

**ADDENDUM NO. 1
TO
BID DOCUMENTS FOR
CONSTRUCTION OF THE NICHOLSON LANDFILL GROUNDWATER
TREATMENT FACILITY UPGRADES
FOR
COUNTY COMMISSIONERS OF KENT COUNTY, MARYLAND**

The following changes, additions, and/or deletions shall be made to the Bid Documents for the Construction of the Nicholson Landfill Groundwater Treatment facility Upgrades for the County Commissioners of Kent County, Maryland.

The information contained herein shall take precedence over the original documents and all previous addenda and is appended thereto. This addendum includes 3 page with additional attachment(s).

Changes in the Bid Documents which are outlined below are referenced to a section, paragraph, page, or drawing in which they appear conspicuously. Updated specifications and drawings in which these changes will be implemented will be issued for construction after contract award. The Bidder is to take note in its review of the documents and include these changes as they affect work or details in other areas not specifically referenced here.

- Item #1: Add and incorporate the pre-bid meeting notes to the contract documents (see Attachment #1).
- Item #2: Add and incorporate the questions received to 12:00 PM on January 19, 2024, and associated answers to the contract documents (see Attachment #2).
- Item #3: Deleted the Replacement Collection Sump Manhole from the Proposed Plan View on drawing P-002.
- Item #4: Add the New Local Control Panel to the Proposed Plan View on Drawing P-002 so the intended location on the interior of the east wall south of the double doors is shown.
- Item #5: Add the Existing Shelves To Be Removed to the Existing Plan View on P-002 on the interior of the east wall south of the double doors so the bidders know removal of these shelves is part of the scope of work.
- Item #6: Add and incorporate the geotechnical report to the contract documents. (see Attachment #3).
- Item #7: Add to the "4. EARTHWORK AND FOUNDATIONS" notes on drawing S001, "Q. THE FOOTING EXCAVATION SHOULD INCLUDE A MINIMUM OF 2 FEET UNDERCUT AND REPLACEMENT OF COMPACTED #57 AGGREGATE TO THE BOTTOM OF FOOTING."

- Item #8: Add to the "4. EARTHWORK AND FOUNDATIONS" notes on drawing S001, "R. THE OVER-EXCAVATION SHOULD EXTEND 1 FOOT OUT FROM THE FOOTING WIDTH ON EITHER SIDE."
- Item #9: Delete paragraph 1.8 in Section 019100-Commissioning.
- Item #10: Delete "as indicated on Drawings" from Paragraph 1.1.A.1 of Section 077123- Manufactured Gutters and Downspouts.
- Item #11: Delete the extra "2.03" and "2.04" from paragraphs 2.03 and 2.04, respectively, in Section 077123- Manufactured Gutters and Downspouts.
- Item #12: Delete the "Possible Mixer" shown in Equalization Tank T-100 on drawing P-001.
- Item #13: Delete the "Possible NaOH Feed" shown added to Equalization Tank T-100 on Drawing P-001.
- Item #14: Change the part number and description for item 11 on drawing E-005 and item 13 on drawing E-006 to SCADAPack 474: Schneider Electric TBU474, SCADAPack 474, 2 Ethernet Ports, 5 serial communications ports, 12 analog inputs, 20 digital inputs, 12 relay outputs, 2 analog outputs.
- Item #15: To account for the fact that the new SCADPack 474 PLC is slightly larger than the SCADAPack 334 and space will need to be allocated for mounting the separate TransNext Radio some adjustments are needed.
- Changes the parts on the layout on drawings E-005 and E-006 to shift items slightly so that the radio will be mounted in the upper-right side of the control panel.
- Item #16: Change the elementary diagrams on drawings E-005 and E-007 to reflect the new I/O count of the SCADAPack 474 PLC.
- Item #17: Change "Items furnished by Owner" to "Existing Treatment System items" in paragraph 1.4.C of Section 0110000-Summary.
- Item #18: Added the existing Well Level Control Wiring diagrams and information to the contract documents (see Attachment #4)
- Item #19: Add and incorporate the pre-bid meeting sign-in sheet to the contract documents (see Attachment #5).

Item #20: In the Advertisement for Bids section replace “Bids for the construction of the Project will be received at the Kent County Department of Public works Located at 709 Morgnec Road, Chestertown, Maryland 21620, until Friday, January 26, 2024 at 10:00 a.m. local time. At that time the bids received will be publicly open and read.” to “Bids for the construction of the Project will be received at the Kent County Department of Public works located at 709 Morgnec Road, Chestertown, Maryland 21620, until Thursday February 8, 2024 at 10 a.m. local time. At that time the Bids received will be publicly opened and read.”

End of Addendum No. 1

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**ATTACHMENT #1:
PRE-BID MEETING NOTES**



Kent County Groundwater Treatment Upgrades for the Nicholson Landfill Pre-Bid Meeting Agenda

Wednesday, January 17, 2024

10:00 AM

1. Sign-in

- a. See attached sign-in
- b. Not on sign-in
 - i. Daniel F. Mattson, Deputy Director, Department of Public Works, Kent County
 - ii. Jessica L. Conner, Procurement Manager, Department of Public Works, Kent County
 - iii. Michael S. Moulds, Director of Public Works, Department of Public Works, Kent County
 - iv. Rainer A. Niederoest, Senior Project Engineer, Dawood Engineering, Inc.

2. Safety Minute – Winter Weather Driving printout was available.

3. Project History

- a. Mike Moulds gave a brief overview of the Nicholson Landfill history and the need for this project. The same information is available in the documents referenced in paragraph 5.03 of Section C-200 - Instructions to Bidders of the bid documents.

4. Pre-bid Overview

- a. Overview of the meeting agenda was given.
- b. Bidders were instructed to hold questions till the end.

5. Project Information

- a. Scope of work
 - i. Construction of upgrades to an existing groundwater treatment system, an associated new building, necessary site and utility improvement, alterations of the existing treatment system to incorporate the upgrades, startup of the improved process, and all
-

necessary work to provide the upgraded treatment system as stipulated in the contract documents.

- ii. Including but not limited to...
 - 1. inclined plate or tube settler,
 - 2. chemical storage and feed,
 - 3. sludge filter system,
 - 4. control panel,
 - 5. new electrical service,
 - 6. site work,
 - 7. foundation,
 - 8. prefabricated building,
 - 9. pipe and mechanical,
 - 10. sludge bench testing,
 - 11. sludge filter pilot testing,
 - 12. commissioning, and startup services
- b. The project is being funded by a USDA loan and associated contract management documentation will be required.
- c. Bidding Deadlines
 - i. Questions due before January 22, 2024, 12:00 p.m.
 - ii. Bids due January 26, 2024, 10:00 a.m. at Kent County Department of Public Works
- d. Anticipated Schedule
 - i. Construction duration is anticipated to be 259 days.
 - ii. Startup and commissioning, sludge filter pilot testing, operator training, through to final completion may take an additional 174 days after that.

6. Documents Overview

- a. Instructions to bidders (EJCDC C-200 w/ RUS Bulletin 1780-26 revision)
 - i. A 5 percent bid security (8.01) is required.
 - ii. Recommend including the following (11.02)
 - 1. Supplier of inclined plate or tube settler, and associated product data and drawings (see Section 464376 paragraph 1.4.C.1.b and 1.4.C.2.b)
 - 2. Supplier of sludge filter system,
 - 3. Control panel supplier,
 - 4. Electrical contractor,
 - 5. Pipe and mechanical contractor, and
 - 6. Commissioning authority
 - iii. Please remember to acknowledge addenda on your bid form.
- b. Bid Form
 - i. Lump Sum Bid Price for Base Bid (including epoxy painted carbon steel or plastic settler)

- ii. Option 1 - Projected Cost of Plate or Tube Pack Replacement (see Section 464376 paragraph 1.4.B.2 through 5)
 - iii. Option 2 - Adder to Provide Stainless Steel Fabrication Settler (see Section 464376 paragraph 1.4.B.7)
- c. Bid Documents
 - i. T-300 of Section 434143 (see paragraph 2.2.F.3) shall be supplied if the plate or tube clarifier is not furnished with an integral flocculation chamber.
 - ii. Section 464376 paragraph 1.4.B.6 – If the operating liquid level in the proposed settler is too high, costs for different T-200 or T-300 tanks, taller stands, or larger equipment pads must be included.

7. Questions Received By Email before 1/16/2023

- a. Question 1:
There are no specs for HVAC but there is HVAC work shown on the Mechanical drawings. Please provide.
- Answer 1:
All the HVAC requirements are shown in the drawings. Dawood calls specific attention to M-001 and M-002 though the bidders should be familiar with all the drawing and site conditions.
- b. Question 2:
Where can I locate the referenced Geotechnical Report for the Nicholson Landfill Groundwater Treatment Plant project of Kent County, Maryland?

Answer 2:
The report will be included in Addendum 1.

- c. Question 3:
We assume the building permit and stormwater permits required to the furnished by the contractor will be provided to the contractor by the Owner, complete for submission to the respective authority.

Answer 3:
Kent County already has a stormwater permit for the project. Provided the bidder can manage the construction as planned in drawings C-004, C-005, and C-006, in which the area of disturbance is under 5,000 SF, no other stormwater submission will be needed.

In the interest of time and with the desire to complete the project as soon as possible, the Kent County Department of Public Works will make the building permit application as well.

d. Question 4:

We assume the building permit and stormwater permit fee will be paid by the Owner. If our assumption is incorrect, please provide the amount of the fees.

Answer 4:

The Kent County Department of Public Works will make the building permit application and will be responsible for the building permit fee.

e. Question 5:

We assume the contractor's Project Manager can serve as the Commission Authority in 019100-1.4.B.2.

Answer 5:

If the contractor meets the qualifications in Section 019100 paragraph 1.7.A and it can be demonstrated by submittal as required by Section 019100 paragraph 1.4.B, it could be acceptable for them to serve as the Commission Authority Firm.

Section 019100 paragraph 1.8 will be deleted by Addendum 1. Thus, the contractor's project manager can serve as an integral part of the commissioning process. The Commission Authority must meet the qualifications required in Section 019100 paragraph 1.7.B and be demonstrated such by submittal as required by Section 019100 paragraph 1.4.B. The requirements can be fulfilled using the expertise of the contractor, the authorized manufacturers' representatives, and others retained by the contractor as needed.

Kent County envisions meetings including the contractor, their sub-contractor, installers, manufacturers' representatives, the Engineer, and the County throughout the process. Such meetings, as outlined in Section 019100, focusing on the various process components, will be an integral part of startup, commissioning, and training the operators.

f. Question 6:

Please confirm that an independent firm is required to be employed and paid by the contractor to perform specified commissioning per 019100-1.8

Answer 6:

As indicated in answer 5, paragraph 1.8 of Section 019100 will be deleted by Addendum 1. Thus, an independent firm will not be required to perform specified commissioning. Commissioning can be completed using the

expertise of the contractor, the authorized manufacturers' representatives, and others retained by the contractor as needed.

g. Question 7:

We assume the foam-in-place insulation in Spec 07200 is not required as it is not called out on the drawings.

Answer 7:

Foam-in-place insulation specified in Section 072000 is required to be applied to the roof panels of the pre-engineered precast concrete building (see Section 133400 paragraph 1.3.D).

h. Question 8:

We assume gutters and downspouts are not required as they are not shown or called out.

Answer 8:

Gutters and downspouts are required. Downspouts are shown on C-003. The roof is required to have a peak and a slope (see Section 133400 paragraph 1.3.C) and the intent was to have gutters for the full length of the downslope edges of the building. Addendum 1 will eliminate "as indicated on Drawings" from paragraph 1.1.A.1 of Section 077123.

i. Question 9:

Please clarify the quantity of each of the Drum Spill Containment for 4ea 55gal drums per 104000-2.1A as it does not appear to be called out on the drawings.

Answer 9:

The quantity is one (1), see the "DRUM STORAGE SPILL CONTAINMENT PALLET" on P-003. Paragraph 2.1 of Section 104000 describes all the requirements for the "DRUM STORAGE SPILL CONTAINMENT PALLET".

j. Question 10:

Please clarify the quantity of each of the Drum Spill Containment Platform with removable grating and 8" max height per 104000-2.1B as it does not appear to be called out on the drawings.

Answer 10:

The quantity is one (1), see the "DRUM STORAGE SPILL CONTAINMENT PALLET" on P-003. Paragraph 2.1 of Section 104000

describes all the requirements for the “DRUM STORAGE SPILL CONTAINMENT PALLET”.

k. Question 11:

Please clarify the quantity of each of the Drum Spill Containment Ramp 31.9 to 36.1 in wide with load capacity of 1500pb per 104000-2.1E as it does not appear to be called out on the drawings.

Answer 11:

The quantity is one (1), see the “REMOVABLE CONTAINMENT RAMP” on P-003. This is an required accessory for the “DRUM STORAGE SPILL CONTAINMENT PALLET” described in Paragraph 2.1.E of Section 104000.

l. Question 12:

Please clarify the quantity of each of the Portable Curb Ramp per 104000-2.2 as it does not appear to be called out on the drawings.

Answer 12:

The quantity is two (2), see them labeled twice as “PORTABLE CURB RAMP” on P-003.

m. Question 13:

Please clarify the quantity of each of the Drum Truck per 104000-2.3 as it does not appear to be called out on the drawings.

Answer 13:

The quantity required shall be one (1).

n. Question 14:

Please clarify the quantity of each of the Dry Chemical Fire Extinguisher per 104000-2.4C1 as it does not appear to be called out on the drawings.

Answer 14:

Though it is part of the contractor’s scope to determine in conjunction with the prefabricated building supplier how many and what type of fire extinguishers are required by building code, bidders can assume that one Dry Chemical Fire Extinguisher will be required for each room and floor elevation, for a total of four (4).

o. Question 15:

Please clarify the quantity of each of the Water Mist Fire Extinguisher per 104000-2.4C2 as it does not appear to be called out on the drawings.

Answer 15:

Though it is part of the contractor's scope to determine in conjunction with the prefabricated building supplier how many and what type of fire extinguishers are required by building code, bidders can assume that one (1) Water Mist Fire Extinguisher will be required next to the roll up door.

p. Question 16:

Please clarify which vendor Note 2 on P007 is intended to apply to. The note states, "IF TESTING DURING START UP DETERMINES POLYMER OR OTHER CHEMICAL ADDITION IS REQUIRED FOR THE SLUDGE FILTERS TO PERFORM AS SPECIFIED, PROVIDE THE ASSOCIATED FEED SYSTEM AND A STATIC MIXER AT NO ADDITIONAL COST TO OWNER," the note is referenced next to a Possible Static Mixer.

Answer 16:

Though the contractor is ultimately responsible for sourcing all needed equipment and services, please see Section 467633 - Fabric Filter Sludge Dewatering. Among other items and services, this section requires Bench Testing (paragraph 3.2) and Pilot Testing (paragraph 3.3) as well as indicates under what conditions a polymer or other chemical addition would be needed (paragraph 2.8.A) and of what it should consist (paragraph 2.8.B and C).

q. Question 17:

The P&IDs on P004 through P009 include many instruments, controllers and devices not shown throughout the documents. In addition, the specification sections included in Division 40 do not contain integration requirements or instrumentation and control direction. We assume the I&C, including the design, programming, devices, hardware, software and integration is provided by others.

Answer 17:

The only instruments, controllers and devices on P&IDs P-004 through P-009 which are not required are the few instruments and switches that are shown at a lighter line weight. For example, FE-001 through FE-007 are shown at a lighter line weight. FE-001 through FE-007 will receive new transmitting flow rate and flow total indicators. The transmitters will be connected to the analog inputs of the new local control panel (see drawing E-005). For guidance on what line types and weight represent instruments, controllers and devices see the legend on P-004.

r. Question 18:

The instrumentation specs indicate model numbers but don't seem to correlate with the P&ID drawings. There are no instrument schedules identifying the device id or quantity. Please provide.

Answer 18:

No instrument schedule will be provided. It is considered a required basic competency that the contractor, their electrical sub-contractor, and/or their control panel provider be capable of reading the already adequate information provided in the P&IDs, electrical drawings, and associated specifications.

s. Question 19:

Please clarify why the mixer shown on the 325gal EQ Tank T100 is noted as Possible Mixer?

Answer 19:

In Addendum 1, the "Possible Mixer" shown in Equalization Tank T-100 on drawing P-001 will be eliminated. This drawing element is from a time before the bench testing on the raw water was completed. The "Possible Mixer" was accidentally included in this plot.

t. Question 20:

Please clarify why the NaOH Feed shown on the 325gal EQ Tank T100 is noted as Possible NaOH Feed?

