirements of Section 01 33 00 "Submittals".

B. Construction:

1. Materials: Mango wood, painted.

2. Dimensions: 6 ¾" x 25" x 5 ¾" (w x height x depth).

3. Mounting: Galvanized steel post 1 ½" dia., ¼" thick and galvanized steel mounting bracket 8" x 16"; surface mount to concrete footer.

2.5 Magnifying Lens Post

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Western red cedar post.

2. Dimensions: 6" x 6" x 36" (l x w x height)

3. Mounting: Surface mount to concrete footer with 6" x 6" x 3/8" (l x w x depth) galvanized steel mounting bracket.

4. Finish: Untreated.

5. Lens: 4" x 4" magnifying lens, 5 x magnification, inset in 6" x 6" stainless steel plate/post cap.

2.6 Stump Climb

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Hardwood trunk section; 9 stumps per grouping.

2. Dimension range:

    a. Min. 18” x 18” (h x dia.)
    b. Max. 36” x 36” (h x dia.)

2.7 BALANCE STAR

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials:

    a. Beams: Untreated Northern white cedar.
    b. Support: Hardwood trunk section.

2. Dimensions:

    a. Beams: 3” x 6” x 120” (l x w x h)
    b. Support: 33” x 24” (h x dia.)

3. Mounting: Secure beams to support using 6” hex washerhead stainless steel screw, drilled from top surface of support; 2 each support, countersink ½” below surface of support.

2.8 Tic Tac Toe

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Hardwood trunk section.
2. Dimension:

    a. Min. 30” x 18” (h x dia.)

2.9 Boulder

A. Locally sourced landscape boulder.

B. Construction:

1. Dimension Range:

    a. Height: Min. 30”, Max. 48”
    b. Length/Width: Min. 36”, Max. 60”

2. File as needed to remove all sharp exposed edges.

2.10 Tunnel

A. Reinforced concrete cylinder pipe.

B. Construction:

1. Dimension:

a. 48” x 144 “ (dia. x l)

2.11 Teeter Totter

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Untreated Northern white cedar.

2. Dimensions: Varies.

3. Mounting: Surface mount to concrete footer with 6” x 6” x 3/8” (l x w x d) galvanized steel mounting bracket.

2.12 Boulder Terrace

A. Locally sourced landscape boulder.

B. Construction:

1. Dimension Range:

a. Height: 20” Min. 28” Max.
b. Length/Width: Min. 72”, Max. 90”

2. File as needed to remove all sharp exposed edges.

3. Minimal height variation in slope of exposed surface.

2.13 Owl Nesting Box

A. Subject to compliance with requirements, provide the following product or approved equivalent:

1. Basis of design product: Barn Owl Box Company, Barn owl box.

2. Comparable products submitted and approved in accordance with requirements of Section 01 60 00 “Product Requirements”.

B. Construction:

1. Materials: molded plastic, double box

2. Dimensions: 17 ½” x 17 ½” x 27” (w x h x d)

3. Mounting: Galvanized steel post 3” dia. ¼” thick and galvanized steel mounting bracket 8” x 16”; surface mount to concrete footer.

4. Finish: White outer box, brown inner box.

2.14 Disc Golf Basket Target

A. Subject to compliance with requirements, provide the following product or approved equivalent:

1. Basis of design product: DGA Mach 7 permanent disc golf basket.

2. Comparable products submitted and approved in accordance with requirements of Section 01 60 00 “Product Requirements”.

B. Construction:

1. Materials: Hot dip galvanized steel 2” dia. pole, 28 sting chain assembly, and trapper basket.

2. Dimensions: 23” dia. x 48 2 ½” (w x height)

3. Mounting: Surface mount to concrete footer with 8” x 8” x 3/8” (l x w x d) mounting bracket.

4. Finish: Galvanized steel.

5. Options: High visibility vinyl ring.

2.15 Disc Golf Tee Post

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Western red cedar post.

2. Dimensions: 6” x 6” x 36” (l x w x height)

3. Mounting: Surface mount to concrete footer with 6” x 6” x 3/8” (l x w x d) galvanized steel mounting bracket.

4. Finish: Untreated.

2.16 Disc Golf Tee Box

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Untreated northern white cedar.
2. Dimensions: 144”/60” x 6” x 6” (l x w x d)
3. Mounting: Secure with #3 rebar, countersink ½” below surface.
4. Finish: Ground contact pressure treated.
5. Weed Barrier: Polypropylene landscape fabric.

2.17 Shade Structure

A. Custom construction as detailed in contract documents.

B. Construction:

1. Materials: Western red cedar.

2. Dimensions:

   a. Posts 8” x 8” x 144” (l x w x height)

3. Mounting: Surface mount to concrete footer with 8” x 8” x 3/8” (l x w x depth) galvanized steel mounting bracket.

4. Finish: Untreated.

2.18 Weather Station

A. Relocate existing weather station.

B. Construction:

1. Mounting: Surface mount to concrete footer.

2. Anchor: Secure using ground anchors, anchor depth to be coordinated with the CONSTRUCTION MANAGEMENT ENGINEER.

2.19 MATERIALS

Materials used in the construction of the various site items as specified herein shall consist of the following materials or combination of materials as appropriate.

A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A36/A36M.

2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.

3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.

4. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.

B. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.

1. Wood Species:

a. FSC 100% certified Louro Gamela hardwood.
b. Western Red Cedar.
c. Northern White Cedar.
d. Mango.
e. Hardwoods: Oak, Walnut, Maple, Beech.

C. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.

D. Polyethylene: Fabricated from virgin plastic HDPE resin.

E. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality.

F. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M; recommended in writing by manufacturer, for exterior applications.

G. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

H. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
2. Hot-Dip Galvanizing: According to ASTM A123/A123M, ASTM A153/A153M, or ASTM A924/A924M.

2.20 Fabrication

The site items as specified herein shall be fabricated units of one or more of the methods as identified:

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends chamfered or capped as indicated in contract documents.

E. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.21 General Finish Requirements

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.22 Steel and Galvanized-Steel Finishes

A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 Examination

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and installation of gravel access roads have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings. Install in accordance with the details as shown on the CONTRACT DRAWINGS.

D. Post Setting: Refer to contract drawings for additional information on size of mounting brackets.

-- End of Section –

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SECTION 32 92 19
UPLAND MEADOW ESTABLISHMENT

1. GENERAL

1.1 Description

A. This Section includes requirements for seeding and mulching to the limits shown and as required for restoration and restabilization of any and all disturbed areas, and as specified in the Contract Documents and directed by the CONSTRUCTION MANAGEMENT ENGINEER.

1.2 Related Work Specified Elsewhere

A. Section 01 33 00 – Submittals.

B. Section 01 40 00 – Quality Control.

C. Section 31 05 15 – Earthwork.

D. Section 31 25 00 – Erosion and Sediment Control.

1.3 References

A. Maryland Department of the Environment. Maryland Standards and Specifications for Soil Erosion and Sediment Control (2011).

B. Maryland Department of Transportation (MDOT) State Highway Administration (SHA). Standard Specifications for Construction and Materials (2018).

C. Montgomery County Department of Permitting Services, Sediment Control Permit.

1.4 Quality Assurance

A. The Geotechnical Testing Laboratory shall serve as the Quality Control Laboratory and shall meet the qualifications in Specification Section 01 40 00, Quality Control. The CONTRACTOR shall submit soil samples to the Geotechnical Testing Laboratory to confirm acceptable soil conditions exist, as shown in the Contract Documents.

B. Obtain a certification of compliance from seed supplier to assure sufficient seed species percentages in the mixture, purity, germination rate, and maximum weed seed content of the grass seed mixture.

C. Regulatory Requirements: Comply with the Agricultural Article of the Annotated Code of Maryland, Section 15.08.01, Maryland Seed Law; seed shall be certified by

the Maryland Department of Agriculture.

D. Source Quality Control: Each seed species shall be tested by the grower or distributor for purity, germination, and weed seed; and carry tags provided by the grower or distributor that indicate test results.

E. Herbicide Application: All herbicides shall be applied by or under the direct supervision of a Maryland Certified Pesticide Applicator.

1.5 Submittals

A. Submit, in accordance with Specification Section 01 33 00, Submittals, certificates of compliance before delivery of materials for the following items:

1. Seed.
2. Sod.
3. Fertilizer.
4. Lime.
5. Mulch.

B. Manufacturer's and/or source data for topsoil.

C. Certified chemical and mechanical analysis of samples of topsoil, soil mixes, soil amendments and organic compost materials used in making of soil mixes.

D. Landscaper's Qualifications: Company name and individual performing meadow establishment, and a list with references of 3 projects of similar magnitude completed within the last 8 years. Company name and individual performing pesticide applications, including current MD Department of Agriculture Certified Pesticide Applicator Number.

E. Topsoil: Certificate of compliance from a laboratory approved by the CONSTRUCTION MANAGEMENT ENGINEER, stating pH, texture, and percent of organic content.

F. Soil Test Results: Provide soil testing of existing soil identifying pH, fertility, and soil structure.

G. Certificate of compliance from the seed supplier stating percentages of the mixture, purity, germination rate, and maximum weed seed content of the grass seed mixture.

H. Seeding Schedule: Develop a Schedule that provides dates for completing major operations of the Contract, including herbicide application, mowing, tilling / scarifying, and seeding. Submit the written Schedule to the CONSTRUCTION MANAGEMENT ENGINEER at least 14 days before beginning operations for approval.

I. Provide samples and technical data for all other products listed in Part 2 of this Specification section for testing and visual inspection.

J. Integrated Pest Management (IPM) Program: Develop an IPM Program that includes methods of pest monitoring for noxious weed and invasive species control, pesticide selection, application rates, and scheduling. IPM Program shall include monthly inspections to identify and spot spray noxious weed and invasive species. The inspector shall have knowledge and be able to identify 90% of species on the following lists.

1. List of Invasive Species of Concern established by the Maryland Invasive Species Council.

2. List of Maryland Noxious Weeds regulated by the Maryland Department of Agriculture.

Submit the IPM Program prior to commencing seeding operations to the CONSTRUCTION MANAGEMENT ENGINEER for review and approval.

K. Establishment Schedule: The Establishment Schedule shall include dates for Upland Meadow Establishment maintenance operations such as mowing. Submit the Establishment Schedule when seeding operations are completed to the CONSTRUCTION MANAGEMENT ENGINEER for review and approval.

L. Management Plan: Provide a plan for management of the meadow for a minimum of 3 years. Plan should include plans and schedule for watering, annual mowing and invasive management.

1.6 Delivery, Storage, Handling, Protection

A. Deliver the material in packages of uniform weight that do not exceed 75 lb. (34 kg) net weight and bears the name of the manufacturer, the new weight, and supplemental statement of the net weight content.

B. Store seed in a cool, dry place. Do not allow seed to get wet or freeze.

C. Meadow Seed Mixes shall be mixed by the grower or distributer in advance of delivery.

2. MATERIALS

A. Topsoil may be sourced from onsite stockpiled material or brought from offsite and shall meet the requirements of MDOT SHA Section 920.01.02. Topsoil shall only be provided for the permanent improved areas and shall be placed in a 4-inch layer.

B. Topsoil shall be free from foreign material such as hard pan, stones larger than 1-inch

diameter, concrete, cinders, brick asphalt, or other undesirable materials. It shall also be reasonably free from weeds and objectionable plant material.

C. Seed Mix #1: Upland Deer Tolerant Meadow Seed Mix:

1. Basis of Design: Custom Seed Mix by Ernst Conservation Seeds. www.ernstseed.com, or approved equal.

% of Mix	Latin Name	Common Name	Cultivar/ Ecotype
1.3	*Asclepias tuberosa*	Butterfly Milkweed	Any
1.3	*Aster oblongifolius*	Aromatic Aster	PA
1.3	*Aster prenanthoides*	Zig Zag Aster	PA
0.3	*Baptisia tinctoria*	Wild Indigo	PA
4.0	*Chamaecrista fasciculata*	Partridge Pea	PA
4.0	*Coreopsis lanceolata*	Lance Leaf Coreopsis	Any
8.6	*Echinacea purpurea*	Purple Coneflower	Any
20.0	*Elymus virginicus*	Virginia Wildrye	PA
0.3	*Eragrostis spectabilis*	Purple Lovegrass	PA
0.7	*Eupatorium coelestinum*	Mistflower	VA
0.2	*Geum canadense*	White Avens	PA
2.6	*Heliopsis helianthoides*	Ox-Eye Sunflower	PA
0.5	*Liatris spicata*	Spiked Gayfeather	PA or any
1.0	*Liatris squarrosa*	Scaly Blazing Star	VA
0.4	*Monarda fistulosa*	Wild Bergamot	FIG (PA)
0.3	*Monarda punctata*	Dotted Mint	MD or APB
0.3	*Oenothera fruticosa*	Sundrops	PA
19.0	*Panicum anceps*	Beaked Panicgrass	MD
3.0	*Panicum sphaerocarpon*	Roundseeded Panicgrass	PA
0.4	*Penstemon canescens*	Grayhairy Beardtongue	WV
0.7	*Penstemon digitalis*	Tall White Beardtongue	PA
0.4	*Penstemon hirsutus*	Hairy Beardtongue	PA
0.9	*Pycnanthemum tenuifolium*	Narrow Leaved Mountain Mint	PA
0.7	*Rudbeckia fulgida*	Orange Coneflower	VA
4.0	*Rudbeckia hirta*	Black Eyed Susan	PA or any
20.0	*Schizachyrium scoparium*	Little Bluestem	PA or Camper
1.0	*Senna hebecarpa*	Wild Senna	WV
0.6	*Solidago nemoralis*	Gray Goldenrod	PA
0.2	*Solidago odora*	Licorice Scented Goldenrod	PA
1.5	*Tradescantia ohiensis*	Ohio Spiderwort	PA
0.5	*Zizia aurea*	Golden Alexanders	PA
100	*Total*		

2. By seed count this mix has approximately 357,000 seeds/lb and is 28.1% grasses and 71.9% wildflowers.

3. If an item in this mix is not available, add its percentage to a member of the same genera in the mix or to *Schizachyrium scoparium*. Mix shall include no less than 25 individual species.

4. Seeding Rates:

   i. On sites with slope less than 3:1, apply this mix at 10 lbs PLS or 15 bulk lbs/acre along with a cover crop.

   ii. If slope is 3:1, this mix may be applied at 14 lbs PLS or 20 bulk lbs/acre along with a cover crop and possibly an erosion control blanket.

B. Mix #2: Active Areas: Three-Way Tall Fescue Mix

1. Basis of Design: Three-Way Tall Fescue Mix by Ernst Conservation Seeds. www.ernstseed.com, or approved equal.

2. Mix Composition – ERNMX-136

   i. 34.0% Festuca arundinacea, "Firecracker SLS" turf type Tall Fescue
   ii. 33.0% Festuca arundinacea, "Ninja III" Tall Fescue
   iii. 33.0% Festuca arundinacea, "Valkyrie LS" turf type Tall Fescue

3. Seeding Rate: 7=10 lbs/1,000 sf.

C. Mix #3: Upland Deer Tolerant Meadow Seed Mix:

1. To be used where slopes are steeper than 3:1 and as indicated on the plans.

2. Basis of Design: Custom Seed Mix by Ernst Conservation Seeds. www.ernstseed.com, or approved equal.

% of Mix	Latin Name	Common Name	Cultivar/ Ecotype
0.2	*Asclepias tuberosa*	Butterfly Milkweed	Any
0.2	*Aster oblongifolius*	Aromatic Aster	PA
0.2	*Aster prenanthoides*	Zig Zag Aster	PA
1.6	*Chamaecrista fasciculata*	Partridge Pea	PA
1.3	*Coreopsis lanceolata*	Lance Leaf Coreopsis	Any
2.8	*Echinacea purpurea*	Purple Coneflower	Any

% of Mix	Latin Name	Common Name	Cultivar/ Ecotype
22.2	*Elymus virginicus*	Virginia Wildrye	PA
0.1	*Eragrostis spectabilis*	Purple Lovegrass	PA
0.1	*Eupatorium coelestinum*	Mistflower	VA
0.1	*Geum canadense*	White Avens	PA
0.9	*Heliopsis helianthoides*	Ox-Eye Sunflower	PA
0.1	*Liatris spicata*	Spiked Gayfeather	PA or any
0.1	*Liatris squarrosa*	Scaly Blazing Star	VA
0.2	*Monarda fistulosa*	Wild Bergamot	FIG (PA)
0.2	*Monarda punctata*	Dotted Mint	MD or APB
0.1	*Oenothera fruticosa*	Sundrops	PA
31.1	*Panicum anceps*	Beaked Panicgrass	MD
4.4	*Panicum sphaerocarpon*	Roundseeded Panicgrass	PA
0.1	*Penstemon canescens*	Grayhairy Beardtongue	WV
0.2	*Penstemon digitalis*	Tall White Beardtongue	PA
0.1	*Penstemon hirsutus*	Hairy Beardtongue	PA
0.2	*Pycnanthemum tenuifolium*	Narrow Leaved Mountain Mint	PA
0.1	*Rudbeckia fulgida*	Orange Coneflower	VA
1.3	*Rudbeckia hirta*	Black Eyed Susan	PA or any
31.1	*Schizachyrium scoparium*	Little Bluestem	PA or Camper
0.4	*Senna hebecarpa*	Wild Senna	WV
0.1	*Solidago nemoralis*	Gray Goldenrod	PA
0.1	*Solidago odora*	Licorice Scented Goldenrod	PA
0.3	*Tradescantia ohiensis*	Ohio Spiderwort	PA
0.1	*Zizia aurea*	Golden Alexanders	PA
100	*Total*		

3. By seed count this mix has approximately 234,000 seeds/lb and is 63.7% grasses and 36.3% wildflowers.

4. If an item in this mix is not available, add its percentage to a member of the same genera in the mix or to *Schizachyrium scoparium*. Mix shall include no less than 25 individual species.

5. If an item in this mix is not available, add its percentage to a member of the same genera in the mix or to *Schizachyrium scoparium*. Mix shall include no less than 25 individual species.

6. Seeding Rates:

    i. On sites with slope that are slightly greater than 3H:1V, apply this mix at 45 bulk lbs/acre along with a cover crop and an erosion control blanket.

D. Cover Crops:

1. Seed a cover crop of grain crops, at the time of seeding, based on the following recommendations:

   i. Grain oats (1 Jan to 30 Apr; 30 lbs/acre)
   ii. Brown top millet (1 May to 31 Aug; 10 lbs/acre)
   iii. Grain rye (1 Sept to 31 Dec; 30 lbs/acre)

E. Mulch:

1. Mulch and mulch anchoring for protection of temporary and permanent seeding shall be in accordance with Contract Documents.

2. Mulch application rates shall be in accordance with Contract Documents.

3. In locations where soil stabilization matting is used, no mulch is required to protect temporary or permanent seeding. Refer to Specification Section 31 25 00, Erosion and Sediment Control.

4. Straw Mulch: For areas where erosion control blankets are not used, provide straw mulch that consists of thoroughly threshed cereal grains that is free of mold, foreign substances, or noxious weeds and weed seeds.

5. Erosion Control Blankets: For Mix #3 provide a 100% biodegradable woven bristle coir stabilization matting with 48% open area.

F. Fertilizer:

1. The CONTRACTOR shall submit soil samples to the Geotechnical Testing Laboratory or an approved soils testing laboratory for recommended adjustments to fertilizer and lime application rates shown on Contract Drawings. Recommendations shall be submitted to and approved by the CONSTRUCTION MANAGEMENT ENGINEER before implementation.

2. Fertilizer shall be uniform in composition, free-flowing, and delivered to the site fully labeled according to applicable state fertilizer laws and shall bear the name, trade name or trademark, and warranty of the producer. Fertilizer shall be in accordance with Contract Documents.

G. Water: Use only potable water from fresh water sources, free of injurious chemicals and other toxic substances harmful to plant life.

3. EXECUTION

3.1 Temporary and Permanent Seeding

A. Temporary and permanent seeding shall be installed as shown on the Contract Drawings.

3.2 Time Restrictions

A. When permanent seeding is specified or directed but seeding is not allowed because of specified time restrictions, utilize one or more of the following methods to prevent erosion and sedimentation until such time as permanent seeding or sodding is allowed:

1. Place and anchor straw mulch or wood chips.

2. Prepare soil as for permanent seeding and then mulch as specified; overseed during the next seasonal seeding period.

3. Provide other erosion control measures acceptable to the CONSTRUCTION MANAGEMENT ENGINEER.

B. Perform seeding when the temperature is above 32° F and the soil is not frozen. Spring planting shall be between the dates of February 15th through June 15th; fall planting shall be between the dates of September 1st through November 30th.

3.3 Preparation

A. Mark areas to be seeded and obtain approval from the CONSTRUCTION MANAGEMENT ENGINEER before applying herbicide, mowing, or beginning seeding operations.

B. Treatment of Invasives: After a period of approximately 3 months of the growing season, during which time growth is approximately 6 inches in height, apply a non-selective herbicide to eliminate undesirable vegetation.

Treatments shall occur when air temperatures are above 65°F and on a windless day. Ensure herbicides are nontoxic for aquatic environments, spraying shall not occur within 25 feet of any waterway. Use caution to avoid off-target drift when applying herbicides adjacent to vegetation to remain.

Apply a glyphosate product @ 2% with wetting agent and dye in conformance with the IPM Program a minimum of 10 days before seeding as follows:

MATERIAL	RATE PER ACRE
Glyphosate Herbicide	5 lb. of active ingredient
Marking Dye	6 to 15 oz.
Water	To 50 gallon

Follow with a second application one month later to address skips or persistent species.

C. Debris Removal: Any and all debris encountered shall be removed, including rocks greater than 1-inch diameter and residual plant biomass, and hauled away by the CONTRACTOR.

3.4 Application

A. Broadcast Seeding: In areas where Upland Meadow Establishment and Forest Plantings areas overlap, use a broadcast seed method. Mix the cover crop seeds and upland meadow seeds, at the rates specified. Spread seed mixture evenly over the prepared site using a broadcast spreader.

B. Drill Seeding: In areas where Upland Meadow Establishment is located in an open field, use a drill seed method. Mix the cover crop seeds and upland meadow seeds, at the rates specified. Spread seed mixture evenly over the prepared site using a Seed Drill with Rake.

C. Seeding on Steep Slopes: Run machinery perpendicular to the slope.

D. Firm the Soil: In order to achieve a good seed-to-soil contact, firm the soil using a roller to press seeds into the soil. Seeds shall be planted no deeper than ¼ inch. Perform seed establishment to the lines, grades, and limits shown on the contract documents.

E. Mulch: Spread a ½ inch layer of straw mulch over the area of meadow immediately after seeding. If using a mulch blower, ensure material is in an air-dry condition. Mulch shall be secured using a tackifier.

F. Erosion Control Blanket: Where specified install an erosion control blanket immediately after seeding.

1. Unroll in the direction of the flow of water. Lay matting smoothly in firm, uniform contact with the soil surface, without stretching or tenting. Overlap with the upslope portion on top. Overlap at least 2-inches and ends at least 6”.

2. Secure matting with a U-shaped staple, 8-inches in length, driven perpendicular to the soil grade and flush with the surface of the matting.

3. Placement of staples per the follow table:

Area of Matting	Maximum Distance Between Fasteners
Uppermost or Leading Edge of Matting	6-inch
Overlapping Edges of Matting	18-inch
Lowermost or Toe-Edge of Matting	18-inch

G. Stabilization: Same day stabilization is required including seed application and straw mulch for all scarified areas.

H. Watering: Gently apply water over the surface of erosion control blanket or straw mulch to wet the soil at least 2" depth. Apply water weekly for the first two months.

3.5 Acceptance

A. Seed Phase Acceptance: Submit a request for Seeding Phase Acceptance when operations are completed and provide the Establishment Phase Schedule. The CONSTRUCTION MANAGEMENT ENGINEER shall perform an inspection to verify completion and provide Seeding Phase Acceptance if all requirements have been met.

3.6 Maintenance

A. Establishment Phase: The Establishment Phase begins upon Seed Phase Acceptance. Areas of seeding shall be maintained for a period of 12 months after Seed Phase Acceptance and accepted in writing by the CONTRACT MANAGEMENT ENGINEER.

B. Mowing:

1. During the first growing season, when the meadow vegetation reaches a height of 18 inches – 24 inches, approximately every 6 weeks, use a mower to trim the meadow to a height of 8 inches. Mowing shall cease by mid-September.

2. Annually, prior to new spring growth, trim any material standing from the previous year to approximately 2 inches.

3. During the second growing season, if the meadow has a heavy presence of Ragweed or Foxtail, trim the meadow to a height of 8 inches. Mowing shall cease by mid-September.

C. Weed Control: Implement weed control in accordance with the IPM Program.

D. Inspections:

1. Conduct inspections for invasive species with the CONSTRUCTION MANAGEMENT ENGINEER on or about July 15.

2. CONTRACTOR shall inspect seeded areas for failures in need of repairs due to poor vegetative growth, traffic or equipment damage, weather damage, or erosion.

E. Watering: Water weekly the first two months and throughout the first growing season during droughts when rain has not occurred over a 10-day period, or as necessary to maintain adequate moisture in the upper 4 inches of soil.

F. Repairs and Reseeding:

1. Provide repairs or reseeding during specified planting seasons for areas where they are deemed necessary by the CONSTRUCTION MANAGEMENT ENGINEER at no additional cost to the OWNER.

2. Reseed using the broadcast seeding method.

3. If a stand of turf is inadequate as determined by the CONSTRUCTION MANAGEMENT ENGINEER, overseed and fertilize using half of the rates originally applied. If the stand is over 60% damaged, as determined by the CONSTRUCTION MANAGEMENT ENGINEER, perform seed bed preparation and follow installation seeding recommendations. This shall continue until a satisfactory stand of vegetation has been established and accepted by the CONSTRUCTION MANAGEMENT ENGINEER.

G. Final Acceptance: At completion of the 1-year maintenance period, the CONSTRUCTION MANAGEMENT ENGINEER will conduct an inspection to determine if satisfactory coverage has been achieved. Satisfactory coverage is defined as follows:

1. for Upland Meadow Seed: at least 95% total vegetation cover shall be achieved. Meadow will only be accepted when there are less than 15% coverage by invasive species.

2. For Turfgrass Seed: At least 95% vegetation cover shall be achieved. No bare spots larger than 3 square feet. Not more than 10% of total area with bare spots larger than 1 square foot.

H. As-Built Survey:

1. Survey as specified in Specification Section 01 70 00, Execution and Closeout Requirements.

-- End of Section --

SECTION 32 93 00
PLANTS

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. Section 31 05 15 Earthwork

1.2 Summary

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Tree-watering devices.

1.3 References

A. Standards: Comply with applicable recommendations of the following:

1. "Standardized Plant Names", American Joint Committee on Horticultural Nomenclature.

2. American Standard for Nursery Stock", American Association of Nurserymen (ANSI 260.1)

1.4 Definitions

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not

less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

G. Finish Grade: Elevation of finished surface of planting soil.

H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

J. Planting Area: Areas to be planted.

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 31 05 15 "Earthwork" for topsoil.

L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

O. Subsoil: The surface or elevation of soil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.5 Coordination

A. Coordination with Turf and Meadow Areas: Plant trees, shrubs, and other plants after finish grades are established and before planting turf or meadow areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.6 Preinstallation Meetings

A. Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

1. Preinstallation Conference: Conduct conference at Project site. Schedules for planting, requested substitutions, planting methods and site inspections will be reviewed.

1.7 Action Submittals

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

B. Samples for Verification: For each of the following:

1. Mulch: 1-quart (1-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

1.8 Informational Submittals

A. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.

2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

B. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

C. Slow-Release, Tree-Watering Device: Manufacturer and product information.

D. Planting Schedule: Submit planting schedule for installation of material including invasive management.

E. Deer Protection Fence: Manufacturer and product information.

1.9 Closeout Submittals

A. Maintenance Data: Recommended procedures to be established by OWNER for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.10 Quality Assurance

A. Installer Qualifications: A qualified landscape installer with no less than 5 years documented experience for installation resulting in successful establishment of work similar to requirements of this project.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

2. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.

D. Plant Material Observation: CONSTRUCTION MANAGEMENT ENGINEER may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. CONSTRUCTION MANAGEMENT ENGINEER may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify CONSTRUCTION MANAGEMENT ENGINEER of sources of planting materials seven days in advance of delivery to site.

2. CONSTRUCTION MANAGEMENT ENGINEER or his representative may view plants at their place of growth or upon delivery.

1.11 Delivery, Storage, and Handling

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

H. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

I. Plants damaged in transit, storage or handling may be rejected at the sole discretion of the CONSTRUCTION MANAGEMENT ENGINEER. CONTRACTOR shall note that consideration for plant material damage may not be life threatening, but rather cosmetic such as broken branches or scratched trunks, to qualify plant for rejection.

1.12 Field Conditions

A. Field Measurements: Verify actual grade elevations, service and utility locations, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.13 Plant Seasons

A. B&B, deciduous trees and shrub materials:

1. May be installed between October 15 until April 15.

2. Lowest Risk:

a. Deciduous plants dug and planted while dormant in spring or fall except those listed below.

b. Deciduous plants dug during dormancy and planted after producing leaves providing they have been properly stored.

c. Deciduous plants dug after leaves have fully expanded and harden off.

3. Highest Risk:

a. Deciduous plants dug in the spring during newly expanding leaf production.

B. Evergreen B&B material:

1. Freshly dug evergreen material should not be moved without proper conditioning during active growth.

C. Perennials:

1. May be installed as soon as the ground is workable in Spring after March 15 until June 15 and September 15 until November 15.

D. Excluded Material:

1. The following trees may not be installed between November 15 and March 1: White oak (Quercus alba), Scarlet Oak (Quercus coccinea), Red Oak (Quercus rubra), Willow Oak (Quercus phellos), Flowering Dogwood Varieties (Cornus florida), Sweet Gum (Liquidambar styraciflua) and all conifers with the exception of White Pines (Pinus strobus).

E. Out of season plant installation:

1. Planting outside of the planting time stated in this Article shall be considered to be out of season plant installation.

2. Generally, out of season plant installation shall not be allowed.

3. Variance in planting seasons will only be permitted when authorized in advance by the OWNER and CONSTRUCTION MANAGEMENT ENGINEER in response to CONTRACTOR's request. The CONTRACTOR shall not permit any out of season plant installation without this authorization.

4. If out of season plant installation is requested, the CONTRACTOR shall provide in writing a list of plant species to the CONSTRUCTION MANAGEMENT ENGINEER or OWNER.

a. No plants shall be stored on site or installed outside of established plant seasons without the written consent of the CONSTRUCTION MANAGEMENT ENGINEER.

5. The warranty for out of season plant installation shall be extended one calendar year to compensate for the variance.

1.14 Warranty

A. Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

B. Any delay in completion of planting operations which extends the planting into more than one planting season shall extend the Warranty period correspondingly.

C. CONTRACTOR shall provide written warranty certificates to the CONSTRUCTION MANAGEMENT ENGINEER.

D. Warranty Provisions:

1. Failures include, but are not limited to, the following:

   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by OWNER.

   b. Structural failures including plantings falling or blowing over.

   c. Faulty performance of tree stabilization.

2. Warranty Periods: From date of Installation Acceptance.

   a. Trees and Shrubs: 12 months.
   b. Perennials and Ornamental Grasses: 12 months.

3. Include the following remedial actions as a minimum:

   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

   c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.

   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 Plant Material

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to CONSTRUCTION MANAGEMENT ENGINEER, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

F. Perennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 Fertilizers

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 5-gram tablets.

2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 Mulches

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees, shrubs, and planting beds consisting of one of the following:

1. Type: Shredded hardwood.

2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.

3. Color: Natural.

4. Depth: Apply 3-inch average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems or trunk.

2.4 Pesticides

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 Tree-Stabilization Materials

A. No tree staking to occur in areas covered by the geosynthetic liner landfill cap.

B. Retain this article if tree stabilization is required; coordinate with details on Drawings. See Evaluations for discussion of advantages and disadvantages of stabilization methods.

C. Retain "Trunk-Stabilization Materials" Paragraph below for tree-trunk stabilization (staking and guying). Compression springs provide more line flexibility than turnbuckles.

D. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end. Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Use the number of stakes as follows:

    a. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper. Space stakes equally around trees.

    b. All trees greater than 3” caliper and all trees in the planters should be guyed to supports mounted into the rock curb.

    c. Attach flags to each guy wire, 30 inches above finish grade.

2. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.

3. Guy Cable: 5-strand, 3/16-inch-diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

4. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect tree trunks from damage.

5. Flags: Standard surveyor's plastic flagging tape, white, 6-inches long.

2.6 Tree-Watering Devices

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

1. Color: dark chocolate green or tan.

2.7 Miscellaneous Products

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Burlap: Non-synthetic, biodegradable.

2.8 Planting Soil

A. Meet the requirements of topsoil in 32 05 15 – Earthwork.

PART 3 - PRODUCTS

3.1 Examination

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.

3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by CONSTRUCTION MANAGEMENT ENGINEER and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Contact 'MISS UTILITY' at 800-257-7777 (72) hours prior to digging. CONTRACTOR shall take sole responsibility for any cost incurred due to damage due to these utilities.

E. Do not willfully proceed with planting as designed when it is obvious that conditions and/or obstructions exist due to changes in site conditions. Such conditions shall be brought to the immediate attention of the CONSTRUCTION MANAGEMENT ENGINEER. The CONTRACTOR will be held responsible for all necessary revisions due to failure to give such notification so that material can be relocated or conditions corrected prior to plant installations.

F. Remove any existing plant material necessary for the installation and the completion of the planting designed and contracted as part of this project.