Answer 20:

In Addendum 1, the "Possible NaOH Feed" shown added to Equalization Tank T-100 on drawing P-001 will be eliminated. This drawing element is also from a time before the bench testing on the raw water was completed.

u. Question 21:

Please provide us with the elevation of the existing SS, as shown on drawing C-003, where we're tying in the new influent and effluent lines.

Answer 21:

Though it is the responsibility of the contractor to determine onsite conditions, bidders can assume that the existing discharge line from the current treatment system is at a depth of no more than 5 feet.

v. Question 22:

Would Modicon M340 PLC be an Approved Equal? The ScadaPACK 334 has been discontinued, a new Platform of ScadaPack is available but will not work an existing ScadaPack 334 Paltform.

Answer 21:

The SCADAPack334 Programmable Controller shown on Drawings E-005 and E-006 has a built-in 900 mHz Spread Spectrum Radio. A SCADAPack 474 and a GE TransNEXT 900 mHz Spread Spectrum Radio may be substituted for the SCADAPack 334. Equals will be determined by submittal after contract award.

The new SCADPack 474 PLC is slightly larger than the SCADAPack 334 and space will need to be allocated for mounting the separate TransNext Radio. The parts on the layout on drawings E-005 and E-006 will be shifted slightly so that the radio will be mounted in the upper-right side of the control panel. The part number and description for item 11 on E-005 and item 13 on E-006 will be updated for the SCADAPack 474: Schneider Electric TBU474, SCADAPack 474, 2 Ethernet Ports, 5 serial communications ports, 12 analog inputs, 20 digital inputs, 12 relay outputs, 2 analog outputs. The elementary diagrams on E-005 and E-007 will be changed to reflect the new I/O count of the SCADAPack 474 PLC.

8. Addenda

- a. Addendum 1
 - i. Pre-bid Sign-in Sheet
 - ii. Pre-bid meeting minutes
 - iii. Questions received before noon on January 19, 2024, and associated answers
 - iv. Geotechnical Report
 - v. A list of corrections to the specifications and drawings that will be made when the conformed sets of both are issue for construction.

9. Questions

- a. Question 23:

There was a question about available area for material layout for the project.

Answer 23:

Attached is an aerial view of another portion of the Nicholson Landfill with a designated layout area.

b. Question 24:

What precast building products/companies were considered when developing the Pre-Engineered Precast Building specification (Section 133400)?

Answer 24:

The following in order of influence: Easi, Easi-Set, Easi-Span, Smith-Midland (www.smithmidland.com), M&W Precast, LLC (www.mwprecastsupply.com), Tindall Building Systems, High Concrete Group, and Fenton. Dutchland LLC was mentioned by a bidder during the meeting. Though Dawood believes they could provide such a structure, they do not market themselves as providers of such structures.

c. Question 25:

The expected schedule was questioned.

Answer 25:

The projected schedule indicated during the meeting has been corrected in item 5.d above.

d. Question 26:

A bidder indicated they could not find the mixer specification.

Answer 26:

See Section 464100 - Mixing Equipment.

e. Question 27:

Will the Build America, Buy America Act requirements apply?

Answer 27:

No, the USDA date of obligation of the Loan was March 26, 2021. This preceded the May 14, 2022 effective date of the Build America, Buy America Act.

f. Question 28:

Who is Kent County's current systems integrator?

Answer 28:

Marino Representative:

Jon LeFevre

856-628-1117

jlefevre@marinoindustrial.com

- g. Question 29:
What 7 pumps will we be required to install in the wells?

Answer 29:

The 7 well pumps are existing well pumps already installed in the wells and are a part of the existing treatment system. These and other items listed in paragraph 1.4.C of Section 011000 are shown as existing on drawing P-005 and P-002. The granular activated carbon vessels (paragraph 1.4.C.4) to be relocated are shown on P-002, P-003, and P-007.

As part of Addendum 1, "Items furnished by Owner" will be replaced with "Existing treatment system items" in paragraph 1.4.C of Section 011000.

- h. Question 30:
What are the contractor experience requirements?

Answer 30:

Please see C-200 - Instructions to Bidders paragraph 3.01.A and C-451 - Qualifications Statement Article 8, Schedule A, and Schedule B.

- i. Question 31:
What are the minority owned business participation requirements for this project?

Answer 31:

Section '19.05 Small, Minority and Women Owned Businesses' of the EJCDC C-800 Supplementary Conditions to the Contract provides the requirements for subcontractors and fair solicitation from small, minority and women owned businesses.

- j. Question 32:
What tube or plate suppliers are acceptable?

Answer 32:

Though significant freedom was built into Section 464376 with regard to tube or plate packs, Kent County is currently using tube packs at their Fairlee facility. The Fairlee Clariflocculator unit was manufactured by Wes Tech Engineering, Inc. The PVC Tube Settler Modules were manufactured by Brentwood Industries, Inc.

- k. Question 33:
What is the engineer's estimate for the project?

Answer 33:

As stated in the contract documents, bidders are responsible for familiarizing themselves with the site and contract documents before submitting their bid. The engineer's estimate is no guarantee of a maximum cost and bidders should base their bids on their experience, their available labor pool, site conditions, materials availability, the contract documents, and other pertinent items effecting their cost. The engineer's estimate for this work is between \$1,867,000 and \$2,031,000.

l. Question 34:

Are there any wage rate requirements for this job?

Answer 34:

Davis Bacon Act compliance is required if there is federal government funding for the project. This project is funded by a USDA loan and not a grant. USDA has approved the bid documents without inclusion of Davis Bacon conditions.

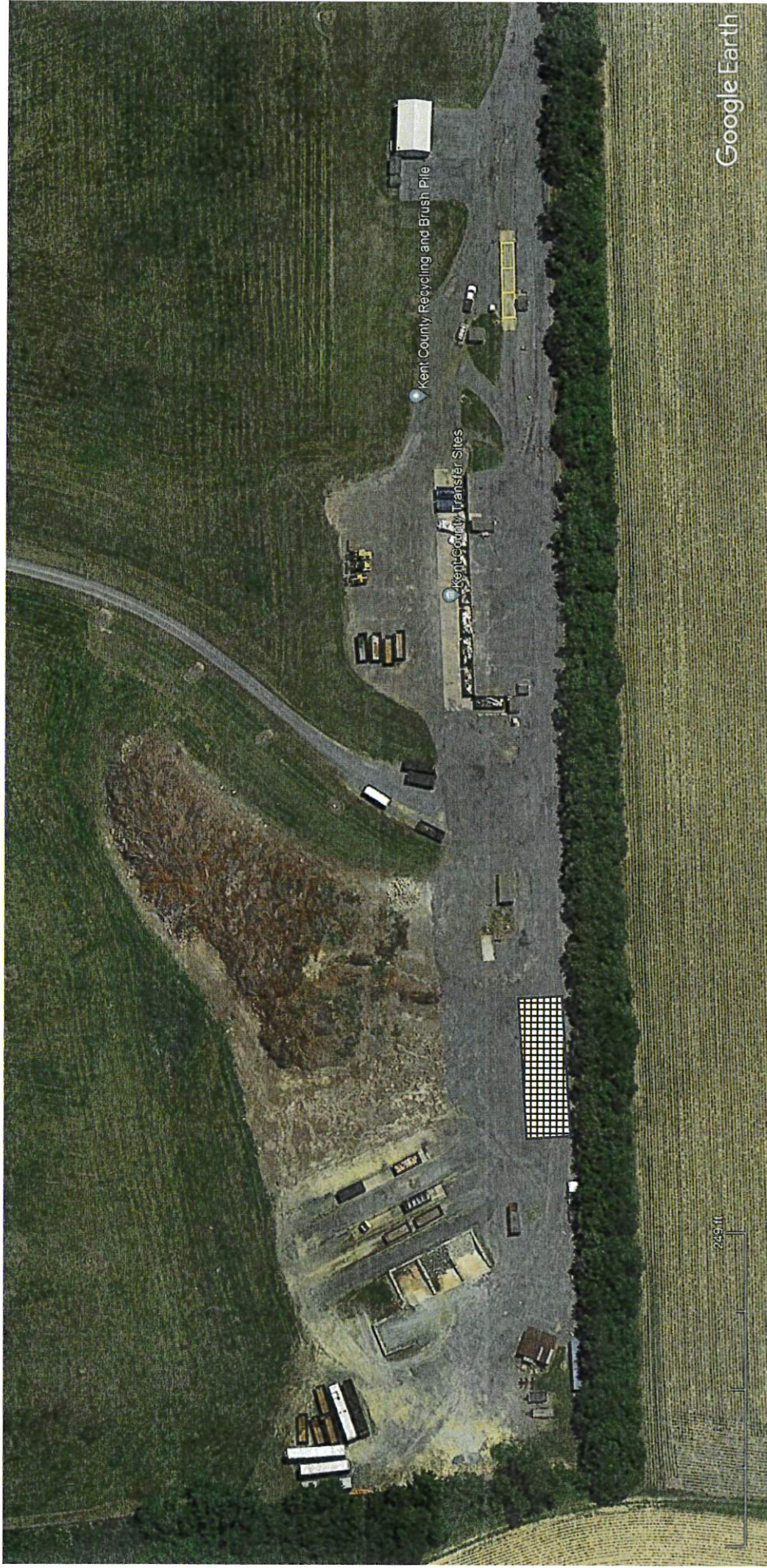
m. Question 35:

During the site walk there was some discussion of whether the chemistry in use at Kent County's water treatment facilities should be similar to what is needed for this project. Whether that information should be provided was also discussed.

Answer 35:

Kent County reports that the polymer currently being used at the Fairlee Water Plant for iron removal in the tube settler clariflocculator is Pollu-Treat A33PWG from PolluTech, Inc. They also report that the polymer is dosed at 0.57 milligrams of polymer per liter of raw water. The bench testing for this project suggests that from 127 and 143 milligrams of caustic (NaOH) per liter raw water will be needed.

10. A Site Walk was also conducted



Nicholson Landfill Groundwater Treatment Facility Construction

Proposed Designated Material Layout Area (Approximately 3,300 sq. ft.)

**ATTACHMENT #2:
QUESTIONS AND ANSWERS**

Groundwater Treatment Upgrades for Nicholson Landfill

Responses to a Question Received Before 12 noon on January 19, 2024

Question 36:

Please clarify the capacity for hydropneumatics tank

Answer 36:

The capacity of the hydropneumatics tank shall be a 60-gallon tank.

Question 37:

We assume Type L Cu pipe for domestic hot water line and sch 80 PVC Pipe for domestic cold-water lines.

Answer 37:

Copper is acceptable for the domestic hot water, but please remember that the minimum working pressure for domestic water piping and specialties is 125psig.

Question 38:

Please clarify the locations of the hose bibb an non-freeze mentioned in specs section 221119.

Answer 38:

There shall be three (3) hose bibbs on the interior of the building and one (1) non-freeze hose bibb. The non-freeze hose bibb shall be accessible from the exterior of the east side wall and shall be south of the double doors. There shall be one interior hose bib on the east wall next to the door to the area that has a floor elevation of 62' on the south side of the door. There shall be another interior hose bib on the east wall next to the door to the chemical room on the south side of the door. The third interior hose bib shall be on the west wall between the stairs and the carbon manifold.

Question 39:

Can the model/part number be provided for the existing Paddlewheel flow meters? The specified transmitter has been retire and we would like to ensure the suggested replacement is compatible.

Answer 39:

The part number for the seven (7) paddlewheel flow meters is P51530-P0, the body as polypro, rotor is black PVDF, and the pin as Titanium. The serial Numbers are

61012080821, 61012080877, 61009230194, 61007100211, 61007100196, 61007100220, and 61007100218.

Question 40:

Can a wiring diagram be provided for the clear well pump motor starter panel?

Answer 40:

The wiring diagram will be included with Addendum 1.

Question 41:

Can a wiring diagram be provided for the filtrate and building sump pump motor starter panel?

Answer 41:

The filtrate and building sump pump is a $\frac{3}{4}$ hp pump and does not require a motor starter.

Question 42:

Please confirm the PLC control panel on E-005 is acceptable in NEMA 4 mild steel cabinet. NP1 on the schedule referenced being NEMA 4X.

Answer 42:

NEMA 4 will not be acceptable. The control panel should be NEMA 4X.

Question 43:

PI-403A & 403B are shown with diaphragm seals. Is a specification available for the seals?

Answer 43:

Section 402000 paragraph 1.4.A.1 and Section 463000 paragraphs 2.01.E.1.d and 2.01.E.2.d indicate that the material selected for the seals shall be chemical resistant to each chemical and chemical mixture in the liquid stream. The chemical service is provided, and the contractor is expected to consult the manufacturer for materials selection.

Question 44:

PI-404A & 404B are shown with pulsation dampeners. Is a specification available for the dampeners?

Answer 44:

See Section 463000 paragraph 2.02.F.

Question 45:

P-007 shows differential pressure gauges for the existing GAC units. Can specifications be provided for these?

Answer 45:

McMaster-Carr 4028K1 with pressure range of 0 to 15 psi or approved equal.

Question 46:

Please provide complete model numbers of instruments required on the project. For example, the Model 2088 is not a full part number. Rosemont uses full part numbers, such as 2088G1S22A1, to fully identify products. Since design parameters are not included in the documents, these part number will be required to provide a working system.

Answer 46:

All the required design parameters are included in the documents. For example, the specifications and drawing P-006 provide all that is needed for QI/FIT/FE 203. It has a flow element with a 1-1/2" flow tube, a local display that that indicates flow and total flow, and a transmitter that sends a 4-20 mA flow signal to the PLC. It is a magnetic flowmeter so it must conform to Section 409123.33 paragraph 2.1 which indicates everything from the connection and enclosure type to the accuracy required and the flow tube lining material.

Question 47:

Please provide flow and head requirements for the Multi-stage Vertical In-line Centrifugal Pump specified in Spec 221123. We were not able to locate this information in the plans or specifications.

Answer 47:

The multi-stage vertical in-line Centrifugal Pump is part of the pre-fabricated pump package system. The performance for the pre-fabricated pump package system is detailed in paragraph 2.1.D. These are output requirements for the pre-fabricated pump package system which already account for conditions outside of the package and associated demand. The supplier of the package can determine the effective head and flow conditions required for the multi-stage vertical in-line centrifugal pump from them. Additional information for the package is shown on P-007.

ATTACHMENT #3:
THE GEOTECHINICAL REPORT

**GEOTECHNICAL
INVESTIGATION REPORT**

FOR:

**NICHOLSON LANDFILL
GROUNDWATER TREATMENT
FACILITY UPGRADES
KENT COUNTY, MARYLAND**

JULY 2021

PREPARED FOR:

**COUNTY COMMISSIONERS OF KENT COUNTY, MARYLAND
400 HIGH STREET
CHESTERTOWN, MD 21620**

PREPARED BY:



4250 Crums Mill Road, Suite 301, Harrisburg, PA 17112.
Phone: (717) 732-8576 Fax: (717) 732-8596
Dawood Project No. 2000114.00

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FIGURES:

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Figure 3 – Geologic Map
Figure 4 – Soil Map

APPENDICES:

Appendix A – Boring Location Plan
Appendix B – Typed Boring Logs
Appendix C – Calculations
Appendix D – Laboratory Testing Results

1.0 GENERAL

1.1 PURPOSE AND SCOPE

The scope of the report is to provide an analysis and evaluation of the geological and subsurface conditions at the site in relation to the proposed construction of a new water treatment plant. Based on the encountered subsurface conditions and the results of the testing performed for this project, geotechnical recommendations have been developed, as well as general earthwork and construction guidelines.

1.2 SITE LOCATION AND DESCRIPTION

The project is located in Kent County, Maryland. The Project Location Map is included as **Figure 1**.

1.3 PROPOSED CONSTRUCTION

It is our understanding that the Nicholson Landfill Project will include construction of a new water treatment plant. Two locations were investigated for feasibility of construction. Please refer to **Appendix A** for locations of the proposed structures and boring locations. The footprint of the building will be approximately 30 feet by 50 feet with a sump in the middle of the building with a depth of approximately 10 feet below existing grade (BEG). The water treatment plant building will be a precast concrete structure with a below grade floor acting as a tank and precast concrete walls. The expected Maximum Bearing Pressure will be 3,000 psf.

2.0 SUBSURFACE CONDITIONS

2.1 TOPOGRAPHY

The Topographic Map, **Figure 2**, indicates that the project area is lightly populated farmland. The approximate ground surface elevations within a half-mile radius of the project site range from approximately 40 to 100 feet. The project area is gently sloped.

2.2 GEOLOGY

The Geologic Map, **Figure 3**, indicates the project site is underlain by the Monmouth Formation of the Cretaceous Period. The formation consists of dark gray to reddish-brown, micaceous, glauconitic, argillaceous, fine to coarse grained sand. The formation thickness is 0 to 100 feet.