3.2 Preparation

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf and meadow areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake or flag locations, outline areas, adjust locations when requested, and obtain CONSTRUCTION MANAGEMENT ENGINEER's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by the CONSTRUCTION MANAGEMENT ENGINEER. Stake or flag locations of individual trees and shrubs and outline areas for multiple plantings. Do not install plants until the CONSTRUCTION MANAGEMENT ENGINEER has approved the locations.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting

3.3 Excavation For Trees And Shrubs

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

2. Excavate approximately three times as wide as ball diameter for plant stock.

3. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subsoils of adjacent paving, structures, hardscapes, or other new or existing improvements.

7. Maintain supervision of excavations during working hours.

8. Keep excavations covered or otherwise protected overnight and when unattended by Installer's personnel.

B. Obstructions: Notify CONSTRUCTION MANAGEMENT ENGINEER if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

C. Drainage: Notify CONSTRUCTION MANAGEMENT ENGINEER if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

D. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.4 Tree and Shrub Planting

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Vegetative support soil according to Section 31 05 15 "Earthwork." For trees, use excavated soil for backfill.

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

   a. Quantity: Two per plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Vegetative support soil according to Section 31 05 15 "Earthwork." For trees, use excavated soil for backfill.

2. Carefully remove root ball from container without damaging root ball or plant.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly

before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

   a. Quantity: Two per plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Vegetative support soil according to Section 31 05 15 "Earthwork." For trees, use excavated soil for backfill.

2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

   a. Quantity: Two per plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.5 Tree and Shrub Pruning

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees and shrubs as directed by CONSTRUCTION MANAGEMENT ENGINEER.

C. Prune, thin, and shape trees and shrubs according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by CONSTRUCTION MANAGEMENT ENGINEER, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.6 Tree Stabilization

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1830 mm) above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. Upright Staking and Tying: Stake trees with two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.

3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.7 Perennial Planting

A. Set out and space ground cover and plants other than trees and shrubs as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 Planting Area Mulching

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees in Turf or Meadow Areas: Apply organic mulch ring of 3-inch (75-mm) average thickness, with 36-inch (900-mm) radius around trunks or stems. Do not place mulch within 3 inches (75 mm) of trunks or stems.

2. Organic Mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.9 Edging Installation

A. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch- (100- to 150-mm-) deep, shovel-cut edge.

3.10 Installing Slow-Release Watering Device

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.11 Installing Deer Protection Fence

A. Provide one device for each tree and shrub.

B. Install device according to manufacturer's written instructions.

3.12 Plant Maintenance

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include

physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.13 Pesticide Application

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with OWNER's operations and others in proximity to the Work. Notify OWNER before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.14 Repair and Replacement

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by CONSTRUCTION MANAGEMENT ENGINEER.

1. Submit details of proposed pruning and repairs.

2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.

3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by CONSTRUCTION MANAGEMENT ENGINEER.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that CONSTRUCTION MANAGEMENT ENGINEER determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree.

2. Species of Replacement Trees: Species selected by CONSTRUCTION MANAGEMENT ENGINEER.

C. The CONTRACTOR shall request an inspection by the CONSTRUCTION MANAGEMENT ENGINEER for tree and shrub plantings at the end of the 1 year maintenance period. For any replacement plants required, a re-inspection will occur at the end of the growing season following replanting. If additional corrections are required an additional maintenance period and subsequent inspection will be required.

D. The CONTRACTOR shall request an inspection by the CONSTRUCTION MANAGEMENT ENGINEER for perennial plantings at the end of the 6 month maintenance period. For any replacement plants required, a re-inspection will occur 6 months after installation. If additional corrections are required an additional maintenance period and subsequent inspection will be required.

3.15 Cleaning and Protection

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off OWNER's property.

C. Protect plants from damage due to landscape operations and operations of other CONTRACTORs and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Installation Acceptance, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.16 Establishment Phase

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 12 months from date of Installation Acceptance.

B. Maintenance Service for Perennial Plants: Provide maintenance by skilled employees of landscape installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: Six months from date of Installation Acceptance.

- End of Section --

SECTION 33 31 00
STORMWATER PIPING AND APPURTENANCES

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. This Section includes requirements for supply, delivery, installation and testing of stormwater piping materials, manholes, inlets, box culverts, and appurtenances as specified in the Contract Documents. Materials noted in this Section shall be installed as shown on the Contract Drawings and as noted in Table 33 31 00-1 below.

TABLE 33 31 00-1
Location of Specified Materials

Specified Material	Location/Description
6-inch HDPE Piping	Northwest Slope Discharge Facility
Concrete Pipe	Storm Drains
Manholes	Storm Drains
Inlets	Storm Drains
Box Culverts	Swales at Road Crossings

B. The Work includes furnishing all materials, supplies, supervision, equipment, and construction machinery that may be necessary to construct the project as described in these Specifications.

1.1.2 Related Work Specified Elsewhere

A. Section 01 33 00, Submittals.

B. Section 01 70 00, Execution and Closeout Requirements.

C. Section 31 05 15, Earthwork.

D. Section 31 05 16, Aggregates.

E. Section 31 05 19.16, Geomembrane.

1.2 References

1.2.1 American Association of State Highway and Transportation Officials (AASHTO)

A. AASHTO M154 (2012) Standard Specification for Air-Entraining Admixtures for Concrete.

B. AASHTO M 198 (2010) Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

1.2.2 ASTM International

A. ASTM C 443 (2020) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

B. ASTM C 76 (2019b) Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

C. ASTM C857 (2019) Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

D. ASTM C890 (2019) Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

1.3 Definitions

A. Not used.

1.4 Qualifications

A. All manufacturers of precast concrete utility structures shall possess a current certification from the National Precast Concrete Association (NPCA).

1.5 Submittals

1.5.1 Certificate of Compliance

A. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER Certificates of Compliance before delivery of materials covered under this Section. Certificates shall include a copy of the manufacturer's certified test reports; job location; the CONTRACTOR'S name; types, classes, and strengths of pipe; and the pipe manufacturer's name.

B. Materials shall not be delivered to the site until approved by the CONSTRUCTION MANAGEMENT ENGINEER.

C. Precast concrete manufacturer's current certification from NPCA.

1.5.2 Certified Test Reports

A. Certified test reports within the requirements of standards and testing methods specified herein shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER for approval prior to material delivery. The pipe manufacturer and

CONTRACTOR must satisfy the CONSTRUCTION MANAGEMENT ENGINEER that the material offered to be furnished and installed will meet the requirements set forth in these Specifications. The CONTRACTOR shall transmit to the CONSTRUCTION MANAGEMENT ENGINEER all information provided by the manufacturer or supplier prior to approval for delivery of any such material.

1.5.3 Packing List

A. A packing list or invoice shall accompany every shipment and shall contain the following information: CONTRACTOR'S name, kind and class of pipe, length, and other pertinent information.

1.5.4 Installation and Repair Recommendations

A. The CONTRACTOR shall submit to the CONSTRUCTION MANAGEMENT ENGINEER the manufacturer's recommended installation and repair procedures for pipe, pipe connections, and structures.

1.6 Safety

A. Not used.

1.7 Quality Assurance

A. HDPE pipe—HDPE pipe shall be tested prior to shipment to ensure that the physical properties are in accordance with this Specification. Copies of the manufacturer's quality assurance testing shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER.

B. Concrete pipe—Concrete pipe shall be tested prior to shipment to ensure that the physical properties are in accordance with this Specification. Copies of the manufacturer's quality assurance testing shall be submitted to the CONSTRUCTION MANAGEMENT ENGINEER.

C. Precast concrete structure—Any precast concrete sections which are not in compliance with the required dimensions; which are not true, square, plumb, symmetrical; which have honeycombing; cracks; chips; which do not have smooth surfaces; or otherwise have visible material defects shall be rejected and removed from the project site. Rejected materials may not be repaired but shall be replaced with new products. Cosmetic defects, if in the opinion of the CONSTRUCTION MANAGEMENT ENGINEER, will not affect the integrity, longevity, and water tightness of the structure, may be allowed if approved in writing.

1.8 Delivery, Handling, and Storage

A. Delivery of pipe and related materials shall be coordinated with installation of the materials. Materials shall be unloaded with proper equipment and shall be properly wedged secure. They shall be stored outside of traffic and work areas in a reasonably level, well-drained area away from brush and poison oak or ivy. Individual pieces or bundles shall be stored with safe walking space and clearance between them to allow full view for inspection. Other materials shall not be placed over or against the stored pipe. Pipe shall be stored on a flat surface so that the barrel of the pipe is evenly supported and not piled more than 4 feet high. Bundles and containers shall not be stacked on one another.

B. Pipe, fittings, and appurtenances shall be unloaded and handled with crane, backhoe, or other equipment of adequate capacity with an appropriate sling to protect the materials from damage. Materials shall be handled in a manner that ensures delivery to installation location in sound, undamaged conditions. Pipe shall be carried to placement location, not dragged.

C. If damage occurs and is deemed repairable, it shall be repaired as directed by the CONSTRUCTION MANAGEMENT ENGINEER in accordance with approved manufacturer's recommendations. If damage is not repairable in the opinion of the CONSTRUCTION MANAGEMENT ENGINEER, such items will be rejected and shall be removed and replaced at the CONTRACTOR'S expense.

D. No precast unit shall be shipped less than 7 days from the date of manufacture, unless the unit has been tested and is shown to be in full compliance with the Contract Documents. Date of manufacture shall be stamped on each concrete unit.

E. Precast sections shall be transported and handled with proper equipment to protect the elements from damage. Sections shall be handled by means of lifting inserts embedded in the concrete. Damaged sections shall be replaced new unused materials.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 Pipe and Fittings

A. Pipe between structures or between structure and terminus shall be of the same size and material and shall be furnished by the same manufacturer. Each pipe length and fitting shall be clearly marked with the manufacturer's name or trademark, specification designation, and pipe class.

2.2 Smooth HDPE Piping

A. HDPE pipe for the Northwest Slope Discharge Facility shall be the diameter size(s) shown on the Contract Drawings. Wall thickness classification SDR-17 HDPE pipe material shall, at a minimum, conform to the requirements of ASTM 3350, PE 3408, AWWA 906, Cell Classification, 345464C. Pipe shall be DriscoPipe 4100 or approved equal.

B. If required, HDPE pipe shall be butt-welded to provide a watertight joint. All welding will be performed by a trained individual according to the pipe manufacturer's recommendations.

2.3 Concrete Pipe

A. Concrete pipe for culvert improvements shall be of the sizes indicated on the Contract Drawings.

B. Concrete pipe shall be manufactured in accordance with and conforming to ASTM C 76, Class IV.

Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Gaskets shall have not more than one factory-fabricated splice.

C. Watertight joints shall be tested and shall meet test requirements of Paragraph 3.6.3 of this Specification. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C 443. Certified copies of test results shall be delivered to the OWNER before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.4 Precast Concrete Structures

A. Structural design for precast units shall be prepared by a Maryland-Registered Professional Engineer for the precast concrete manufacturer. Units shall be designed for HS 20 load designation or 300 pounds per square foot live load, whichever is more critical for determining the concrete and steel stresses. Distribution of earth loading and live load shall be in accordance with ASTM C 857 or ASTM C 890.

B. Walls shall be designed using an equivalent fluid pressure of 83 pounds per cubic foot and a 2--foot surcharge. The units shall also be designed to resist all stresses encountered during casting, handling, and erection.

C. The precast units shall be factory cast. Job site casting will not be permitted. Concrete in the precast elements shall be continuously placed to prevent formation of seams.

The finished units shall be free of voids and cracks. Exposed corners and edges shall be beveled. All inserts shall be securely attached or embedded in their proper location.

D. Concrete strength of all precast units at 28 days shall be 4,000 psi minimum, unless otherwise specified. It shall be the precast unit manufacturer's responsibility to ensure that the specified concrete strength is maintained throughout production of the units. Mix design shall be those previously used by the manufacturer which has proven satisfactory for casting units similar to those specified and producing required strength. All precast concrete shall be air entrained in accordance with AASHTO M154. Admixtures containing calcium chloride shall not be used.

E. Vault wall sleeves or gaskets for piping, sumps, steps, access hatches, and other inserts as shown on the Contract Documents shall be cast into the structure or inserted at the place of manufacturer.

F. Precast concrete utility vault bases, risers, and top slabs shall met the material and manufacturing requirements of ASTM C857 and C85, except the minimum 28-day compressive strength of the concrete shall be 4,000 psi. Joints shall meet the requirements of ASTM C443, shall be self-centering, and shall form a tight joint free from water leakage and seepage.

G. Each section of the vault shall be clearly marked on the inside with the following:

1. ASTM designation.
2. Vault Size.
3. Date of Manufacturer.
4. Name or Trademark of Manufacturer.

H. Joints shall be sealed with manufacturer-supplied gaskets or mastic sealing compound which meets the recommendation of the manufacturer. Joints shall provide a waterproof joint free from water leakage or seepage.

I. Steps shall be in accordance with Montgomery County DOT Standard Detail MC-520.01.

J. Pipe bedding shall be Granular Fill in accordance with Specification Section 31 05 16, Aggregates.

K. Pipe penetrations for pipe openings shall be cast into the precast sections.

1. A banded-boot type rubber gasket shall be provided for a vertical pipeline alignments greater than 18% slope.

2. A compression type rubber gasket shall be provided for a vertical pipeline alignment less than 18% slope.

3. A mechanically compressed rubberized gasket shall be used for cored openings.

3. EXECUTION

3.1 Installation of Pipe

3.1.1 Excavation

A. Excavate trenches to the width and depth dimensions as indicated on the Contract Drawings. Provide uniform, continuous support for pipe or structure on required pipe bedding. In general, the trench bottom shall be excavated to conform with the shape and dimensions of the proposed pipe or structure. If the shape of the trench cannot be preserved or the trench varies from the shape of the structure, the space between the desired trench dimensions and the bottom of the excavation, as made, shall be filled with Granular Fill. Allowance shall be made for the placement of pipe bedding, where specified. Damage caused to existing facilities by the CONTRACTOR'S operations shall be repaired or replaced at no additional expense to the OWNER.

B. Unless otherwise authorized by the CONSTRUCTION MANAGEMENT ENGINEER, trench excavation shall proceed no more than 50 feet in advance of the placement and compaction of backfill materials. The CONSTRUCTION MANAGEMENT ENGINEER may require backfilling and subsequent re-excavation on trenches left open for an unreasonable amount of time in advance of pipe installation at no additional expense to the OWNER. Trenches left open overnight, or during periods when the CONTRACTOR'S forces are not present, shall be so protected or enclosed and marked so as to cause no danger to the public or others.

C. Sides of trenches adjacent to other utilities or structures shall be practically plumb. Where permitted by the CONSTRUCTION MANAGEMENT ENGINEER, sides of trenches in other areas may be sloped from a point 1 foot above the top of the pipe to grade. Such slopes shall be at no additional cost to the OWNER. Slopes shall be cut so as not to allow displacement of material or present a danger to personnel. Sides of trenches from a point 1 foot above the top of the pipe to the bottom of the trench shall be practically plumb. Pipe bell holes shall be excavated in the bottom of the trench wherever necessary to permit the proper assembling of joints.

D. Before pipe installation, excavate sufficient trench in advance so that reasonable changes in line and grade can be made where the location of existing structures vary from that shown on Contract Drawings, and to assure that no unforeseeable obstructions exist. Work required by failure to take such precautions shall be performed at no additional cost to the OWNER.

E. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in pipe strength or special installation procedures will be

necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the CONTRACTOR without additional cost to the OWNER.

F. The pipeline trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joint shall be made under water.

G. No pipe shall be laid upon a foundation into which frost has penetrated, or at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the pipe has been installed.

H. Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the CONSTRUCTION MANAGEMENT ENGINEER, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with Granular Fill, in accordance with Specification Section 31 05 16, Aggregates. When removal of unstable material is due to the fault or neglect of the CONTRACTOR while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the OWNER.

3.1.2 Bedding

A. Pipe bedding shall be Granular Fill in accordance with the Contract Drawings and Specification Section 31 05 16, Aggregates. Provide bell holes at each joint to permit proper joint assembly and firm bedding for the entire length of the pipe barrel. Each pipe shall be bedded on a solid foundation acceptable to the CONSTRUCTION MANAGEMENT ENGINEER and in accordance with the Contract Documents.

3.1.3 Placement

A. Prior to pipe installation, bring bedding material to grade along the entire length of pipe trench to be installed. Excavate bell hole as required. Install pipe to a true uniform line and grade as indicated with continuous bearing of the barrel on the bedding material. Install pipe upgrade with the bell or groove pointing upstream. Place each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to prevent sudden offsets in the flow line.

B. Foreign matter shall be removed from each pipe, fitting, and appurtenance before placement in the trench. Should foreign matter be observed in previously installed pipe, fittings, or appurtenances, work shall cease until foreign matter is removed.

C. Pipe shall be carefully handled and lowered into the trench. Pipe shall be installed with special care to ensure that each joint is watertight, has met the required manufacturer’s insertion depth, and has no shoulder or unevenness of any kind along the inside of the pipeline. No wedging or blocking will be permitted in installing any

pipe unless directed by written order or permission in writing from the CONSTRUCTION MANAGEMENT ENGINEER.

D. The pipes shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work. Open ends of pipes and fittings shall be closed with a watertight cap or plug when work is not proceeding.

E. Place sufficient backfill on each section of installed pipe to hold it firmly in place.

F. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Care shall be used to assure water tightness and prevent damage to, or disturbing of, the joints during the refilling process. After pipes have been installed and joints have been made, there shall be no walking on or working over the pipe, except as may be necessary in tamping the backfill material, until the backfill is at least 2 feet over the top of the pipe.

G. Whenever a pipe requires cutting, to fit into the line or bring it to the required location, the work shall be performed by an approved method that leaves a smooth, square end. Field spigots shall be stop-marked with a felt-tip marker or wax crayon for proper length of assembly insertion.

H. A calibrated, precise sewer pipe laser shall be used to align pipe to the proper grade. The CONTRACTOR is responsible to continuously monitor the line and grade in each pipe run between structures. It is the CONTRACTOR's responsibility to maintain proper calibration of the equipment throughout the duration of the project.

I. Unless otherwise specified by the CONSTRUCTION MANAGEMENT ENGINEER, the elevation of all drainage structures shall be within ±0.1 foot of those shown on the Contract Drawings.

3.1.4 Backfill

A. After the pipe has been properly bedded, and placed, backfill shall be placed in accordance with Contract Drawings and Specification Section 31 05 15, Earthwork. Material tests for density shall be made as necessary to ensure conformance to this Specification.

B. When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the CONTRACTOR'S risk. Any damaged pipe shall be repaired or replaced.

3.2 Jointing

A. Before any joints are made in the trench, the CONTRACTOR shall demonstrate to the CONSTRUCTION MANAGEMENT ENGINEER by making a sample joint that

methods he/she will employ conform with the Contract Specifications, will secure a watertight joint, and that the workmen whom he intends to use for this work are familiar with the requirements for making proper joints.

3.2.1 HDPE Pipe

A. Sections of HDPE shall be joined into continuous lengths on the job site following the guidelines of ASTM F 2620, using simultaneous butt fusion as the method of joining the dual contained polyethylene piping system.

B. System supplier shall approve all fusion equipment used for the containment system. The butt fusion equipment used to join the pipe shall be capable of meeting all normal butt fusion requirements: alignment, heating, trimming, and fusion pressure.

C. System supplier shall provide written butt fusion pressure procedure as part of the submittal package.

D. Fused segments of pipe shall be moved to avoid damage to the pipe. Handle dual contained pipe with care. Limit bending of the pipe. Nylon slings are preferred.

E. For HDPE pipe, clean joint surfaces immediately before joining, square (face) end of each pipe to be fused, then butt weld the pipe together according to the manufacturer's recommendations. Allow welds sufficient time to cool before working with the pipe.

3.2.2 Concrete Pipe

A. Bell and Spigot—The first pipe shall be bedded to the established grade line, with the bell end placed upstream. The interior surface of the bell shall be thoroughly cleaned with a wet brush and the lower portion of the bell filled with mortar as required to bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into a bell so that sections are closely fitted. After each section is laid, the remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped or bandaged with cheesecloth to hold mortar in place.

B. Tongue and Groove—The first pipe shall be bedded carefully to the established grade line with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be thoroughly cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned with a wet brush; while in horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe shall be inserted in the grooved end of the first pipe until mortar is squeezed out on interior

and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside.

C. Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.3 Precast Concrete Structures

A. Precast concrete structures include inlets, manholes, box culverts, and other miscellaneous structures noted on the Contract Drawings.

B. Precast sections shall be transported and handled with proper equipment to protect the units from damage. Sections shall be handled by means of lifting inserts embedded in the concrete. All precast concrete unit construction shall consist of new and un-used products, free from defects. Repairs to precast concrete units shall be strictly prohibited, before, and after shipment. Precast concrete units damaged as a result of installations shall be removed and disposed of by the CONTRACTOR at no additional cost to the OWNER and not returned to the project site. Damaged precast units shall be replaced with new, un-used precast units from the same manufacture. Injection of grout sealant in the surrounding soils to correct joint leakage is prohibited.

C. Precast units shall be installed where shown on the Contract Drawings.

D. Mating surfaces shall be cleaned of all foreign materials such as dirt, mud, stones, etc., and where appropriate, joint sealing materials applied prior to assembly of the units. If mastic is used as a joint sealant, it shall be re-applied with new material every time precast units are re-set or re-positioned.

3.4 Field Testing

3.4.1 Hydrostatic Test on Watertight Joints

A. A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme

temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to AASHTO M 198 or ASTM C 443M (ASTM C 443) and PE plastic pipe shall conform to ASTM D 3212.

3.5 Repair/Retest

A. Should test results show displacement, damage, or leakage in excess of the allowable amount, the CONTRACTOR shall repair the displacement and damage and eliminate the leakage. Testing shall be continued until specified conditions are met to the satisfaction of the CONSTRUCTION MANAGEMENT ENGINEER, at no additional cost to the OWNER.

3.6 Work Affecting Existing Piping

A. The CONTRACTOR is responsible for field verifying the location of existing piping or structures to which connections are to be made, and location of other facilities which could be destroyed during earth moving activities.

3.7 As-Built Survey

A. Survey shall in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

-- End of Section –

SECTION 33 51 10
LANDFILL GAS COLLECTION AND CONVEYANCE SYSTEM

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The CONTRACTOR shall supply all materials, equipment, and labor needed to install, complete and make ready for use all pipe, pipe fittings, and valves for landfill gas collection and conveyance as specified herein and as indicated on the Contract Drawings.

B. The CONTRACTOR shall provide an operator for the landfill gas collection and conveyance system to perform the scope of work identified in Attachment F.

C. The CONTRACTOR shall prepare a gas collection and conveyance system work plan as indicated on the Contract Drawings.

1.1.2 Related Work Specified Elsewhere

A. Section 01 33 00, Submittals.

B. Section 01 45 00, Health and Safety.

C. Section 01 70 00, Execution and Closeout Requirements.

D. Section 33 51 11, Landfill Gas Extraction Well and Condensate Drain System.

1.2 References

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only. Use of the most recent version is required.

1.2.1 ASTM International (ASTM)

A. ASTM D 1248, Specification for Polyethylene Plastics Molding and Extrusion Materials.

B. ASTM D 1598, Test for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.

C. ASTM D 1599, Test for Short-Time Rupture Strength of Plastic Pipe, Tubing and Fittings.

D. ASTM D 2122, Determining Dimensions of Thermoplastic Pipe and Fittings.

E. ASTM D 2513, Specification for Thermoplastic Gas Pressure Pipe Tubing and Fittings.

F. ASTM D 2774, Practice for Underground Installation of Thermoplastic Pressure Piping.

G. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

H. ASTM D 3035, Polyethylene Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

I. ASTM D 3350, Specification for Polyethylene Plastics Pipe and Fittings Materials.

J. ASTM F-714, Standard Specifications for 3-Inch to 36-Inch Polyethylene Pipe.

K. ASTM F 1417, Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air.

L. ASTM D638-03, Standard Test Method for Tensile Properties of Plastics.

M. ASTM D790-07, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

N. ASTM D1505-03, Standard Test Method for Density of Plastics by the Density-Gradient Technique.

O. ASTM D1693-07a, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.

1.2.2 American National Standard Institute (ANSI)

A. ANSI B 31.8, Code for Pressure Piping, Appendix N.

1.2.3 Plastics Piping Institute (PPI)

A. PE Pipe Handbook. Installation guidance is in Chapter 7 and hydrostatic testing procedures are in Chapter 2.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. The CONTRACTOR is to provide a qualified operator for the landfill gas collection and conveyance system. The operator shall have five (5) or more years of experience providing similar services, including operation of a blower/flare skid, balancing of landfill gas extraction wells, monitoring of landfill gas probes, and reporting.

1.5 Submittals

A. The CONTRACTOR shall prepare and submit to the CONSTRUCTION MANAGEMENT ENGINEER for review and approval in accordance with Specification Section 01 33 00, Submittals, certificates of compliance on materials furnished and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, and repair of each type of pipe, pipe fitting, and valve furnished.

B. The CONTRACTOR shall prepare and submit a gas collection and conveyance system work plan to the CONSTRUCTION MANAGEMENT ENGINEER and OWNER for review and approval for all phases of the project as defined on G-002 of the Contract Drawings.

C. The CONTRACTOR is to provide qualifications for the landfill gas collection and conveyance operator for approval by the CONSTRUCTION MANAGEMENT ENGINEER and OWNER.

D. The CONTRACTOR shall prepare and submit Shop Drawings to the CONSTRUCTION MANAGEMENT ENGINEER for review and approval. The Shop Drawings shall show the following:

1. Dimensions, slopes, and invert elevations at connections.

2. Tie-ins to the existing system.

3. Detailed procedures to be used in joining and installing piping system, including manufacturer's recommendations.

4. Interfacing of piping system to equipment and appurtenances.

5. Detailed requirements for burial, supports, anchors, guides, expansion joints, and accessories required for a satisfactory piping system.

6. Bill of materials, indicating material composition of pipe, pressure rating, nominal size with wall dimensions, and its installation drawing.

7. Valve Operation and Maintenance Data: Submit detailed operation and maintenance data for valves and appurtenances provided under this Section. As a minimum, include the following:

   a. Technical information required to replace any piece of equipment

   b. A list of manufacturers and suppliers, including addresses and phone numbers

   c. Manufacturer's design and sizing criteria and calculations

   d. A list of recommended spare parts.

8. Tests: Submit description of proposed testing methods, procedures, and apparatus. Prepare and submit report for each test.

E. The CONTRACTOR shall provide photographic documentation of the installation of isolation valves, tie-in to the existing header pipe at the blower flare station, and any other installation as identified while performing the work as directed by the CONSTRUCTION MANAGEMENT ENGINEER.

1.6 Safety

A. Safety shall be in accordance with Specification Section 01 45 00, Health and Safety.

1.7 Quality Assurance

A. Piping manufacturer shall maintain a continuous quality control program. Plastic molding materials used to manufacture pipe and fittings under this Section shall be tested for conformance to ASTM D 3035, ASTM D 3350, or ASTM D 1248.

B. Valves and appurtenances provided under this Section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service for at least two (2) years.

C. Insofar as possible, valves shall be the product of one (1) manufacturer.

1.8 Delivery, Storage, and Handling

A. Pipe shall be stored or stacked to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be limited to six (6) feet. Pipe shall be stored in accordance with the manufacturer's recommendations.

B. Pipe and pipe fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skidways in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the pipe into the extraction well borings. Pipe and pipe fittings shall not be dropped or dumped.

C. Unload pipe, fittings, and appurtenances opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign material.

D. Handle valves and appurtenances very carefully. Valves that are cracked, dented, or otherwise damaged or dropped will not be acceptable.

E. Store valves and appurtenances in approved enclosed shelter and off the ground, unless otherwise acceptable to CONSTRUCTION MANAGEMENT ENGINEER.

1.9 Schedule

A. Not used.

2. MATERIALS

2.1 High Density Polyethylene (HDPE) Pipe

A. General

1. HDPE pipe and fittings greater than three (3)-inch-diameter as indicated on the Contract Drawings shall be Standard Dimension Rating (SDR) 17 HDPE pipe using a 3408 type resin or approved equal. HDPE pipe and fittings that are three (3)-inch-diameter and less shall be SDR 11.

2. Pipe shall be extruded from a Type III, Class C, Category 5, Grade P34 compound as described in ASTM D 1248. It shall be classified as cell 345434C according to ASTM D 3350 and have the material designation of PE 3408. The pipe shall be manufactured to meet the requirements of ASTM D 2513. Manufacturer's literature shall be adhered to when "manufacturer's recommendations" are specified. Pipe and fittings shall be provided by one (1) manufacturer. Acceptable manufacturers include Plexco, Driscopipe, or approved equal.

3. The HDPE pipe shall have the typical physical properties as determined by the appropriate test method, as listed in Table 33 51 10-1.

TABLE 33 51 10
Material Physical Properties

Physical Property	Test Method	Nominal Value
Density	ASTM D-1505	0.955 gram per cubic centimeter
Tensile Yield Strength	ASTM D-638	3,200 pounds per square inch
Tensile Modulus of Elast.	ASTM D-638	130,000 pounds per square inch
Flexural Modulus	ASTM D-790	135,000 pounds per square inch
Environmental Stress Condition A, B, C	ASTM D-1693	>5,000 hours
Compression	ASTM D-1248	>3,500 hours
Melt Index	ASTM D-1238	<0.15

a. HDPE Fittings—Fittings shall be ASTM D-2513-latest edition, butt fusion molded. Fittings shall be pressure rated to match the system piping to which they are fused. Fittings shall conform to all applicable reference standards listed herein.

b. Flexible Mechanical Couplings—Flexible mechanical couplings for buried and exposed service pipe connections shall be the stainless-steel type suitable for use with polyethylene pipe.

c. HDPE Pipe shall be joined by heat fusion to provide a homogeneous, sealed and leak proof joint. Pipe shall be joined following manufacturer's recommendation. Polyethylene pipe shall not be joined by solvents.

2.2 Flanges for HDPE Pipe

A. Flanges for HDPE pipe shall be convoluted ductile iron back-up rings with a minimum thickness of one (1) inch, as manufactured by Improved Piping Products (925-254-0962), Inc., of Orinda, California or approved equal. Backup rings shall be finished with red oxide primer.

B. Studs and bolts, nuts, and washers for flanges shall be 316 stainless steel.

2.3 Well Heads

A. Refer to Specification Section 33 51 11, Landfill Gas Extraction Well and Condensate Drain System.

2.4 Valves

A. General

1. Valves shall be complete with necessary operators, actuators, handwheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, wrenches, and other accessories or appurtenances which are required for

the proper completion of the work. Operators, actuators, and other accessories shall be sized and furnished by the valve supplier and factory mounted.

2. Manual valve operators shall turn right to close unless otherwise specified. Valves shall indicate the direction of operation.

3. Valves and operators shall be suitable for the exposure they are to be subjected to, e.g., buried and landfill gas. Valves shall have safety features required by the Occupational Safety and Health Administration.

4. Unless otherwise shown, valves shall be the same size as the adjoining pipe.

5. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body. Valves shall be Type 57 provided by Asahi/America, Inc. of Malden, Massachusetts, or approved equal. Landfill gas Type 57 collection system valves should be polyvinyl chloride (PVC) body with polypropylene discs, and nitrile or ethylene-propylene-diene-monomer (EPDM) seat and seals. Manufacturer must be ISO-9001 certified.

6. All valves shall have a permanent (not painted on) open/close position indicator.

B. Butterfly Valves

1. The header isolation valves shall be corrosion-resistant Type 1, Grade 1, butterfly bubble tight, wafer design, with a PVC body, nitrile seat, and compatible with a flat face flange, as manufactured by Asahi/America or equal. Butterfly valves shall be resistant to landfill and methane gas. The valves shall be rated for one hundred (100) pounds per square inch at thirty (30) to one hundred twenty (120) degrees Fahrenheit. If called for, the valve shall be supplied from the manufacturer with a two (2)-piece stem and housing for buried applications. The housing shall be carbon steel with a baked powder epoxy coat. The valve and where called for, the valve stem, shall be Type 57 for landfill gas collection system valves. If required, stem extensions shall be stainless steel in an epoxy coated steel outer housing with a gear box assembly mounted on top and equipped with a removable manual operating wheel. Monitoring ports at the butterfly valves shall be quick connects. If required, quick connects shall be attached to the pipeline via flexible metal hose connector, Swagelok Part No. SS-4HO-6-L4, or equal.

C. Labcock Valves

1. Quick connects used for monitoring ports may be replaced by labcock valves at all monitoring ports in the system, subject to approval by the CONSTRUCTION MANAGEMENT ENGINEER. Labcock valves shall be one-quarter (1/4)-inch PVC with EPDM seats and seals. Valves shall have one-quarter (1/4)-inch male pipe thread on one (1) end and hose connection on the other end.

2.5 Pipeline Locator/Warning Tape

A. Tape shall be a metallic locator/warning tape imprinted with the words "Caution Gas Line Buried Below," as supplied by Terra Tape (800-231-2417) or equal.

2.6 Detailed Requirements

A. Workmanship—The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.

B. Dimensions and Tolerances—Dimensions and tolerances shall be measured in accordance with ASTM D 3035 (HDPE). The eccentricity of the inside and outside circumferences of the pipe walls shall not exceed twelve (12) percent.