2.3 SOIL

The Soils Map of the project area, **Figure 4**, indicates that the soil at the project area is characterized as:

Metapeake silt loam (MnB) with 2 to 5 percent slopes. The loam is classified as prime farmland with the parent material of silty eolian deposits over fluvio-marine sediments. The depth to the water table is typically more than 80 inches. The soils have a high water capacity, a low runoff class, and are well drained.

Metapeake silt loam (MnC2) with 5 to 10 percent slopes, moderately eroded. The loam is classified as farmland of statewide importance with the parent material of silty eolian deposits over fluviomarine sediments. The depth to the water table is typically more than 80 inches. The soils have a low water capacity, a medium runoff class, and are well drained.

Sassafras gravelly loam (SgD3) with a 5 to 10 percent slopes. The loam is classified as not prime farmland with a parent material of Loamy fluviomarine deposits. The depth to the water table is typically more than 80 inches. The soils have a moderately high to high water capacity, a medium runoff class, and are well drained.

Udorthents refuse substratum (UfB) with a 0 to 5 percent slopes. The loam is classified as not prime farmland. The depth to the water table is typically 40 to 72 inches. The soils have a low water capacity, a low runoff class, and are well drained.

3.0 SUBSURFACE EXPLORATON

A total of 4 standard test borings were drilled at the project location. All test borings were scheduled to be advanced to 20 linear feet (LF) or auger refusal, whichever occurs first. The borings were drilled May 10, 2021, by Negley's Drilling, Inc. Dawood personnel provided full-time inspection services and logged the recovered soil samples. The purpose of these borings was to investigate subsurface conditions at two proposed structure locations for the new Water Treatment Plant. The western site was selected for the proposed groundwater treatment facility due to weight of hammer material in boring SB-02 from 9.0 feet to 14.0 feet which would result in high settlement potential. The location of the test borings and structures is shown on the **Boring Location Plan**, included as **Appendix A** of this report.

3.1 SUBSURFACE INVESTIGATION PROCEDURE

Standard methods (ASTM D-1452 and D-1586) were employed in drilling of the test borings. As each test boring progressed, the Standard Penetration Test (SPT) was conducted continuously. Blows were recorded for each six-inches of penetration. For the SPT, a conventional two-inch diameter split spoon sampler is driven by a 140-pound hammer falling from a vertical height of thirty inches. For the test, the number of blows required to drive a split spoon every six-inches over a 2 feet length is recorded. The N-value represents the addition of the second and third six-inch interval blow counts. The N-value is subsequently used to evaluate the load carrying capabilities of the soil and indicates the compactness of the soil in place at the conditions prevailing at the time of the test. Groundwater readings for all 4 borings were taken upon completion of the borings prior to grout backfilling.

3.2 SUBSURFACE CONDITIONS AT THE PROPOSED STRUCTURES

Test borings SB-01 through SB-02 were located around the perimeter of the proposed east structure location and SB-03 and SB-04 were located around the perimeter of the proposed west structure location. Each of the soil samples recovered from the test boring investigation was examined by Dawood. Based upon visual classification, it was determined that the subsurface soil conditions were poor within the test borings SB-01 and SB-02 with weight of hammer to very soft clay layers at 9.0 feet to 14.0 feet below existing ground elevations. The subsurface soil conditions were found to be more favorable within test borings SB-03 and SB-04. Auger refusal or bedrock

was not encountered in any boring. Based on these observations the western proposed building location was chosen for design. The total depth and the conditions encountered of each test boring are shown on the typed test boring logs, which are included in **Appendix B** and a summary of the test boring results are presented in **Table 1** below.

Table 1: Subsurface Investigation Summary

Test Boring No.	Ground Surface Elev. (ft)	Drilled Depth		Bedrock Depth		Groundwater Readings		Remarks
		Depth (ft)	Elev. (ft)	0-HR (ft)	Elev. (ft)	0-HR (ft)	Elev. (ft)	
WESTERN STRUCTURE								
B-03	61.7	20.0	41.7	Dry	-	N/E	N/E	
B-04	58.5	20.0	38.5	Dry	-	N/E	N/E	
EASTERN STRUCTURE								
B-01	53.9	20.0	33.9	Dry	-	N/E	N/E	
B-02	54.1	20.0	34.1	Dry	-	N/E	N/E	

N/E – Not Encountered

The material at the proposed western structure site which was selected was visually classified into two stratum designated as **FILL** and **ALLUVIUM**. The **FILL** material was not encountered in boring SB-04 and extended to two feet in SB-03. The **ALLUVIUM** material is visually described as orange-brown to olive green Clayey SAND. **ALLUVIUM** was encountered in test borings SB-04 below the topsoil and at 2.0 feet below the topsoil and fill in SB-03. The layer extends to the termination depth of boring at 20.0 feet below the existing ground surface in both borings. The SPT N-values recorded during the sampling of this material ranged from 4 to 19 blows per foot of penetration. This material exists in a very loose to medium dense state. Bedrock or groundwater was not encountered in any of the borings. It should be noted that groundwater is seasonal and may be present at higher elevations during certain parts of the year.

4.0 LABORATORY TESTING

The laboratory testing program was designed to characterize the materials located within the vicinity of the project and to confirm parameters provided for the engineering analyses. The program consisted of the following: two soil classification tests including sieve analysis, moisture content, and Atterberg Limits, and one soil shear strength determination (direct shear test). Classification testing in general indicated that the soils consist of Clayey SAND (SC). Laboratory testing was only performed on the selected western site. The full laboratory testing results are included in **Appendix D** and a summary of the soil classification results is included in **Table 2**.

Table 2: Soil Classification Results

Boring No.	Depth (ft)	Classification		Natural Moisture Content (%)	PL (%)	LL (%)	PI (%)	ϕ (°)	C (psf)
		USCS	AASHTO						
B-3	2.0 – 8.0	SC	A-2-6	19.4	20	33	13	-	-
B-4	8.0 – 14.0	SC	A-2-7	26.0	23	45	22	24.6	370

5.0 DATA INTERPRETATION, ANALYSIS, CONCLUSIONS

5.1 STRUCTURE FOUNDATION

The bottom of footing elevations for the proposed new wastewater treatment plant structure is approximately 56 feet in elevation (assumed). Based on the subsurface conditions encountered in the test borings and results of the laboratory test result, foundation soils were generally found to be very loose to medium dense Clayey SAND. Ground water was not encountered in any borings.

Bearing capacity calculations were performed using equation AASHTO 10.6.3.1.2a-1 and a factor of safety of 3. The bearing capacity of the in-situ soils encountered are not capable of supporting the proposed structure. Ground improvements in the form of an undercut and replacement with a compacted AASHTO #57 aggregate are required to increase the bearing capacity of the soils. Based upon the results of these calculations, undercuts of two (2) feet will be necessary to meet the required bearing pressures. The continuous spread footing will be bearing on a minimum of two (2) feet of compacted AASHTO #57 aggregate over medium dense Clayey SAND. The bearing capacities were calculated using a two-layer system per AASHTO 10.6.3.1.2d and C10.6.3.1.2f-1. The two-layer calculation resulted in a 3.0 ksf allowable bearing capacity for the proposed structure. Based on the maximum allowable bearing pressure for the foundations and the foundation soil conditions, less than 1 inch of total settlement and less than ½ an inch of differential settlement is anticipated. Calculations are provided in **Appendix C**.

All foundation excavations should be verified for bearing capacity by the geotechnical engineer or a qualified representative prior to placement. The purpose of the observation will be to verify that the exposed bearing materials are suitable for the design soil bearing pressure. If soft or very loose pockets are encountered in the footing excavations, the unsuitable materials should be removed via undercut and replaced with compacted AASHTO #57 aggregate placed and compacted in accordance with the recommendations of this report.

Exterior footings and footing in unheated areas should be located at a depth of at least 30 inches below final exterior grades to provide adequate frost cover protection.

Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition, such as disturbances from rain or frost. Surface run-off should be drained away from the excavations and not be allowed to pond. If possible, all foundation concrete should be placed during the same day the excavations are made. If this is not possible, the foundation excavations should be adequately protected.

It is not anticipated these foundation excavations will require dewatering prior to foundation placement. However, if dewatering is required it should be performed by pumping the water from one or more sump water collection areas placed at a lower elevation than the foundation elements. Once dewatered and the prior to the foundation placement the dewatered areas should be approved for bearing capacity by a representative of the Geotechnical Engineer of Record. A site class "E" may be used for seismic parameters in accordance with IBC 2015.

5.2 SITE PREPARATION

5.2.1 REQUIRED FOUNDATION UNDERCUT

Bearing capacity calculations performed for the retaining wall indicate that the soils present are not adequate to support the structure. Therefore, foundation improvements in the form of an undercut and replacement with compacted AASHTO #57 aggregate are necessary to meet the retaining wall foundation pressures. The undercut shall be performed as follows:

- Undercut and remove the soils to the required depth of two (2) feet. The soils should be undercut from the foundation footprint area.
- A qualified representative of the geotechnical engineer of record should observe and verify the excavated footings prior to the aggregate placement.
- Place Class 4, Type A geotextile on the bottom and up the sidewalls of the excavation.
- Backfill the excavation to the bottom of the footing elevation with compacted AASHTO #57 aggregate as described in section **5.2.3 Compaction Criteria**.

5.2.2 PROOF-ROLLING

Before earthwork activities begin, the proposed construction area should be stripped of all vegetation, root mats, topsoil, soils with organic content, miscellaneous debris, and rubble for a minimum distance of 5 feet beyond the proposed construction areas. Following excavation of the foundation undercut to the proposed subgrade elevations, the subgrade should be proof-rolled and compacted. Proof-rolling and compaction procedures are integral parts of the site preparation process and are necessary to densify and verify the integrity of the subgrade bearing materials. Dawood recommends that a sheepsfoot roller or smooth drum vibratory roller having a minimum static weight of 10 tons be utilized for this purpose and that proof-rolling operations be observed and evaluated by the on-site representative of the Geotechnical Engineer of Record.

Any wet and soft zones of soil encountered during proof-rolling should be dried in place. Following adequate drying time, these soils can be densified in place. Alternatively, any wet, loose, or soft soils can be removed and replaced with structural fill or compacted AASHTO #57 aggregate as described in subsection **5.2.3 COMPACTION CRITERIA** subsection of this report. The need to excavate and replace the soft materials will be reduced if the development of the site occurs during periods of dry and warm conditions, such as the summer months. During these periods, scarifying and aeration will be greatly enhanced and the need to over-excavate and replace soft and/or loose soils will be reduced.

The site should be graded during development to convey surface runoff away from construction. The work areas should be sealed by rolling on a daily basis to promote runoff. Careful grading and management of surface water runoff will help minimize disturbance of the subgrade. Dawood recommends that all construction areas, including those that will be excavated to achieve the planned subgrade elevation, be proof-rolled immediately before the placement of any structural fill or compacted AASHTO #57 aggregate, and again before the installation of concrete.

5.2.3 COMPACTION CRITERIA

Compacted AASHTO #57 aggregate material should generally be placed in lifts not exceeding six (6) inches in loose thickness where compaction by vibratory trench roller or hand-operated equipment is necessary. The optimum lift thickness and number of repetitions necessary to achieve the required percentage compaction values should be determined in the field with test passes of the chosen compaction equipment.

If the placement of structural fill is required, structural fill material should generally be placed in lifts not exceeding six (6) inches in loose thickness where compaction by hand-operated equipment is necessary. The optimum lift thickness and number of repetitions necessary to achieve the required percentage compaction values should be determined in the field with test passes of the chosen compaction equipment. The approved structural fill material should be placed at $\pm 2\%$ the optimum moisture content as determined in accordance with ASTM Standard D1557 and compacted to a minimum 95% of the maximum dry density.

The site should be graded and sealed daily during construction to direct surface runoff away from the construction areas as described in subsection **5.2.2 PROOF-ROLLING**.

5.2.4 FILL CRITERIA

Based on the assumed finished slab elevation, Dawood does not anticipate that significant quantities of structural fill will be required for the project. However, should structural fill be needed, Dawood provides the information discussed herein. Fill material which supports foundations, floor slabs, and pavements, in addition to material used for retaining wall backfill is considered structural fill. Structural fill may have to be imported from off site.

Dawood recommends the content of the structural fill material be evaluated to determine the suitability of this material for use as structural fill during site construction activities by a representative of the Geotechnical Engineer of Record. Portions of the fill containing significant organics or other deleterious material, if any, should be stockpiled separately and used in non-structural areas of the site or disposed of properly.

The fine-grained soils require careful moisture control as they are sensitive to moisture changes. Caution should be exercised during construction to not expose these soils to weather conditions for long periods of time. During periods of wet site conditions, travel upon the building pad and construction areas should be limited to minimize disturbance of the subgrade which will lead to instabilities.

Any structural or load-bearing soil for use in the building pad and paved areas, which is required to be placed at the site, should meet the following criteria:

- Free of organic matter, ash, cinders, deleterious material, and debris.
- Plasticity index less than 10.
- Less than 15 percent by weight rock fragments larger than 3", less than 30 percent by weight larger than 3/4" and less than 30 percent by weight smaller than the No. 200 sieve.

The above criteria are provided as a general guideline for soil materials to be placed at the site. Soil materials available for use as a structural fill should be submitted to the Geotechnical Engineer of Record for evaluation and subsequent consideration prior to its importation or placement at the site.

5.2.5 CONSTRUCTION QUALITY CONTROL

As documented within this report, the proposed construction will include earthwork procedures and foundation construction activities. The quality of this work is an integral part of the development of this site and directly affects the validity of the recommendations presented in this report. Based upon Dawood's experience, the most effective and economical earthwork inspection is obtained through the presence of a qualified representative of the Geotechnical Engineer of Record during site preparation, excavation of on-site materials, site development, proof-rolling, placement of fill, and installation of foundation elements. Dawood recommends these activities be examined, tested, and confirmed by the Geotechnical Engineer of Record.

6.0 LATERAL EARTH PRESSURES

The lateral earth pressures that may be used for design, construction, and excavation stability purposes below grade are shown in **Table 3**. Retaining walls which are restrained from deflection such as basement or other structure walls, should be designed for the at rest (K_0) condition. Retaining walls which are free to deflect such as landscaped walls should be designed for the active (K_a) condition. The data for the onsite soils was determined based upon the laboratory testing and visual classification of the site soil samples compared to generally accepted published values for the various properties. The effective angle of internal friction of 24° is based on laboratory testing and is considered conservative and was used in the lateral load calculations because soils onsite will contain predominately soils classified as Clayey SAND.

Table 3: Soil Properties for Computation of Lateral Loads

Soil Property	Onsite Soils
Effective Angle of Internal Friction - ϕ	24°
Rankine Coefficient of Active Earth Pressure - K_a	0.42
Rankine Coefficient of Passive Earth Pressure - K_p	2.37
Rankine Coefficient of At Rest Earth Pressure - K_0	0.59
Moist Unit Weight (pcf)	110.0

Sloping, benching, or shoring of all construction excavations should be conducted in accordance with established Occupational Safety and Health Administration (OSHA) requirements. The actual excavation wall slopes, benching, or shoring should be determined based on the required depth of cuts and soil types encountered.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The following foundation notes are specific to the project site and are to be included into the Final Structure Plans.

1. If any revisions are made to the plans for the proposed structure following the date of this report, they should be brought to the attention of the Engineer of Record.

2. The foundation soils will require a minimum two (2) feet undercut and replacement of compacted AASHTO #57 aggregate to meet the required foundation bearing pressures. Follow **Section 5.2 Site Preparation** for the undercutting procedure.
3. At the start of construction, the site should be proof-rolled and if unsuitable organic, soft, or yielding soil areas are encountered, as determined by the Representative, the soils are to be removed and replaced. The sub-grade of the foundation footprint at the bottom of the proposed undercut should be proof-rolled prior to placement of compacted AASHTO #57 aggregate and additionally undercut if required.
4. An allowable bearing capacity of 3.0 ksf can be used for the continuous spread foundation assuming the foundation bears upon 2 feet of compacted AASHTO #57 aggregate on top of medium dense Clayey SAND approved by the Geotechnical Engineer of Record.
5. Provide a minimum of 30 inches of frost cover over the bottom of all foundations subject to frost action.
6. If deviations from the noted foundation conditions are encountered during construction, they should be brought to the attention of the Engineer of Record.
7. Utilize staged construction methods to minimize the exposure of the subgrade soils to atmospheric conditions. Do not allow water to pond.
8. The proposed continuous spread footings will be above the groundwater level. Therefore, it is anticipated that dewatering of footing excavations will not be necessary during construction. However, if dewatering is required it should be performed by pumping the water from one or more sump water collection areas placed at a lower elevation than the foundation elements. Once dewatered and the prior to the foundation placement the dewatered areas should be approved for bearing capacity by a representative of the Geotechnical Engineer of Record.
9. All concrete must be placed on a foundation surface with no debris or loose material and no surface water. Excavations should follow OSHA requirements.
10. During construction activity, all excavations shall be protected against storm water entering the foundation. Should water enter the excavation, remove it, and re-evaluate the foundation bottom prior to concrete placement. If groundwater is expected to be encountered in footing excavations, the foundation excavations should be dewatered and approved by a representative of the Geotechnical Engineer of Record prior to the placement of foundation elements.
11. Competent engineering inspection should be provided during the excavation of the foundation for the proposed building to verify bearing material.