C. Sustained Pressure—The pipe shall not fail, balloon, burst, or weep as defined in ASTM D 1598.

D. Burst Pressure—The minimum burst pressure shall be as given, when determined in accordance with ASTM D 1599.

2.7 Identification

A. Marking on the pipe shall include the following, spaced at intervals of not more than five (5) feet.

1. Pipe nominal size.

2. Pipe schedule.

3. Specification of plastic material.

4. Type and grade of plastic.

5. Provide butt welded joints, except joints at equipment and valves shall be flanged and gasketed.

3. EXECUTION

3.1 HDPE Pipe Handling

A. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will overstress or buckle the HDPE piping or impose excessive stress on the joints.

B. Joining HDPE Pipe

1. Only two (2) methods shall be utilized for joining HDPE pipe: heat fusion and mechanical joining.

a. Mechanical Joining shall be accomplished with HDPE flange adapters, neoprene gaskets, and ductile iron back-up flanges, and shall be used only where shown on the Contract Drawings. Refer also to Paragraph 3.2 of this Section.

b. Heat Fusion joints shall be made in accordance with manufacturer's step by step procedures and recommendations. Fusion equipment and a trained operator shall be provided by the CONTRACTOR. Pipe fusion equipment shall be of the size and nature to adequately weld all pipe sizes and fittings necessary to complete the project. Branch saddle fusions shall be made in accordance with manufacturer's recommendations and step-by-step procedures. Branch saddle fusion equipment will be of the size to facilitate saddle fusion within the pipe trench. Heat fusion shall be performed outside of the trench whenever practical. Before heat fusing pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed. At the end of each day, all open ends of fused pipe shall be capped or otherwise covered to prevent entry by animals or debris.

c. As per the manufacturer's instructions, no fusion shall be performed in precipitation unless a shelter is provided.

3.2 HDPE Pipe Installation

A. Pipe installation shall comply with the requirements of ASTM D 2321, PPI PE Pipe Handbook Chapter 7, and the manufacturer's recommendations.

B. Lengths of fused pipe to be handled as one (1) segment shall not exceed four hundred (400) feet.

C. The CONSTRUCTION MANAGEMENT ENGINEER shall be notified prior to any pipe being installed in the trench in order for the inspector to have an opportunity to inspect the following items:

1. Butt and saddle fusions.
2. Pipe integrity.
3. Trench excavation for rocks and foreign material.
4. Proper trench slope.
5. Trench contour to ensure the pipe will have uniform and continuous support.

D. Any irregularities found by the CONSTRUCTION MANAGEMENT ENGINEER during this inspection must be corrected before lowering the pipe into the trench. Pipe shall be allowed sufficient time to adjust to trench temperature prior to any testing, segment tie-ins, and/or backfilling.

E. Tie-ins shall be made outside of the trench whenever possible. When tie-ins are to be made only in the trench, a bell hole shall be excavated large enough to ensure an adequate and safe work area.

F. Below grade piping shall be marked with metallic locator/warning tape to be buried in the trench above the pipe as indicated on the Contract Drawings.

G. Plugs:

1. Temporarily plug installed pipe at the end of each day's work or other interruption to the installation of any pipeline. Plugging shall be adequate to prevent the entry of animals or liquids into the pipe or the entrance, or insertion of deleterious materials.

2. Where plugging is required for phasing of the Work for later connection, install watertight, permanent-type plugs.

3.3 Flanged Connections

A. Flanged connections for polyethylene (PE) pipe shall be installed per manufacturer's recommendations.

B. The CONTRACTOR shall use an anti-seize compound on all stainless steel nuts and bolts.

C. The CONTRACTOR shall wrap and tape the flanges and bolts in five (5)-mil polyethylene sheeting prior to backfilling to help protect the assembly from corrosion.

3.4 Segment Testing

A. The HDPE pipeline shall be subjected to an air test per ASTM F-1417 and as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The CONTRACTOR shall accept the responsibility for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.

B. Like sizes of HDPE piping shall be butt welded together into testing segment not to exceed one thousand (1,000) feet. Segments shall be connected to a testing apparatus on one (1) end and fitted with fusion-welded caps on all openings.

C. The segment to be tested should be allowed time to reach constant and/or ambient temperature before initiating the test.

D. The test should be performed during a period when the pipe segment will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days.

E. This will minimize the pressure changes which will occur during temperature fluctuations.

F. The test pressure shall be four (4) pounds per square inch gauge.

G. Pressure drop during the test shall not exceed one (1) percent of the testing gauge pressure over a period of one (1) hour. (See Paragraph 3.5 in this Section for test failures.) The CONSTRUCTION MANAGEMENT ENGINEER shall sign off on a test form to indicate test compliance. The test form shall include:

1. Contract Number.
2. Date.
3. Location of test/pipe segment.
4. Length of pipe segment.
5. Size and pipe material.
6. PSI and time test is started and stopped.
7. Change in PSI.
8. If the test passed or failed.
9. Technician performing the test.
10. CONSTRUCTION MANAGEMENT ENGINEER'S signature confirming oversight.

H. The CONSTRUCTION MANAGEMENT ENGINEER shall be notified prior to commencement of the testing procedure and shall be present during the test.

I. Equipment for this testing procedure will be furnished by the CONTRACTOR. The testing apparatus will attach to pipeline being tested and include an appropriate low-range pressure gauge and temperature gauge, and valves and fittings to introduce

pressurized air to perform the test. The testing apparatus and gauges are to be inspected and approved by the CONSTRUCTION MANAGEMENT ENGINEER.

3.5 Test Failure

A. The following steps shall be performed when a pipe segment fails the one (1) percent-one (1) hour test described in this Section.

1. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.

2. Blocked risers and capped ends shall be inspected for leaks.

3. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.

B. Pipe and fused joint leaks shall be repaired by cutting out the leaking area and refusing the pipe.

C. After all leaks are repaired, a retest shall be performed in accordance with this Section.

3.6 Valve Installation

A. Install valves and appurtenances in accordance with manufacturer's recommendations.

B. Butterfly valves shall be installed between two (2) flanged connections with stainless-steel nuts and bolts coated with anti-seize compound prior to assembly. Stud lengths shall accommodate the required distance between flanges and spacers.

C. Spacers may be required for full operation of flanged butterfly valves. Install spacers with approval of CONSTRUCTION MANAGEMENT ENGINEER.

D. Valve flanges, bolts and nuts shall be wrapped and taped in five (5)-mil polyethylene sheeting prior to backfilling.

E. Unless otherwise approved, install valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment, or other causes.

F. Install valves in horizontal pipes with shafts vertical unless otherwise indicated.

3.7 Valve Field Tests and Adjustments

A. Adjust parts and components as required to provide correct operation.

B. Conduct functional field test of each valve in presence of CONSTRUCTION MANAGEMENT ENGINEER to demonstrate that each part and components together function correctly. Testing equipment required shall be provided.

C. CONTRACTOR shall provide manufacturer's recommended maximum torque data for bolted connections and furnish his intended installation method to ensure that bolts are not over-torqued. Hand wrenching of plastic pipe connections without torque monitoring shall not be permitted. Cracking of pipe/appurtenances shall be repaired by CONTRACTOR at no additional cost to the OWNER.

3.8 As-Built Surveys

A. The CONTRACTOR shall survey the landfill gas pipe as it is placed to confirm alignment and that minimum slope is achieved. The CONTRACTOR shall survey the top of all landfill gas valves, condensate drains, extraction wells (ground and top of wellhead), and appurtenances associated with the landfill gas system. Survey shall be in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

-- End of Section --

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SECTION 33 51 11
LANDFILL GAS EXTRACTION WELL AND CONDENSATE DRAIN SYSTEM

1. GENERAL

1.1 Description

1.1.1 Scope of Work

A. The work covered under this Section includes the furnishing of all labor, equipment, and materials, and performing all operations in connection with the installation and testing of the vertical landfill gas (LFG) extraction wells and condensate systems.

1.1.2 Related Work Specified Elsewhere

A. Section 01 33 00, Submittals.

B. Section 01 45 00, Health and Safety.

C. Section 01 70 00, Execution and Closeout Requirements.

D. Section 31 05 16, Aggregates.

E. Section 33 51 10, Landfill Gas Collection and Conveyance System.

1.2 References

1.2.1 ASTM International

A. ASTM D-2513, Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

B. ASTM D-3350, Specification for Polyethylene Plastic Pipe and Fittings Materials.

C. ASTM D-1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC Compounds.

D. ASTM D-2467, Socket-Type Poly (Vinyl Chloride) PVC Plastic Pipe Fittings, Schedule 80.

1.3 Definitions

A. Not used.

1.4 Qualifications

A. The CONTRACTOR responsible for constructing the gas extraction wells shall be licensed as a driller employing only competent workers for the execution of this Work. All such Work shall be performed under the direct supervision of an experienced driller satisfactory to the CONSTRUCTION MANAGEMENT ENGINEER. The driller shall have a minimum of three (3) years of demonstrated experience installing LFG collection wells in municipal landfill refuse.

B. The CONTRACTOR will provide a list of all personnel who will be involved in the project and their corresponding qualifications and experience for review and approval by the CONSTRUCTION MANAGEMENT ENGINEER prior to commencing work.

C. The CONTRACTOR shall employ a qualified technician with a minimum of five (5) years of experience in LFG flow rate control and LFG blower and flare system operations who shall perform the initial balancing of the well field.

1.5 Submittals

A. CONTRACTOR qualifications.

B. The CONTRACTOR shall supply to the CONSTRUCTION MANAGEMENT ENGINEER, in writing within ten (10) days after the Notice to Proceed, the proposed work schedule including the following:

1. The starting date of construction.

2. The dates and order of gas extraction well and condensate drain drilling.

3. The completion date of gas extraction well and condensate drain drilling.

4. Any anticipated work stoppage of duration greater than twenty-four (24) hours with exception of weekends and holidays.

C. The CONTRACTOR shall submit shop drawings and/or product data for approval to the CONSTRUCTION MANAGEMENT ENGINEER for the following items:

1. Piping and fittings, for high-density polyethylene (HDPE) hoses, gauges, and test parts.

2. All dimensions and components of the well head and adapters shall be drawn to scale. A complete shop drawing showing all components shall be provided as a single submittal.

3. Ductile iron flange adaptors.

4. Construction diagrams for each well.

5. Manufacturer's installation instructions.

6. Shop drawings showing the dimensions and all components of the well fittings and adapters.

7. Manufacturer's Operation and Maintenance Manual.

8. Manufacturer's warranty information.

9. Prior to construction, the CONTRACTOR shall provide the CONSTRUCTION MANAGEMENT ENGINEER coordinates and surface elevation of proposed well and condensate drain locations. Notify CONSTRUCTION MANAGEMENT ENGINEER if surface elevation at drilling location differs more than one (1) foot from plan elevation.

D. During all gas extraction well and condensate drain drilling, a detailed driller's report shall be maintained and submitted in duplicate to the CONSTRUCTION MANAGEMENT ENGINEER. The report shall give a complete description of all subsurface material encountered, number of feet drilled, number of hours on the job, shutdown due to breakdown, and other pertinent data requested by the CONSTRUCTION MANAGEMENT ENGINEER.

E. During drilling of each borehole within the refuse disposal area, the CONTRACTOR shall maintain a log of the reference points of depth measurements and the depth of each borehole.

F. Upon completion of each gas extraction well and condensate drain, the CONTRACTOR shall also submit to the CONSTRUCTION MANAGEMENT ENGINEER a report to include the following:

1. The name and location of the job.

2. The date and time of the borehole drilling (start and finish), with borehole identification labeling.

3. Gas extraction well and condensate drain number and coordinates.

4. Surface elevation.

5. Depth to water.

6. The depth or location of any lost drilling materials or tools.

7. Names of drilling/installation crew staff, firm, and supervisor.

8. Size and materials of pipe used in wells and drains.

9. Type of drilling rig used for boreholes.

10. Depth of completed gas extraction well and condensate drain, including depths to beginning and end of perforated sections, to the bottom of the well cap and height above ground of well head.

11. The nominal hole diameter of the borehole.

12. Description of extraordinary events encountered, including weather description.

13. Photoionization detector and combustible gas indicator lower explosive limit readings.

14. Amount, size, and description of crushed stone used and vertical limits.

15. Amount, description, quantity, and vertical limits of bentonite plugs installed.

16. Amount, description, and vertical limits of sand backfill installed.

17. Problems encountered in advancing the boreholes including locations of refusal and depth advanced.

18. Other pertinent data requested by the CONSTRUCTION MANAGEMENT ENGINEER.

1.6 Safety

A. Safety shall be in accordance with Specification Section 01 45 00, Health and Safety.

1.7 Quality Assurance

A. The CONTRACTOR shall be capable of identifying subsurface conditions and maintaining complete and current logs and daily notes for the gas extraction well completion reports.

B. The OWNER or CONSTRUCTION MANAGEMENT ENGINEER may make any other investigations regarding qualifications as deemed necessary to determine the ability of the CONTRACTOR to perform the Work, and the CONTRACTOR shall furnish to the OWNER or CONSTRUCTION MANAGEMENT ENGINEER all such information and data for this purpose as the OWNER or CONSTRUCTION MANAGEMENT ENGINEER may request.

1.8 Delivery, Storage, and Handling

A. Parts and materials shall be properly protected so that no damage, deterioration, or contamination will occur from time of shipment until installation is completed.

B. If, in the opinion of the CONSTRUCTION MANAGEMENT ENGINEER, parts and materials are damaged, deteriorated, or contaminated before acceptance of the well, the material and/or the gas extraction well will be rejected. The CONTRACTOR shall replace the labor, parts, and materials at no additional cost to the OWNER.

C. Materials shall be stored to ensure preservation of their quality and fitness for work. When deemed necessary, they shall be placed on wooden platforms or other hard, clean surfaces and not on the ground. Stored materials shall be located so as to facilitate prompt inspection.

1.9 Schedule

A. Not used.

1.10 Subsurface Conditions

A. Subsurface investigations have not been made within the landfill area to the depth of the proposed LFG wells. Landfill gas extraction wells shall penetrate through municipal landfill refuse until reaching the depths shown on the Contract Drawings.

B. The CONTRACTOR shall be aware that unfavorable subsurface conditions may exist at the sites selected for the gas extraction wells and condensate drains. Subsurface conditions at the landfill may include soils of any description, density, or consistency; municipal refuse, boulders, concrete rubble, perched water, or other large objects.

C. The information concerning the subsurface conditions and problems of which the CONTRACTOR is advised is for the sole purpose of assisting the CONTRACTOR in the bid preparation. The OWNER, CONSTRUCTION MANAGEMENT ENGINEER, and their consultants do not guarantee the accuracy and the conditions and concerns stated above. These conditions and concerns may not be indicative of the conditions at the site.

D. In the event subsurface conditions, in the opinion of the CONTRACTOR, may be unfavorable for gas extraction well installation, the CONTRACTOR shall promptly notify the CONSTRUCTION MANAGEMENT ENGINEER verbally, and in writing, of such conditions and present an alternative location for approval.

E. Obstructions may be encountered when drilling in a landfill, many of which can be drilled through. The CONTRACTOR is expected to make reasonable effort to drill through such obstructions.

F. During construction, it is expected that minor relocations of well installation will be necessary. Such relocations shall be made only by direction of the CONSTRUCTION MANAGEMENT ENGINEER. If obstructions are encountered during drilling requiring well or drain relocation, the CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER verbally and in writing before continuing with the construction in order that the CONSTRUCTION MANAGEMENT ENGINEER may make such field revisions as are necessary. If the CONTRACTOR fails to notify the CONSTRUCTION MANAGEMENT ENGINEER when an obstruction is encountered, and proceeds with the construction despite this interference, the CONTRACTOR shall do so at his own risk. Holes that are abandoned will be filled with sand to the original grade level. The CONTRACTOR shall receive no payment for any footage drilled for an abandoned borehole. Drilling occurring at a borehole which has been directed for abandonment and/or relocation by the CONSTRUCTION MANAGEMENT ENGINEER will be at the CONTRACTOR'S expense.

1.11 Well Field Balancing

A. Prior to tuning the well field, the CONTRACTOR shall submit for approval his schedule and general procedure for balancing the well field, including instrumentation. Note that initially, daily measurements will allow timely corrections for wells and may ultimately reduce the overall adjustment period.

B. The CONTRACTOR shall submit a statement indicating the test methods proposed to be used to evaluate each parameter.

C. The CONTRACTOR shall provide copies of all field logs and test results to the OWNER and CONSTRUCTION MANAGEMENT ENGINEER with twenty-four (24) hours of sampling, including any well field adjustments.

1.12 Notification

A. The CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER, in writing, of the number of drilling rigs and personnel to be used on the project. Any change in the number of rigs and personnel shall require written notification to the CONSTRUCTION MANAGEMENT ENGINEER, forty-eight (48) hours prior to the change.

B. The CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER, in writing, ten (10) days prior to the commencement of drilling activities.

C. The CONTRACTOR shall notify the CONSTRUCTION MANAGEMENT ENGINEER twenty-four (24) hours prior to start of any gas extraction well or condensate drain drilling activities.

1.13 Gas Extraction Well and Condensate Drain Acceptance Criteria

A. Each gas extraction well and drain shall be approved based on the following criteria in the opinion of the CONSTRUCTION MANAGEMENT ENGINEER:

1. The well/drain is structurally sound and in conformance with designated standards.

2. The borehole is drilled plumb and true to line.

3. Provisions are made to keep well and drain piping centered in the borehole.

B. All piping, crushed stone, bentonite seals, etc. shall be installed as directed by the Contract Drawings.

C. No payment for the wells or drains shall be due to the CONTRACTOR if all of the above requirements are not met.

1.14 Disposal of Drill Cuttings

A. Waste and waste soil excavated during construction of gas extraction wells and condensate drains shall be placed by the CONTRACTOR below the cap subgrade elevations if construction sequence allows for direct placement or at an approved location.

2. MATERIALS

2.1 Landfill Gas Extraction Wells and Condensate Drains

2.1.1 Pipe

A. HDPE, ASTM D2513/D3350 (Cell classification PE355434C), SDR-17, Material PE 3408, DriscoPlex 4100 or approved equal.

B. All HDPE piping shall be butt-fused in strict compliance with the manufacturer's recommendations.

2.1.2 Fittings and Flanges

A. HDPE, ASTM D2513/D3350, SDR-17.

2.1.3 Bolts, Washers, and Nuts

A. Stainless Steel, Type 304.

2.2 Landfill Gas Extraction Wellheads

A. The LFG collection system wellheads shall be a Quick-Change Orifice Plate design, Model ORP215 as manufactured by QED Environmental Systems, Inc. or equal as approved by the CONSTRUCTION MANAGEMENT ENGINEER and shall consist of well head piping and fittings, flow control valve, gas temperature gauge port, quick connect gas sampling, static and differential pressure ports, reinforced flexible hose connector, dust cap. All well head piping and fittings shall be Schedule 80 polyvinyl chloride (PVC). Adapters shall be Elastomeric PVC.

B. The wellhead shall incorporate an orifice plate system such that the plates can be quickly exchanged without shutting off the control valve.

C. The wellhead shall incorporate a fine tune control valve.

D. Each well head shall include a minimum of four (4) sample ports.

E. The equipment shall be capable of withstanding the rigors of LFG recovery application, including internal high vacuum, weathering, gas constituent, and ultraviolet light exposure.

F. The well heads shall be tight and leak-free and shall be height adjustable in the field.

G. The well head assemblies shall be capable of being used with a Landtec GEM-2000 or 5000 Gas Analyzer incorporating all monitoring functions.

H. The wellhead assemblies shall have a nominal size of two (2) inches and a nominal flow capacity range of zero (0) to one hundred twenty-five (125) cubic feet per minute (cfm).

I. The wellhead shall be designed to withstand a vacuum of one hundred (100) inches of water.

2.2.1 Measurement Tube

A. The measurement tube shall be of sufficient length to allow gas to achieve a uniform velocity profile before being measured.

B. The measurement tube assembly shall be pre-assembled and leak tested. The manufacturer shall conduct one hundred (100) percent testing for functionality. All units shall leak not more than ten (10) cubic centimeters per minute at a pressure of ten (10) pounds per square inch.

2.2.2 Orifice Plate

A. The orifice plates shall be constructed of one-sixteenth (1/16)-inch laser cut stainless steel.

B. Each plate shall have an easy to read tab with the plate size. The plate size can be read without removing the plate from the housing.

C. Each wellhead will be provided with a set of six (6) orifice plates, ranging in size from four-tenths (0.4) to one and four-tenths (1.4) inches.

2.2.3 Temperature Gauges

A. The temperature gauges shall have a stainless steel probe and all stainless steel fittings, hermetically sealed water-tight dial cover, UV resistant components, heavy-duty shatter-resistant glass dial, and calibration nut. They shall be connected to the well heads with quick-connect fittings or approved equal and operate from zero (0) to two hundred fifty (250) degrees Fahrenheit. Dial shall be Ashcroft two (2)-inch series EI Grade A or equal.

2.2.4 Quick-Connect Test Ports

A. Test ports shall be positive sealing and shall be constructed of chrome-plated brass compatible for use with the GEM-2000 or 5000 Gas Analyzer. Test Ports shall be Colder Products Company; Plugs#PMC 30; Test Port #MCD10-04 with shutoff. Or approved equal.

2.2.5 Valves

A. Wellhead Control Valve shall be constructed of Schedule 80 PVC and stainless steel.

B. The Valve housing shall include an indexed scale for indexing valve settings for easy adjustment and reset.

C. The Valve shall have a rising stem for easy identification of valve position.

D. The Valve Stem shall have a three-quarter (3/4)-inch stainless steel shaft with coarse threads for long term durability and linear flow adjustment.

E. The Valve Handle shall be made of stainless steel for long term durability. No plastic handles are allowed.

F. All valves shall carry a permanent decal securely fastened to the body which includes the manufacturer and serial number.

G. The Valve Handle shall include a numeric scale for easy setting adjustment and reset.

H. Valve be capable of flows up to one hundred twenty-five (125) standard cfm and up to one hundred twenty (120) degrees Fahrenheit temperature.

2.2.6 Molded Well Cap

A. Each wellhead system shall include a high visibility molded well cap, which secures the gas extraction wellhead and provides ports for a downhole dewatering pump and liquid level access. Liquid level access will be completed without needing to close control valve, or remove the LFG wellhead.

B. Well caps shall be manufactured to assure proper fit on standard well casings. Cap sizes shall be available for six (6)-inch standard casing.

C. Well caps shall include flexible seals for the well casing and for the gas extraction wellhead pipe.

D. Well caps will have a minimum of five (5) threaded ports for installing pass through style compression fittings. Three (3) fittings can be used with nylon pump tubing, the other two (2) ports can be used for liquid sensing.

E. Caps will include an integral gas pipe support ring at the cap base. The support ring and flexible coupling will provide two (2) points of stabilization for the gas pipe minimizing stress on the flexible gas hose.

2.2.7 Flex Connectors

A. Flex connectors shall be used to accommodate landfill settlement.

B. The flex connectors shall be two (2)-inch-diameter hose and provided by the wellhead manufacturer for this connection. Flexible hose to pipe connections shall be made using stainless steel hose clamps to secure the flexible hose.

C. Diameter of flexible connector shall be mated with wellhead discharge to ensure airtight connection.

D. Two (2) extra flex connectors with clamps shall be provided for each well head.

2.2.8 Nuts, Bolts, Washers, and Gaskets

A. Nuts, bolts, and washers shall be Type 304 stainless steel.

B. Gaskets for flange installation shall be neoprene.

2.2.9 Well Identification

A. Four (4)-inch by six (6)-inch aluminum well identification tags shall be permanently attached to each well head with stainless steel clamps. The well identification tags shall indicate the well identification number.

B. Yellow fiberglass flexible marker, six (6) ft long, with well identification number in black three (3)-inch letters, Model PM-301 manufactured by Pro-Mark Utility Supply, Inc., or approved equal.

2.3 Granular Fill

A. Granular Fill, in accordance with Specification Section 31 05 16, Aggregates, shall be placed around the LFG extraction wells and condensate drains as indicated on the Contract Drawings.

3. EXECUTION

3.1 Preparation

A. The CONTRACTOR shall be responsible for the layout and staking of all wells and condensate drains. The location (coordinates and surface elevations) of each well and condensate drain shall be documented.

3.2 LFG Extraction Well and Condensate Drain Installation

A. Drill hole to diameter and depth as indicated. Wells are not to be vented to the atmosphere without permission from the CONSTRUCTION MANAGEMENT ENGINEER. Blind flanges shall be installed on wells after installation to prevent discharge prior to well head installation.

B. Well installation shall be accomplished with a thirty-six (36) inch bucket auger rig. After the auger has reached its lowest elevation, all loose earth and debris shall be removed.

C. The HDPE extraction well pipe and condensate drain pipe shall be inserted, taking care that it is centered in the hole. The annular space between the casing and the outer wall of the hole shall then be filled with crushed stone, sand, and bentonite as indicated on the Contract Drawings.

D. Every effort shall be made on the part of the CONTRACTOR to ensure pipe plumbness and centralization. The CONTRACTOR shall use spacers at the perforated section of the well to assure the pipe is maintained within the center of the borehole. The CONSTRUCTION MANAGEMENT ENGINEER shall approve the spacer design method prior to its use.

3.3 Well Head Installation

A. The well heads shall be lifted and handled according to written procedures supplied by the manufacturer.

B. The well heads shall be installed within two (2) percent of vertical (plumb).

C. Where the well heads connect directly to the collection header, a reducer shall be welded to the lateral for flex hose connection in accordance with accepted methods and standards appropriate for the header material.

D. The well heads shall be installed on the well casing in accordance with the manufacturer's written instructions.

3.4 Well Head Testing

A. After installing the well head, the following minimum test operations shall be performed:

1. Leak test all components and connections of the wellhead to the landfill gas piping system. Apply soapy water to all fittings for visual observation for leaks.

2. Test temperature gauge.

3. Test pressure ports across orifice plate. Provide flow vs. pressure curve for zero (0) to forty (40) cfm range. Test shall be made on actual device installed. All well heads shall be identical.

4. Test valve for proper closure and seat.

B. Prior to acceptance, the following verifications shall be made:

1. Verify that the well head is installed per the manufacturer's written instructions and these Specifications.

2. Verify that the well head has passed the tests as specified.

3. Verify that all submittal requirements have been met.

3.5 Well Field Balancing

A. The CONTRACTOR is responsible for balancing the well field to demonstrate its stability to the satisfaction of the CONSTRUCTION MANAGEMENT ENGINEER. Stability will be demonstrated by minimizing oxygen below one (1.0) percent by volume, and maximizing methane recovered for the long term. A vacuum must be observed at each well head. CONTRACTOR shall provide personnel for a minimum

of two (2) months to balance the wellfield following substantial completion. No adjustments to fee will be made relative to the duration of the well balancing period.

B. Balancing of the well field shall be performed by measurement of flow rate and composition. The following measurement parameters shall be recorded for each well every time it is monitored during the balancing process:

1. Methane.
2. Oxygen.
3. Carbon dioxide.
4. Balance gas (primarily nitrogen).
5. Well head gas temperature (flowing).
6. Ambient temperature.
7. Barometric Pressure.
8. Static pressure.
9. Velocity head.
10. Well head gas flow.
11. Well head adjusted valve position (initial and adjusted).
12. New well head vacuum and flow information after adjustments.
13. Water level.
14. Additional observations or comments.

C. At a minimum, each well must be tested once per week, with the above information recorded. Results are to be submitted to the CONSTRUCTION MANAGEMENT ENGINEER and the OWNER.

D. As part of the well adjustment process, the CONTRACTOR shall compare previous readings on wells, and be aware of the effects the adjustments may have on the nearby wells.

E. CONTRACTOR shall coordinate the transition of the operation and well field balancing with the OWNER following substantial completion of the project. A planning meeting shall be scheduled with the OWNER and CONSTRUCTION MANAGEMENT ENGINEER two (2) weeks prior to the transition.

3.6 Gas Extraction Well Abandonment

A. If the CONTRACTOR fails to meet the gas extraction well and condensate drain acceptance criteria as stated in this Section, or should the gas extraction well condensate drain be rendered inoperable due to loss of tools, collapse, or other causes related to gas extraction well or drain construction operations, the CONTRACTOR shall abandon the gas extraction well(s) or drain. The abandonment shall entail backfilling the borehole with sand. Under these conditions, the CONTRACTOR shall receive no payment for time, materials, or work for abandonment and shall receive no compensation for the abandoned gas extraction well or drain.

B. The CONTRACTOR will notify the CONSTRUCTION MANAGEMENT ENGINEER immediately if any obstruction or issue is encountered during drilling. If the CONTRACTOR is directed by the CONSTRUCTION MANAGEMENT ENGINEER to abandon a borehole, the CONTRACTOR will fill the borehole with sand.

C. If borehole abandonment is directed by the CONSTRUCTION MANAGEMENT ENGINEER, the CONTRACTOR shall be compensated for footage drilled and abandonment.

3.7 Protection and Site Cleanup

A. At all times during the progress of the site work, the CONTRACTOR shall use all reasonable precautions to prevent either tampering with the gas extraction wells and condensate drains or the entrance of foreign material.

B. All gas extraction wells and condensate drains shall be protected as indicated during construction by the use of hay bales or other approved means. The CONTRACTOR shall replace any gas extraction well or condensate drain which is damaged by construction operations at the CONTRACTOR'S expense.

C. Immediately upon completion of site work, the CONTRACTOR shall remove all of his or her equipment, materials, and supplies from the site of the work, remove all surplus materials and debris, fill in all holes or excavations, and restore any disturbed areas to their original condition.

D. Excavated material will be removed from the site at the end of each work day. The CONTRACTOR shall be responsible for all loading and transportation costs of the refuse. Refuse shall be handled and controlled such that it does not drift off as litter due to wind, water, or animals.

3.8 As-Built Surveys

A. Survey shall be in accordance with Specification Section 01 70 00, Execution and Closeout Requirements.

-- End of Section --

Attachment A

Geotechnical Investigation

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September 10, 2018

Mr. Mark Gutberlet, PE
Project Manager
EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Rockville, MD 20850

RE: Geotechnical Evaluation
Gude Landfill
Rockville, Maryland
RBB Project No. 16943-0

Dear Mr. Gutberlet:

The Robert B. Balter Company is pleased to submit this geotechnical evaluation report for the subject project. The purpose was to assess the existing soil cap condition and provide recommendation regarding soil reuse.

Project information provided to us by various parties helped form the basis for our recommendations. If any of the project information discussed in this report differs from the actual proposed construction, we should be contacted to re-evaluate the recommendations provided herein and provide revisions if necessary.

We have appreciated this opportunity to be of service. If you have any questions regarding this report, or if we can assist you in any way, please do not hesitate to call our office.

Sincerely,

THE ROBERT B. BALTER COMPANY

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland. License No. 23261, Expiration Date: 06/25/2020

James M. Bailey, E.I.T.
Geotechnical Engineer

Joseph F. Whittle Jr., P.G., P.E.
Chief Engineer

STATE OF MARYLAND JOSEPH F. WHITTLE, JR. No. 23261 PROFESSIONAL ENGINEER

9/10/2018

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1.0 INTRODUCTION

1.1 General

The proposed project will consist of a new toupee cap for the Gude Landfill, as well as an analysis of the stability of the site as it pertains to future developments, such as potential access roads, parking areas, and new facilities.

1.2 Authorization

The geotechnical evaluation was authorized by EA, based on our September 28, 2017 *Revised Proposal for Geotechnical Evaluation.*

1.3 Scope

The scope of the geotechnical evaluation included the following: site reconnaissance, subsurface sampling and testing, geotechnical laboratory testing, engineering evaluation and report preparation.

1.4 Summary of Recommendations

Cap Fill Soil Reuse	The existing site cap fill soils are expected to be suitable for reuse. However, laboratory testing indicated that site soils are presently in excess of the optimum moisture content and may require drying before placement. We would expect the moisture content of the existing fill soils to change over time.
Topsoil	The current site topsoil was only encountered sporadically, with most plant covering growing in the fill soils rather than a distinct topsoil stratum. It is unlikely to be cost-effective to salvage for reuse as topsoil

2.0 PROJECT DESCRIPTION

2.1 Site Conditions

The project is located at 600 East Gude Drive, Rockville, Maryland. The site is bordered to the northwest by Gude Trail, followed by a residential development, to the northeast by a heavily forested area, to the southeast by a mixed commercial/retail development, and to the southwest by East Gude Drive followed by mixed commercial/retail development. The site is currently occupied by the closed Gude MSW Landfill including a gas energy production facility and is currently being used as a radio-controlled (RC) model airplane recreational area. A **Vicinity Map** is shown on **Plate 1**, attached.

2.2 Project Information

The proposed project will consist of the reconstruction of the landfill cap. The purpose of this investigation was to determine the depth of the existing cap and to determine the potential for reuse of the existing cap soils.

2.3 Site Geology

According to the National Geologic Map Database provided by USGS, the subject site is underlain by the Wissahickon Formation. This formation is known to consist of Muscovite-chlorite-albite schist, muscovite-chlorite schist, chloritoid schist, and quartzite; intensely folded and cleaved.

3.0 EVALUATION PROGRAM

3.1 Subsurface Explorations

The subsurface exploration program for this study included a total of 128 new Test Pits, labeled TP-200 to TP-335, with the exclusions of TP-296, TP-297, TP-300, TP-306, TP-313, TP-316 and TP-328. These test locations were not performed due to time constraints. The locations for the test pits were selected by EA and located in the field by Balter using standard taping procedures and are assumed accurate to within 10 – 15 feet. Additionally, longitude and latitude coordinates were recorded by cell phone GPS for each test pit location and are assumed accurate to within 10 to 15 feet. Prior to the start of the test pit operations, the test pits were cleared for utilities by Miss Utility. The attached **Plate 2, Boring Location Plan,** indicates the approximate as-dug locations of the test pits.

The test were advanced to depths ranging from 1.5 feet to 8 feet below the existing ground surface using a Case 580 N backhoe. During the test operations, bulk samples of representative soils from the upper regions of the soils were recovered for laboratory evaluation. Following completion, the test pit locations were backfilled with landfill garbage at the bottom and soils on top lightly compacted with the backhoe bucket. After backfill, all test pits were strawed and seeded.

All test pits were screened for oxygen levels and combustible gases as per the site Health and Safety Plan.

The subsurface data obtained from the recent explorations are presented in log form in **Appendix A**.

The depths at which water was observed in the test were recorded upon completion. The method of classification used in preparing the strata descriptions is based on our interpretation of the Unified Soils Classification System (USCS).

Test pit logs show the estimated general soil classifications and the assumed boundaries between soil types. The actual boundaries in the field could vary significantly from those assumed for the logs. *It is noted that the subsurface data shown on the figures are an integral portion of this report. Separation of the figures from the remainder of the report may lead to misinterpretation of the data by others.*

3.2 Laboratory Testing Program

Selected samples were subjected to laboratory analyses to estimate their classifications according to the Unified Soils Classification System. This testing included moisture content determination, sieve gradation analyses, and Atterberg limits determinations. The bulk samples were subjected to evaluation of their compaction properties by AASHTO T-180 (Modified Proctor).

The results of our laboratory testing are presented in Appendix B and are summarized in **Table 1** of Section 4.2 Subsurface Materials.

4.0 SUBSURFACE CONDITIONS

4.1 General

This section provides a description of the estimated subsurface conditions encountered at the borings at the time of drilling. Significant variations may occur outside specific test locations.

4.2 Subsurface Materials

4.2.1 Surficial Materials

Topsoil - Topsoil was only encountered in borings TP-201, TP-202, TP-203, TP-254, TP-255, TP-256, TP-257, TP-258, TP-259, and TP-263 to depths ranging between 1 inch and 4.0 inches. The term "topsoil," as used in this report refers to surface soils having an apparently significant organic content, based only on visual estimates in the field. It does not imply that the subject materials meet the requirements or specifications for topsoil set by any particular organization or agency. Plant growth was present across the landfill, however the growth appears to be within the fill soils rather than within a distinct topsoil layer.

4.2.2 Existing Cap Fill Soils

Fill soils associated with the existing landfill cap were found to generally consist of Sand and Silt mixtures (SM, ML) and Sand and Clay mixtures (SC), and Clays (CL) with significant amounts of gravel and significant amounts of cobbles and boulders encountered in some borings. Some borings encountered crushed stone (CR-6) layers within the soil cap. Existing cap fill soils extended to depths ranging between 1.5 feet and 8 feet. Test pits TP-279, TP-293, and TP-298 terminated in the existing cap soils (i.e. they were not fully penetrated). The existing cap fill depths for each test pit are presented on the following page in Table 1.

Table 1 – Existing Cap Fill Soil Depths

Test Pit	Cap Thickness (ft)	Test Pit	Cap Thickness (ft)	Test Pit	Cap Thickness (ft)
TP-200	NA	TP-243	1.3	TP-286	3.0
TP-201	NA	TP-244	1.0	TP-287	6.5
TP-202	NA	TP-245	1.3	TP-288	2.3
TP-203	NA	TP-246	3.8	TP-289	4.3
TP-204	2.0	TP-247	3.3	TP-290	2.7
TP-205	5.0	TP-248	1.5	TP-291	3.5
TP-206	2.0	TP-249	3.0	TP-292	1.5
TP-207	2.0	TP-250	1.8	TP-293	NP
TP-208	5.0	TP-251	1.0	TP-294	4.0
TP-209	0.9	TP-252	1.5	TP-295	5.0
TP-210	2.5	TP-253	5.5	TP-298	NP
TP-211	1.7	TP-254	3.9	TP-299	2.0
TP-212	1.7	TP-255	3.3	TP-301	5.8
TP-213	2.3	TP-256	4.8	TP-302	2.0
TP-214	3.0	TP-257	1.9	TP-303	4.3
TP-215	5.3	TP-258	4.0	TP-304	1.8
TP-216	2.3	TP-259	6.0	TP-305	3.3
TP-217	4.0	TP-260	4.0	TP-307	3.5
TP-218	4.0	TP-261	6.0	TP-308	3.5
TP-219	4.3	TP-262	2.0	TP-309	3.0
TP-220	3.0	TP-263	6.0	TP-310	1.0
TP-221	1.3	TP-264	3.0	TP-311	1.6
TP-222	1.5	TP-265	3.0	TP-312	3.5
TP-223	0.9	TP-266	2.3	TP-314	3.5
TP-224	2.3	TP-267	2.0	TP-315	1.3
TP-225	0.3	TP-268	3.0	TP-317	3.2
TP-226	1.5	TP-269	2.5	TP-318	2.5
TP-227	2.0	TP-270	3.0	TP-319	1.5
TP-228	3.5	TP-271	2.0	TP-320	3.9
TP-229	5.3	TP-272	3.5	TP-321	1.5
TP-230	2.7	TP-273	6.5	TP-322	2.3
TP-231	5.0	TP-274	4.0	TP-323	4.0
TP-232	3.0	TP-275	3.5	TP-324	2.2
TP-233	2.2	TP-276	3.0	TP-325	2.5
TP-234	3.3	TP-277	1.8	TP-326	3.0
TP-235	2.0	TP-278	2.8	TP-327	3.3
TP-236	2.7	TP-279	NP	TP-329	2.3
TP-237	3.5	TP-280	5.5	TP-330	6.0
TP-238	1.7	TP-281	3.5	TP-331	3.5
TP-239	3.8	TP-282	4.0	TP-332	3.5
TP-240	2.3	TP-283	5.5	TP-333	2.0
TP-241	3.0	TP-284	3.8	TP-334	5.5
TP-242	3.0	TP-285	3.5	TP-335	2.3

Notes: NA = Cap penetrated but no trash encountered; NP = Cap not penetrated

4.2.3 Landfill Trash

Landfill Trash was encountered beneath the existing cap soils in all locations with the exception of test pits TP-200, TP-201, TP-202, TP-203, TP-279, TP-293, and TP-298. The landfill trash generally consisted of various types of debris intermixed with varying amounts of soils. The depth to trash for each test pit are presented on the following page in Table 1.

4.2.4 Residual Soils

Residual soils were encountered beneath the existing cap fill soils in Test Pits TP-200 through TP-203. These soils generally consisted of clay and sand mixtures (USCS: CL) with varying amounts of gravel and extended to the depth of termination where encountered. No landfill trash was encountered in these test pits.

4.2.5 Environmental Screenings

No Combustible Gas or Oxygen readings exceeding the requirements in the Health and Safety Plan were noted during the investigation. All oxygen readings were noted as 20.9% with the exception of test pits performed during a period of precipitation in which slightly lower oxygen levels were noted. It is possible that the precipitation was the cause of the lower level of oxygen. The results of the screening for oxygen and LELs are presented below.

Table 2 – Environmental Monitoring Results

Test Pit	O_2 (%)	LEL (%)	Test Pit	O_2 (%)	LEL (%)	Test Pit	O_2 (%)	LEL (%)
TP-200	20.9	0	TP-243	20.3	0	TP-286	20.9	0
TP-201	20.9	0	TP-244	20.6	0	TP-287	20.9	0
TP-202	20.9	0	TP-245	20.9	0	TP-288	20.9	0
TP-203	20.9	0	TP-246	20.9	0	TP-289	20.9	0
TP-204	20.9	0	TP-247	20.9	0	TP-290	20.9	0
TP-205	20.9	0	TP-248	20.9	0	TP-291	20.9	0
TP-206	20.9	0	TP-249	20.9	0	TP-292	20.9	0
TP-207	20.9	0	TP-250	20.6	0	TP-293	20.9	0
TP-208	20.9	0	TP-251	20.9	0	TP-294	20.9	0
TP-209	20.9	0	TP-252	20.9	0	TP-295	20.9	0
TP-210	20.9	0	TP-253	20.9	0	TP-298	20.9	0
TP-211	20.9	0	TP-254	20.9	0	TP-299	20.9	0
TP-212	20.9	0	TP-255	20.9	0	TP-301	20.9	0

Notes: O_2 = Oxygen; LEL = Lower Explosive limit

Table 2 – Environmental Monitoring Results (cont.)

TP-213	20.9	0	TP-256	20.9	0	TP-302	20.9	0
TP-214	20.9	0	TP-257	20.9	0	TP-303	20.9	0
TP-215	20.9	0	TP-258	20.9	0	TP-304	20.9	0
TP-216	20.9	0	TP-259	20.9	0	TP-305	20.9	0
TP-217	20.9	0	TP-260	20.9	0	TP-307	20.9	0
TP-218	20.9	0	TP-261	20.9	0	TP-308	20.9	0
TP-219	20.9	0	TP-262	20.9	0	TP-309	20.9	0
TP-220	20.9	0	TP-263	20.9	0	TP-310	20.9	0
TP-221	20.9	0	TP-264	20.9	0	TP-311	20.9	0
TP-222	20.9	0	TP-265	20.9	0	TP-312	20.9	0
TP-223	20.9	0	TP-266	20.9	0	TP-314	20.9	0
TP-224	20.9	0	TP-267	20.9	0	TP-315	20.9	0
TP-225	20.9	0	TP-268	20.9	0	TP-317	20.9	0
TP-226	20.9	0	TP-269	20.9	0	TP-318	20.9	0
TP-227	20.9	0	TP-270	20.9	0	TP-319	20.9	0
TP-228	20.9	0	TP-271	20.9	0	TP-320	20.9	0
TP-229	20.9	0	TP-272	20.9	0	TP-321	20.9	0
TP-230	20.9	0	TP-273	20.9	0	TP-322	20.9	0
TP-231	20.9	0	TP-274	20.9	0	TP-323	20.9	0
TP-232	20.9	0	TP-275	20.9	0	TP-324	20.9	0
TP-233	20.9	0	TP-276	20.9	0	TP-325	20.9	0
TP-234	20.6	0	TP-277	20.9	0	TP-326	20.9	0
TP-235	20.6	0	TP-278	20.9	0	TP-327	20.9	0
TP-236	20.6	0	TP-279	20.9	0	TP-329	20.9	0
TP-237	20.9	0	TP-280	20.9	0	TP-330	20.9	0
TP-238	20.9	0	TP-281	20.9	0	TP-331	20.9	0
TP-239	20.9	0	TP-282	20.9	0	TP-332	20.9	0
TP-240	20.9	0	TP-283	20.9	0	TP-333	20.9	0
TP-241	20.4	0	TP-284	20.9	0	TP-334	20.9	0
TP-242	20.3	0	TP-285	20.9	0	TP-335	20.9	0

Notes: O_2 = Oxygen; LEL = Lower Explosive limit

4.2.7 Ground Water Conditions

Static groundwater was not observed in any of the test pits. Subsurface water levels will fluctuate with changes in rainfall and runoff, construction and development activities, and other causes. Future groundwater levels across the site should be expected to vary from those noted during the recent exploration program.

4.2.8 Laboratory Test Results

The completed laboratory index tests performed on samples of the existing cap fill soils are summarized on the following Table 1 - Laboratory Test Results. The laboratory results are presented in graphic form in **Appendix B**.

Table 3 – Laboratory Test Results

Boring	Sample Depth (ft)	USCS Class.	In-Place Moisture (%)	Atterberg Limits			- #200 Sieve (%)	Modified Proctor [1]	
				LL	PL	PI		MDD (pcf)	OMC (%)
TP-208	0.0 - 2.0	SM	27.6	36	26	10	48	118.7	13.3
TP-215	0.0 - 2.0	ML	29.8	36	25	11	62	115.0	14.4
TP-228	0.0 - 2.0	ML	26.3	40	27	13	71	112.9	15.5
TP-231	0.0 - 2.0	ML	28.9	34	24	10	62	118.2	13.6
TP-241	0.0 - 2.0	ML	29.7	38	31	7	52	121.7	9.0
TP-253	0.0 - 2.0	SM	24.1	35	29	6	41	119.4	12.4
TP-258	0.0 - 2.0	ML	26.0	37	26	11	60	115.8	13.8
TP-259	0.0 - 2.0	ML	31.0	49	37	12	54	108.4	17.8
TP-263	0.0 - 2.0	SM	31.0	36	30	6	41	117.6	10.5
TP-273	0.0 - 2.0	SM	24.3	30	24	6	49	121.7	12.0

Notes: [1] Modified Proctor performed in accordance with AASHTO T-180; MDD = Maximum Dry Density, OMC = Optimum Moisture Content

5.0 EVALUATION AND RECOMMENDATIONS

5.1 Topsoil Reuse

Generally, topsoil was encountered sporadically, with most plant covering growing directly in the existing fill soils with no distinct topsoil stratum. As such, the existing topsoil is not expected to be suitable for reuse as topsoil, since it is likely not cost effective to collect. However, it could be mixed with the existing cap fill soils for reuse with them.

5.2 Cap Fill Soil Reuse

The site soils are suitable for reuse as controlled compacted fills. It should be noted that the fill materials may contain minor amounts of trash debris however these are not expected to affect the reusability of the soils. Fill placed at any location requiring stable support or minimal settlement shall be constructed as controlled compacted fill. Compacted fill should be placed in relatively horizontal 8-inch loose lifts. Each lift should be uniformly and evenly bladed and mixed during spreading to ensure uniformity of the material in each layer. Each layer should be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density as determined by AASHTO T-180. The moisture content of the materials shall be maintained such that the required degree of compaction can be obtained.

If fills are to be placed on slopes, the original ground should be deeply scarified, or where slopes are steeper than 5 horizontal to 1 vertical, the slope should be stepped or benched, when considered necessary by the Geotechnical Engineer, in order that the placement of fill may be accomplished in horizontal lifts.

5.3 Compaction Moisture Contents

It was noted that the measured natural moisture contents were both higher than the optimum moisture values for most efficient compaction. As a result, drying of excessively wet soils by special manipulation (aerating, discing, etc.) will be required in order to achieve the specified degree of compaction. However it should also be noted that the investigation took place during a period of particularly active precipitation, and the moisture contents obtained may not be indicative of more typical site conditions.

Wet weather could exacerbate the potential compaction difficulties. Cement or lime modification, or mixing with drier or more granular soils, or other methods, could also be used to improve wet or unstable soils at the time of compaction. If earthwork operations are performed during the winter months, the contractor must not work with frozen soils.

5.4 Weather Conditions

Weather (rainfall and freezing) has a huge influence on site earthwork, foundations, and concrete placement. Average monthly weather data reported by the nearest National Oceanic and Atmospheric Administration (NOAA) station, located within Baltimore, provide an insight to the local temperature and precipitation conditions.

Table 4 –Baltimore City NOAA station

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precipitation[1] (in.)	2.84	2.32	3.56	2.99	3.89	3.43	3.85	3.74	3.98	3.16	3.02	3.03	39.81
Below Freezing Days	25	21	14	3	*	0	0	0	0	2	11	21	97

Source: National Oceanic and Atmospheric Administration, minimum 30-year reporting period
[1]Adjusted precipitation to reflect rainfall only (excludes frozen precipitation- pellets, sleet and hail).
*Not reported

According to NOAA, the typical monthly precipitation for the reporting station averages from 2.32 inches in February to 3.98 inches in September. The number of days experiencing freezing temperatures varied from 2 days in October to 25 days in January.

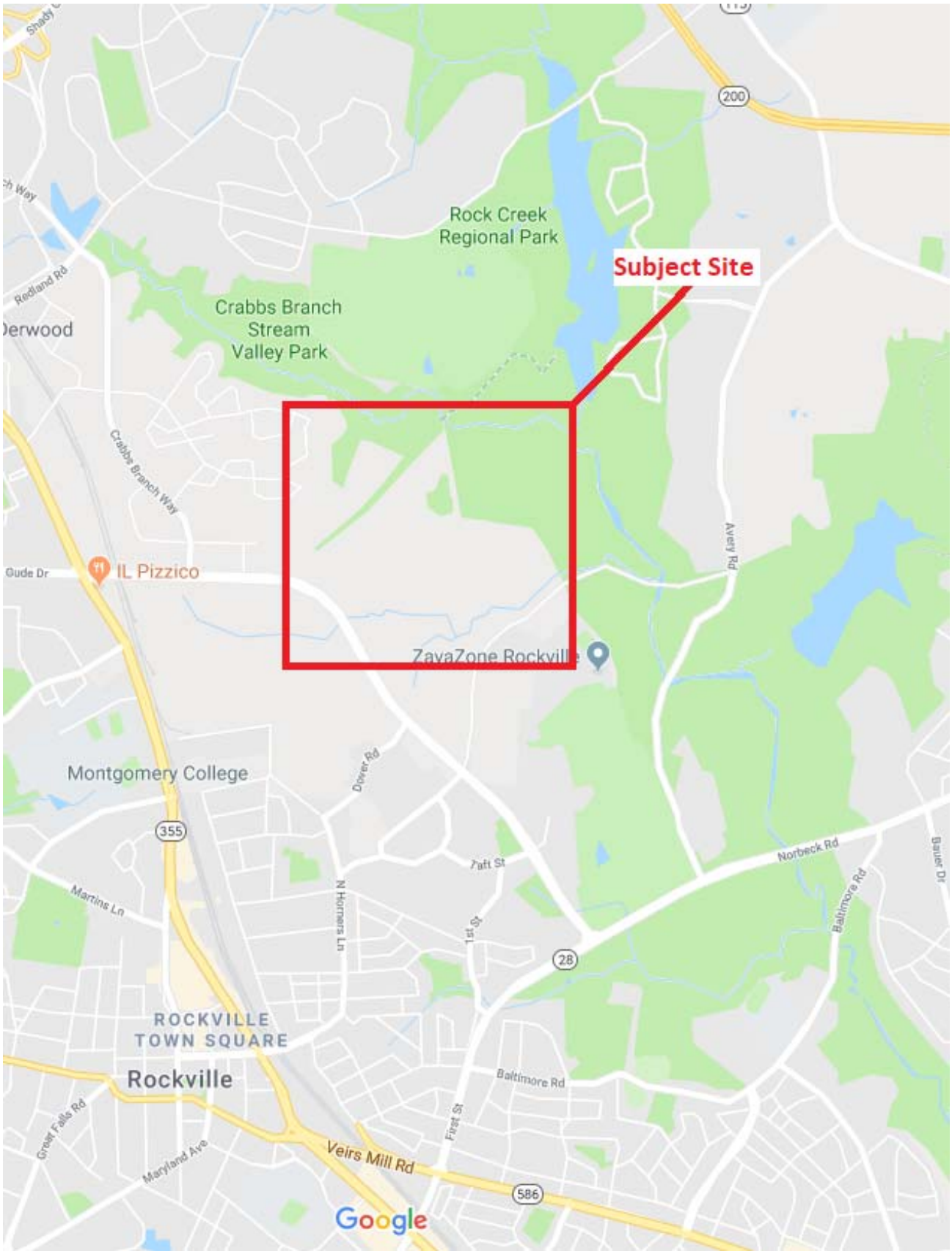
6.0 GEOTECHNICAL OBSERVATION AND TESTING

As variations in soil conditions can be expected to some degree on any project, it is strongly recommended that The Robert B. Balter Company, as project geotechnical engineer, provide full time, on-site observation and testing of all soil related aspects of construction. This is to assure compliance with design concepts and recommendations, and to verify that the subsurface conditions are consistent with those anticipated prior to construction.

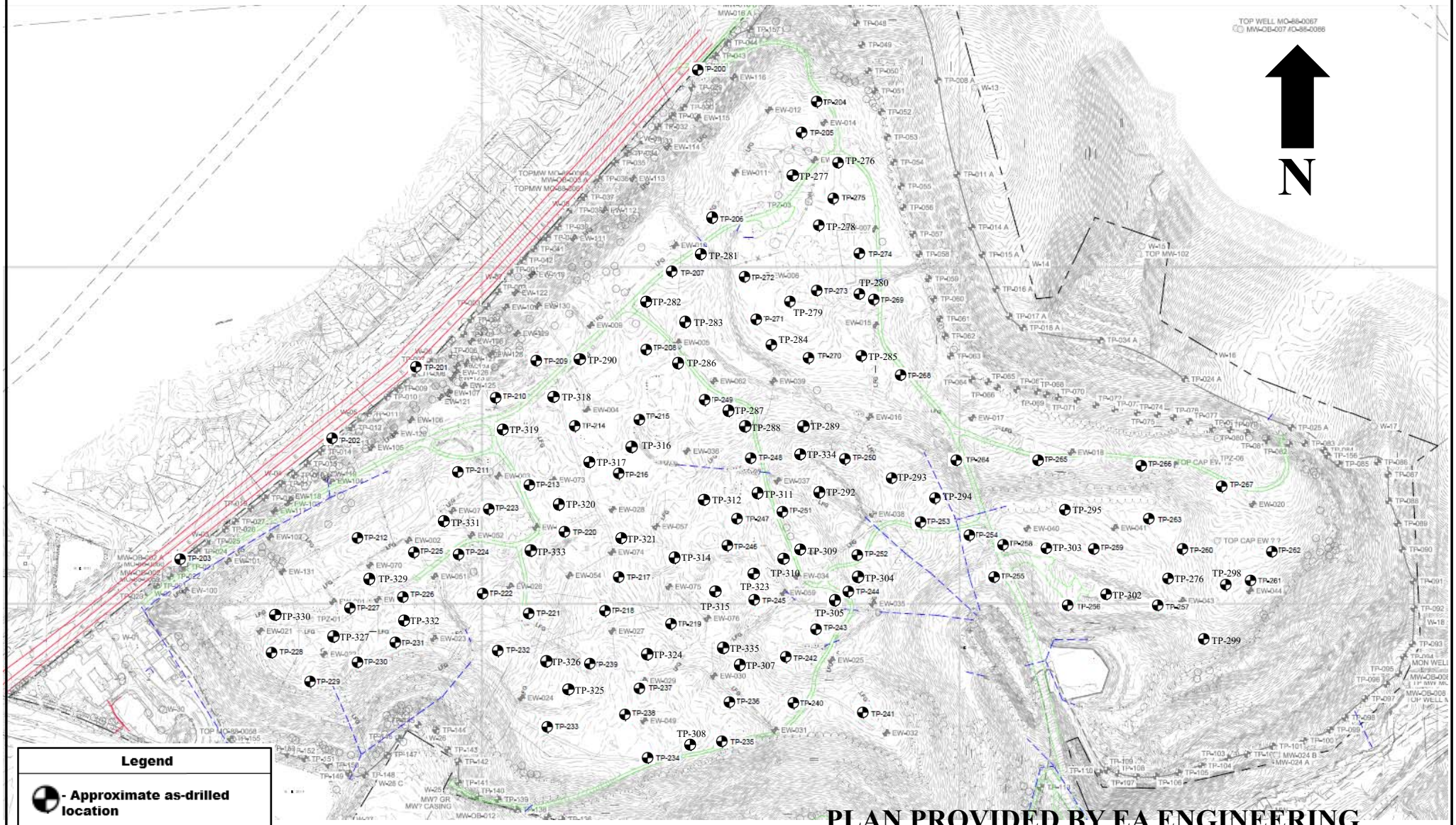
7.0 GENERAL COMMENTS

The evaluations and recommendations contained in this report were based upon the finite data obtained from the borings which are presented within this report. Although we have described typical variations which may affect the project, there is the possibility that significant unanticipated conditions may be present outside the specific boring locations. The nature and extent of differing subsurface conditions, as well as their impact on the proposed construction, will most likely not be evident until the time of construction. If significant differences are discovered in the field during construction, it may be necessary for us to re-evaluate and revise the contents of this report.

Also, this report specifically excludes exploration, sampling, testing, evaluation and recommendations relating to the presence of hazardous materials or other environmental concerns which could affect future development of the site. The Robert B. Balter Company performs such services and would be pleased to provide a proposal to address your needs.



Gude Landfill **Rockville, MD** THE ROBERT B. BALTER COMPANY® Geotechnical and Geo-environmental Engineers	**Site Vicinity Map**		**Project No.** **16943-0**
	Scale: None	**Date: Sept. 2018**	**PLATE 1**



PLAN PROVIDED BY EA ENGINEERING

THE ROBERT B. BALTER COMPANY®
Geotechnical and Geo-environmental Engineers

Gude Landfill
Rockville, MD

DRAFT BORING LOCATION PLAN

Project No. 16943-0

Date: August 2018

Plate 2

APPENDIX A

TEST PIT LOGS

THE ROBERT B. BALTER COMPANY

IDENTIFICATION OF SOIL SAMPLES

Soils are described in the boring logs according to the following criteria with the principal constituents written in capital letters. Other constituents are preceded by descriptive terminology that is used to denote the percentage of weight of each component. Soil descriptions are determined visually except where laboratory classification test data are available. Classifications are based on The Robert B. Balter Company's interpretation of ASTM D 2487-00.

COARSE GRAINED SOIL > 50% Retained on No. 200 Sieve	**GRAVEL**	0 to 5% Fines	Well Graded		**GW**	GRAVEL
			Poorly Graded		**GP**	GRAVEL
		6 to 12% Fines	Silty Fines	Well Graded	**GW-GM**	GRAVEL with Silt
				Poorly Graded	**GP-GM**	GRAVEL with Silt
			Clayey Fines	Well Graded	**GW-GC**	GRAVEL with Clay
				Poorly Graded	**GP-GC**	GRAVEL with Clay
		13 to 50% Fines	Silty Fines		**GM**	Silty GRAVEL
			Silty Clay Fines		**GC-GM**	Silty, Clayey GRAVEL
			Clayey Fines		**GC**	Clayey GRAVEL
	SAND	0 to 5% Fines	Well Graded		**SW**	SAND
			Poorly Graded		**SP**	SAND
		6 to 12% Fines	Silty Fines	Well Graded	**SW-SM**	SAND with Silt
				Poorly Graded	**SP-SM**	SAND with Silt
			Clayey Fines	Well Graded	**SW-SC**	SAND with Clay
				Poorly Graded	**SP-SC**	SAND with Clay
		13 to 50% Fines	Silty Fines		**SM**	Silty SAND
			Silty, Clayey Fines		**SC-SM**	Silty, Clayey SAND
			Clayey Fines		**SC**	Clayey SAND
FINE GRAINED SOIL ≥ 50% Passing No. 200 Sieve	**SILT & CLAY (LL<50)**	Low Plastic Fines, PI<4	Plots below "A" line		**ML**	SILT
		Low Plastic Fines, 4≤PI≤7	Plots on or above "A" line		**CL-ML**	Silty CLAY
		Plastic Fines, PI>7	Plots on or above "A" line		**CL**	Lean CLAY
		Significant Organics, PI<4	Plots below "A" line		**OL**	Organic SILT
		Significant Organics, PI≥4	Plots on or above "A" line		**OL**	Organic CLAY
	SILT & CLAY (LL≥50)	Elastic Fines	Plots below "A" line		**MH**	Elastic SILT
		Plastic Fines	Plots on or above "A" line		**CH**	Fat CLAY
		Significant Organics	Plots below "A" line		**OH**	Organic SILT
		Significant Organics	Plots on or above "A" line		**OH**	Organic CLAY
HIGHLY ORGANIC SOIL		Dark, highly organic, decomposed vegetative tissue			**PT**	PEAT

ADDITIONAL TERMINOLOGY:

Descriptive Components

Descriptive Terms	Proportions
Trace	1 - 5%
Little (Sand, Gravel)	6 - 14%
With (Sand, Gravel)	15 – 30%
With (Silt, Clay)	6 – 12%
Adjective Form (**Sandy, Gravelly**)	31 - 50%
Adjective Form (**Silty, Clayey**)	13 - 50%

Density or Consistency

SAND and GRAVEL		SILT and CLAY	
N-Value	**Density**	**N-Value**	**Consistency**
0-4	Very Loose	0-1	Very Soft
5-10	Loose	2-4	Soft
11-30	Medium Dense	5-8	Medium Stiff
31-50	Dense	9-15	Stiff
> 50	Very Dense	16-30	Very Stiff
		> 30	Hard

Fill materials are placed by man, and may be identified by unnatural artifacts, unnatural mixed grain sizes or layering, or trustworthy documentation of fill placement.
Possible Fill materials are difficult to distinguish from natural soils, exhibiting minor distinctions.
Decomposed Rock consists of residual soil with SPT N-values between 50 blows per foot and blows per 4 inches (50/4").
Highly Weathered Rock consists of residual soil with SPT N-values between 50/3" and 50/1".

The Robert B. Balter Company
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TEST PIT TP-200

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES _____

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		Moist, Light Brown, Silty SAND (Fill)
					1.5
					Moist, Reddish Brown, Sandy CLAY
2.5					
5.0			CL		
7.5		Trash Not Encountered			8.0
					Bottom of test pit at 8.0 feet

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TEST PIT TP-201

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES _____

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
					Topsoil
0.3					
			CL		Moist, Reddish Brown, Sandy CLAY (Fill)
1.5					
					Moist, Reddish Brown, Sandy CLAY
2.5					
			CL		
5.0					
7.5					
		Trash Not Encountered			
8.0					
					Bottom of test pit at 8.0 feet

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TEST PIT TP-202

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES _____

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					0.1 Topsoil
			CL		Moist, Light Brown, Sandy CLAY (Fill)
					1.8 Moist, Red Brown, Sandy CLAY (Fill)
2.5					
5.0			CL		
7.5		Trash Not Encountered			8.0 Bottom of test pit at 8.0 feet

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TEST PIT TP-203

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES _____

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					0.1 Topsoil
			CL		Moist, Reddish Brown, Sandy CLAY (Fill)
					2.0
2.5					Moist, Reddish Brown, Sandy CLAY
5.0			CL		
7.5		Trash Not Encountered			8.0
					Bottom of test pit at 8.0 feet

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TEST PIT TP-204

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11148 Long: -77.13783

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
4.0				
				Trash
4.5				
				Bottom of test pit at 4.0 feet

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TEST PIT TP-205

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11118 Long: -77.13796

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Moist, Light Brown, Silty SAND
2.5		SM		
5.0				5.0
				Trash
				5.5
				Bottom of test pit at 5.5 feet

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TEST PIT TP-206

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11053 Long: -77.13894

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-207

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11008 Long: -77.13921

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				Bottom of test pit at 2.5 feet

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TEST PIT TP-208

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10939 Long: -77.13972

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			SM		Moist, Light Brown, Silty SAND
2.5					
5.0					5.0
					Trash
					6.0
					Bottom of test pit at 6.0 feet

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TEST PIT TP-209

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10926 Long: -77.14083

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM	F F	Moist, Light Brown, Silty SAND
0.9				Trash
1.5				Bottom of test pit at 1.5 feet

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TEST PIT TP-210

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10896 Long: -77.14148

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				Trash
				4.0
				Bottom of test pit at 4.0 feet

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TEST PIT TP-211

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10841 Long: -77.14166

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.7				Trash
2.3				Bottom of test pit at 2.3 feet

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TEST PIT TP-212

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10788 Long: -77.14278

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.7				Trash
2.5				Bottom of test pit at 2.5 feet

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TEST PIT TP-213

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10826 Long: -77.1409

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				
3.2				Bottom of test pit at 3.2 feet

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TEST PIT TP-214

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10877 Long: -77.14042

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.5
				Bottom of test pit at 3.5 feet

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TEST PIT TP-215

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10899 Long: -77.13973

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Moist, Light Brown, Sandy SILT
2.5			ML		
5.0					
					5.3
					Trash
					6.5
					Bottom of test pit at 6.5 feet

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TEST PIT TP-216

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10851 Long: -77.13996

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				
2.5				Trash
3.5				Bottom of test pit at 3.5 feet

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TEST PIT TP-217

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10756 Long: -77.13993

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
4.0				Trash
4.7				Bottom of test pit at 4.7 feet

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TEST PIT TP-218

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10719 Long: -77.14022

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
4.0				Trash
5.0				Bottom of test pit at 5.0 feet

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TEST PIT TP-219

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10721 Long: -77.1394

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
4.3				Trash
5.0				Bottom of test pit at 5.0 feet

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TEST PIT TP-220

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10789 Long: -77.14055

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.3
				Bottom of test pit at 3.3 feet

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TEST PIT TP-221

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10726 Long: -77.14095

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.3				Trash
1.7				Bottom of test pit at 1.7 feet

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TEST PIT TP-222

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10736 Long: -77.14129

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.0				Bottom of test pit at 2.0 feet

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TEST PIT TP-223

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10799 Long: -77.14142

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM	F F	Moist, Light Brown, Silty SAND
0.9				Trash
2.0				Bottom of test pit at 2.0 feet

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TEST PIT TP-224

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10762 Long: -77.14197

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				Bottom of test pit at 2.7 feet
2.7				

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TEST PIT TP-225

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10778 Long: -77.14199

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM	F	Moist, Light Brown, Silty SAND
0.3				Trash
1.7				Bottom of test pit at 1.7 feet

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TEST PIT TP-226

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10732 Long: -77.14234

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.0				Bottom of test pit at 2.1 feet

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TEST PIT TP-227

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10709 Long: -77.14275

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				Bottom of test pit at 2.5 feet

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TEST PIT TP-228

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1069 Long: -77.14385

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		Moist, Light Brown, Sandy SILT
2.5					
					3.5
					Trash
					4.0
					Bottom of test pit at 4.0 feet

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TEST PIT TP-229

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10657 Long: -77.1433

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
5.3				Trash
5.7				Bottom of test pit at 5.7 feet

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TEST PIT TP-230

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10674 Long: -77.14291

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			2.7	
				Trash
			4.0	
				Bottom of test pit at 4.0 feet