8.0 LIMITATIONS AND QUALIFICATIONS

The conclusions and recommendations presented in this report have been based upon the available geotechnical information. The soil and bedrock conditions at other locations on the site may differ significantly from those occurring at the boring locations. If deviations from the noted foundation conditions are encountered during construction, they should also be brought to the attention of the Geotechnical Engineer of Record.

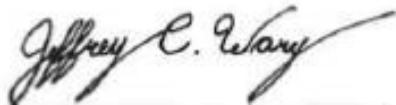
This report has been prepared in order to assist the design professionals in the planning and design for the proposed construction. Dawood should be informed of any changes in the estimated building loads, floor elevations, or structure location so that we can review and revise our recommendations, if required.

Unless specifically indicated to the contrary in this report, the scope of work for this project was limited only to investigations and evaluation of the geotechnical aspects of the site conditions and does not include any considerations of potential site pollution, contamination, or other environmental issues. This report offers no facts or opinions related to potential pollution or contamination of the site.

Our recommendations are also based on the assumption that a **Professional Engineer** qualified in Geotechnical Engineering and registered in the state of Maryland will be retained to oversee the inspection of the site preparation, proof-rolling effort, foundation construction, and other critical earthwork operations.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practice. DAWOOD ENGINEERING, INC. is not responsible for the conclusions made by others based upon the data herein.

DAWOOD ENGINEERING, INC.



Jeffrey C. Wary
Project Engineer
Geotechnical Services



Patrick J. Owen
Task Manager
Geotechnical Services

REFERENCES

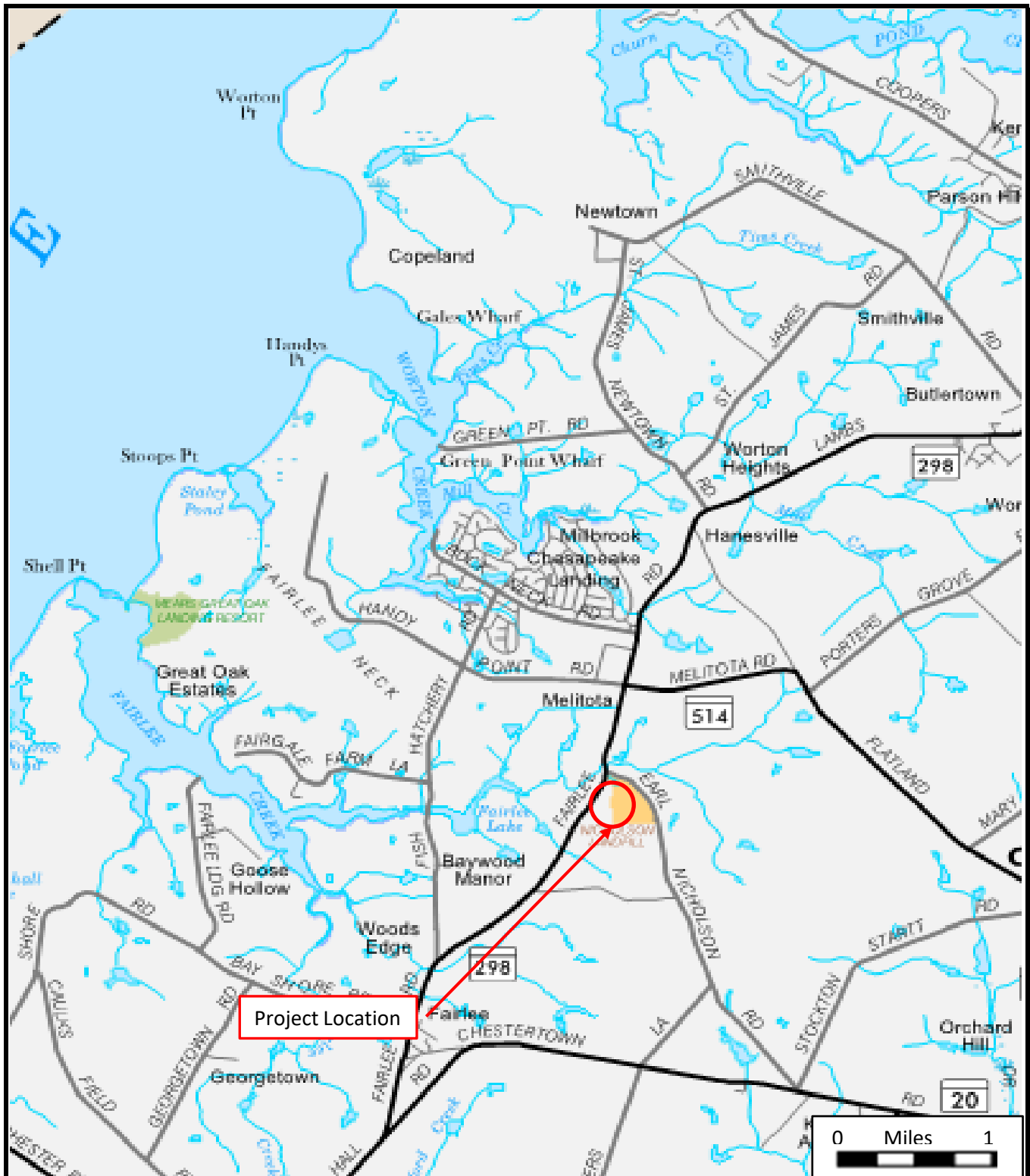
AASHTO LRFD Bridge Design Specifications, American Association of State Highway and Transportation Officials, 2015.

International Building Code, International Code Council, 2018.



Geologic Maps of Maryland, Kent County, Maryland Geological Survey, 1968.

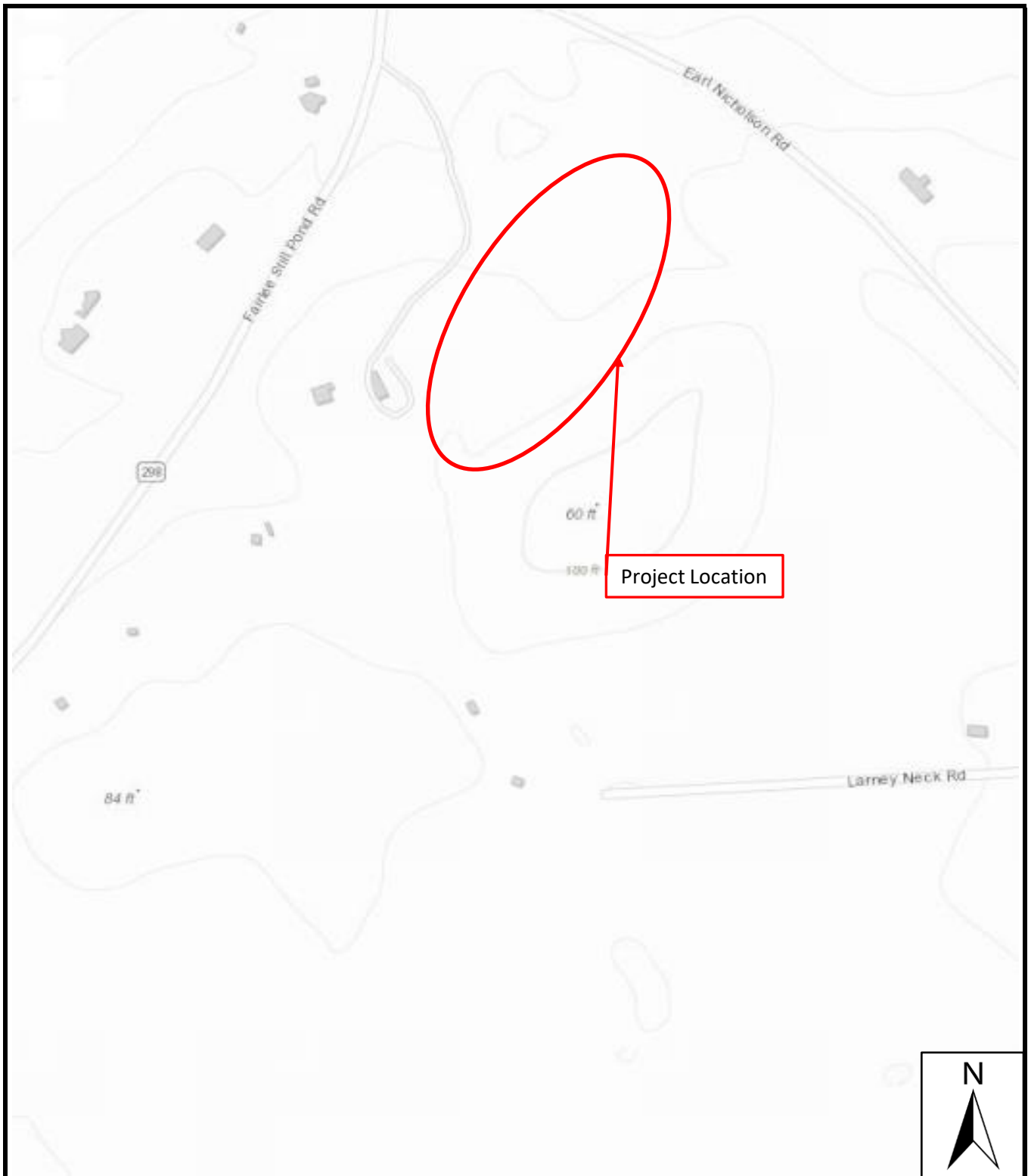
Web Soil Survey, United States Department of Agriculture, Natural Resources Conservation Service, 2021.

FIGURES





Source: General Highway Map Kent County Maryland, Maryland Department of Transportation, 2021

 <p>SCALE : AS SHOWN</p>	<p>LOCATION MAP</p> <p>NICHOLSON LANDFILL GROUNDWATER TREATMENT FACILITY UPGRADES KENT COUNTY, MARYLAND</p>	 <p>QUADRANGLE LOCATION</p> <p>FIGURE 1</p>
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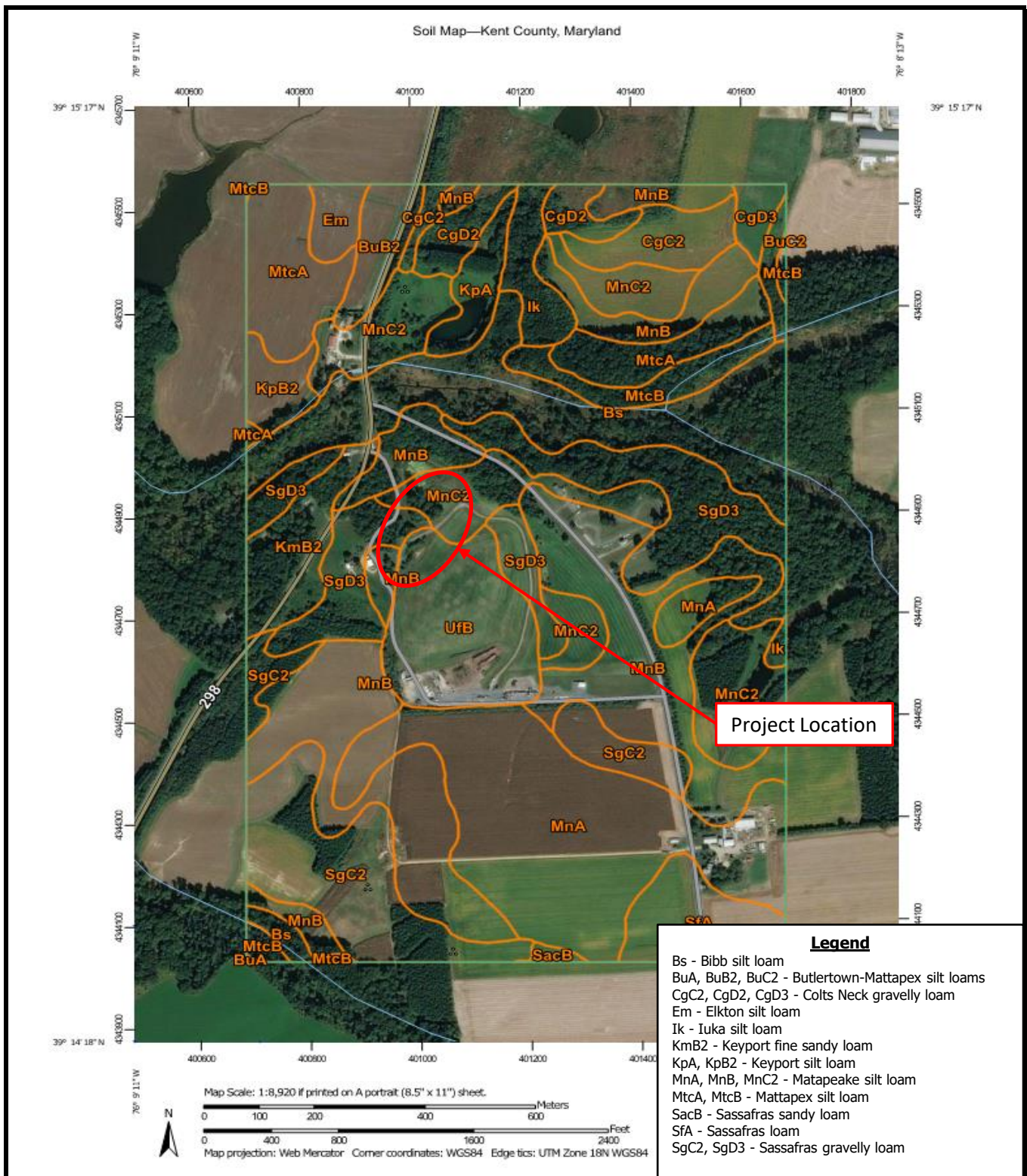
Source: Maryland ArcGIS, 2021

 SCALE : UNKNOWN	TOPOGRAPHIC MAP	MARYLAND
	NICHOLSON LANDFILL GROUNDWATER TREATMENT FACILITY UPGRADES KENT COUNTY, MARYLAND	 QUADRANGLE LOCATION FIGURE 2



Source: Maryland Department of Natural Resources, Maryland Geological Survey, Geologic Map of Maryland, 1968