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TEST PIT TP-231

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10682 Long: -77.14237

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Moist, Light Brown, Silty SAND
2.5			ML		
5.0					5.0
					Trash
					5.5
					Bottom of test pit at 5.5 feet

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TEST PIT TP-232

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10691 Long: -77.1414

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.3
				Bottom of test pit at 3.3 feet

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TEST PIT TP-233

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10613 Long: -77.14079

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.2				Trash
2.5				
3.5				Bottom of test pit at 3.5 feet

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TEST PIT TP-234

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10595 Long: -77.13967

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.3				Trash
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-235

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10613 Long: -77.13878

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				Bottom of test pit at 2.7 feet

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TEST PIT TP-236

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10645 Long: -77.13873

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			2.7	
				Trash
			3.0	
				Bottom of test pit at 3.0 feet

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TEST PIT TP-237

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10652 Long: -77.1396

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.0				Bottom of test pit at 4.1 feet

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TEST PIT TP-238

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10627 Long: -77.13977

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.7				Trash
2.5				Bottom of test pit at 2.7 feet
2.7				

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TEST PIT TP-239

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/18/18 **COMPLETED** 7/18/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10656 Long: -77.14034

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/18/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
3.8				Trash
5.0				Bottom of test pit at 5.0 feet

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TEST PIT TP-240

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: N/A Long: N/A

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-241

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10637 Long: -77.13711

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		Moist, Light Brown, Sandy SILT
2.5					
					3.0
					3.3 Trash
					Bottom of test pit at 3.0 feet

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TEST PIT TP-242

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD _____
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1065 Long: -77.13825

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			3.0	
			3.3	Trash
				Bottom of test pit at 3.0 feet

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TEST PIT TP-243

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10665 Long: -77.13783

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.3				Trash
2.3				Bottom of test pit at 2.3 feet

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TEST PIT TP-244

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10739 Long: -77.13747

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.0				Trash
1.3				Bottom of test pit at 1.4 feet

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TEST PIT TP-245

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10734 Long: -77.13841

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.3				Trash
2.5				
3.3				Bottom of test pit at 3.3 feet

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TEST PIT TP-246

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10779 Long: -77.13878

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
3.8				Trash
5.2				Bottom of test pit at 6.2 feet
2.5				
5.0				

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TEST PIT TP-247

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10806 Long: -77.13856

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.3				
3.5				Trash
				Bottom of test pit at 3.6 feet

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TEST PIT TP-248

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10856 Long: -77.1384

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.0				Bottom of test pit at 2.0 feet

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TEST PIT TP-249

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10801 Long: -77.13895

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.5
				Bottom of test pit at 3.5 feet

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TEST PIT TP-250

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10853 Long: -77.13708

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.8				Trash
2.0				Bottom of test pit at 2.0 feet

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TEST PIT TP-251

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10802 Long: -77.13806

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.0				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-252

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10769 Long: -77.13729

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.0				Bottom of test pit at 2.0 feet

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TEST PIT TP-253

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10805 Long: -77.1365

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		Moist, Light Brown, Silty SAND
5.5					Trash
7.0					
10.0					Bottom of test pit at 10.0 feet

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TEST PIT TP-254

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107852 Long: -77.13603

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				
			0.3	Topsoil
		SM		Moist, Reddish Brown, Silty SAND with Gravel (Fill)
2.5				
			3.9	
				Trash
			4.3	
				Bottom of test pit at 4.3 feet

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TEST PIT TP-255

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107514 Long: -77.135773

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Topsoil
			0.3	
		SM		Moist, Brown, Silty SAND with Gravel And Boulders
2.5				
			3.3	
			3.5	Trash
				Bottom of test pit at 3.3 feet

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TEST PIT TP-256

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107207 Long: -77.135056

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Topsoil
			0.3	
		SM		Moist, Brown, Silty SAND with Gravel
2.5				
			4.8	
5.0				Trash
			6.5	
				Bottom of test pit at 6.5 feet

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TEST PIT TP-257

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10724 Long: -77.134086

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				
		SM		0.1 Topsoil Dry, Brown, Silty SAND with Gravel
				1.9 Trash
2.5				3.0 Bottom of test pit at 3.0 feet

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TEST PIT TP-258

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107704 Long: -77.135629

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Topsoil
					0.5
			ML		Moist, Brown, Sandy SILT
2.5					
					4.0
					Trash
					4.5
					Bottom of test pit at 4.5 feet

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TEST PIT TP-259

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107749 Long: -77.134712

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Topsoil
				0.3	
			ML		Moist, Brown, Sandy SILT
2.5					
5.0					
				6.0	
					Trash
				6.9	
					Bottom of test pit at 6.8 feet

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TEST PIT TP-260

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10566 Long: -77.13373

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Brown, SIlty SAND
2.5				
4.0				Trash
4.5				Bottom of test pit at 4.6 feet

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TEST PIT TP-261

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10746 Long: -77.133188

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
5.0				
6.0				Trash
6.5				Bottom of test pit at 6.5 feet

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TEST PIT TP-262

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107675 Long: -77.133093

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Brown, Silty SAND
2.0				Trash
2.5				
3.8				Bottom of test pit at 3.8 feet

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TEST PIT TP-263

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.107969 Long: -77.134034

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Topsoil
0.5					Moist, Brown, Silty SAND
2.5			SM		
5.0					
6.0					Trash
7.5					
10.0					

Bottom of test pit at 10.0 feet

GENERAL BH / TP / WELL 16943-0 GUDE LANDFILL.GPJ ROBERT B BALTER.GDT 9/5/18

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TEST PIT TP-264

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.108534 Long: -77.136183

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Brown, Silty SAND with Boulders
3.0				Trash
5.5				Bottom of test pit at 5.5 feet

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TEST PIT TP-265

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.108515 Long: -77.135298

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Reddish Brown, Silty SAND
2.5				
				3.0
				Trash
				3.7
				Bottom of test pit at 3.7 feet

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TEST PIT TP-266

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.108506 Long: -77.134112

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Brown, Silty SAND
2.3				Trash
2.5				
3.2				Bottom of test pit at 3.2 feet

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TEST PIT TP-267

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/16/18 **COMPLETED** 7/16/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.108229 Long: -77.13338

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/16/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Brown, Silty SAND
2.0				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-268

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10909 Long: -77.13675

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.5
				Bottom of test pit at 3.5 feet

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TEST PIT TP-269

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10985 Long: -77.13716

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				Trash
3.5				Bottom of test pit at 3.5 feet

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TEST PIT TP-270

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10939 Long: -77.1377

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.5
				Bottom of test pit at 3.5 feet

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TEST PIT TP-271

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10966 Long: -77.13839

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.3				Bottom of test pit at 2.3 feet

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TEST PIT TP-272

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10686 Long: -77.1832

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.0		GM		Moist, Gray, Silty GRAVEL
1.5		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.5				Bottom of test pit at 4.5 feet

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TEST PIT TP-273

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10993 Long: -77.13773

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Moist, Reddish Brown, Sandy CLAY
2.5			CL		
5.0					
					6.5
					Trash
					7.0
					Bottom of test pit at 7.0 feet

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TEST PIT TP-274

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11031 Long: -77.13718

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
4.0				Trash
4.5				Bottom of test pit at 4.5 feet

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TEST PIT TP-275

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/17/18 **COMPLETED** 7/17/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11088 Long: -77.13745

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/17/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-276

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11103 Long: -77.13744

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			3.0	
				Trash
			3.8	
				Bottom of test pit at 3.8 feet

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TEST PIT TP-277

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11097 Long: -77.13793

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		GM		Crushed Stone
				0.9
		SM		Moist, Light Brown, Silty SAND
				1.8
2.5				Trash
				2.7
				Bottom of test pit at 2.7 feet

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TEST PIT TP-278

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11052 Long: -77.13746

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			2.8	Trash
			3.7	Bottom of test pit at 3.7 feet

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TEST PIT TP-279

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10976 Long: -77.13802

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		Moist, Light Brown, Silty SAND with trace amount of trash debris
2.5					
5.0					
7.5		Trash Not Encountered			8.0
					Bottom of test pit at 8.0 feet

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TEST PIT TP-280

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10993 Long: -77.1375

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Asphalt Debris
0.8		SM		Moist, Light Brown, Silty SAND with variable amounts of garbage
2.5				
5.0				
5.5				Trash
6.5				Bottom of test pit at 6.5 feet

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TEST PIT TP-281

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.11028 Long: -77.1391

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.8				Bottom of test pit at 4.8 feet

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TEST PIT TP-282

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10991 Long: -77.13948

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
4.0				Trash
5.3				Bottom of test pit at 5.3 feet

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TEST PIT TP-283

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10964 Long: -77.13941

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Moist, Light Brown, Silty SAND
2.5		SM		
5.0				
				5.5
				Trash
				7.0
				Bottom of test pit at 7.0 feet

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TEST PIT TP-284

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10951 Long: -77.13799

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.8				Trash
4.5				Bottom of test pit at 4.5 feet

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TEST PIT TP-285

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10952 Long: -77.13738

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.7				Bottom of test pit at 4.7 feet

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TEST PIT TP-286

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10932 Long: -77.13918

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				3.7
				Bottom of test pit at 3.7 feet

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Telephone No. (410) 363-1555
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TEST PIT TP-287

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1089 Long: -77.13878

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
6.5				Trash
7.5				Bottom of test pit at 7.5 feet

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TEST PIT TP-288

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10865 Long: -77.13855

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-289

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10885 Long: -77.13804

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
4.3				Trash
6.5				Bottom of test pit at 6.5 feet
2.5				
5.0				

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TEST PIT TP-290

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10935 Long: -77.14033

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			2.7	
				Trash
			3.0	
				Bottom of test pit at 3.0 feet

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TEST PIT TP-291

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10877 Long: -77.13928

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
3.5				Trash
5.0				Bottom of test pit at 5.0 feet

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TEST PIT TP-292

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10834 Long: -77.13774

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.5				
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-293

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1085 Long: -77.13673

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Moist, Light Brown, Silty SAND
2.5			SM		
5.0					
7.5					
		Trash Not Encountered			8.0
					Bottom of test pit at 8.0 feet

The Robert B. Balter Company
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Telephone No. (410) 363-1555
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TEST PIT TP-294

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10817 Long: -77.13632

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
4.0				Trash
4.5				Bottom of test pit at 4.5 feet

The Robert B. Balter Company
Geotechnical and Environmental Engineers
Materials and Construction Inspection and Testing
Telephone No. (410) 363-1555
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TEST PIT TP-295

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1081 Long: -77.13471

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Moist, Light Brown, Silty SAND
2.5		SM		
5.0				5.0
				Trash
				6.0
				Bottom of test pit at 6.0 feet

The Robert B. Balter Company
Geotechnical and Environmental Engineers
Materials and Construction Inspection and Testing
Telephone No. (410) 363-1555
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TEST PIT TP-298

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1073 Long: -77.13336

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Moist, Light Brown, Silty SAND
2.5			SM		
5.0					
7.5					
		Trash Not Encountered			8.0
					Bottom of test pit at 8.0 feet

The Robert B. Balter Company
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Telephone No. (410) 363-1555
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TEST PIT TP-299

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10701 Long: -77.13348

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				2.7
				Bottom of test pit at 2.7 feet

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TEST PIT TP-301

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10739 Long: -77.13395

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
5.8				Trash
7.0				Bottom of test pit at 7.0 feet

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TEST PIT TP-302

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10737 Long: -77.13473

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				3.0
				Bottom of test pit at 3.0 feet

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TEST PIT TP-303

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10767 Long: -77.13531

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
4.3				Trash
5.0				Bottom of test pit at 5.0 feet

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TEST PIT TP-304

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10749 Long: -77.13753

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.8				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-305

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1074 Long: -77.13733

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.3				Trash
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-307

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10668 Long: -77.13871

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-308

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10613 Long: -77.13903

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
3.5				
3.7				Trash
				Bottom of test pit at 1.8 feet

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TEST PIT TP-309

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10789 Long: -77.13805

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
			3.0	
				Trash
			3.8	
				Bottom of test pit at 3.8 feet

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TEST PIT TP-310

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10764 Long: -77.13807

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.0				Trash
2.5				
4.1				Bottom of test pit at 4.1 feet

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TEST PIT TP-311

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10814 Long: -77.13841

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.6				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-312

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10807 Long: -77.13892

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-314

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: N/A Long: N/A

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.5				Bottom of test pit at 4.5 feet

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TEST PIT TP-315

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10742 Long: -77.139

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.3				Trash
2.5				
3.3				Bottom of test pit at 3.3 feet

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TEST PIT TP-317

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10847 Long: -77.14028

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.2				Trash
4.0				Bottom of test pit at 4.0 feet

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TEST PIT TP-318

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10904 Long: -77.14062

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				Trash
3.8				Bottom of test pit at 3.8 feet

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TEST PIT TP-319

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10879 Long: -77.14117

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.5				Bottom of test pit at 2.5 feet

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TEST PIT TP-320

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10809 Long: -77.14083

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.9				Trash
4.9				Bottom of test pit at 4.8 feet

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TEST PIT TP-321

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10799 Long: -77.14

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
1.5				Trash
2.5				
3.2				Bottom of test pit at 3.2 feet

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TEST PIT TP-322

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10762 Long: -77.14041

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-323

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10753 Long: -77.1384

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
4.0				Trash
5.2				Bottom of test pit at 5.2 feet

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TEST PIT TP-324

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10692 Long: -77.13959

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.2				Trash
2.5				
3.8				Bottom of test pit at 4.0 feet

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TEST PIT TP-325

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.1064 Long: -77.14037

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				Trash
				4.0
				Bottom of test pit at 4.0 feet

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TEST PIT TP-326

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10673 Long: -77.14073

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
				3.0
				Trash
				4.5
				Bottom of test pit at 4.5 feet

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TEST PIT TP-327

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10714 Long: -77.14309

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.3				Trash
4.2				Bottom of test pit at 4.2 feet

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TEST PIT TP-329

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10752 Long: -77.14253

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

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TEST PIT TP-330

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10728 Long: -77.14366

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
6.0				Trash
7.0				Bottom of test pit at 7.0 feet

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TEST PIT TP-331

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10803 Long: -77.14175

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.2				Bottom of test pit at 4.2 feet

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TEST PIT TP-332

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10711 Long: -77.1423

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.5				
3.5				Trash
4.5				Bottom of test pit at 4.5 feet

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TEST PIT TP-333

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10778 Long: -77.1409

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.0				Trash
2.5				
3.3				Bottom of test pit at 3.3 feet

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TEST PIT TP-334

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/19/18 **COMPLETED** 7/19/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10849 Long: -77.13795

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/19/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				Moist, Light Brown, Silty SAND
2.5		SM		
5.0				
				5.5
				Trash
				6.0
				Bottom of test pit at 6.0 feet

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TEST PIT TP-335

CLIENT EA Engineering, Inc.
PROJECT NAME Gude Landfill
PROJECT LOCATION Montgomery County, Maryland
PROJECT NUMBER 16943-0 MD
DATE STARTED 7/20/18 **COMPLETED** 7/20/18
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR The Robert B. Balter Company
EXCAVATION METHOD Case 580N Backhoe
LOGGED BY J. Bailey **CHECKED BY** K. Crist
NOTES Lat: 39.10695 Long: -77.13868

WATER LEVELS

DATE	TIME	ELAPSED HOURS	CASING DEPTH (ft)	HOLE DEPTH (ft)	WATER DEPTH (ft)	WATER ELEV (ft)
7/20/18		0 ▽			NE	

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		SM		Moist, Light Brown, Silty SAND
2.3				Trash
2.5				
3.0				Bottom of test pit at 3.0 feet

APPENDIX B

LABORATORY TEST RESULTS

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SUMMARY OF LABORATORY RESULTS

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/31/2018

Borehole	Depth	Sample Number	Liquid Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	ASTM Classification	Water Content (%)	Max Dry Density (pcf)	Optimum Moisture (%)	CBR Value
TP-208	0.0' - 2.0'	BULK	36	10	37.5	48	A-4	SM	27.6	118.7	13.3	
TP-215	0.0' - 2.0'	BULK	36	11	25	62	A-6	ML	29.8	115.0	14.4	
TP-228	0.0' - 2.0'	BULK	40	13	12.5	71	A-6	ML	26.3	112.9	15.5	
TP-231	0.0' - 2.0'	BULK	34	10	19	62	A-4	ML	28.9	118.2	13.6	
TP-241	0.0' - 2.0'	BULK	38	7	12.5	52	A-4	ML	29.7	121.7	9.0	
TP-253	0.0' - 2.0'	BULK	35	6	37.5	41	A-4	SM	24.1	119.4	12.4	
TP-258	0.0' - 2.0'	BULK	37	11	37.5	60	A-6	ML	26.0	115.8	13.8	
TP-259	0.0' - 2.0'	BULK	49	12	37.5	54	A-7-5	ML	31.0	108.4	17.8	
TP-263	0.0' - 2.0'	BULK	36	6	25	41	A-4	SM	31.0	117.6	10.5	
TP-273	0.0' - 2.0'	BULK	30	6	25	49	A-4	SM	24.3	121.7	12.0	

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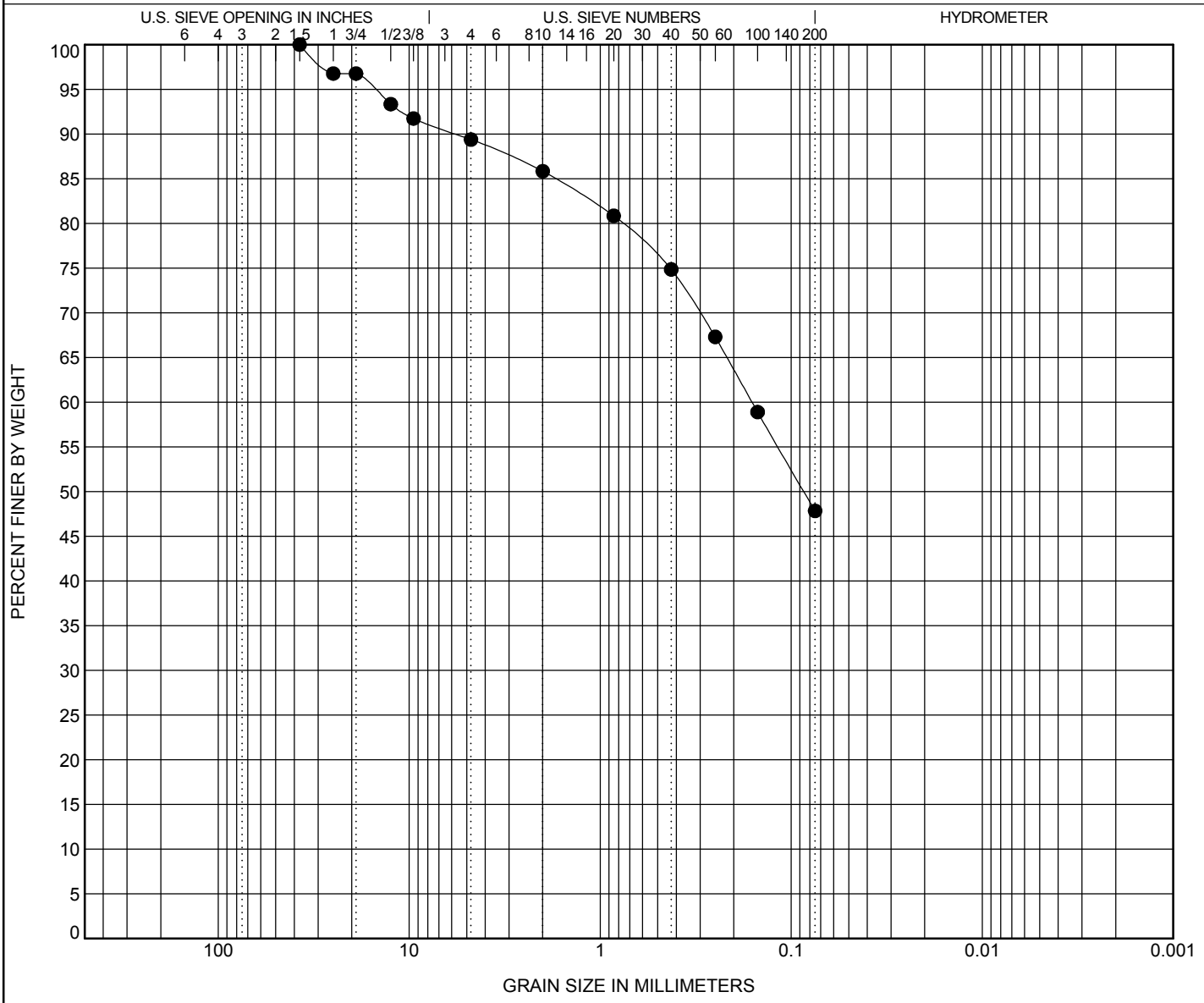
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/31/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-208, BULK**	**Darek Yellowish Brown SILTY SAND(SM) {A-4, GI=2}**	**36**	**26**	**10**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-208, BULK**	**37.5**	**0.16**			**10.6**	**41.5**	**47.8**	

COPY OF GRAIN SIZE ASTM AND AASHTO 16943-0 GUDE LANDFILL.GPJ MTA REDLINE.GDT 8/6/18

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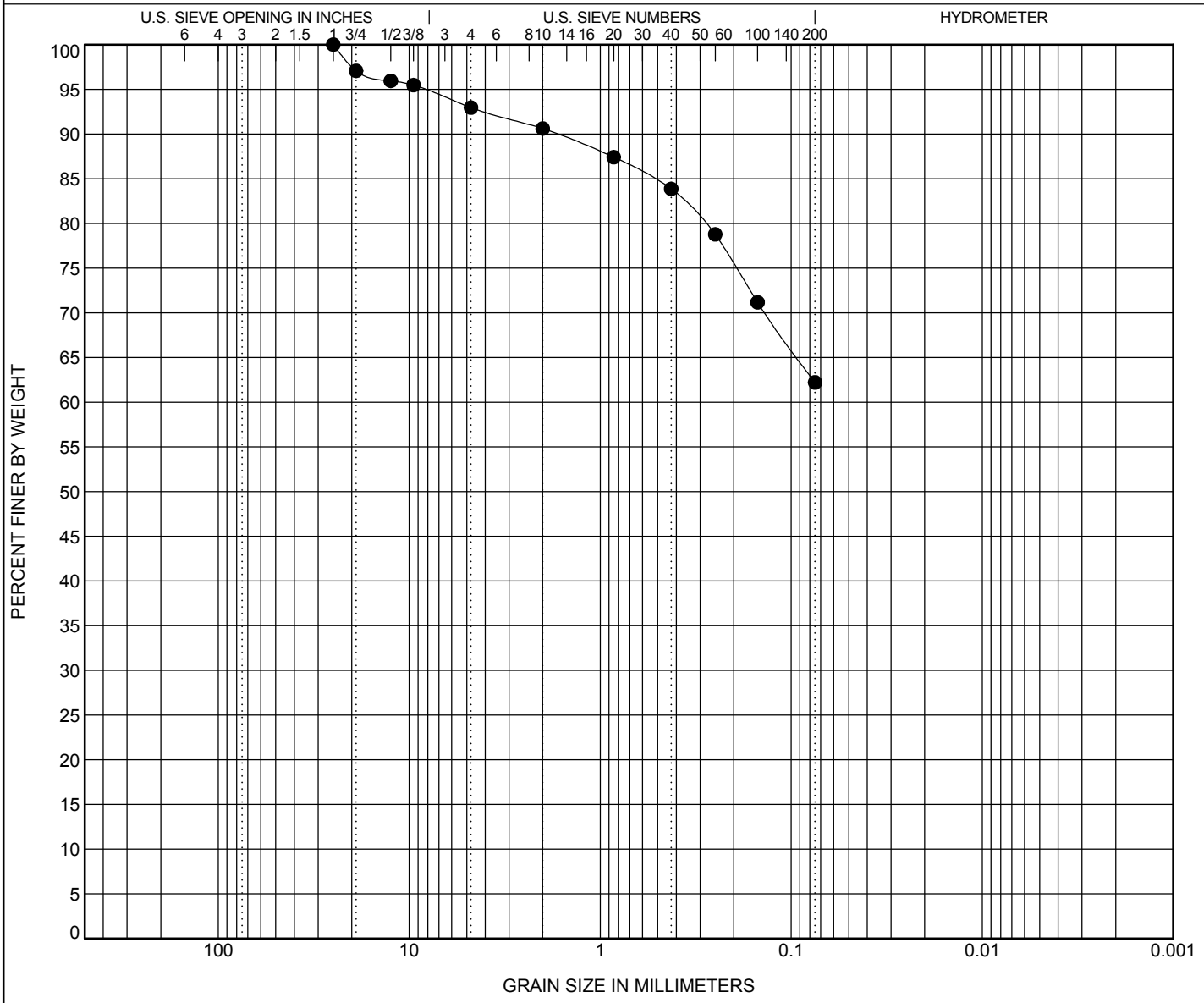
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/31/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-215, BULK**	**Reddish Brown SANDY SILT(ML) {A-6, GI=5}**	**36**	**25**	**11**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-215, BULK**	**25**				**7.1**	**30.7**	**62.2**	

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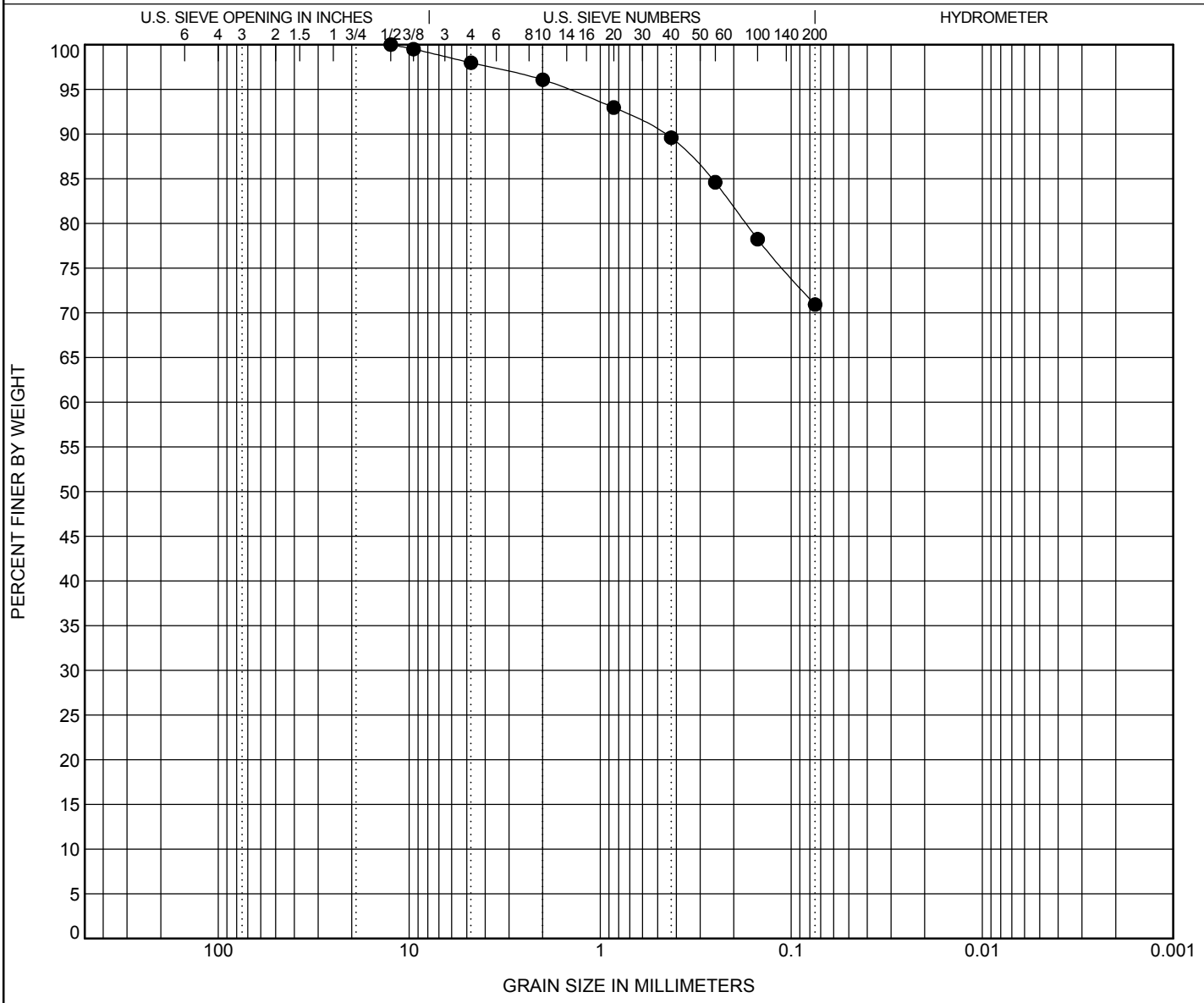
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/29/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-228, BULK**	**Yellowish Red SILT with SAND(ML) {A-6, GI=9}**	**40**	**27**	**13**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-228, BULK**	**12.5**				**2.0**	**27.0**	**70.9**	

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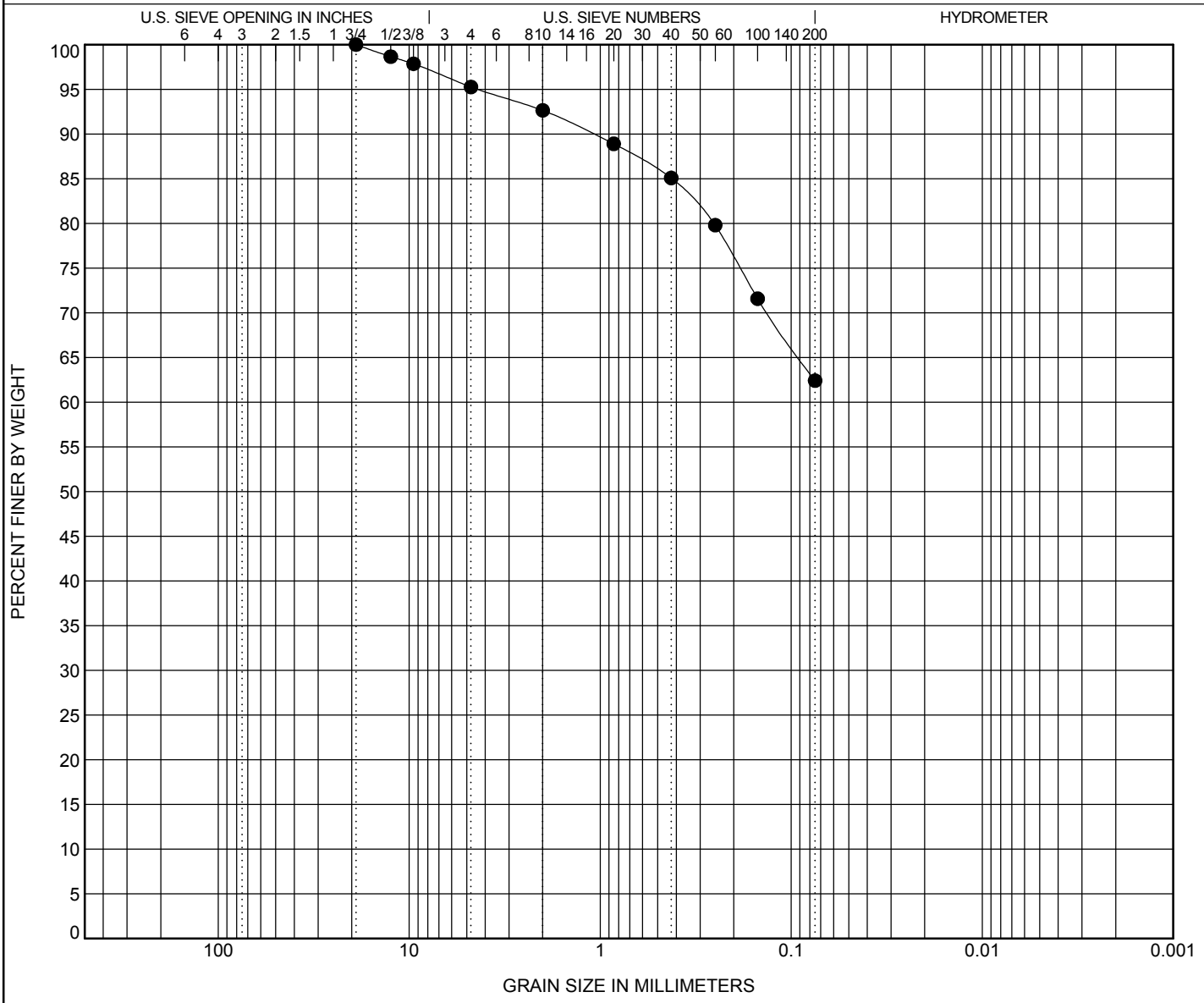
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/29/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-231, BULK**	**Yellowish Red SANDY SILT(ML) {A-4, GI=5}**	**34**	**24**	**10**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-231, BULK**	**19**				**4.7**	**32.9**	**62.4**	