 <p>SCALE : UNKNOWN</p>	<p>GEOLOGIC MAP</p> <p>NICHOLSON LANDFILL GROUNDWATER TREATMENT FACILITY UPGRADES KENT COUNTY, MARYLAND</p>	<p>MARYLAND</p>  <p>QUADRANGLE LOCATION</p> <p>FIGURE 3</p>
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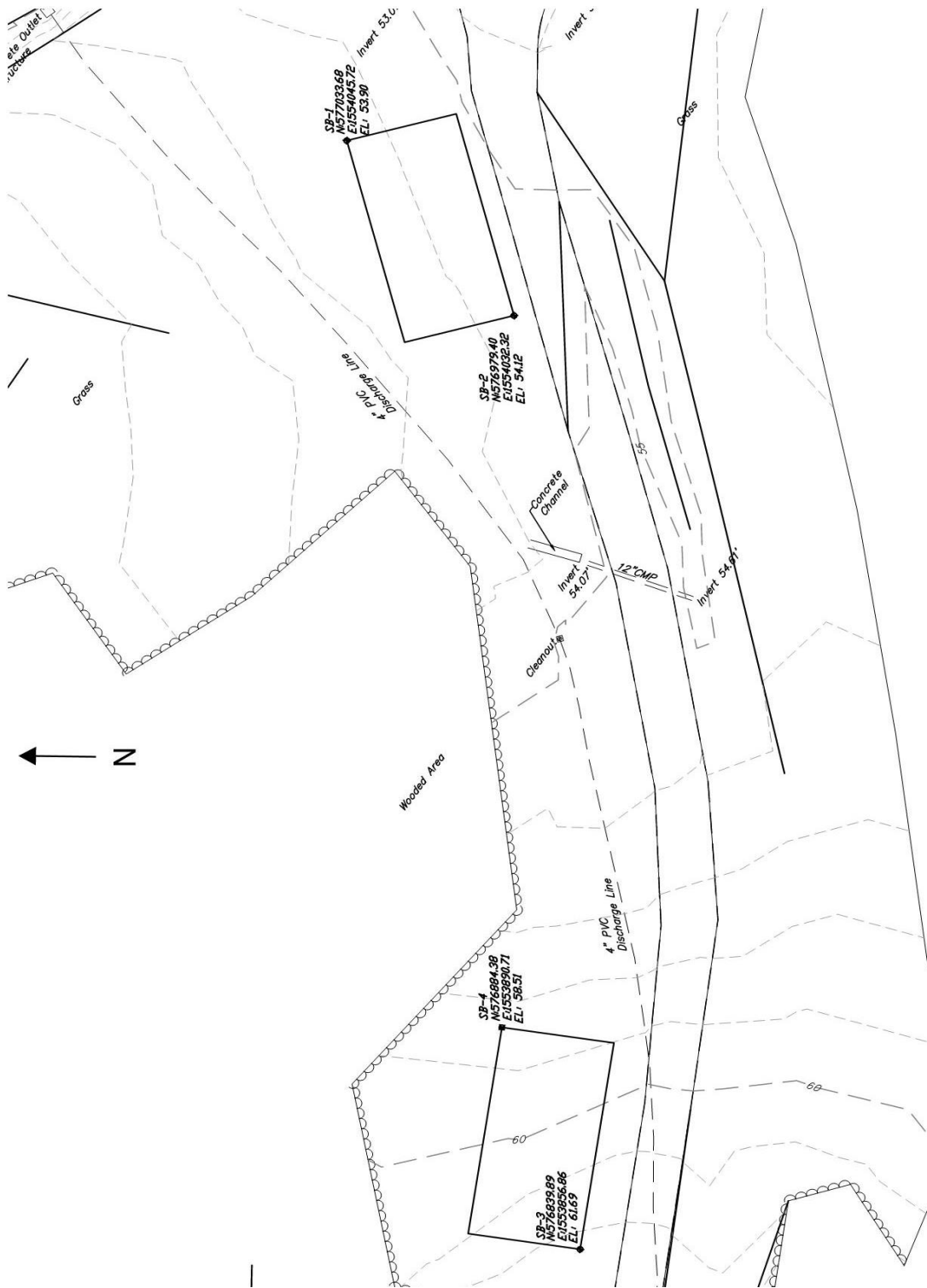


Source: United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, 2021

<p style="font-size: 1.2em; font-weight: bold;">DAWOOD</p>	<p style="font-weight: bold;">SOIL MAP</p> <p>NICHOLSON LANDFILL GROUNDWATER TREATMENT FACILITY UPGRADES KENT COUNTY, MARYLAND</p>	<p style="font-size: 0.8em;">MARYLAND</p> <p style="font-size: 0.8em;">QUADRANGLE LOCATION</p>
<p>SCALE : AS SHOWN</p>		<p>FIGURE 4</p>

APPENDIX A

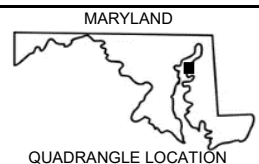
BORING LOCATION PLAN



SCALE : NOT TO SCALE

BORING LOCATION PLAN

NICHOLSON LANDFILL
GROUNDWATER TREATMENT FACILITY UPGRADES
KENT COUNTY, MARYLAND



APPENDIX B

TYPED BORING LOGS

PROJECT NAME Nicholson Landfill COUNTY Kent

LOCATION Chestertown, MD NORTHING 577033.68 EASTING 1554045.72

INSPECTOR (SIGNED) Michael Noone DRILLERS NAME/COMPANY Matt Ballew/Negley's Drilling

EQUIPMENT USED Acker Track Mounted XLS

DRILLING METHODS Continuous SPT, Hollow Stem Auger

CASING SIZE: 3.25" ; DEPTH: 18' ; WATER: DEPTH: _____ TIME: 0 hr. DATE: 5/10/2021

CHECKED BY: Pete Uhlig ; DATE: 6/11/2021 DEPTH: _____ TIME: _____ DATE: _____

NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY	RECOVERY (%)	POCKET PENT/ TORVANE (TSF)	USCS	AASHTO	H ₂ O CONTENT	DESCRIPTION	REMARKS
0.0		1							0.2 TOPSOIL	53.7
	S-1	4	1.6'	80					Silty SAND, loose, damp to moist, heterogeneous, uniformly graded, rounded, low plastic fines, tan and brown, fill, sm, a-2-4	
2.0		4								
	S-2	3	2.0'	100				dp		
4.0		3								
	S-3	2	1.2'	60				sm / a-2-4		
6.0		2								
	S-4	2	2.0'	100						
8.0		3							8.0	45.9
	S-5	2	0.2'	10					Silty Clayey SAND, contains organics, soft to very stiff, moist, heterogeneous, poorly graded, rounded, medium plastic, black and tan, fill, sc, a-2-6	
10.0		3								
								sc / a-2-6		
13.0								ms		
	S-6	6	1.9'	95						
15.0		8							15.0	38.9
		8							Sandy SILT, medium dense, moist, homogeneous, poorly graded, rounded, low plastic fines, olive green, alluvium, sm, a-2-4	
18.0		7								
	S-7	9	1.5'	75				sm / a-2-4		
20.0		8							20.0 Bottom of Boring at 20.0'	33.9

DEI Project Number: 2000114.00

PROJECT NAME Nicholson Landfill COUNTY Kent

LOCATION Chestertown, MD NORTHING 576979.4 EASTING 1554032.32

INSPECTOR (SIGNED) Michael Noone DRILLERS NAME/COMPANY Matt Ballew/Negley's Drilling

EQUIPMENT USED Acker Track Mounted XLS

DRILLING METHODS Continuous SPT, Hollow Stem Auger

CASING SIZE: 3.25" ; DEPTH: 18' ; WATER: DEPTH: _____ TIME: 0 hr. DATE: 5/10/2021

CHECKED BY: Pete Uhlig ; DATE: 6/11/2021 DEPTH: _____ TIME: _____ DATE: _____

NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY	RECOVERY (%) RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS AASHTO	H ₂ O CONTENT	DESCRIPTION	REMARKS
0.0		3						0.2 TOPSOIL	53.9
	S-1	7 6	1.4'	70				Silty SAND, very loose to medium dense, damp to moist, heterogeneous, poorly graded, low plastic fines, tan to brown, fill, a-2-4, sm	
2.0		7							
	S-2	4 5 12	0.5'	25			dp		
4.0		6						2.0' to 12.0': Wood fragments	
	S-3	33 14 6	0.5'	25					
6.0		17							
	S-4	3 2 1	0.0'	0		sm / a-2-4			
8.0		1							
	S-5	1 1 WOH	0.3'	15			ms		
10.0		WOH							
	S-6	WOH WOH WOH	0.1'	5					
12.0		WOH							
	S-7	WOH WOH WOH	2.0'	100		cl / a-6		CLAY, very soft, wet, homogeneous, uniformly graded, rounded, medium plastic, grey, alluvium, cl, a-6	
14.0									
	S-8	4 19 16	1.7'	85			wt	15.0	39.1
16.0		7						Sandy GRAVEL, medium dense, moist, heterogeneous, poorly graded, rounded to sub-rounded, white and brown, alluvium, a-2-4, sm	
	S-9	6 5 6	0.0'	0		sm / a-2-4			
18.0		8						18.0	36.1
	S-10	9 8 9	0.7'	35		sm / a-2-4	ms	Sandy SILT, medium dense, moist, homogeneous, uniformly graded, rounded, low plastic fines, green and gray, alluvium, sm, a-2-4	
20.0		10						20.0 Bottom of Boring at 20.0'	34.1

PROJECT NAME Nicholson Landfill COUNTY Kent

LOCATION Chestertown, MD NORTHING 576839.89 EASTING 1553856.86

INSPECTOR (SIGNED) Michael Noone DRILLERS NAME/COMPANY Matt Ballew/Negley's Drilling

EQUIPMENT USED Acker Track Mounted XLS

DRILLING METHODS Continuous SPT, Hollow Stem Auger

CASING SIZE: 3.25" ; DEPTH: 18' ; WATER: DEPTH: _____ TIME: 0 hr. DATE: 5/10/2021

CHECKED BY: Pete Uhlig ; DATE: 6/11/2021 DEPTH: _____ TIME: _____ DATE: _____

NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY	RECOVERY (%)	POCKET PENT/ TORVANE (TSF)	USCS	AASHTO	H ₂ O CONTENT	DESCRIPTION	REMARKS
0.0		8								
	S-1	20	1.6'	80		gp / a-1-a			0.2 TOPSOIL 61.5	
		18							Gravelly SAND, contains rock fragments, dense, damp, heterogeneous, poorly graded, sub-rounded to sub-angular, tan to white, fill, a-1-a, gp	
2.0		15							2.0 59.7	
	S-2	7	1.6'	80			dp		Clayey SAND, contains organics, loose to medium dense, damp to moist, heterogeneous, uniformly graded, rounded, medium plastic fines, orange brown to olive green, alluvium, A-2-6, SC	
		7								
4.0		6								
	S-3	4	2.0'	100					Laboratory Testing Results: Depth: 2.0' to 8.0' Natural Moisture: 19.4% LL: 33 PL: 20 PI: 13	
		3								
6.0		4								
	S-4	2	1.7'	85						
		3								
8.0		4								
	S-5	5	1.8'	90						
		5								
10.0		6								
	S-6	7	1.5'	75		SC / A-2-6				
		8								
12.0		8								
	S-7	9	1.5'	75			ms			
		8								
14.0		11								
	S-8	5	2.0'	100						
		6								
16.0		5								
	S-9	8	1.8'	90						
		9								
18.0		8								
	S-10	5	2.0'	100						
		7								
20.0		8							20.0 Bottom of Boring at 20.0'	41.7

PROJECT NAME Nicholson Landfill COUNTY Kent

LOCATION Chestertown, MD NORTHING 576884.38 EASTING 1553890.71

INSPECTOR (SIGNED) Michael Noone DRILLERS NAME/COMPANY Matt Ballew/Negley's Drilling

EQUIPMENT USED Acker Track Mounted XLS

DRILLING METHODS Continuous SPT, Hollow Stem Auger

CASING SIZE: 3.25" ; DEPTH: 18' ; WATER: DEPTH: _____ TIME: 0 hr. DATE: 5/10/2021

CHECKED BY: Pete Uhlig ; DATE: 6/11/2021 DEPTH: _____ TIME: _____ DATE: _____

NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY	RECOVERY (%)	POCKET PENT/ TORVANE (TSF)	USCS	AASHTO	H ₂ O CONTENT	DESCRIPTION	REMARKS
0.0		4							0.2 TOPSOIL	58.3
	S-1	8	1.8'	90					Clayey SAND, very loose to medium dense, moist, homogeneous, uniformly graded, sub-angular to rounded, medium plastic fines, brown and olive green, alluvium, A-2-7, SC	
2.0		5								
	S-2	4	1.5'	75						
		3								
4.0		4								
	S-3	3	1.0'	50						
		2								
6.0		2								
	S-4	2	1.5'	75					6.0' to 7.0': Silt Layer	
		3								
8.0		4								
	S-5	3	2.0'	100					Laboratory Testing Results: Depth: 8.0' to 14.0' Natural Moisture: 26.0% LL: 45 PL: 23 PI: 22 Internal Angle of Friction: 24.6° Cohesion: 370 psf	
		4								
10.0		5				SC/A-2-7	ms			
	S-6	5	2.0'	100						
		6								
12.0		8								
	S-7	8	2.0'	100						
		7								
14.0		9								
	S-8	4	2.0'	100						
		4								
16.0		6								
	S-9	7	1.7'	85						
		6								
18.0		7								
	S-10	8	1.7'	85						
		6								
20.0		8							20.0 Bottom of Boring at 20.0'	38.5

APPENDIX C

CALCULATIONS



Calculated by: JCW
Checked by: PJO

Date: 6/20/2021
Date: 7/19/2021

Nicholson Landfill

Calculation of Corrected N-values (N1₆₀) for Generalized Subsurface Profile

Soil Type: SC

Hammer Type: Auto (Auto/Safety/Donut) Efficiency: 80

Efficiency = 80/60% = 1.33 (DM-4, 2012, Section 6.3.4.5.3b)

N_{60} = SPT blows count corrected for hammer efficiency (blow/ft)

C_N (correction factor) = $0.77 * \text{Log}(20/\sigma_v')$ (AASHTO, 10.7.2.3.3-4)

$N1_{60} = N_{60} * C_N$

$\gamma_{moist} = 100$ pcf or 0.050 tcf

$\gamma_{sat} = 105$ pcf or 0.053 tcf

$\gamma_w = 62.4$ pcf or 0.031 tcf

NOTE: For simplicity of calculation, unit weights used for N-value correction are not necessarily the values used for bearing and settlement calcs.

NOTE: $CN = 1$ for $\sigma_v' \leq 0.25$ tsf

SB-03							SB-04												
Ground Surface Elevation at Boring (ft.)						61.7	Ground Surface Elevation at Boring (ft.)						58.5						
Approximate Depth to Groundwater (ft.)						DRY	Approximate Depth to Groundwater (ft.)						DRY						
Field N-value	N ₆₀	Depth (ft)	Elevation (ft)	σ _v ' (tsf)	C _N	N1 ₆₀	Field N-value	N ₆₀	Depth (ft)	Elevation (ft)	σ _v ' (tsf)	C _N	N1 ₆₀						
38	51	2.0	59.7	0.100	1.00	51	17	23	2.0	56.5	0.100	1.00	23						
13	17	4.0	57.7	0.200	1.00	17	7	9	4.0	54.5	0.200	1.00	9						
7	9	6.0	55.7	0.300	1.40	13	4	5	6.0	52.5	0.300	1.40	7						
7	9	8.0	53.7	0.400	1.31	12	6	8	8.0	50.5	0.400	1.31	10						
10	13	10.0	51.7	0.500	1.23	16	7	9	10.0	48.5	0.500	1.23	11						
15	20	12.0	49.7	0.600	1.17	23	11	15	12.0	46.5	0.600	1.17	18						
19	25	14.0	47.7	0.700	1.12	28	16	21	14.0	44.5	0.700	1.12	24						
11	15	16.0	45.7	0.800	1.08	16	10	13	16.0	42.5	0.800	1.08	14						
17	23	18.0	43.7	0.900	1.04	24	13	17	18.0	40.5	0.900	1.04	18						
15	20	20.0	41.7	1.000	1.00	20	15	20	20.0	38.5	1.000	1.00	20						
13	17	---- Average Below Foundation ----				19	10	13	---- Average Below Foundation ----				15						
15	21	---- Average Below Sump Foundation ----				22	13	17	---- Average Below Sump Foundation ----				19						

----- Total Average Below Foundation -----17BPF

----- Total Average Below Sump Foundation -----21BPF

If *SPT* N values are used, unless otherwise specified for the design method or correlation being used, they shall be corrected for the effects of overburden pressure determined as:

$$N_1 = C_N N \quad (10.4.6.2.4-1)$$

N_1 = *SPT* blow count corrected for overburden pressure, σ'_v (blows/ft)

$$C_N = [0.77 \log_{10}(40/\sigma'_v)], \text{ and } C_N < 2.0$$

σ'_v = vertical effective stress (ksf)

N = uncorrected *SPT* blow count (blows/ft)

SPT N values should also be corrected for hammer efficiency, if applicable to the design method or correlation being used, determined as:

$$N_{60} = (ER / 60\%)N \quad (10.4.6.2.4-2)$$

where:

N_{60} = *SPT* blow count corrected for hammer efficiency (blows/ft)

ER = hammer efficiency expressed as percent of theoretical free fall energy delivered by the hammer system actually used

N = uncorrected *SPT* blow count (blows/ft)

When *SPT* blow counts have been corrected for both overburden effects and hammer efficiency effects, the resulting corrected blow count shall be denoted as N_{160} , determined as:

$$N_{160} = C_N N_{60} \quad (10.4.6.2.4-3)$$

The drained friction angle of granular deposits should be determined based on the following correlation.

Table 10.4.6.2.4-1—Correlation of *SPT* N_{160} Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

N_{160}	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

relative density estimated from the available in-situ data. The test specimen should be large enough to allow the full grain size range of the soil to be included in the specimen. This may not always be possible, and if not possible, it should be recognized that the shear strength measured would likely be conservative.

A method using the results of *SPT* testing is presented. Other in-situ tests such as *CPT* and *DMT* may be used. For details on determination of ϕ_f from these tests, refer to Sabatini et al. (2002).

The use of automatic trip hammers is increasing. In order to use correlations based on standard rope and cathead hammers, the *SPT* N values must be corrected to reflect the greater energy delivered to the sampler by these systems.

Hammer efficiency (ER) for specific hammer systems used in local practice may be used in lieu of the values provided. If used, specific hammer system efficiencies shall be developed in general accordance with ASTM D4945 for dynamic analysis of driven piles or other accepted procedure.