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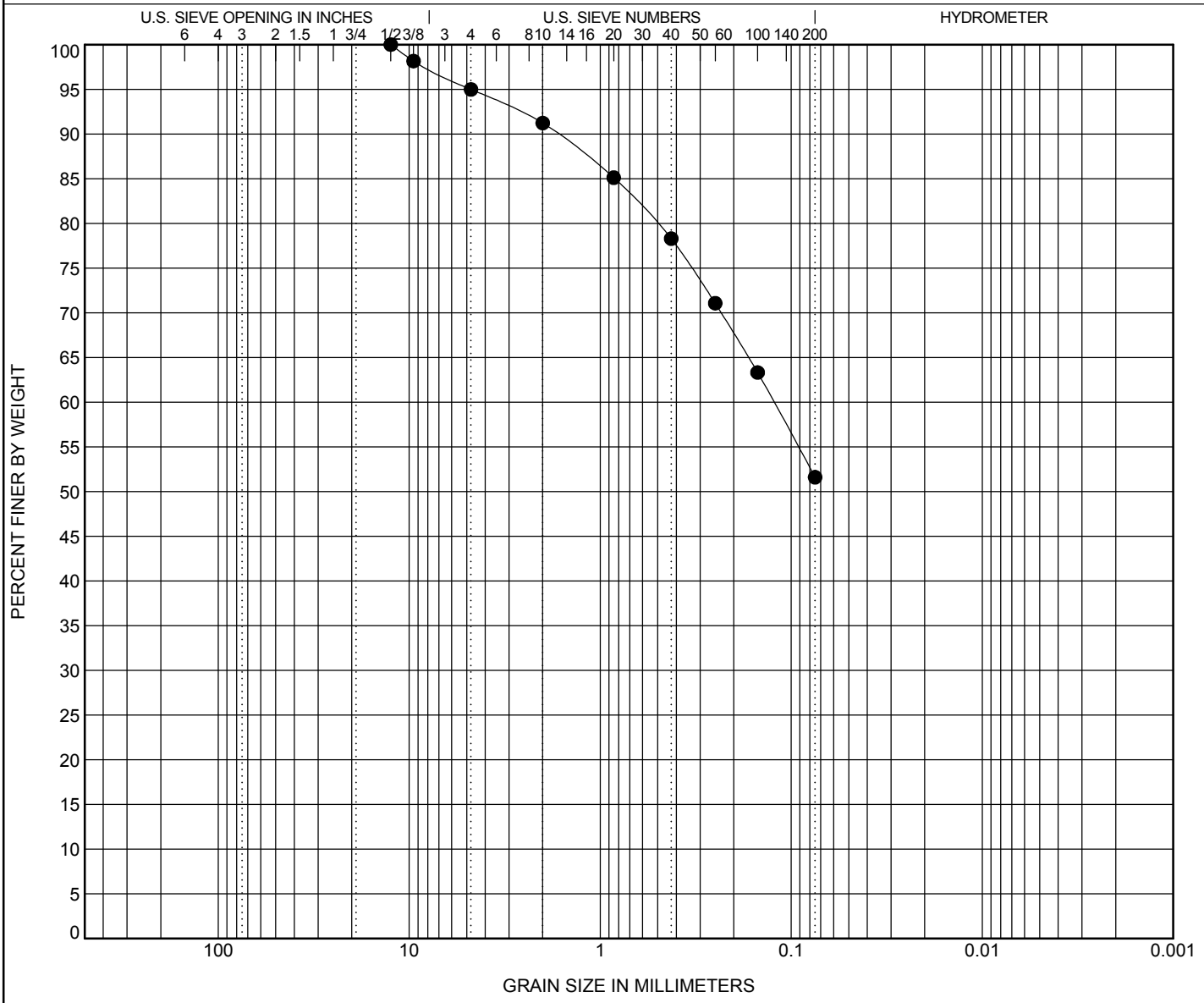
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/29/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-241, BULK**	**Yellowish Red SANDY SILT(ML) {A-4, GI=2}**	**38**	**31**	**7**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-241, BULK**	**12.5**	**0.123**			**5.0**	**43.4**	**51.6**	

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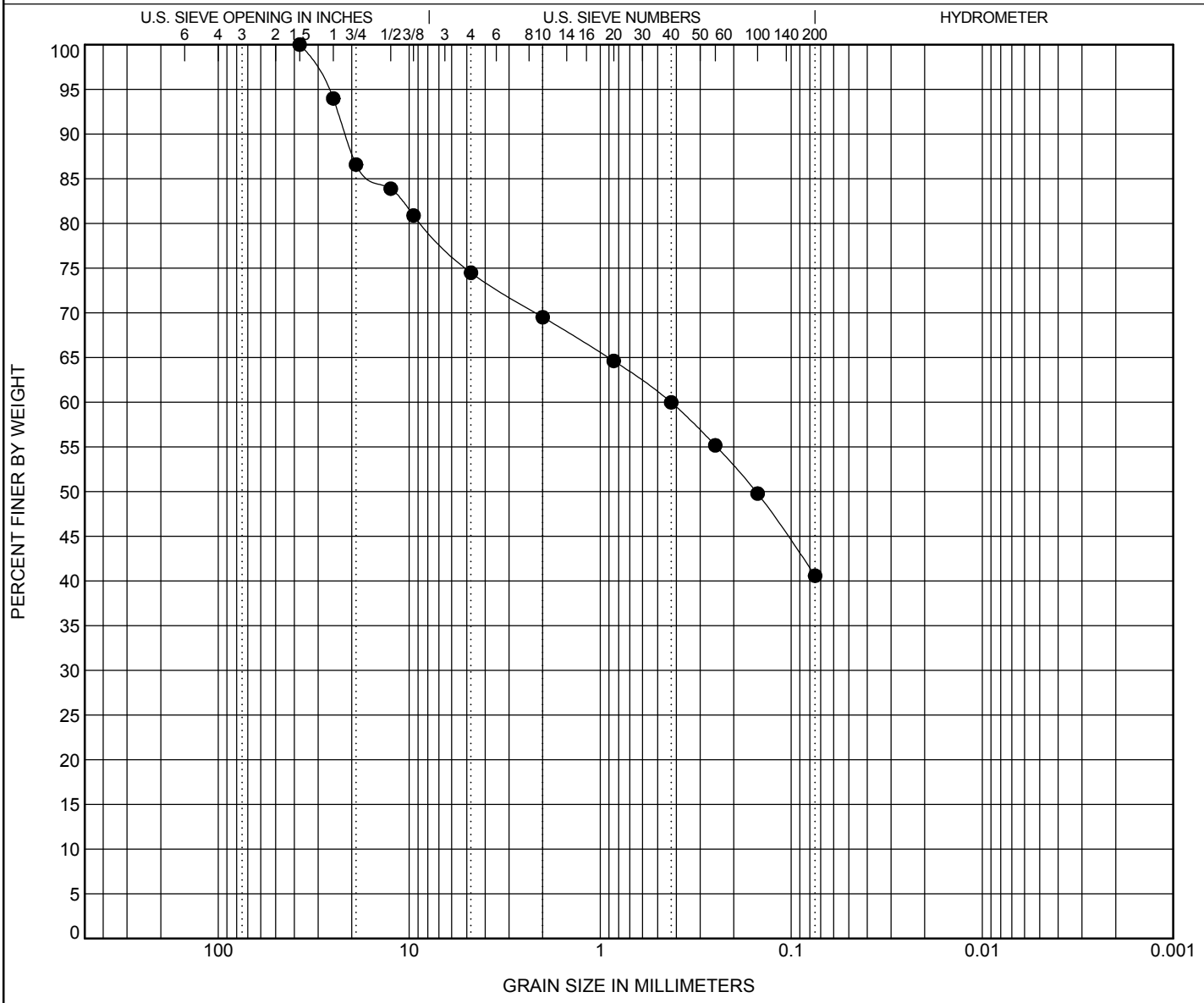
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/27/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-253, BULK**	**Brown SILTY SAND with GRAVEL(SM) {A-4, GI=0}**	**35**	**29**	**6**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-253, BULK**	**37.5**	**0.427**			**25.5**	**33.9**	**40.6**	

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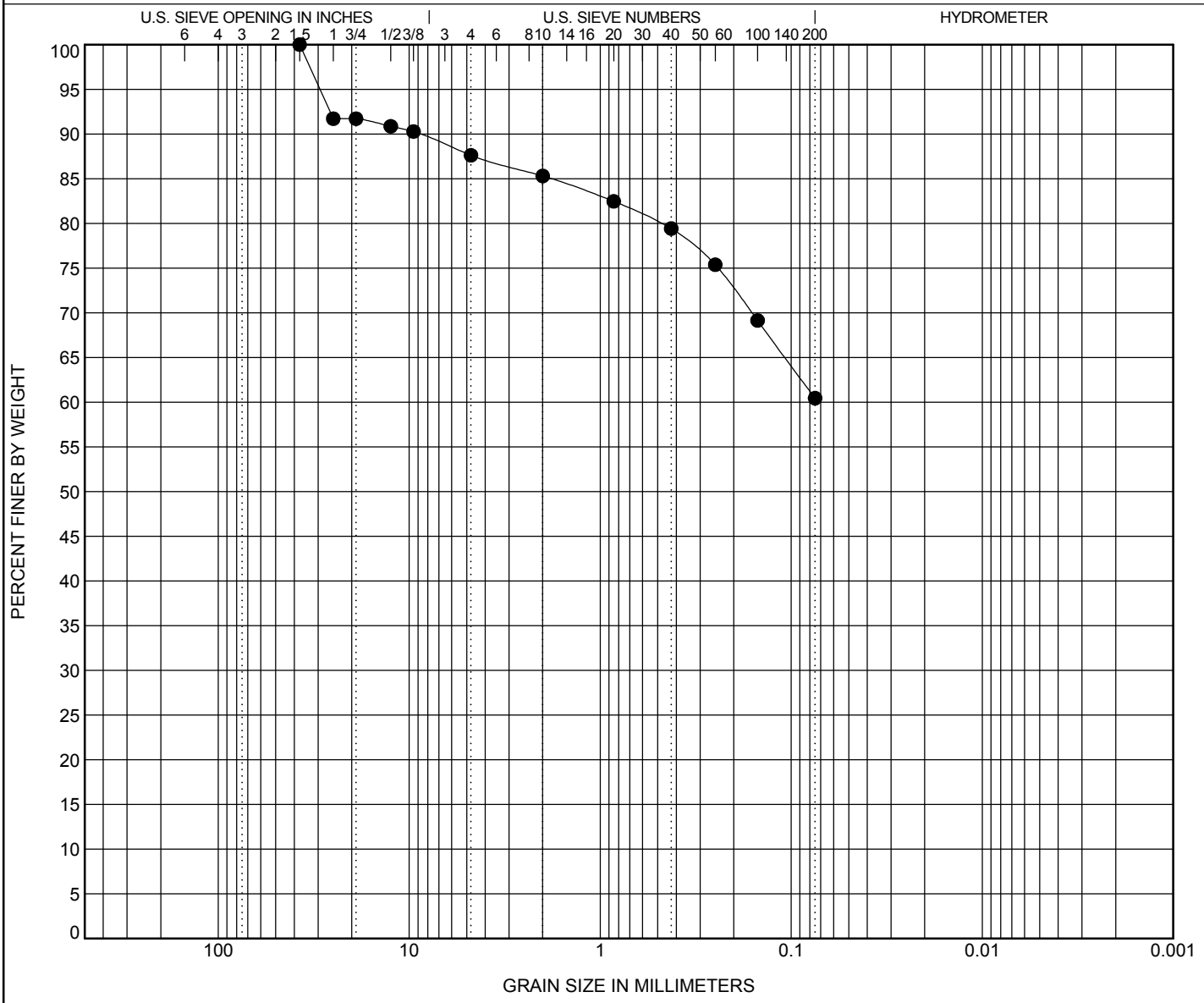
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/30/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-258, BULK**	**Reddish Brown SANDY SILT(ML) {A-6, GI=5}**	**37**	**26**	**11**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-258, BULK**	**37.5**				**12.4**	**27.2**	**60.4**	

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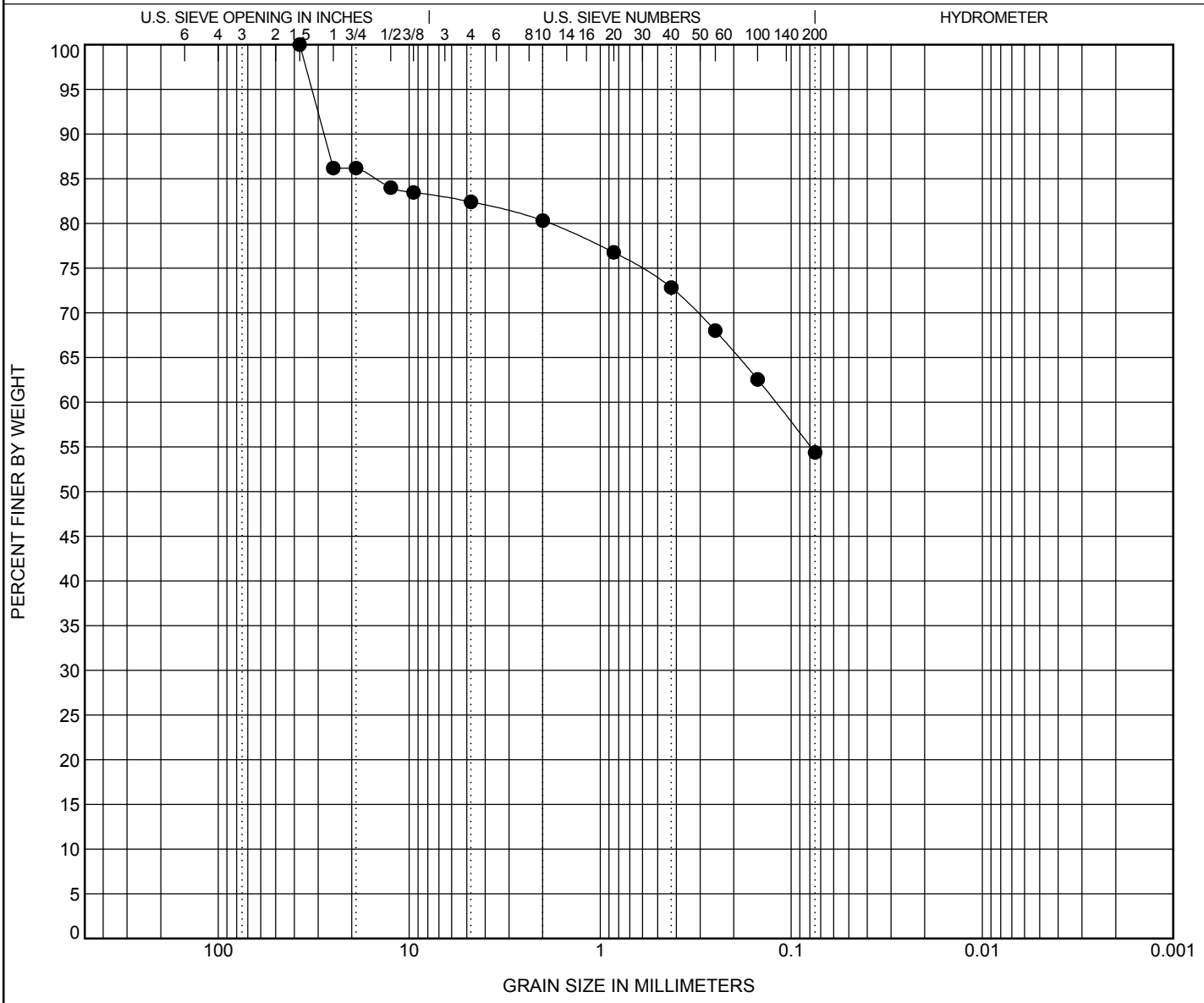
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/28/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-259, BULK**	**Brown SANDY SILT with GRAVEL(ML) {A-7-5, GI=5}**	**49**	**37**	**12**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-259, BULK**	**37.5**	**0.121**			**17.6**	**28.0**	**54.4**	

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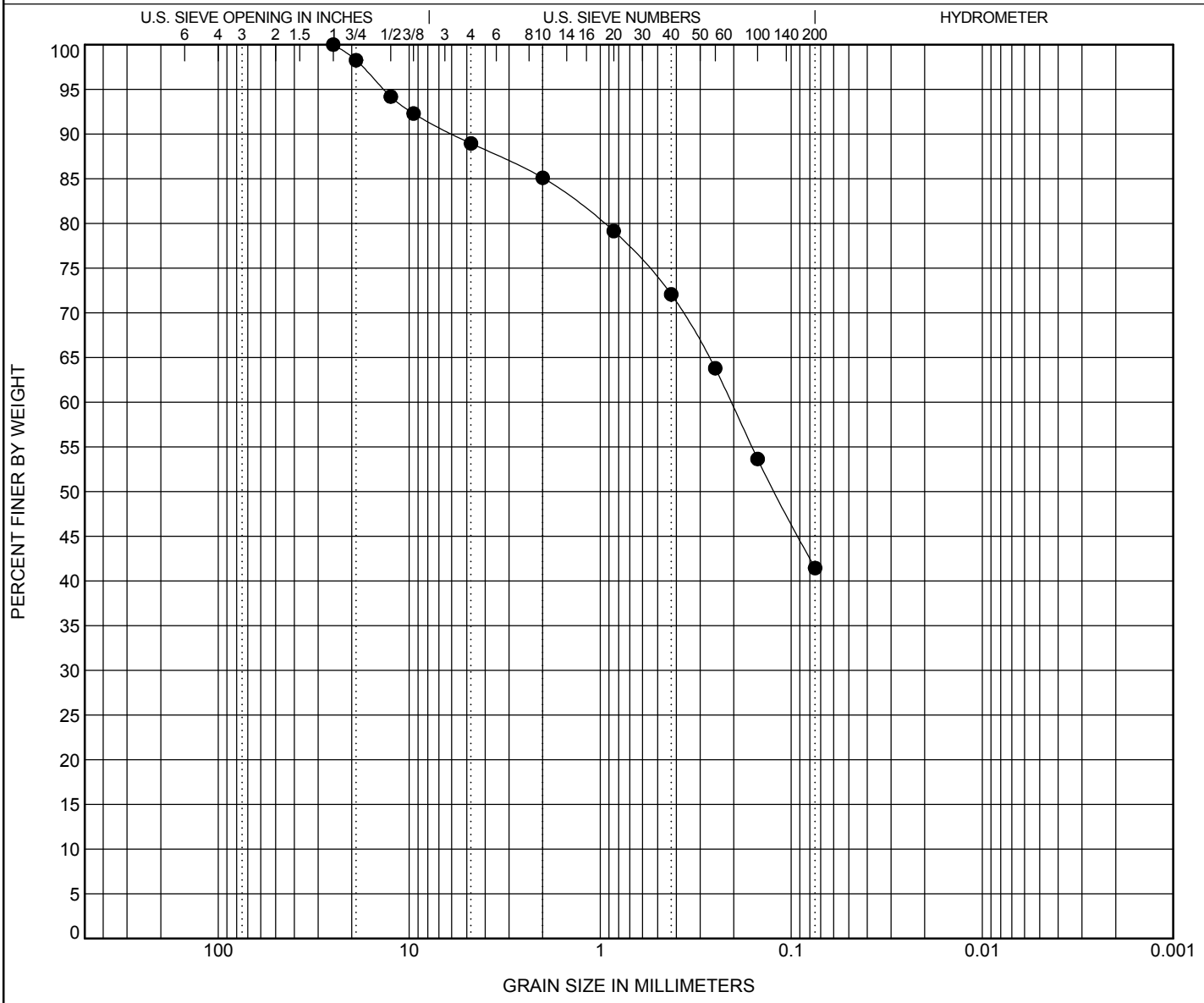
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/30/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-263, BULK**	**Brown SILTY SAND(SM) {A-4, GI=0}**	**36**	**30**	**6**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-263, BULK**	**25**	**0.207**			**11.1**	**47.5**	**41.4**	

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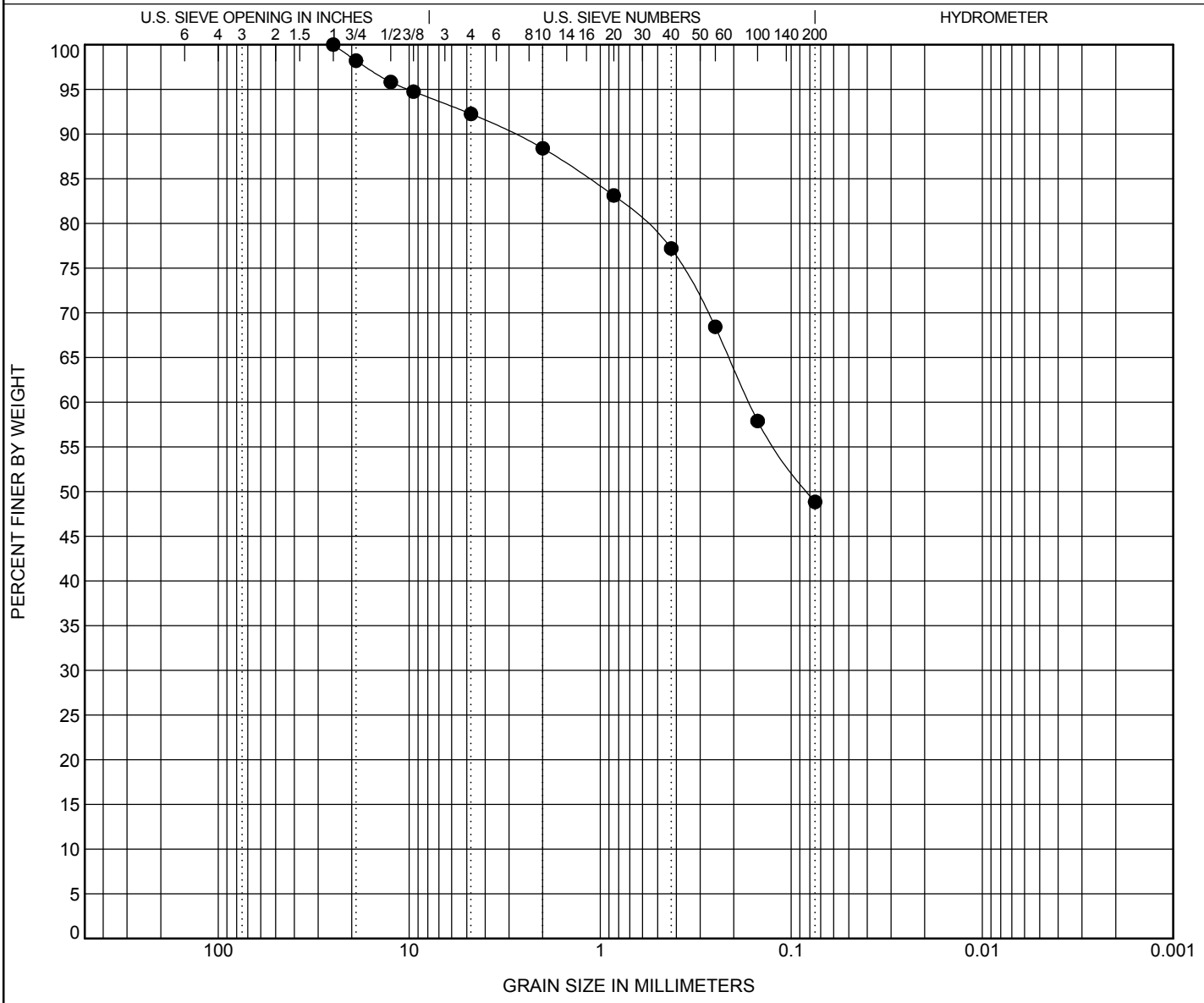
GRAIN SIZE DISTRIBUTION

TEST METHOD ASTM D422

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/27/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-273, BULK**	**Red SILTY SAND(SM) {A-4, GI=1}**	**30**	**24**	**6**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-273, BULK**	**25**	**0.166**			**7.8**	**43.4**	**48.8**	

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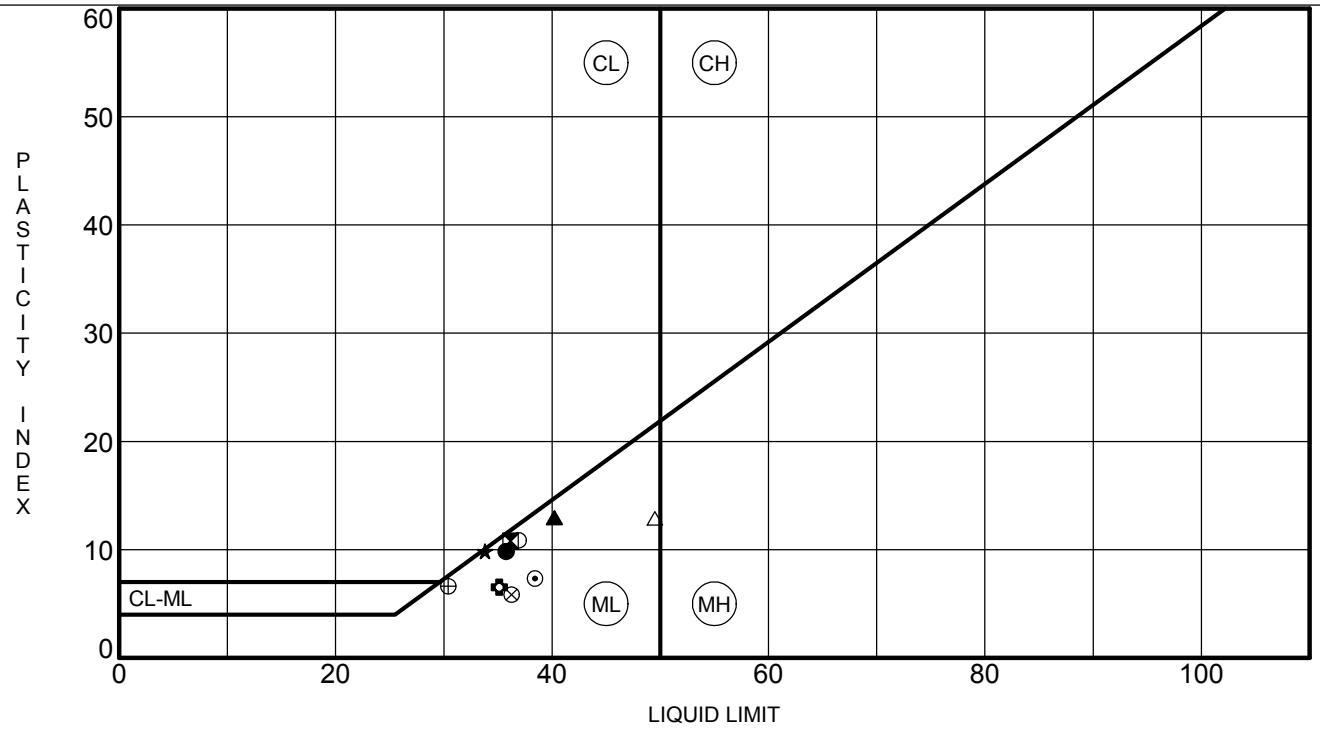
ATTERBERG LIMITS' RESULTS

TEST METHOD ASTM D4318

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/27/2018



	Specimen Identification	LL	PL	PI	Fines	Classification
●	TP-208, BULK @ 0.0' - 2.0',	36	26	10	48	Darek Yellowish Brown SILTY SAND(SM) {A-4, GI=2}
⊠	TP-215, BULK @ 0.0' - 2.0',	36	25	11	62	Reddish Brown SANDY SILT(ML) {A-6, GI=5}
▲	TP-228, BULK @ 0.0' - 2.0',	40	27	13	71	Yellowish Red SILT with SAND(ML) {A-6, GI=9}
★	TP-231, BULK @ 0.0' - 2.0',	34	24	10	62	Yellowish Red SANDY SILT(ML) {A-4, GI=5}
⊙	TP-241, BULK @ 0.0' - 2.0',	38	31	7	52	Yellowish Red SANDY SILT(ML) {A-4, GI=2}
✿	TP-253, BULK @ 0.0' - 2.0',	35	29	6	41	Brown SILTY SAND with GRAVEL(SM) {A-4, GI=0}
○	TP-258, BULK @ 0.0' - 2.0',	37	26	11	60	Reddish Brown SANDY SILT(ML) {A-6, GI=5}
△	TP-259, BULK @ 0.0' - 2.0',	49	37	12	54	Brown SANDY SILT with GRAVEL(ML) {A-7-5, GI=5}
⊗	TP-263, BULK @ 0.0' - 2.0',	36	30	6	41	Brown SILTY SAND(SM) {A-4, GI=0}
⊕	TP-273, BULK @ 0.0' - 2.0',	30	24	6	49	Red SILTY SAND(SM) {A-4, GI=1}

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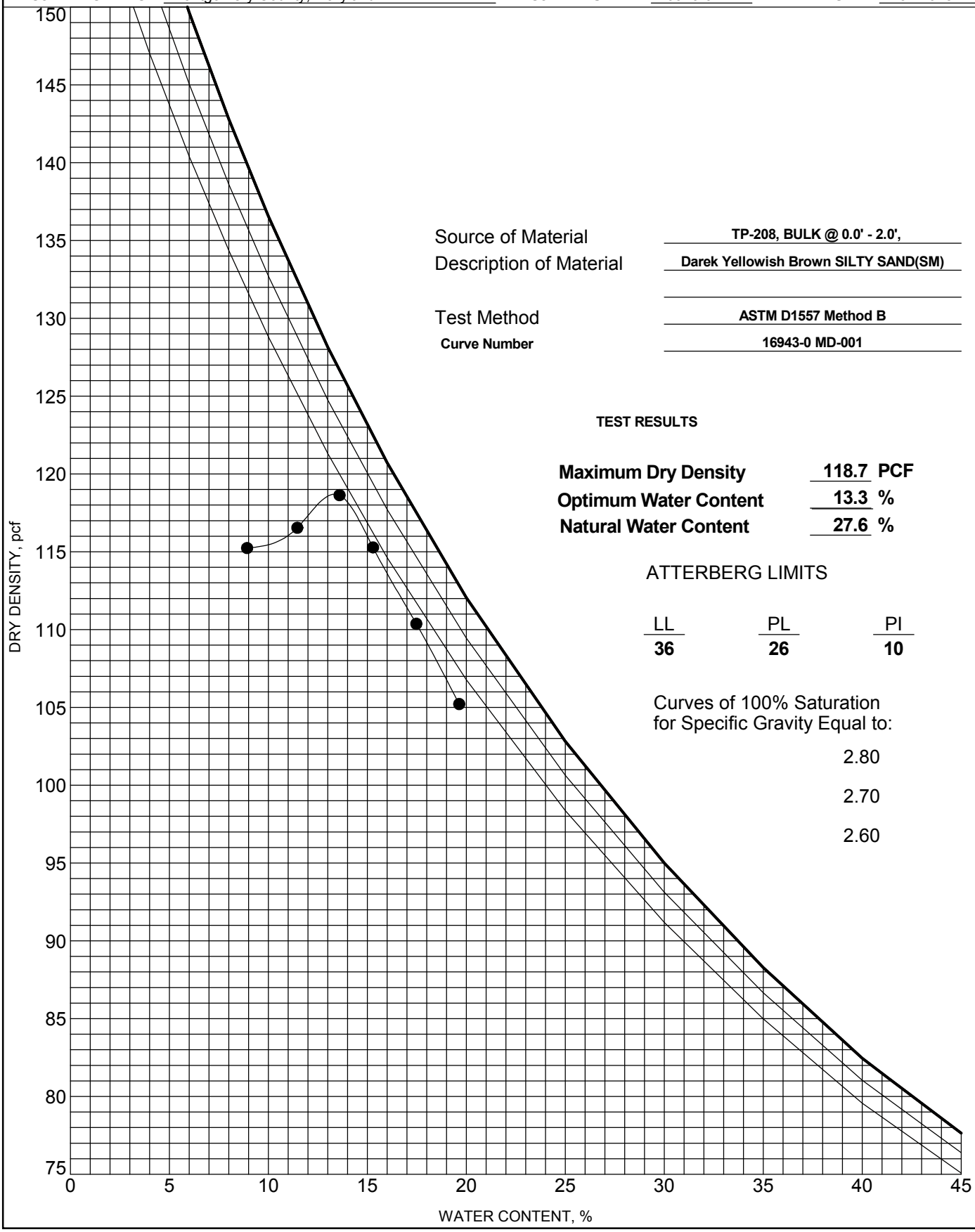
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/31/2018



Source of Material: **TP-208, BULK @ 0.0' - 2.0',**

Description of Material: **Darek Yellowish Brown SILTY SAND(SM)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-001**

TEST RESULTS

Maximum Dry Density	**118.7**	**PCF**
Optimum Water Content	**13.3**	**%**
Natural Water Content	**27.6**	**%**

ATTERBERG LIMITS

LL	PL	PI
36	**26**	**10**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 16943-0 GUDE LANDFILL.GPJ MTA REDLINE.GDT 8/6/18

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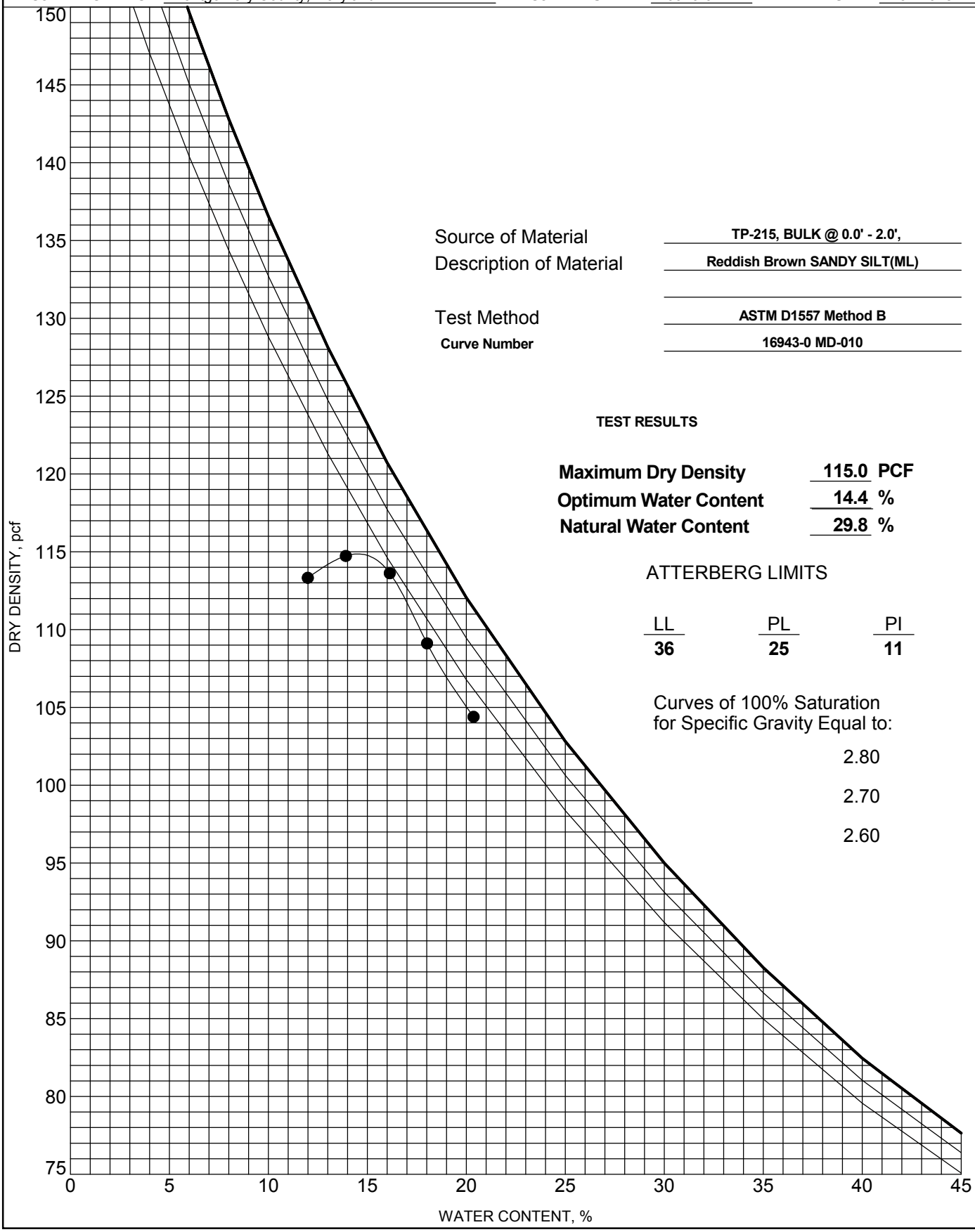
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/31/2018



Source of Material: **TP-215, BULK @ 0.0' - 2.0',**

Description of Material: **Reddish Brown SANDY SILT(ML)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-010**

TEST RESULTS

Maximum Dry Density	**115.0**	**PCF**
Optimum Water Content	**14.4**	**%**
Natural Water Content	**29.8**	**%**

ATTERBERG LIMITS

LL	PL	PI
36	**25**	**11**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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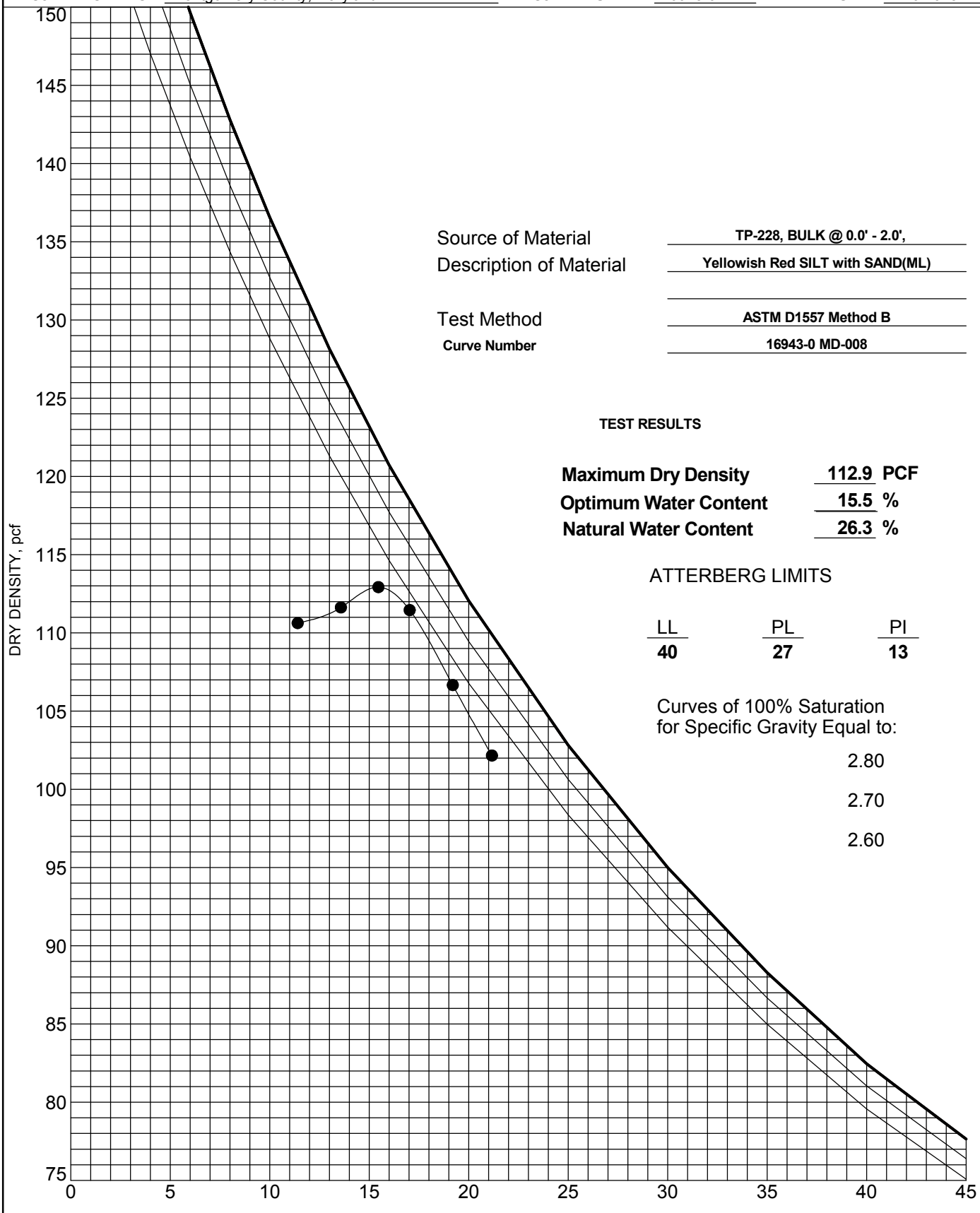
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/29/2018



Source of Material: **TP-228, BULK @ 0.0' - 2.0',**

Description of Material: **Yellowish Red SILT with SAND(ML)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-008**

TEST RESULTS

Maximum Dry Density	**112.9**	**PCF**
Optimum Water Content	**15.5**	**%**
Natural Water Content	**26.3**	**%**

ATTERBERG LIMITS

LL	PL	PI
40	**27**	**13**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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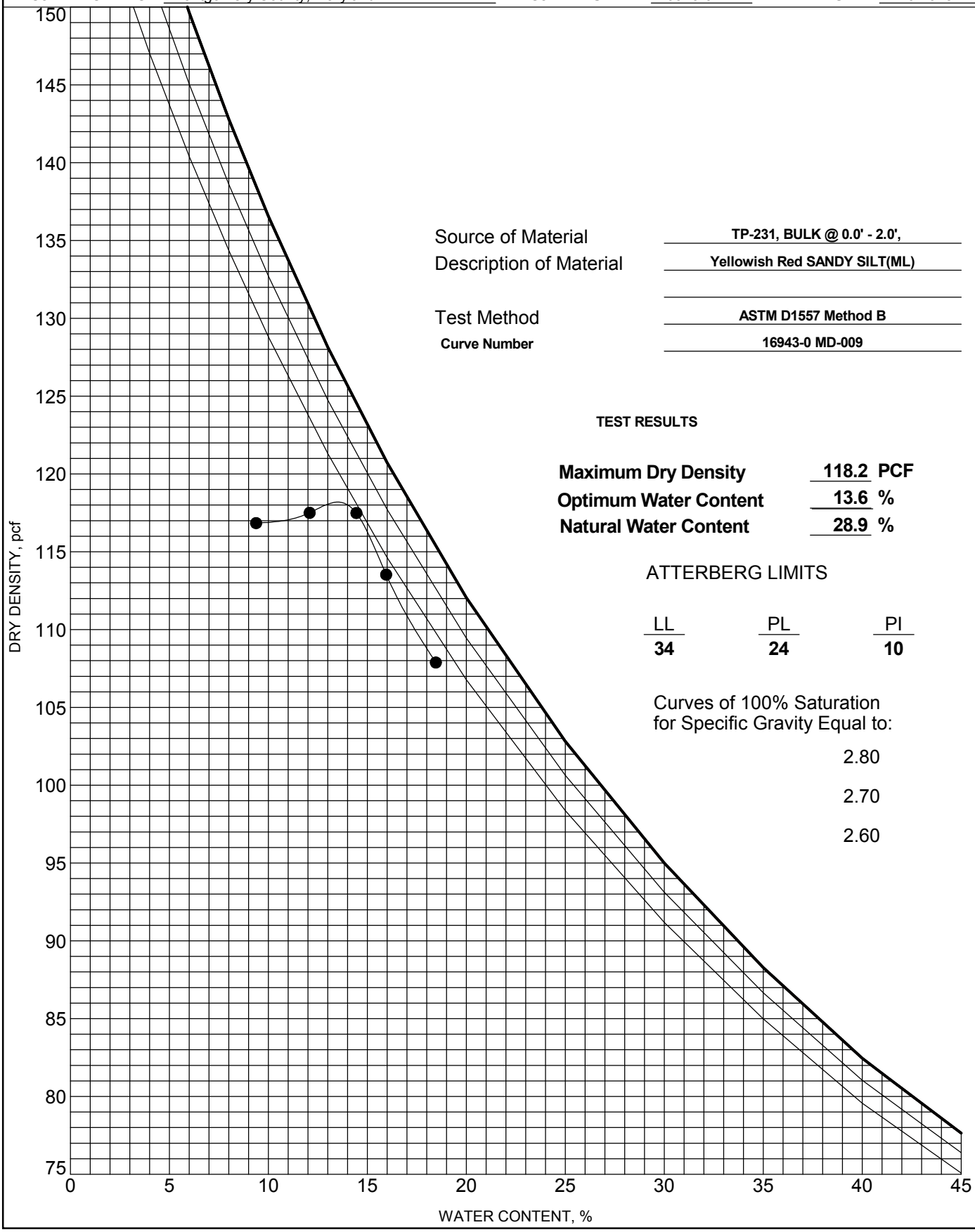
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/29/2018



Source of Material: **TP-231, BULK @ 0.0' - 2.0',**

Description of Material: **Yellowish Red SANDY SILT(ML)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-009**

TEST RESULTS

Maximum Dry Density	**118.2**	**PCF**
Optimum Water Content	**13.6**	**%**
Natural Water Content	**28.9**	**%**

ATTERBERG LIMITS

LL	PL	PI
34	**24**	**10**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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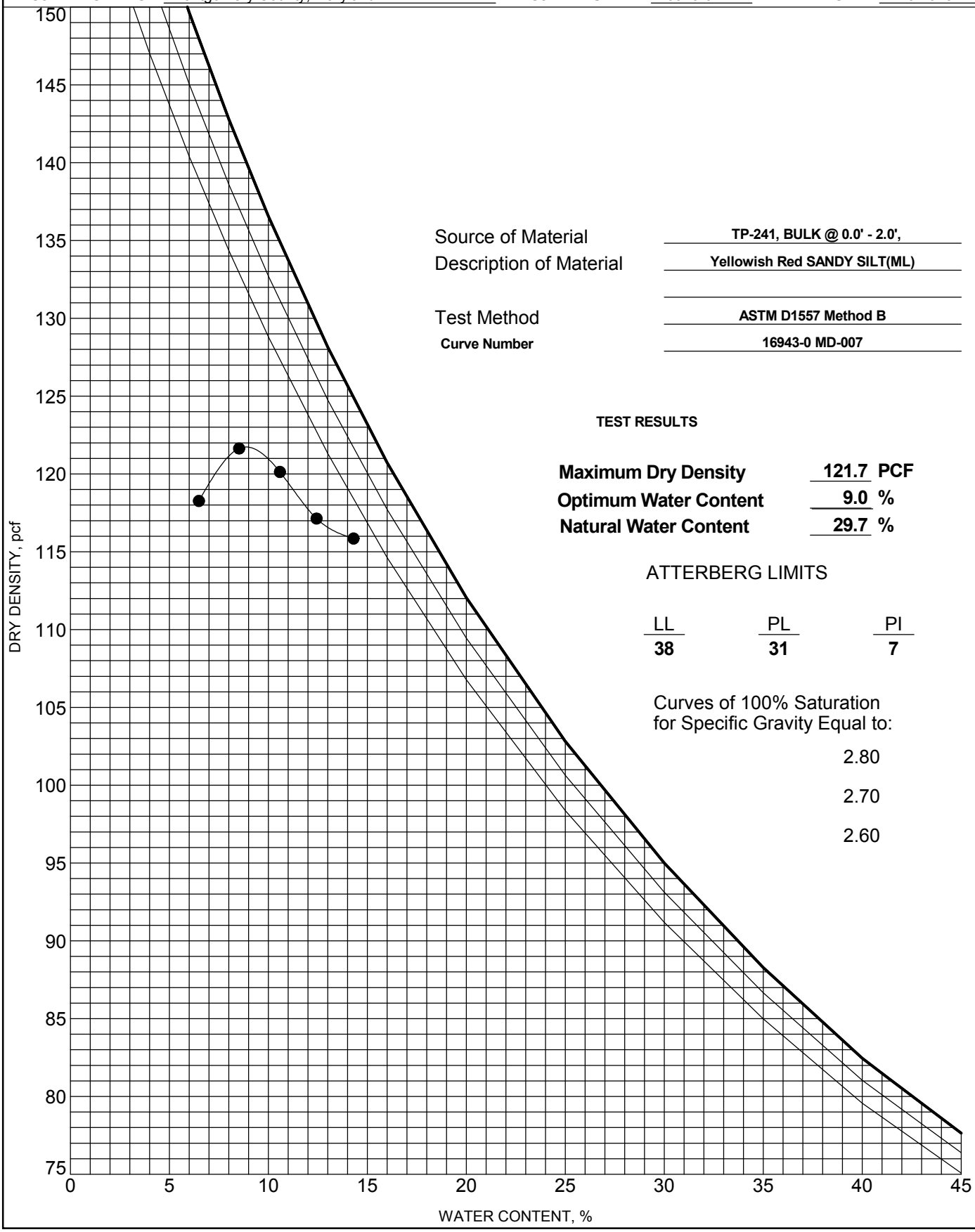
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/29/2018



Source of Material: **TP-241, BULK @ 0.0' - 2.0',**

Description of Material: **Yellowish Red SANDY SILT(ML)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-007**

TEST RESULTS

Maximum Dry Density	**121.7**	**PCF**
Optimum Water Content	**9.0**	**%**
Natural Water Content	**29.7**	**%**

ATTERBERG LIMITS

LL	PL	PI
38	**31**	**7**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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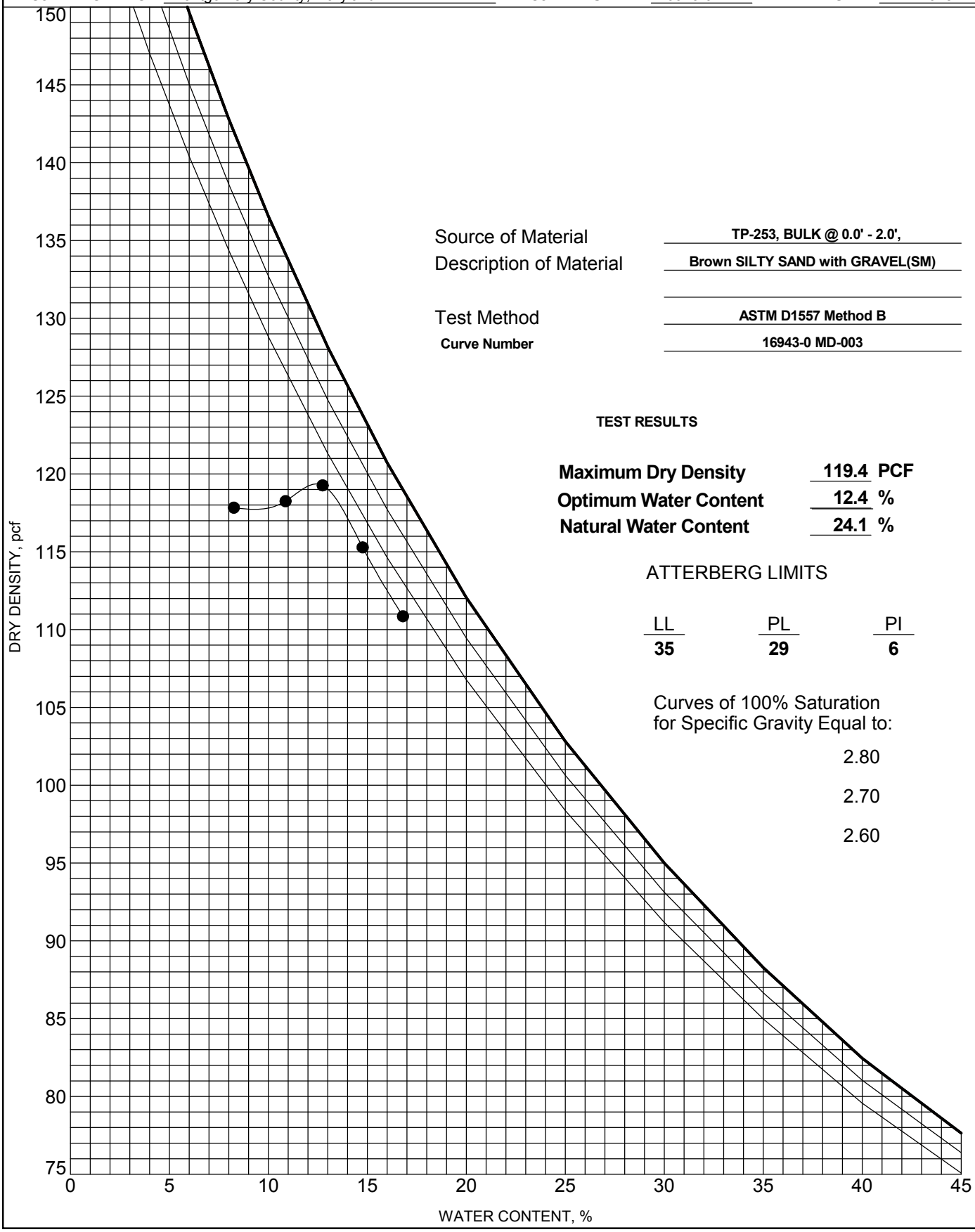
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/27/2018



Source of Material: **TP-253, BULK @ 0.0' - 2.0',**

Description of Material: **Brown SILTY SAND with GRAVEL(SM)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-003**

TEST RESULTS

Maximum Dry Density	**119.4**	**PCF**
Optimum Water Content	**12.4**	**%**
Natural Water Content	**24.1**	**%**

ATTERBERG LIMITS

LL	PL	PI
35	**29**	**6**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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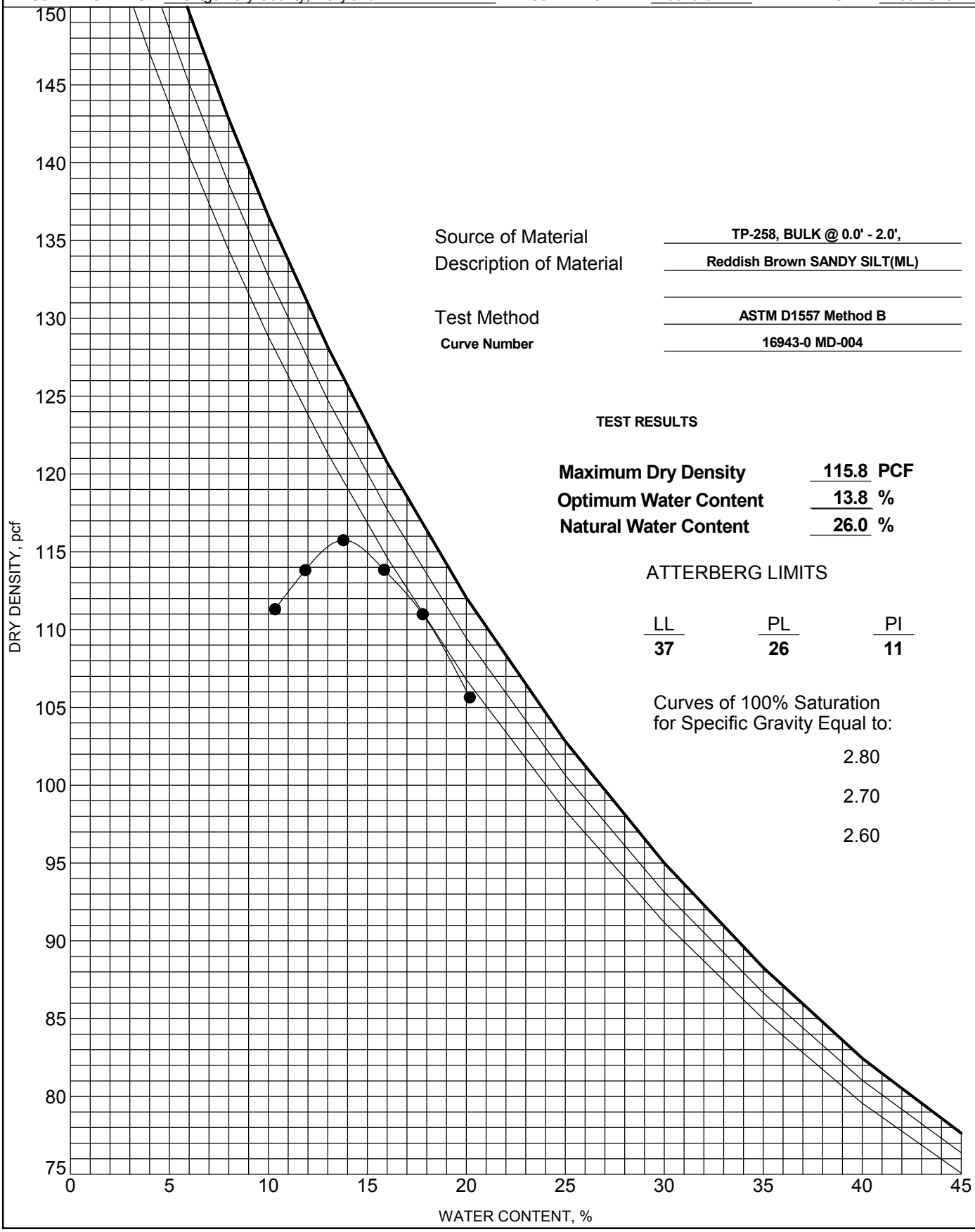
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/30/2018



Source of Material: **TP-258, BULK @ 0.0' - 2.0',**

Description of Material: **Reddish Brown SANDY SILT(ML)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-004**

TEST RESULTS

Maximum Dry Density	**115.8**	**PCF**
Optimum Water Content	**13.8**	**%**
Natural Water Content	**26.0**	**%**

ATTERBERG LIMITS

LL	PL	PI
37	**26**	**11**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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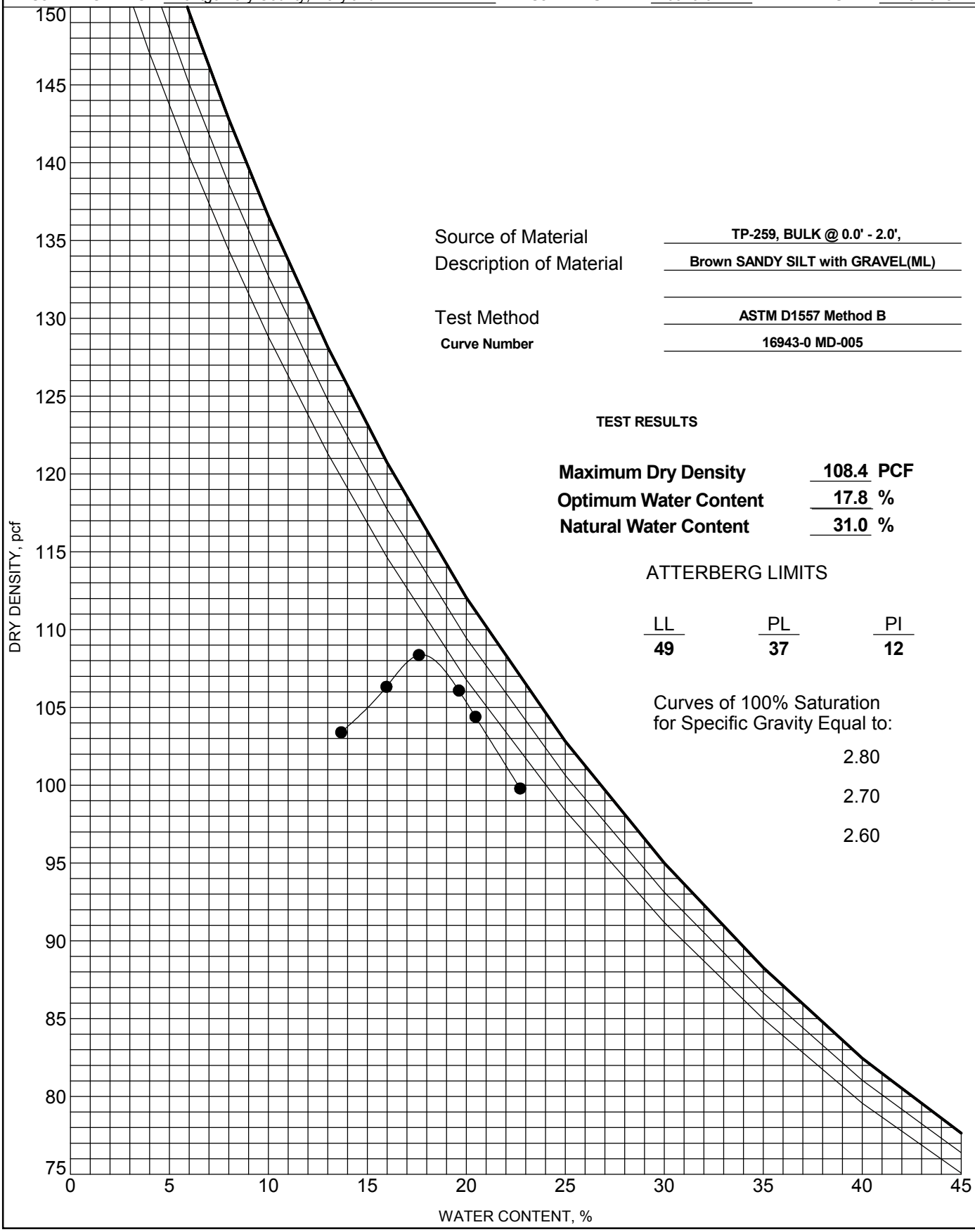
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/28/2018



Source of Material: **TP-259, BULK @ 0.0' - 2.0',**

Description of Material: **Brown SANDY SILT with GRAVEL(ML)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-005**

TEST RESULTS

Maximum Dry Density	**108.4**	**PCF**
Optimum Water Content	**17.8**	**%**
Natural Water Content	**31.0**	**%**

ATTERBERG LIMITS

LL	PL	PI
49	**37**	**12**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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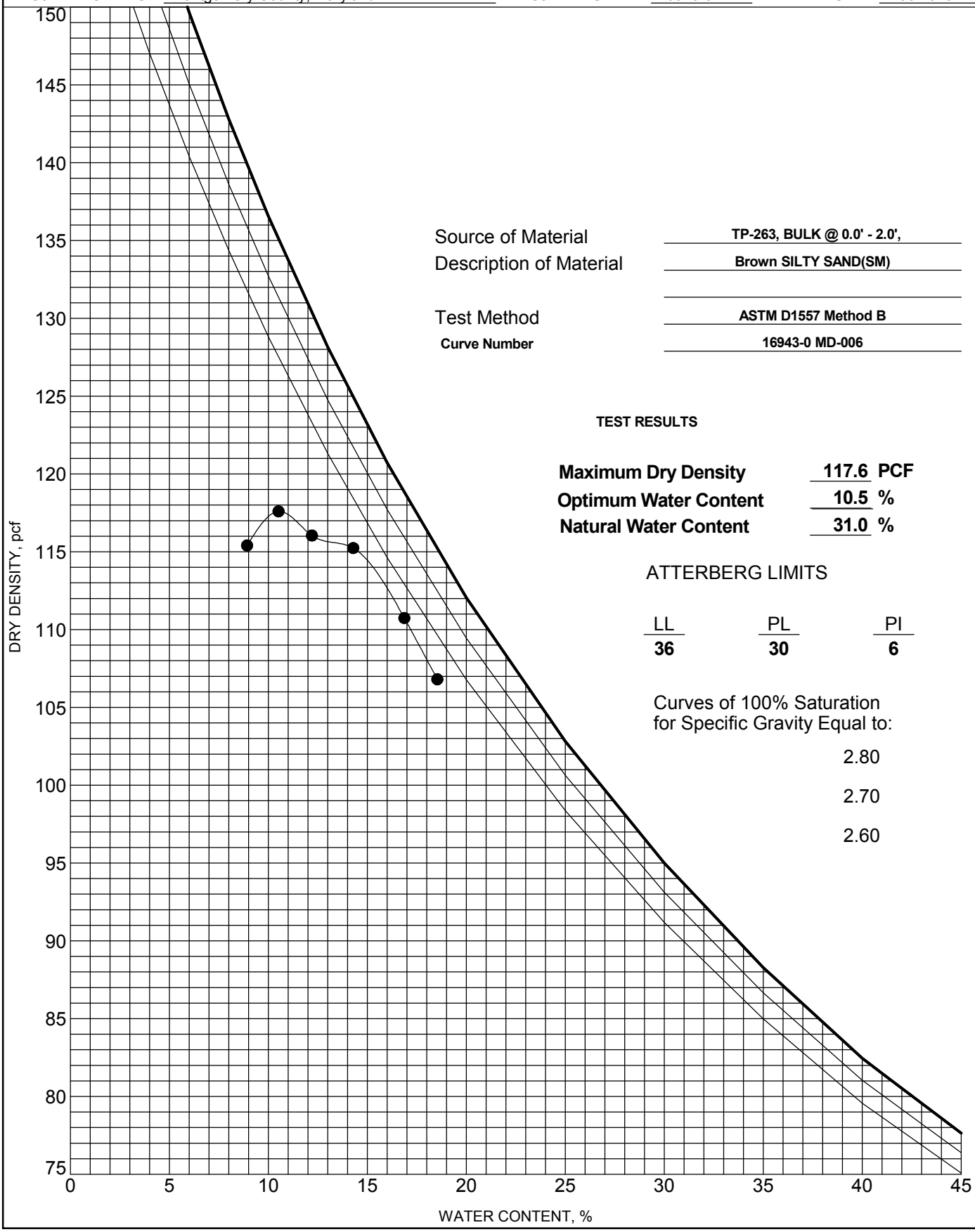
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/30/2018



Source of Material: **TP-263, BULK @ 0.0' - 2.0',**

Description of Material: **Brown SILTY SAND(SM)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-006**

TEST RESULTS

Maximum Dry Density	**117.6**	**PCF**
Optimum Water Content	**10.5**	**%**
Natural Water Content	**31.0**	**%**