The following values for ER may be assumed if hammer specific data are not available, e.g., from older boring logs:

ER = 60 percent for conventional drop hammer using rope and cathead

ER = 80 percent for automatic trip hammer

Corrections for rod length, hole size, and use of a liner may also be made if appropriate. In general, these are only significant in unusual cases or where there is significant variation from standard procedures. These corrections may be significant for evaluation of liquefaction. Information on these additional corrections may be found in Youd and Idriss (1997).

The N_{160} - ϕ_f correlation used is modified after Bowles (1977). The correlation of Peck, Hanson, and

Stone Parameters

Dry Unit Weight = 120 pcf

Saturated Unit Weight = 125 pcf

Friction Angle = 34°

Cohesion = 0

Soil Parameters

Dry Unit Weight = 100 pcf

Saturated Unit Weight = 105 pcf

Friction Angle = 24°

Cohesion = 0

Where evaluation of elastic settlement is critical to the design of the foundation or selection of the foundation type, in-situ methods such as PMT or *DMT* for evaluating the modulus of the stratum should be used.

For preliminary design or for final design where the prediction of deformation is not critical to structure performance, i.e., the structure design can tolerate the potential inaccuracies inherent in the correlations. The elastic properties (E_s , ν) of a soil may be estimated from empirical relationships presented in Table C10.4.6.3-1.

The specific definition of E_s is not always consistent for the various correlations and methods of in-situ measurement. See Sabatini et al. (2002) for additional details regarding the definition and determination of E_s .

An alternative method of evaluating the equivalent elastic modulus using measured shear wave velocities is presented in Sabatini et al. (2002).

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	0.25
Medium dense	1.67–2.78	
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	0.30–0.40
Dense	6.94–11.11	
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	0.30–0.40
Dense	13.89–27.78	
Estimating E_s from $SPT\ N$ Value		
Soil Type	E_s (ksi)	
Silts, sandy silts, slightly cohesive mixtures	0.056 N_{160}	
Clean fine to medium sands and slightly silty sands	0.097 N_{160}	
Coarse sands and sands with little gravel	0.139 N_{160}	
Sandy gravel and gravels	0.167 N_{160}	
Estimating E_s from q_c (static cone resistance)		
Sandy soils	0.028 q_c	

Stone
 $E_s = 13.98$

Soil
 $E_s = 16.7$ ksi

$$i_\gamma = \left[1 - \frac{H}{V + cBL \cot \phi_f} \right]^{(n+1)} \quad (10.6.3.1.2a-8)$$

$$n = [(2 + L/B)/(1 + L/B)] \cos^2 \theta + [(2 + B/L)/(1 + B/L)] \sin^2 \theta \quad (10.6.3.1.2a-9)$$

where:

B = footing width (ft)

L = footing length (ft)

H = unfactored horizontal load (kips)

V = unfactored vertical load (kips)

θ = projected direction of load in the plane of the footing, measured from the side of length L (degrees)

It should further be noted that the resistance factors provided in Article 10.5.5.2.2 were derived for vertical loads. The applicability of these resistance factors to design of footings resisting inclined load combinations is not currently known. The combination of the resistance factors and the load inclination factors may be overly conservative for footings with an embedment of approximately $D_f/B = 1$ or deeper because the load inclination factors were derived for footings without embedment.

In practice, therefore, for footings with modest embedment, consideration may be given to omission of the load inclination factors.

Figure C10.6.3.1.2a-1 shows the convention for determining the θ angle in Eq. 10.6.3.1.2a-9.

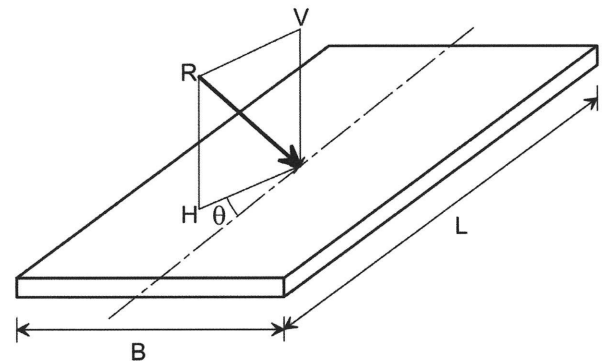


Figure C10.6.3.1.2a-1—Inclined Loading Conventions

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

ESTIMATION OF BEARING CAPACITY 2 FOOT UNDERCUT

D_{f1} =	2.5 ft	Depth to footing (From Foundation Plan and Elevation)
D_{f2} =	4.5 ft	Depth to Layer 2 ($D_{f1} + H_1$)
H_1 =	2.0 ft	Thickness of stone
e =	0.00 ft	Eccentricity
B =	3.00 ft	Basewidth
B' =	3.00 ft	Effective Footing Width (Assume no Eccentricity)
L =	30.0 ft	Footing Length (Shortest Wall Length)
g_w =	62.4 pcf	Unit Weight of Water
g_{m1} =	120.0 pcf	Moist Unit Weight of Bearing Material (Stone)
g_{s1} =	125.0 pcf	Saturated Unit Weight of Bearing Material (Stone)
c_1 =	0.0 psf	Cohesion (Stone)
f_1 =	34 °	Internal Angle of Friction (Stone)
g_{m2} =	100.0 pcf	Moist Unit Weight of Bearing Material
g_{s2} =	105.0 pcf	Saturated Unit Weight of Bearing Material
c_2 =	0.0 psf	Cohesion (In Situ)
f_2 =	24 °	Internal Angle of Friction
FS =	3.00	Factor of Safety

Bearing Capacity Factors: *Ref: AASHTO, Table 10.6.3.1.2a-1*

Layer 1 - Stone	$N_c = 42.1$	$N_q = 29.4$	$N_g = 41.0$
Layer 2 - Soil	$N_c = 19.3$	$N_q = 9.6$	$N_g = 9.4$

Groundwater Corrections: (No groundwater present)

Layer 1 - Stone	$g' = 120.00$ pcf
Layer 2 - Soil	$g' = 100.00$ pcf

Shape Factors:

Ref: AASHTO, Table 10.6.3.1.2a-3

If shape factor greater than 1.0 use a conservative value of 1.0

$S_c = 1 + (B'/L)(N_q/N_c) = 1 + (3/30)(29.4/42.1)$	=	1.07	use	1.00
$S_q = 1 + (B'/L)\tan\phi = 1 + (3/30)\tan 34$	=	1.07	use	1.00
$S_g = 1 - 0.4(B'/L) = 1 - 0.4(3/30)$	=	0.96	use	0.96

Inclination Factors:

Since the effective footing width is used inclination factors are set to 1.00

Calculating Bearing Capacity Layer 1 - Stone:

$$q_{ult1} = cN_c S_{c1} + 0.5g'B'N_g S_{g1} + g'D_f N_q S_{q1}$$

$$q_{ult1} = 0 \cdot 42.1 \cdot 1.00 + 0.5 \cdot 120 \cdot 3 \cdot 41 \cdot 0.96 + 100 \cdot 2.50 \cdot 29.4 \cdot 1.00 = 14,435 \text{ psf}$$

14.4 ksf

Calculating Bearing Capacity Layer 2 - Soil:

$$q_{ult2} = cN_c S_{c2} + 0.5g'B'N_g S_{g2} + g'D_{f2} N_q S_{q2}$$

$$q_{ult2} = 0 \cdot 19.3 \cdot 1.00 + 0.5 \cdot 100 \cdot 3 \cdot 9.4 \cdot 0.96 + 100 \cdot 4.50 \cdot 9.6 \cdot 1.00 = 5674 \text{ psf}$$

5.7 ksf

Bearing Failure Determination - AASHTO 10.6.3.1.2d-1

$$H_{crit} = 3B' \ln(q_{ult1}/q_{ult2}) / (2(1+B'/L)) = 3 \cdot 3 \cdot \ln(14.4/5.7) / (2 \cdot (1+3/30))$$

$$H_{crit} = 3.8 \text{ ft} \quad \text{Failure Occurs in Layer 2} \quad \text{AASHTO C10.6.3.1.2f-1}$$

$$q_{ult} = q_{ult2} \cdot e^{(0.67(1+(B'/L))(H_1/B'))} = 5.7 \cdot e^{(0.67(1+(3/30))(2/3))}$$

$$q_{ult} = 9.3 \text{ ksf} \quad \text{Bearing Pressure} = 3000 \text{ psf}$$

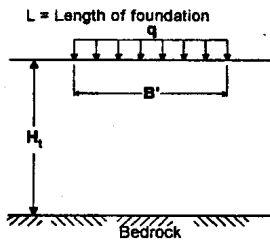
$$Q_{all} = q_{ult} / FS = 3.1 \text{ ksf} > 3.0 \text{ ksf} \quad \text{OK}$$

SETTLEMENT ESTIMATION

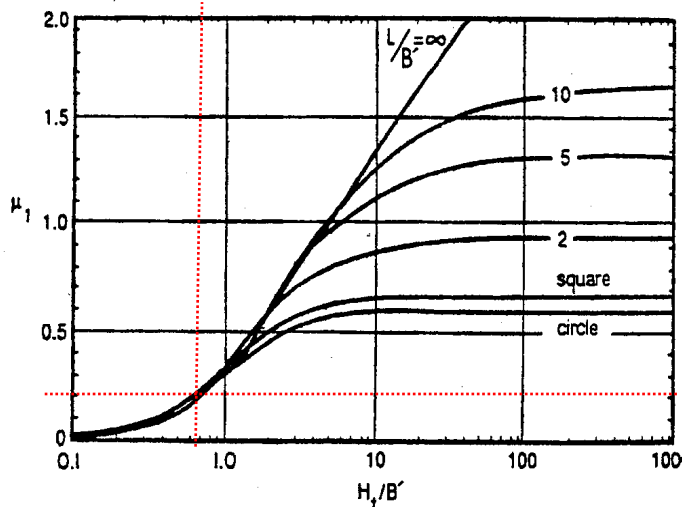
B =	3.0 ft	Footing Width
e =	0.00 ft	Eccentricity (Assume No Eccentricity)
B' =	3.00 ft	Effective Footing Width
L =	30.0 ft	Length of Footing (Shortest Length)
H _f =	2.0 ft	Thickness of Soil from Footing
μ ₀ =	1.0	Depth Factor
μ ₁ =	0.20	Layer Thickness Coefficient From Figure Below
q _o =	3000 psf	Vertical Stress at Base of Load Area (Service Load)
E _s =	13.89 ksi	Elastic Modulus (Stone)
L/B' =	10	
H _f /B' =	0.67	

Calculating Settlement:

$$S_e = \mu_0 \mu_1 \frac{q_o B'}{144 E_s} = 1 * 0.2 \frac{3 * 3}{2,000} = 0.0009 \text{ ft}$$



$$0.0108 \text{ in}$$



Layer 1 = 0.01 in

Layer 2 = 0.04 in

Total Settlement = 0.06 in

Figure 10.6.2.2.3eP-1 - Settlement Influence Factor μ_1 after Christian and Carrier (1978)

SETTLEMENT ESTIMATION

B =	3.0 ft	Footing Width
e =	0.00 ft	Eccentricity (Assume No Eccentricity)
B' =	3.00 ft	Effective Footing Width
L =	30.0 ft	Length of Footing (Shortest Length)
H _t =	50.0 ft	Thickness of Soil from Footing
μ ₀ =	1.0	Depth Factor
μ ₁ =	0.10	Layer Thickness Coefficient From Figure Below
q _o =	3000 psf	Vertical Stress at Base of Load Area (Service Load)
E _s =	1.67 ksi	Elastic Modulus (In Situ Soils (1B))
L/B' =	10	
H _t /B' =	16.67	

Calculating Settlement:

Ref: DM-4 10.6.2.2.3b-1

$$S_e = \mu_0 \mu_1 \frac{q_o B'}{144 E_s} = 1 * 0.1 \frac{3 * 3}{240}$$

= 0.0037 ft

0.0449 in

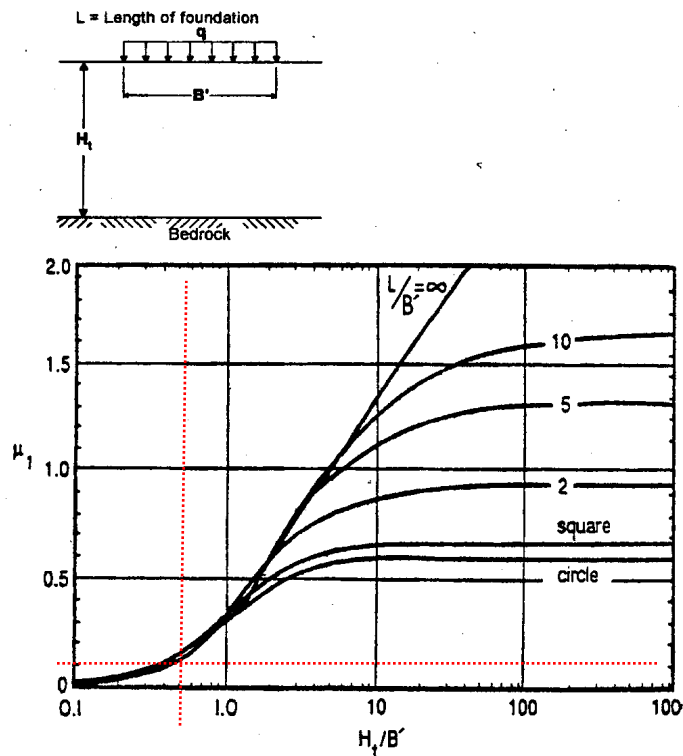


Figure 10.6.2.2.3eP-1 - Settlement Influence Factor μ_1 after Christian and Carrier (1978)

APPENDIX D

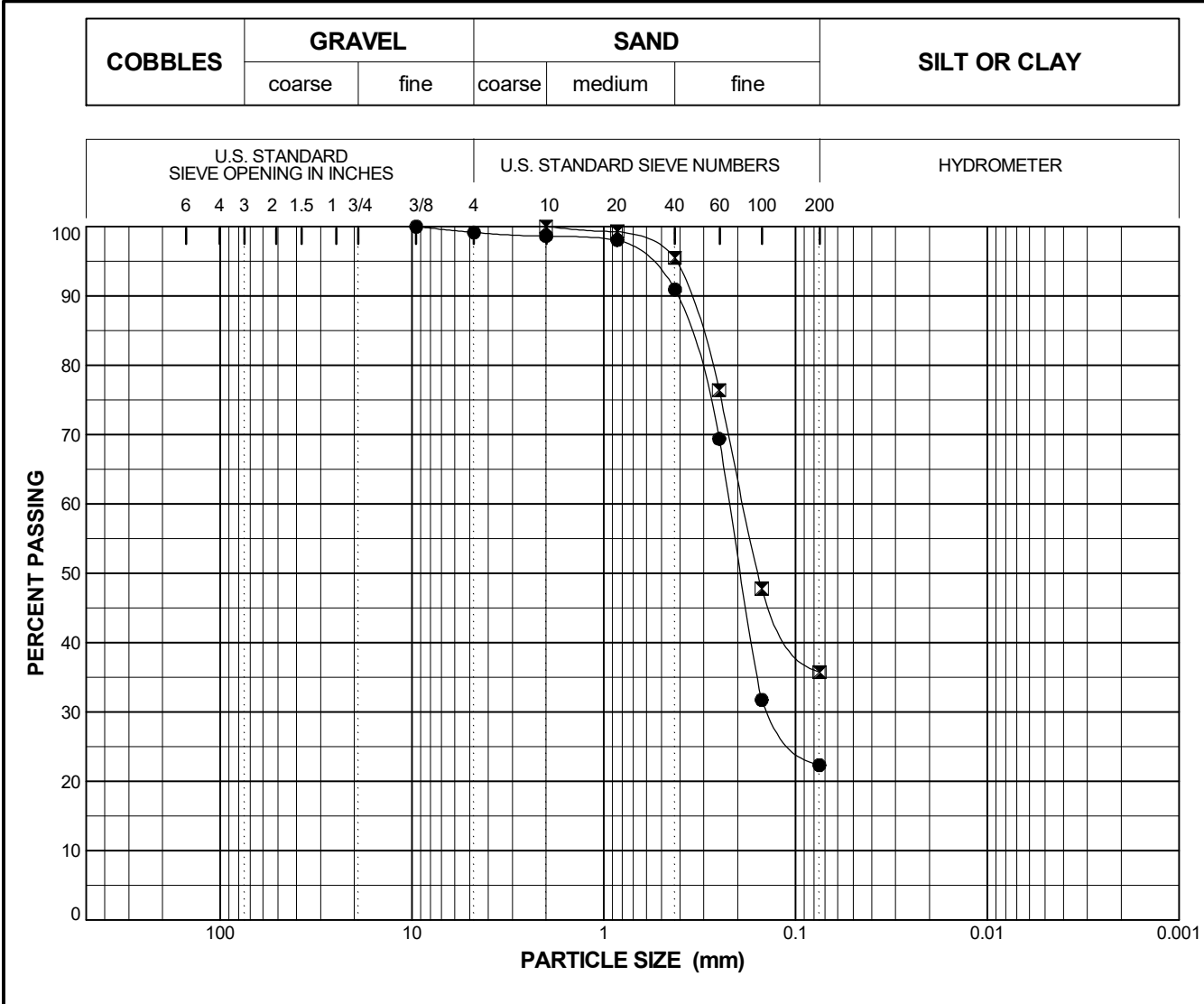
LABORATORY TESTING RESULTS

Project: Nicholson Landfill
Project No.: 60544899



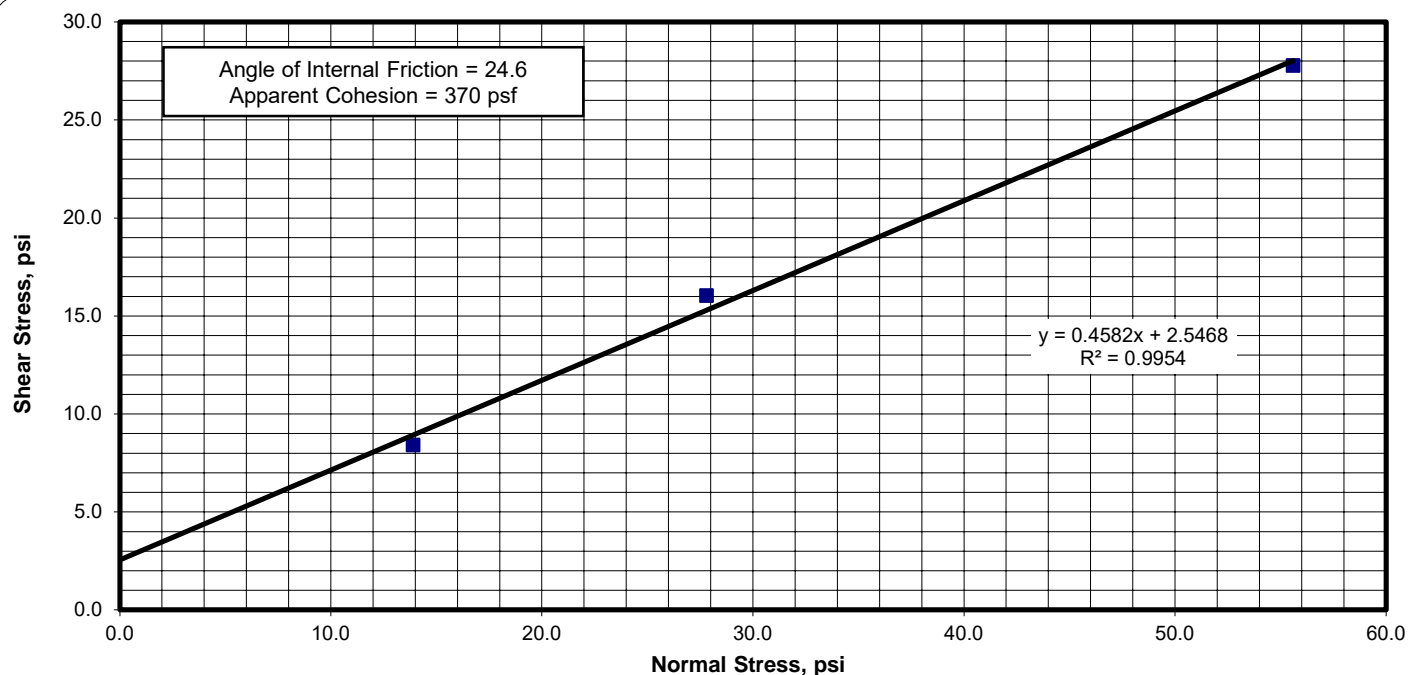
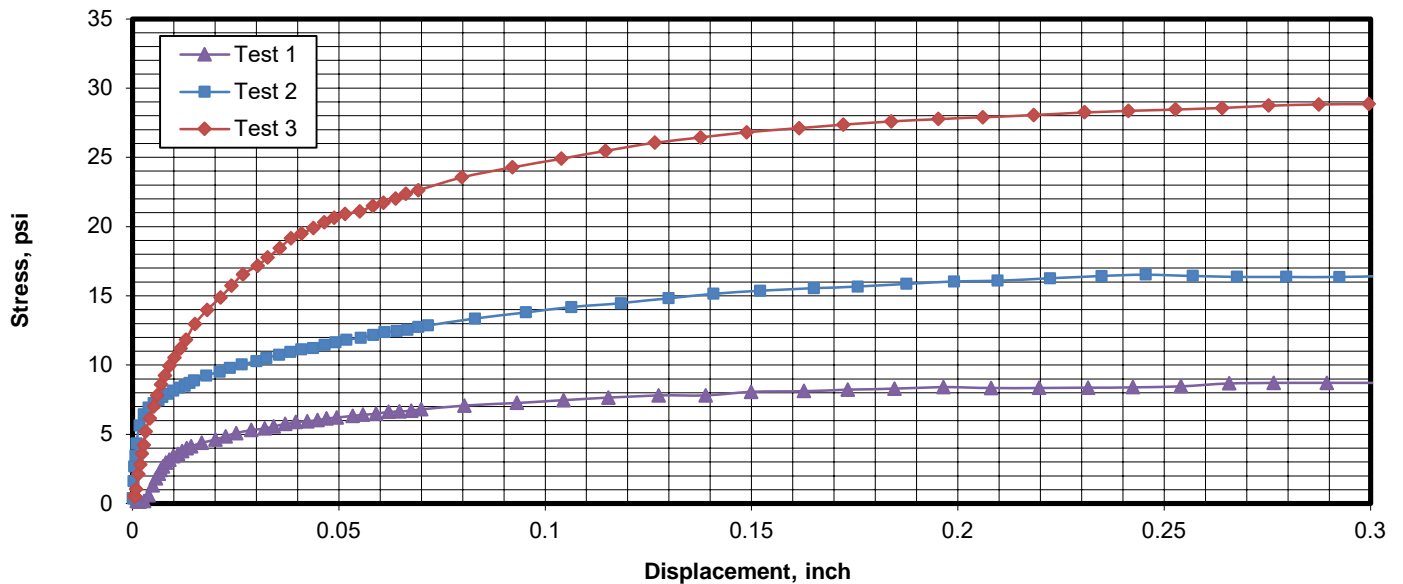
SUMMARY OF LABORATORY TEST RESULTS

Boring and Sample Number	Depth (feet)	Classification	USCS Symbol	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits		Specific Gravity	Organic Content (%)	Grain Size		Compaction	Consolidation	Unconfined Compression		Triaxial Compression		Permeability (cm/sec)	Special Tests
						Liquid Limit	Plastic Limit			<#200 (%)	<2 μ (%)			Stress (psi)	Strain (%)	UU	CIU		
SB-03 S-2-4	2.0-8.0	Brown CLAYEY SAND	SC	19.4		33	20			22									
SB-04 S-5-9	8.0-14.0	Brown CLAYEY SAND	SC	26.0		45	23			36									Direct Shear



SYMBOL	●	☒	
Boring	SB-03	SB-04	
Sample	S-2-4	S-5-9	
Spec			
Depth (ft)	2.0-8.0	8.0-14.0	
% +3"	0.0	0.0	
% Gravel	0.8	0.0	
% Sand	76.8	64.3	
% Fines	22.3	35.7	
% -2μ			
Cc			
Cu			
LL	33	45	
PL	20	23	
PI	13	22	
USCS	SC	SC	
w (%)	19.4	26.0	
Particle Size	PERCENT FINER		
(Sieve #)	●	☒	
2"			
1-1/2"			
1"			
3/4"			
1/2"			
3/8"	100.0		
4	99.2		
10	98.6	100.0	
20	98.0	99.3	
40	90.9	95.5	
60	69.4	76.4	
100	31.7	47.8	
200	22.3	35.7	
PARTICLE SIZE DISTRIBUTION			
Nicholson Landfill			
Project Number	June 2021		
60544899			
AECOM			

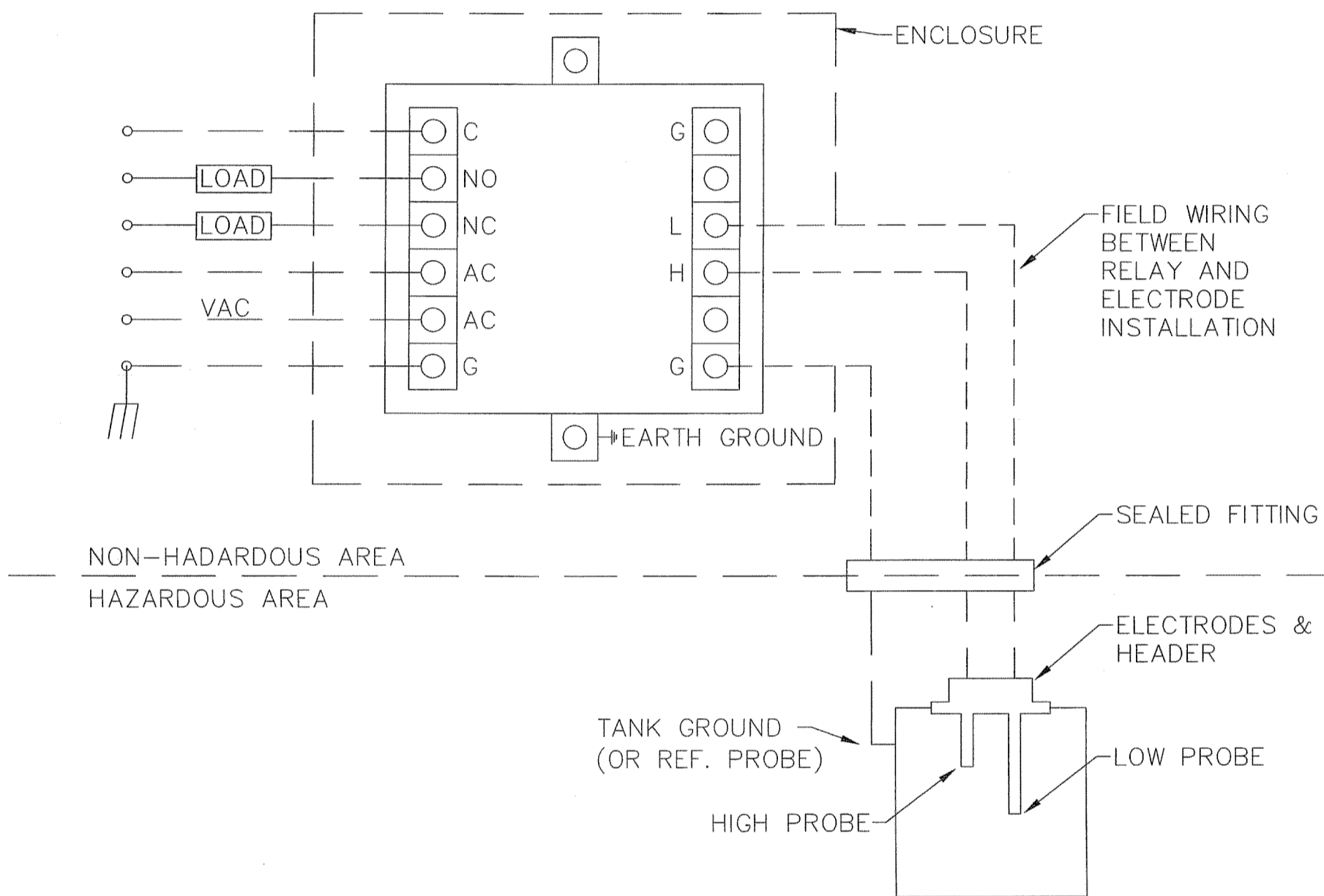
Project No.	6054489	Test No.	1	2	3	4
Project Name	Nicholson Landfill	Initial Water Content, %	25.8	26.1	26.3	
Boring No.	SB-04	Dry Density, pcf	87.5	87.2	87.1	
Sample No.	S-5-9	% Compaction				
Depth, ft.	8.0-14.0	Normal Stress, psi	13.9	27.8	55.6	
Liquid Limit	45	Initial Saturation, %	75.2	75.6	76.1	
Plastic Limit	23	Initial Void Ratio	0.927	0.933	0.935	
Plastic Index	22	Final Water Content, %	32.2	29.5	25.5	
Specific Gravity	2.70 (Assumed)	Final Void Ratio	0.868	0.774	0.698	
Description	Brown CLAYEY SAND	Final Saturation, %	100.0	102.8	98.7	
Compaction Method (ASTM):	NA	Maximum Peak Load, psi	8.41	16.04	27.77	
Target Dry Density γ_d , pcf:	87.2	Displacement at Peak, inch	0.20	0.20	0.20	
Average Moisture Content, %:	26.1	Displacement rate, inch/min	0.0029	0.0029	0.0029	



ATTACHMENT # 4:
WELL LEVEL CONTROL WIRING

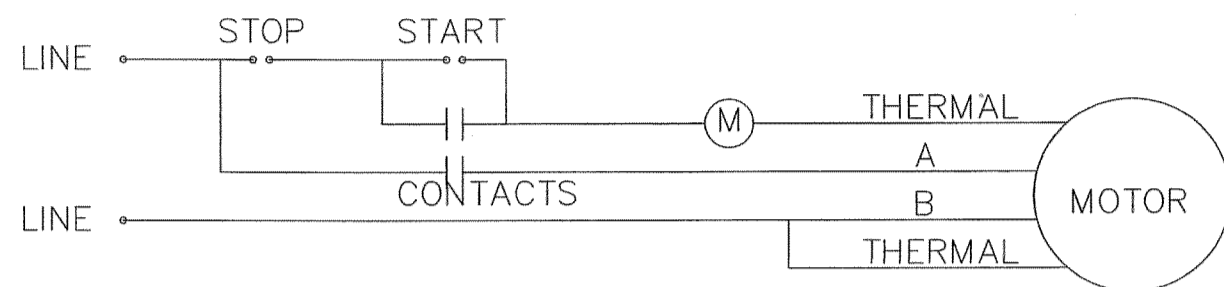
GROUNDWATER RECOVERY & TREATMENT SYSTEM ELECTRICAL DIAGRAM

WIRING DIAGRAM



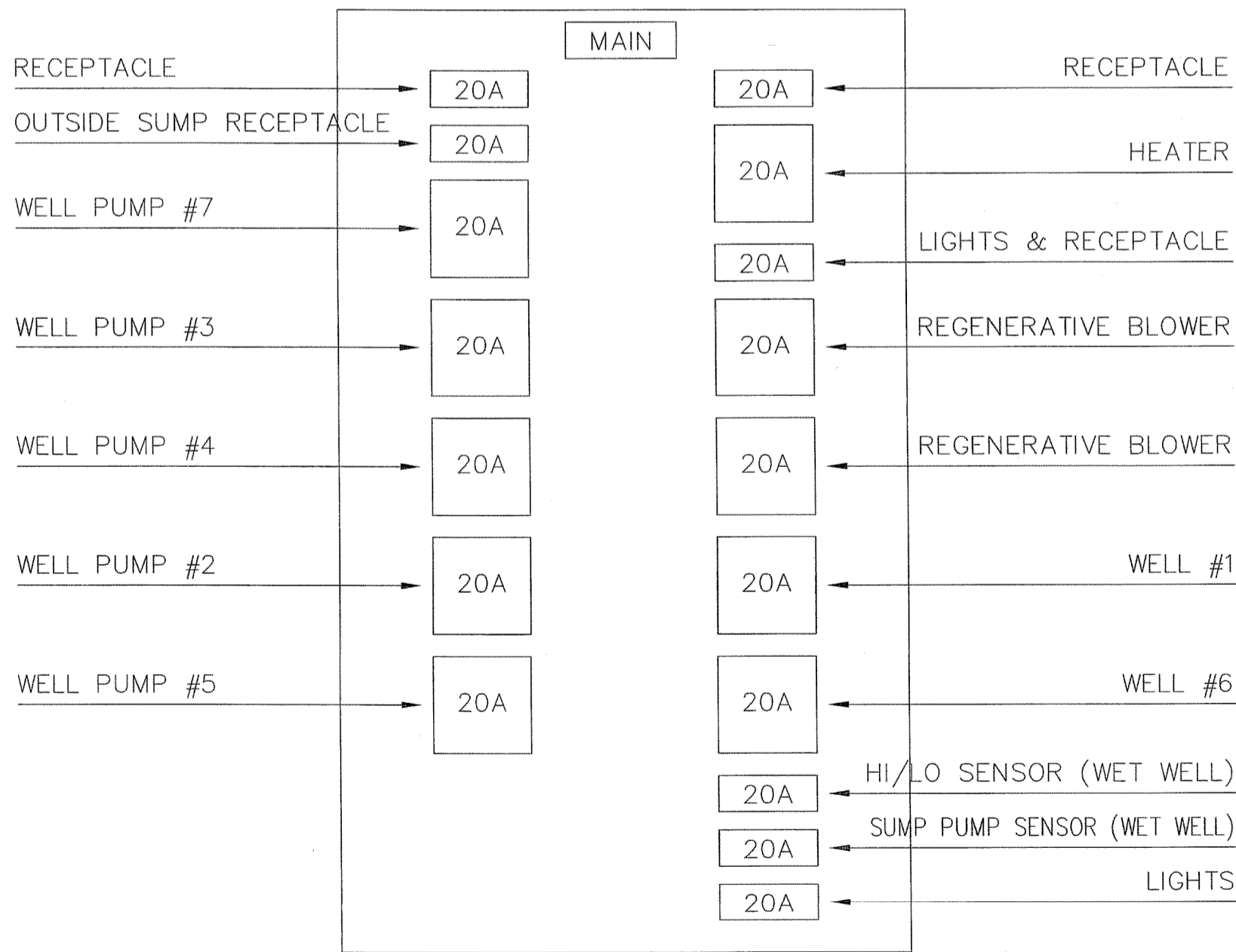
NOT TO SCALE

RECOMMENDED WIRING SCHEMATIC FOR XP MOTORS



	115 V, 6 WIRE	230 V, 6 WIRE	115 V, 7 WIRE	230 V, 7 WIRE
A	1-3-5	1	1-3	1
B	2-4-8	4-8	2-4-8	4-8
TIE		2-3-5	5-9	2-3, 5-9

GROUNDWATER TREATMENT SYSTEM CIRCUIT BOARD DIAGRAM



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. 11865, EXPIRATION DATE 03/04/2010.