ATTERBERG LIMITS

LL	PL	PI
36	**30**	**6**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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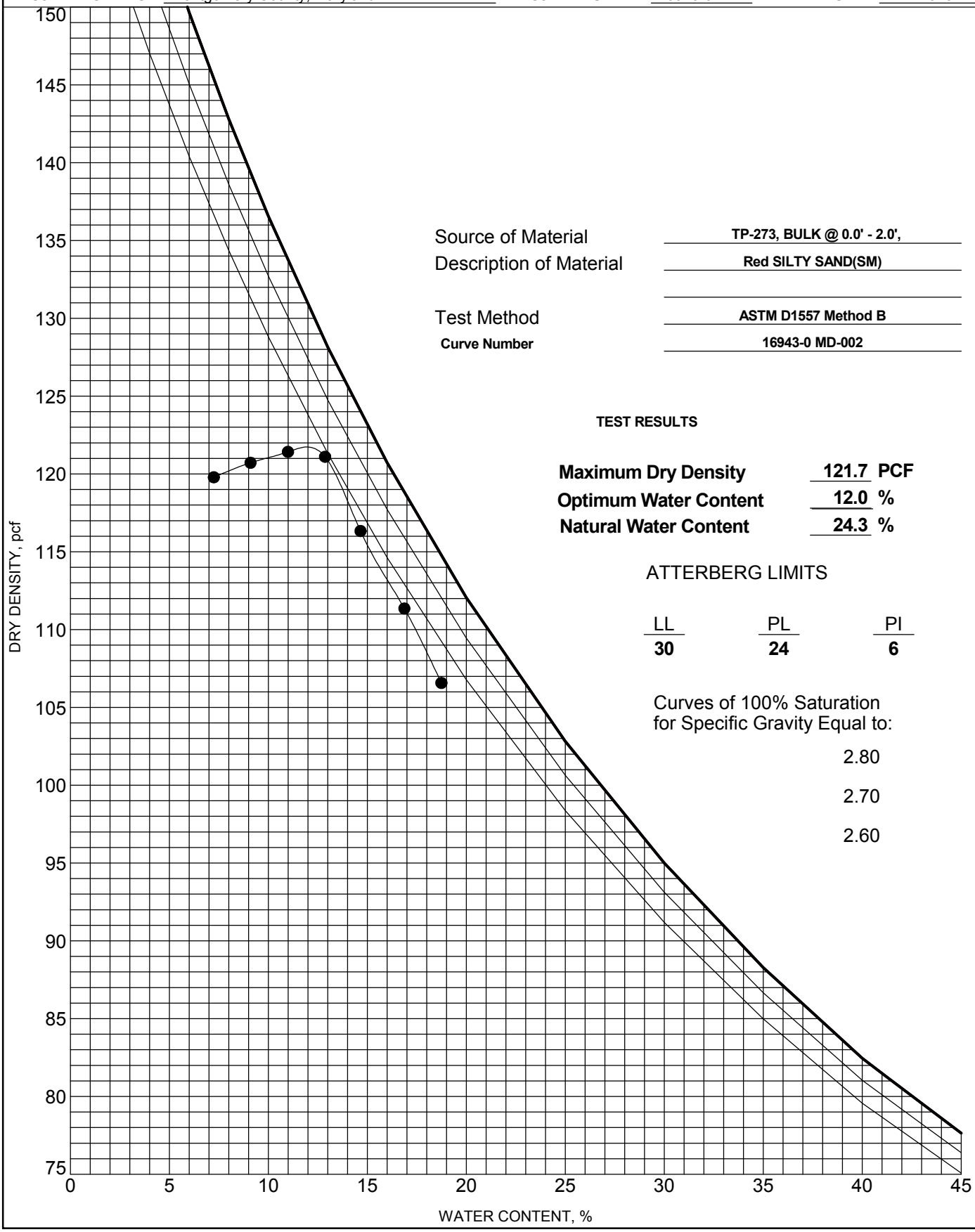
MOISTURE-DENSITY RELATIONSHIP

CLIENT EA Engineering, Inc. **PROJECT NAME** Gude Landfill

PROJECT LOCATION Montgomery County, Maryland **PROJECT NUMBER** 16943-0 MD **DATE TESTED** 7/27/2018



Source of Material: **TP-273, BULK @ 0.0' - 2.0',**

Description of Material: **Red SILTY SAND(SM)**

Test Method: **ASTM D1557 Method B**

Curve Number **16943-0 MD-002**

TEST RESULTS

Maximum Dry Density	**121.7**	**PCF**
Optimum Water Content	**12.0**	**%**
Natural Water Content	**24.3**	**%**

ATTERBERG LIMITS

LL	PL	PI
30	**24**	**6**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION 16943-0 GUDE LANDFILL.GPJ MTA REDLINE.GDT 8/6/18

Attachment B

General Permit for Discharges of Stormwater Associated with Construction Activity [To Be Included – 100% Design]

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Attachment C

Temporary Traffic Control Plan Requirements

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TEMPORARY TRAFFIC CONTROL PLAN REQUIREMENTS

General Requirements:

1. The permittee must always have a certified traffic control manager on site during all phases of construction.
2. Road closures of any duration shall require the submittal of a written request to the Traffic Engineering Design and Operations Section with justification as to why work activity cannot occur while traffic is being maintained. Road closure shall require additional temporary traffic controls including advance notification, approach, and detour signage, as approved by Traffic Engineering Design and Operations Section.
3. All sidewalk closures shall require the approval of the Traffic Engineering Design and Operations Section. Any sidewalk closure greater than two (2) weeks shall require the submittal of a written request to the Division of Traffic Engineering and Operations and may require additional temporary traffic controls and/or temporary sidewalk by-pass. Any work affecting sidewalk shall be specified and a proper pedestrian detour shall be shown on plans and submitted for review. Sidewalk closures shall be limited to occur only during the actual work activity. During closure, sidewalks shall be barricaded to physically prevent pedestrian passage and appropriate pedestrian detours shall be posted. During all other times, provisions for safe pedestrian access through the work area, via a temporary walkway shall be provided.
4. Construction activity, loading or unloading of equipment shall not block any traffic lane other than those delineated within the work zone.
5. Exclusive of emergency work, the permittee shall contact occupants of all adjoining properties and inform them of the scope and the timing of construction. A minimum of 24 hours notification shall be required prior to the commencement of any activity on the site.
6. Access shall be maintained to all driveways unless permission for closure is granted by the property owner/manager. However, accessibility for emergency vehicles shall be maintained at all times.
7. If any temporary traffic control signs are to be placed along a MDSHA roadway or within the limits of an incorporated area, the permittee shall notify the appropriate agency of signage to be installed.
8. No hazardous materials shall be stored within public right-of-way. No materials or equipment shall be stored on the roadway surfaces or sidewalk during non-work hours.
9. All existing traffic control devices (i.e. signs, marking, etc.) that must be removed shall be replaced in their proper location prior to the completion of the project. Cost for the replacement and/or repair of devices damaged as a result of the project shall be assessed to the permittee.
10. For merging, shifting, shoulder taper, the MAXIMUM spacing between devices equals the posted speed in feet.
11. All traffic control devices shall conform to the most recent edition of the Maryland MUTCD and shall meet or exceed NCHRP 350 Crash Worthiness requirements. All temporary traffic control devices shall be on the Maryland Qualified Products List. All signs, traffic drums and cones shall be fully reflectorized with high intensity, reflective sheeting as per the Maryland MUTCD.

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12. Provision shall be made for safe maintenance of pedestrian and bicycle traffic, subject to approval of the County's DPS Inspector. At least one 10-foot travel lane shall be available for traffic at all times
13. Signage, traffic drums, traffic cones, and arrow panels shall be placed in accordance with the appropriate typical and spacing chart. Work Area Ahead (W20-1 modified) signs must be installed at the end of each workday when temporary aggregate ramping is implemented. Channelizing devices shall be placed along excavations at ten (10) foot intervals. Arrow Panels (flashing mode only) shall be used at the beginning of any lane closure on a multi-lane roadway.
14. Appropriate distances for sign legends are *AHEAD*, *500 FT*, *1000 FT*, *1500 FT*, or *1/2 MILE*. For distances less than 500 feet, *AHEAD* shall be used.
15. All warning signs, unless otherwise specified, shall be a minimum of 48" X 48", black symbol or legend on orange background and diamond shaped. All warning signs not applicable to the actual situation shall be removed or covered during non-applicable periods. All portable signs shall be mounted a minimum of one (1) foot above the level of the roadway, with higher mounting heights desirable.
16. During nighttime operations traffic drums shall be used. However, for emergency work activities where traffic drums are not readily available, reflectorized traffic cones that are a minimum of twenty eight (28) inches in height and having six (6) inch and four (4) inch reflective collars within the top sixteen (16) inches of the cone may be used. All work areas left unattended at night shall be delineated with traffic drums.
17. When temporary concrete barrier (TCB) is used, reflectorized markers (8"x 12") are required as per TTCP 109.02. Also, a 12" X 36" object marker (vertical panel as per TTCP 109.01) shall be installed.
18. When pavement markings have been obliterated by the work activity, the permittee shall install any critical interim pavement markings prior to the end of the workday as specified by the county's DPS Inspector and/or the Division of Traffic Engineering and Operations. On road sections that are not scheduled to be overlaid, all temporary pavement markings shall be (removable) detour grade marking tape. Any conflicting markings, which need to be temporarily removed, are to be masked using "3M Removable Black Lane Mask" or an approved equal. On road sections that are to be overlaid, temporary markings can be either tape or paint. Any conflicting markings should be removed via hydro-blasting.
19. Any excavation(s) in the roadway shall be paved to level grade or plated and the roadway reopened to its full cross-section prior to the end of each workday. "STEEL PLATES" (W95-5(1)) signs shall be placed approximately 250 feet in advance of any steel plate. Any excavations in the sidewalk shall be backfilled or plated prior to the end of each workday and sidewalk reopened to its full cross section.
20. Traffic shall not be permitted within ten (10) feet of any excavation that results in a vertical drop-off of more than five (5) inches in the level of pavement during non-working hours unless protected by temporary concrete barriers or ramped with aggregate material at a 3:1 or flatter slope from the edge of pavement. When ramping is utilized, Temporary Traffic Control drums shall be positioned adjacent to the edge of the work area on the traffic side of the slope.
21. Traffic shall not be permitted within two (2) feet of any excavation that results in a vertical drop-off of more than two (2) inches but no more than five (5) inches in the level of pavement during

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non-working hours unless either ramped with aggregate material at a 3:1 or flatter slope, provided with an abutting wedge of bituminous material at a 3:1 or flatter slope or protected by traffic drums.

22. In areas where a drop-off in the level of pavement is two (2) inches or less, traffic may be allowed to freely cross under the following conditions:
    - Where longitudinal paving joints of two (2) inches or less are exposed to traffic, warning signs shall be posted indicating "UNEVEN LANES" (W8-11). These signs should be placed 250 feet in advance of the uneven joint and be spaced at appropriate intervals throughout the area of the uneven joint.
    - Where lateral paving joints of two (2) inches or less are exposed to traffic, a "BUMP" (W8-1) sign shall be posted 100 feet in advance of the joint.
    - When milled pavement is left exposed to traffic a "ROUGH ROAD"(W8-8) or "GROOVED PAVEMENT" (W8-8a) sign shall be placed 250 feet in advance of the milled area.
23. Bagging agreement shall be kept available by the contractor/permittee for inspection by the DPS inspector at any time. Prohibiting the use of metered spaces by the contractor/permittee without receipt of *bagging agreement* is subject to fines.
24. When it is necessary to restrict parking in a non-metered area to facilitate work activity, the permittee shall contact the appropriate County Police Station for temporary "No Parking" signs.
25. The contractor/permittee shall restore all affected Montgomery County parking signage to its previous condition.
26. The County's Department of Permitting Services (DPS) Inspector has the authority to modify the TTCP as deemed necessary. The Inspector has the authority to order the permittee to stop work and vacate the public right-of-way if they are not compliant with the TTCP.
27. The implementation date and continuance of work activities may be altered at the discretion of the County's DPS Inspector in the event of conflicts with previously approved or emergency activities.
28. All drainage conditions and mitigations during construction shall be detailed in the Erosion and Sediment Control Plans.
29. Contractor shall install W11-10(1) sign truck crossing (symbol) sign at designated construction entrance locations.

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Communications:

- The Contractor shall arrange and host a pre-phase traffic switch meeting at least two weeks prior to switching traffic pattern. The following offices shall be notified of this meeting and of the impending traffic switch:
  - ♦ Montgomery County Division of Traffic Engineering and Operations at 240-777-6000
  - ♦ Montgomery County Transportation Systems Engineering Team at 240-777-2100
  - ♦ Montgomery County Transit at 240-777-5800
  - ♦ Montgomery County Public Schools, Local Depot Manager
  - ♦ Montgomery County Fire and Rescue, Local Fire Department Captain Station 26 at 240-773-4726
  - ♦ Montgomery County Police, Local Traffic Sergeant at 240-773-6600
  - ♦ Montgomery County Department of Permitting Services, Permit Inspection Section at 240-777-6300

- Prior to approved road closures, the Contractor shall notify the following offices a minimum of seventy- two (72) hours in advance:
  - ♦ Montgomery County Division of Traffic Engineering & Operations at 240-777-6000
  - ♦ Montgomery County Emergency Operations Center at 240-777-0751
  - ♦ Montgomery County Police, Local Traffic Sergeant at 240-773-6600
  - ♦ Montgomery County Transportation Management Center at 240-777-2100
  - ♦ Montgomery County Fire and Rescue, Local Fire Department Captain Station 26 at 240-773-4726
  - ♦ Montgomery County Public Schools, Local Deport Manager.

- For work on SHA-maintained roadways, the Contractor shall coordinate with the following offices as well:
  - ♦ Mr. Andre Futrell - District Engineer at 301-513-7311
  - ♦ Mr. Derek Gunn - Assistant District Engineer - Traffic at 301-513-7498
  - ♦ Mr. Michael Brown - Assistant District Engineer - Construction at 301-513-7341
  - ♦ Mr. Gregory Edwards - Assistant District Engineer - Maintenance at 301-513-7304
  - ♦ Mr. Mark Loeffler - District Utility Engineer at 301-513-7350
  - ♦ Mrs. Rebecca Lichtenstein, P.E. - Assistant Division Chief - Traffic Operations at 410-787-7625
  - ♦ Mr. Edward Rodenhizer - Manager - Signal Operations Section at 410-787-7650
  - ♦ Mr. Paul Stout - Assistant Division Chief - Sign Operations Section at 410-787-7637

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Applicable Standards Listed Below, But Not Limited To:

- SHA MD 104.00-13

10.5 When a police vehicle is required, the vehicle shall not be located in the buffer and/or taper, but should be located as directed by the Engineer, depending on the type of work. It is sometimes preferable to deploy the police vehicle in advance of the work zone or queue (if queue exists) to encourage speed reduction prior to the work zone.

11.0 STRATEGIES FOR SAFE ENTRY/EXIT OF WORK ZONE VEHICLES TO/FROM THE WORK AREA

11.1 Use TRUCK CROSSING signs (W11–(10)1) when:

1) A work area entrance is allowed along a controlled access highway; OR

2) A work area entrance provided along highways other than controlled access does not have adequate decision sight distance for approaching traffic and the entrance cannot be relocated to provide adequate decision sight distance. Refer to Standard No. MD 104.00–03 of the General Notes for decision sight distance criteria.

TRUCK CROSSING signs shall be placed according to the Shoulder Work Typical Applications, with TRUCK CROSSING signs replacing all SHOULDER WORK signs.

Any distances to be displayed on the TRUCK CROSSING sign shall be installed using supplemental distance plaques.

11.2 All work zone vehicles when entering/exiting the work area or operating within the work zone shall display flashing warning lights, as specified in Standards MD 104.01–18A & B.

11.3 PVMS may be used as a supplementary sign to warn drivers of work zone vehicles entering or exiting the work area.

11.4 Coordinate deliveries of materials with proposed lane closures, preferably during occurences when traffic volumes are low.

SPECIFICATION	CATEGORY CODE ITEMS	**Maryland Department of Transportation STATE HIGHWAY ADMINISTRATION** STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES
APPROVED	DIRECTOR – OFFICE OF TRAFFIC AND SAFETY	
SHA State Highway Administration	APPROVAL • SHA REVISIONS: APPROVAL 6-20-03; REVISED 7-1-09; REVISED 8-11-10; REVISED 8-20-14 / APPROVAL • FEDERAL HIGHWAY ADMINISTRATION: APPROVAL 9-23-03; REVISED 7-27-09; REVISED 7-29-10; REVISED 8-11-14	**GENERAL NOTES**
		STANDARD NO. MD 104.00–13

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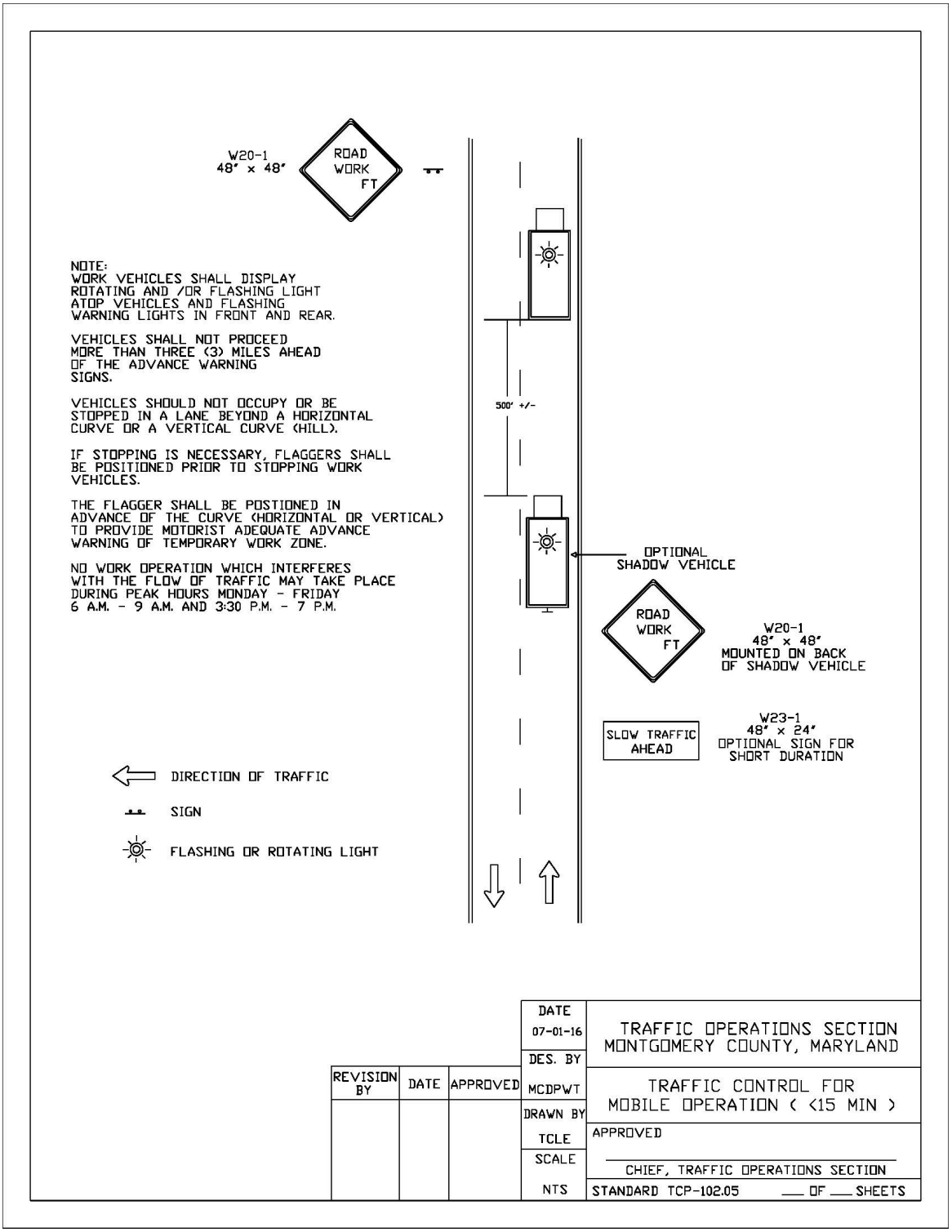
- MCDOT TTCP-102.05



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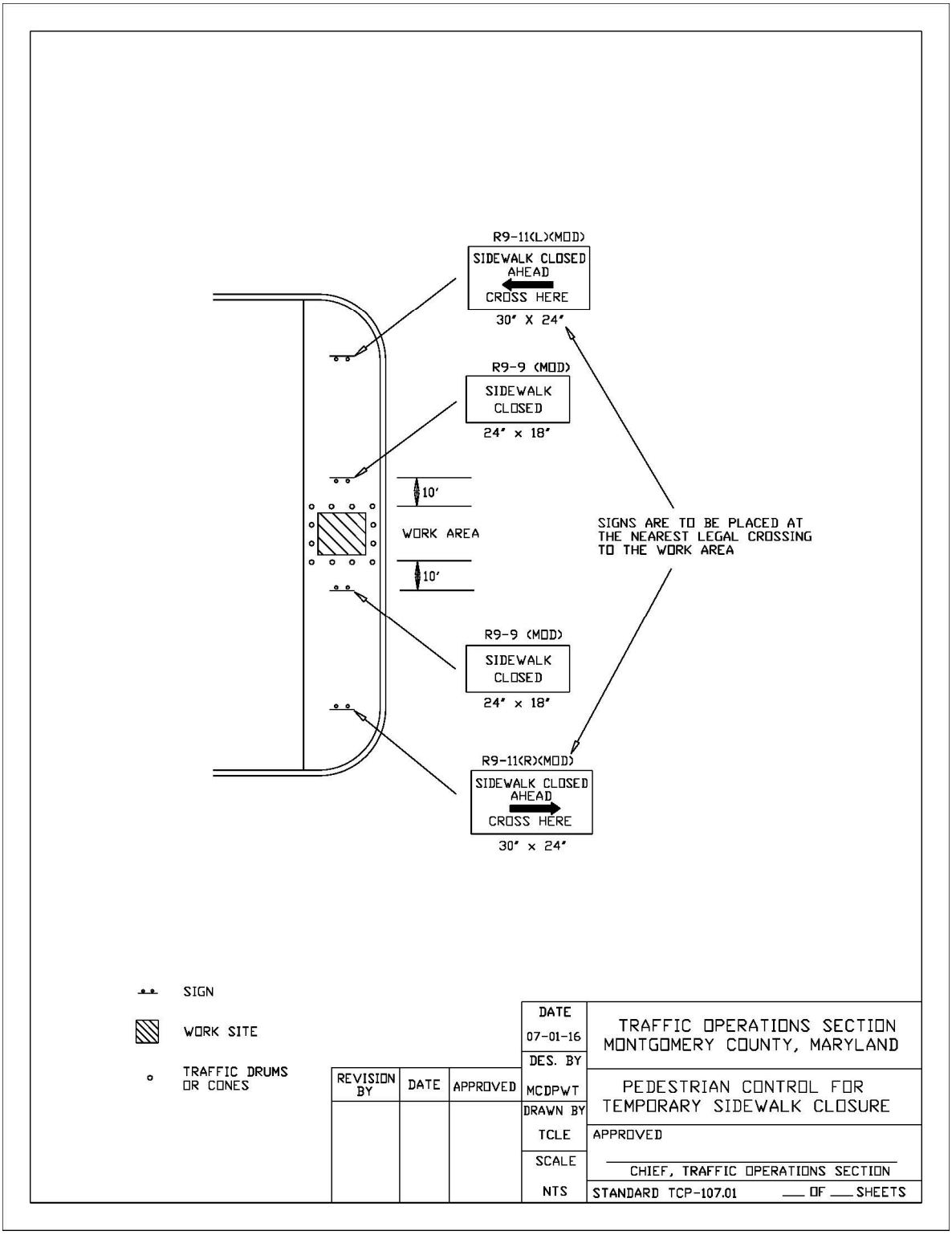
- MCDOT TTCP-107.01



Attachment D

Property Markers

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ATTACHMENT G

PROPERTY MARKERS

PT#	COORDINATES	NAD-83/91	ELEV.	DESC.
1	N 524388.655	E 1270728.730	423.71	MON
1A	N 524691.832	E 1271109.049	416.13	R&C
1B	N 524979.283	E 1271469.334	422.78	R&C
1C	N 525122.727	E 1271649.202	425.00	R&C
2	N 525430.301	E 1272034.877	433.71	MON
2A	N 525660.138	E 1272245.128	431.41	R&C
2B	N 525978.666	E 1272536.511	407.45	R&C
3	N 526248.348	E 1272783.211	419.65	MON
4	N 526636.135	E 1272608.768	390.28	STONE
5	N 526974.996	E 1272444.368	368.93	MON
5A	N 527068.498	E 1272773.308	382.22	R&C
5B	N 527110.856	E 1272922.322	396.94	R&C
6	N 527178.066	E 1273158.764	362.71	MON
7	N 527104.341	E 1273195.780	360.05	MON
7A	N 526723.193	E 1273303.477	365.69	R&C
7B	N 526633.347	E 1273328.864	385.25	R&C
7C	N 526495.691	E 1273367.760	419.02	R&C
7D	N 526286.450	E 1273426.883	466.08	R&C
7E	N 526097.107	E 1273480.384	465.60	R&C
7F	N 525751.819	E 1273577.949	470.53	R&C
8	N 525393.510	E 1273679.193	474.06	MON
8A	N 525364.469	E 1273824.899	470.57	R&C
8B	N 525313.823	E 1274079.001	449.61	R&C
8C	N 525228.220	E 1274508.491	460.16	R&C
8D	N 525206.429	E 1274617.820	460.44	R&C
8E	N 525166.638	E 1274817.463	434.64	R&C
8F	N 525137.527	E 1274963.518	393.36	R&C
9	N 525110.587	E 1275098.685	408.82	STONE
9A	N 524955.733	E 1275106.149	400.07	R&C
9B	N 524498.015	E 1275128.210	326.27	R&C
9C	N 524256.526	E 1275139.849	326.99	R&C
10	N 524219.480	E 1275141.635	330.00	MON
11	N 524193.766	E 1275142.903	*	**
12	N 523735.060	E 1274675.936	*	**
13	N 523695.289	E 1274605.591	*	**
14	N 523706.045	E 1274593.054	329.47	MON
14A	N 523832.295	E 1274445.938	326.17	R&C
15	N 523955.151	E 1274302.776	325.17	MON
16	N 523904.443	E 1274171.252	345.62	MON
17	N 523644.758	E 1274341.977	337.10	MON
18	N 523608.283	E 1274293.706	339.59	R&C
19	N 523882.386	E 1274113.947	345.67	MON
19A	N 523848.306	E 1274025.572	331.49	R&C
19B	N 523799.279	E 1273898.437	*	R&C
19C	N 523758.374	E 1273792.363	339.25	R&C
20	N 523702.476	E 1273647.409	384.08	MON
20A	N 523716.339	E 1273592.042	390.14	R&C
20B	N 523755.153	E 1273437.012	359.82	R&C
20C	N 523830.395	E 1273136.543	362.99	R&C
20D	N 523912.337	E 1272809.206	399.96	R&C
20E	N 523999.059	E 1272462.830	432.98	R&C
20F	N 524058.524	E 1272225.320	427.29	R&C
21	N 524095.212	E 1272078.784	404.78	STONE
22	N 524188.376	E 1272127.707	414.78	MON
23	N 524284.720	E 1271969.212	403.32	MON
23A	N 524108.707	E 1271862.147	399.59	R&C
24	N 523763.488	E 1271652.156	411.16	MON

* NO ELEVATION WAS ESTABLISHED ON THESE POINTS.

** NO MARKER WAS SET. CORNER FALLS IN ROADWAY.

ATTACHMENT G

PROPERTY MARKERS

PT#	COORDINATES	NAD–83/91	ELEV.	DESC.
25	N 526794.925	E 1273283.209	363.42	MON
25A	N 526593.952	E 1273099.362	403.24	R&C
25B	N 526480.755	E 1272995.812	421.67	R&C
26	N 524555.977	E 1275125.434	337.13	MON
27	N 524418.194	E 1275061.458	324.17	MON
28	N 524225.006	E 1274853.912	329.77	MON
28A	N 524159.370	E 1274560.533	346.06	R&C
29	N 524104.842	E 1274316.543	375.19	MON
30	N 524108.829	E 1274134.376	397.26	MON
31	N 524263.286	E 1274058.252	405.37	MON
32	N 524250.413	E 1274024.313	391.33	MON
33	N 524125.625	E 1274054.822	373.59	MON
34	N 524009.103	E 1274102.445	358.56	MON
35	N 526824.557	E 1273310.048	361.66	MON
36	N 526744.303	E 1273534.820	361.07	MON
36A	N 526643.051	E 1273609.173	404.41	R&C
37	N 526558.737	E 1273671.088	424.13	MON
37A	N 526342.888	E 1273730.950	441.01	R&C
37B	N 526118.560	E 1273793.164	454.25	MON
37C	N 525916.357	E 1273849.242	443.53	R&C
38	N 525628.976	E 1273928.943	430.07	MON
39	N 525635.997	E 1273991.915	401.76	MON
40	N 525882.136	E 1274111.304	395.81	MON
41	N 525801.707	E 1274342.694	383.45	MON
42	N 525564.863	E 1274312.081	400.92	MON
42A	N 525474.659	E 1274462.125	436.22	R&C
43	N 525382.088	E 1274616.107	444.99	MON
43A	N 525270.989	E 1274911.115	421.74	R&C
43B	N 525227.733	E 1275025.981	395.97	R&C
44	N 525170.080	E 1275179.062	429.02	MON

Attachment E

Waste Cut and Fill Visualization

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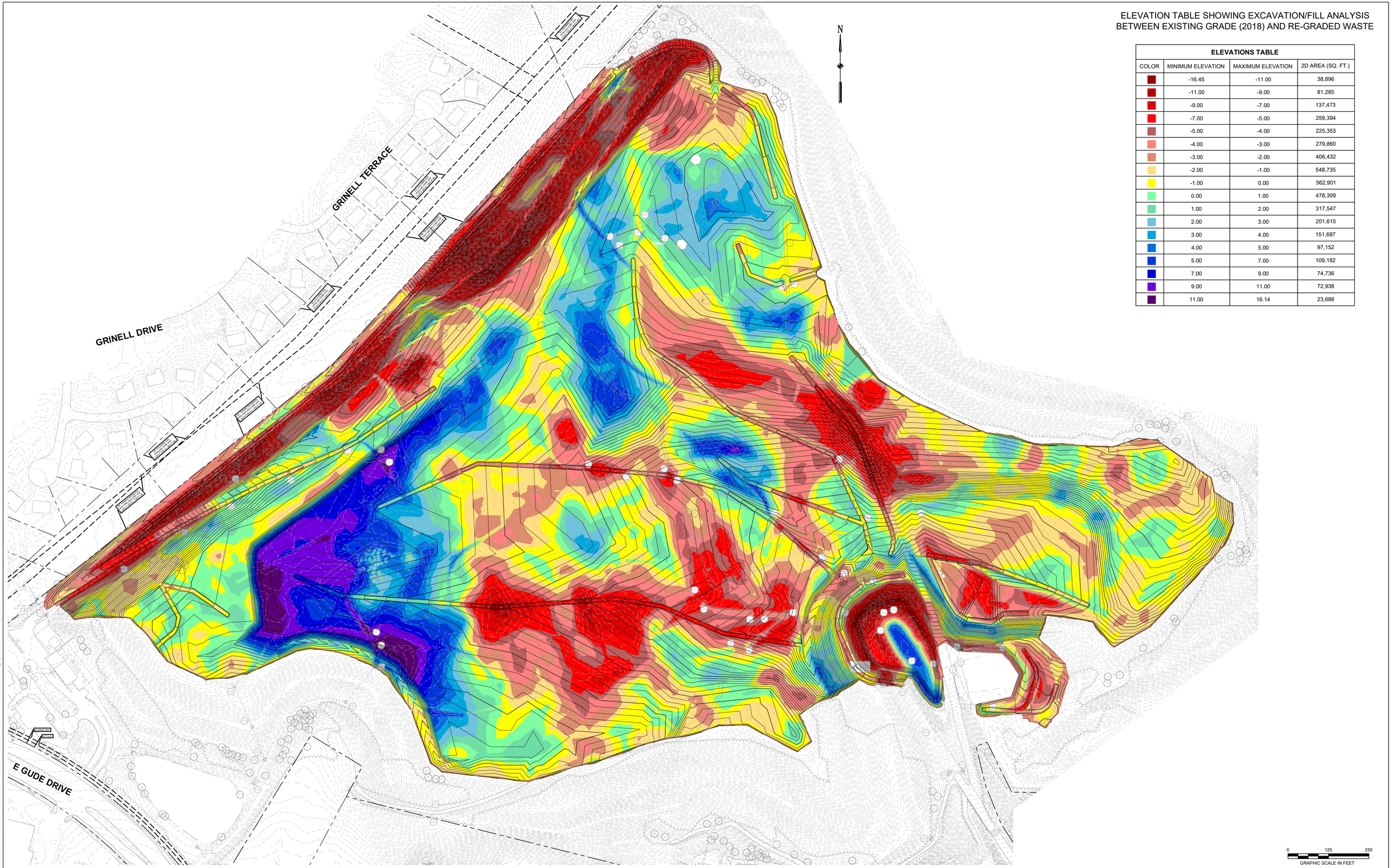
ELEVATION TABLE SHOWING EXCAVATION/FILL ANALYSIS
BETWEEN EXISTING GRADE (2018) AND RE-GRADED WASTE

ELEVATIONS TABLE

COLOR	MINIMUM ELEVATION	MAXIMUM ELEVATION	2D AREA (SQ. FT.)
	-16.45	-11.00	38,896
	-11.00	-9.00	81,285
	-9.00	-7.00	137,473
	-7.00	-5.00	259,394
	-5.00	-4.00	225,353
	-4.00	-3.00	279,860
	-3.00	-2.00	406,432
	-2.00	-1.00	548,735
	-1.00	0.00	562,901
	0.00	1.00	478,309
	1.00	2.00	317,547
	2.00	3.00	201,615
	3.00	4.00	151,687
	4.00	5.00	97,152
	5.00	7.00	109,182
	7.00	9.00	74,736
	9.00	11.00	72,938
	11.00	16.14	23,688



EA Engineering, Science, and Technology, Inc., PBC
Hunt Valley Center
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Hunt Valley, Maryland 21031
(410) 584-7000

PROJECT NUMBER: 1564601	DESIGNED BY: KEF / SMB	DRAWN BY: SMB	FIGURE: ---
DATE: JUNE 2020	CHECKED BY: LJO	PROJECT MANAGER: MJG	SHEET NUMBER: ---

GUDE LANDFILL REMEDIATION DESIGN
NORTHEAST MARYLAND WASTE DISPOSAL AUTHORITY
COST ESTIMATE
MONTGOMERY COUNTY, MARYLAND

EXCAVATION/FILL EXTENT AND DEPTH

FILE PATH: O:\PROJECTS\1564601 - GUDE LF DESIGN\CAD\PRODUCTION\FIGURES\COST ESTIMATE\1564601 - COST ESTIMATE - EXCAVATIONFILL FIGURE.DWG | IF=1 | BISSETT, STEVEN 6/12/2020 8:48 AM

Attachment F

Landfill Gas Operations Scope of Work
[To Be Included – 100% Design]

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