SHEET 7

PROJ. MGR.: A. BULLEN	SCALE: AS SHOWN	CADD FILE: 3612 GRT.dwg	BASE MAP:
DRAWN BY: T. COCHRAN	DATE: 04/14/2011	PROJECT: 3612	SURVEY BY:

GROUNDWATER RECOVERY & TREATMENT SYSTEM AS-BUILT
ELECTRICAL DIAGRAM
FOR
NICHOLSON ROAD LANDFILL
KENT COUNTY, MARYLAND



GROUNDWATER & ENVIRONMENTAL CONSULTANTS
131 COMET DRIVE
CENTREVILLE, MARYLAND 21037
TEL. 410.758.8166 / FAX 410.758.8168
www.earthdatainc.com



Warrick® Series 27 Controls

Installation and Operation Bulletin



This bulletin should be used by experienced personnel as a guide to the installation of series 27. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Gems Sensors or its representative if further information is required.

Important!

Before proceeding to install and wire the control, Read and thoroughly understand these instructions.

***** WARNING:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

When installing according to these instructions, the sensing circuit is intrinsically safe for Class I, Groups A, B, C and D; Class II, Groups E, F and G; Class III:

Electrical equipment connected to associated apparatus should not exceed maximum voltage marked on product.

Location: The control must be situated in a non-hazardous area where an explosive atmosphere will not exist at any time.

Wiring:

1. Intrinsically safe wiring must be kept separate from non-intrinsically safe wiring.
2. Intrinsically safe and non-intrinsically safe wiring may occupy the same enclosure or raceway if they are at least 2 inches (50mm) apart and separately tied down. Inside panels, field wiring terminals for intrinsically safe circuits must be separated by at least 2 inches (50 mm) from non-intrinsically safe terminals.
3. Wire the control device (s) to the Series 27 relay as shown in the specific application wiring diagram in this bulletin. A separate rigid metallic conduit should be used to enclose the conductors of the intrinsically safe control circuit.
4. An approved seal should be used at the point where the intrinsically safe control circuit wiring enters the hazardous area.

For intrinsically safe output wiring, use #14 or #16 AWG type MTW or THHN wire. By using these wire types in conjunction with the following distance recommendations, you will not exceed the maximum capacitance for field wiring. Use the following chart as a guide for maximum wire runs for differential level service (3wire) field wiring.

Model	Max. Sensitivity (K Ohms)	Distance (FT.)
27XXD0	3	4,000
27XXE0	10	900
27XXH0	24	800
27XXG0	100	75

One of the two grounding terminals provided on the intrinsically safe output terminal strip must be connected as reference to the same conductive media presented to terminals "H" and "L" (*See applicable wiring diagram in this bulletin*) Terminal G *on the supply line*/load side terminal strip is a redundant system ground terminal and should be connected to the earth ground buss of the control's AC supply line feeder.

Note:

1. Intrinsically safe terminals can be connected to any non-energy generating or storing switch device such as a pushbutton, limit or float type switch or any Warrick electrode and fitting assembly.
2. To prevent electrical shock from supply line/load side powered connections, Series 27 should be mounted in a tool accessible enclosure of proper NEMA rated integrity.
3. For additional guidance on "Hazardous Location Installation" and "Intrinsically Safe Devices", consult ANSI/ISA standard RP 12-6 or NEC articles 500-516.

27 - X-X - X -X

Enclosure:	0- none, 1- NEMA 1, 4- NEMA 4
Sensitivity (Ohms):	D- 3K, E- 10K, H- 24K, G- 100K
Voltage:	1- 120 VAC, 2- 240 VAC
Mode of Operation:	A- Direct, B- Inverse

Grounding: Both mounting tabs of the Series 27 provide an electrical connection for earth grounding between the control's internal solid state circuitry and the enclosure chassis. To insure proper grounding, use only metal screws and lock washers when mounting this control.

Contact Design

SPDT (1 form C): One normally open (N.O.) and one normally closed (N.C.), non-powered contacts

Contact Ratings: 8A @ 240 VAC resistive,
8Amps @ 30 VDC resistive

Contact Life

Mechanical: 10 million operations.

Electrical: 100,000 operations minimum at rated load

Electronic Module

Solid state components epoxy encapsulated in a black nylon shell

Supply Voltage

120 or 240 VAC models $\pm 10\%$, 50/60 Hz.

Supply Current

Relays energized - 1.7 VA.

Secondary Circuit

11 VAC RMS voltage on probes, 2.3 milli-amp current

Sensitivity

Models operate from 0-100,000 ohms maximum specific resistance (factory set)

Temperature

-40° to 150° F ambient

Terminals

Size 6 pan head screws with captivated wire clamping plate

Listings

U.L. Intrinsically Safe (UL 913)

Wiring diagram

Single Level Service

-Conductance Actuated

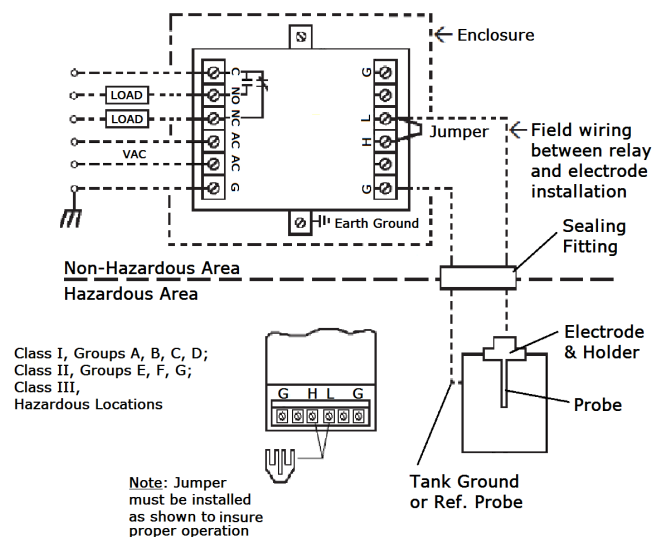
1. Connect (both terminals AC, AC) and G to appropriate VAC supply line.
2. Install metallic jumper between terminal H and L.
3. Connect terminal L to the electrode.

Terminal G must be grounded to the tank if metallic.

When the tank is non-metallic, terminal G must be connected to an additional electrode of length equal to the longest electrode.

4. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.

Note: Jumper must be installed as shown to insure proper Operation.



Wiring diagram

Differential Level Service

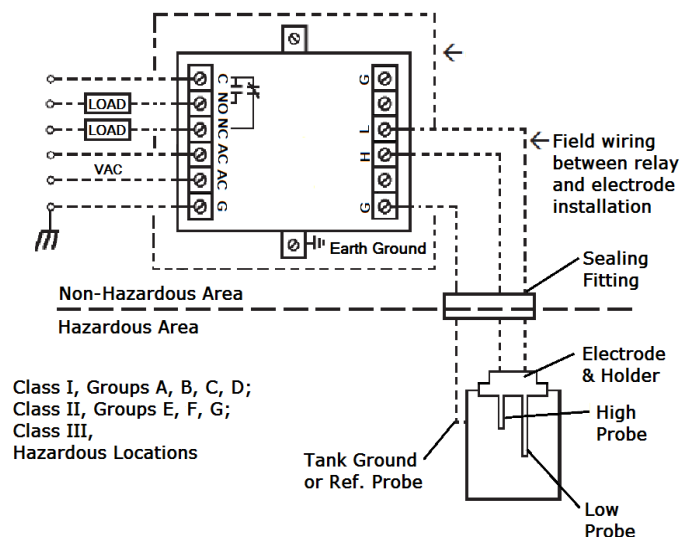
-Conductance Actuated

1. Connect (both terminals AC, AC) and G to appropriate VAC supply line.
2. Connect terminal H to the electrode and terminal L to low electrode.

Terminal G must be grounded to the tank if metallic.

When the tank is non-metallic, terminal G must be connected to an additional electrode of length equal to the longest electrode.

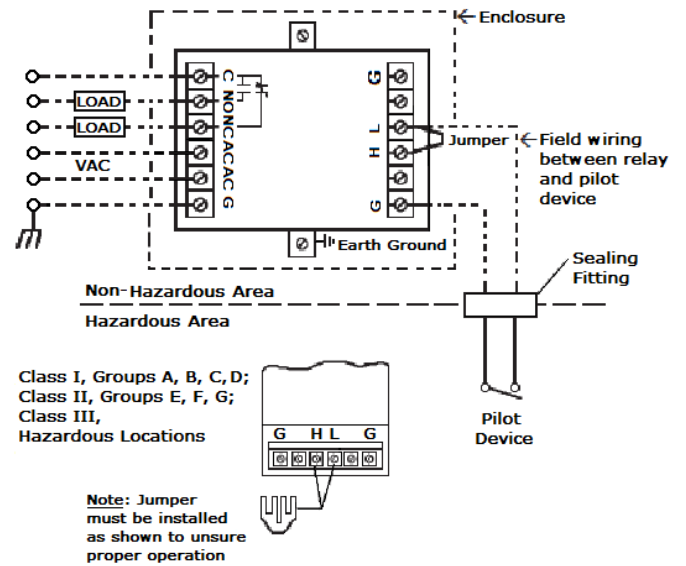
3. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.



Wiring diagram
Single Input (Non Latching)
-Pilot Contact Actuated

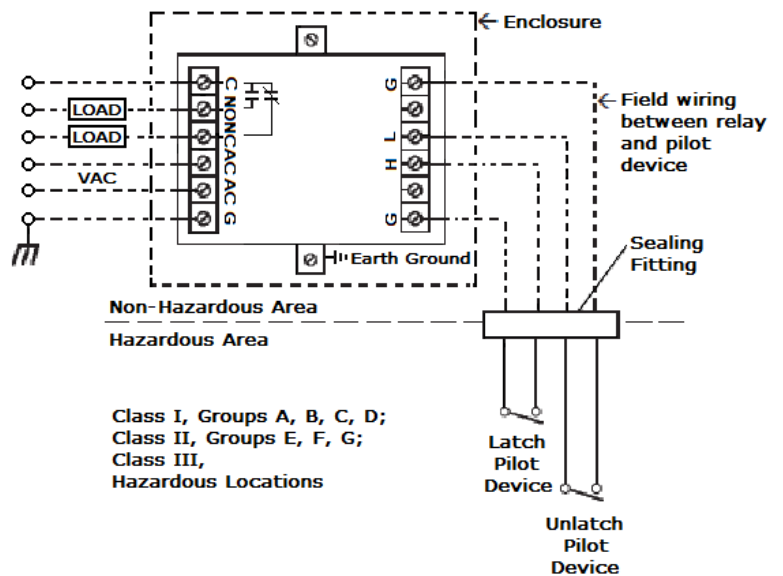
1. Connect (both terminals AC, AC) and G to appropriate VAC supply line.
2. Install metallic jumper between terminal H and L.
3. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.
4. Connect the pilot contact to terminals G and L.

Note: Jumper must be installed as shown to insure proper Operation.



Wiring diagram
Dual Input Latching
-Pilot Contact Actuated

1. Connect (both terminals AC, AC) and G to appropriate VAC supply line.
2. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.
3. Connect the latch pilot contact to terminals G and H and the unlatch Pilot contact to terminal G and L



Series 3W – Wire Suspended Probes

- ▶ Metallic Bars
- ▶ Plastic Shield Protected
- ▶ Adaptable to Many Fittings
- ▶ Field Assembled

Series 3W probes, consisting of metallic bars within a protective plastic shield, are designed to be suspended in liquid with PVC-insulated wires. They are ideal for applications where rigid electrode rods are impractical or cumbersome, such as:

- Deep Wells
- Pump Control
- Waste Water
- Deep Tanks

7/8" (2.22 cm) diameter x 3-3/4" (9.52 cm) length. 3Z1A wire and 3Z1B adaptor kit required for use with 3E, 3F and 3N fittings.

How to Order

Select a 3W electrode, a 3Z1B adaptor and a length of 3Z1A suspension wire to form a complete suspended probe.

1. 3W Electrodes

Probe Material	Part Number
Brass	3W1
316 Stainless Steel	3W2

2. 3Z1B Adaptor Kit

For use with 3E, 3F and 3N fittings.
Part Number: 3Z1B

3. 3Z1A Suspension Wire

Order in standard or custom length.

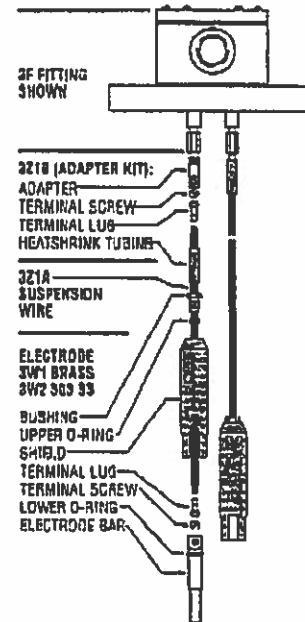
Length (Feet)	Part Number
100	100325-600
1000	100325-1000
5000	100325-5000
Custom	3Z1A-XX

Specify in one foot increments up to 5000 ft.



Series 3W

Components Detail



Series 3Y – Corrosion Resistant Probes

- ▶ Metallic Bars
- ▶ Corrosion Resistant
- ▶ Available in Many Materials for Various Requirements
- ▶ Adaptable for Various Fittings

Series 3Y wire suspended probes consist of metallic bars within a protective plastic shield, designed to be suspended in liquid. Series 3Y suspension wires are PVC or Teflon[®] insulated for use in corrosive liquid applications. 7/8" (2.22 cm) diameter x 3-1/2" (8.90 cm) length.

Specifications

Style	Wire suspended
Tip Material	Carp. 20, Hastelloy C, 316 Stainless steel
Shield Material	PVC 150°F (66°C) - Teflon

How to Order

Use the Bold characters from the chart below to construct a product code.

	3Y	X	X	X
Series	3Y			
Shield Material	1 - PVC	3 - Teflon [®]		
Probe Tip Material	C - 316 Stainless Steel	F - Hastelloy C		
	D - Carp. 20			
Length of Wire	1 - 10 feet	3 - 30 feet		
	2 - 20 feet	etc.		

Note: 3Z1B Connector is used to connect suspension wire with 3E, 3F, 3G or 3N fitting.

Applications

- General Purpose
- Wire Suspended Probes
- Corrosive Liquids, Chemicals



Series 3Y



Warrick® 3W1/3W2 Wire Suspended Electrodes

3Z1A Suspension Wire

Installation and Operation Bulletin

3Z1B Adapter Kit

The 3Z1B adapter kit must be used when the fitting has a 1/4"-20 threaded coupling.

Assemble as shown in the diagram.

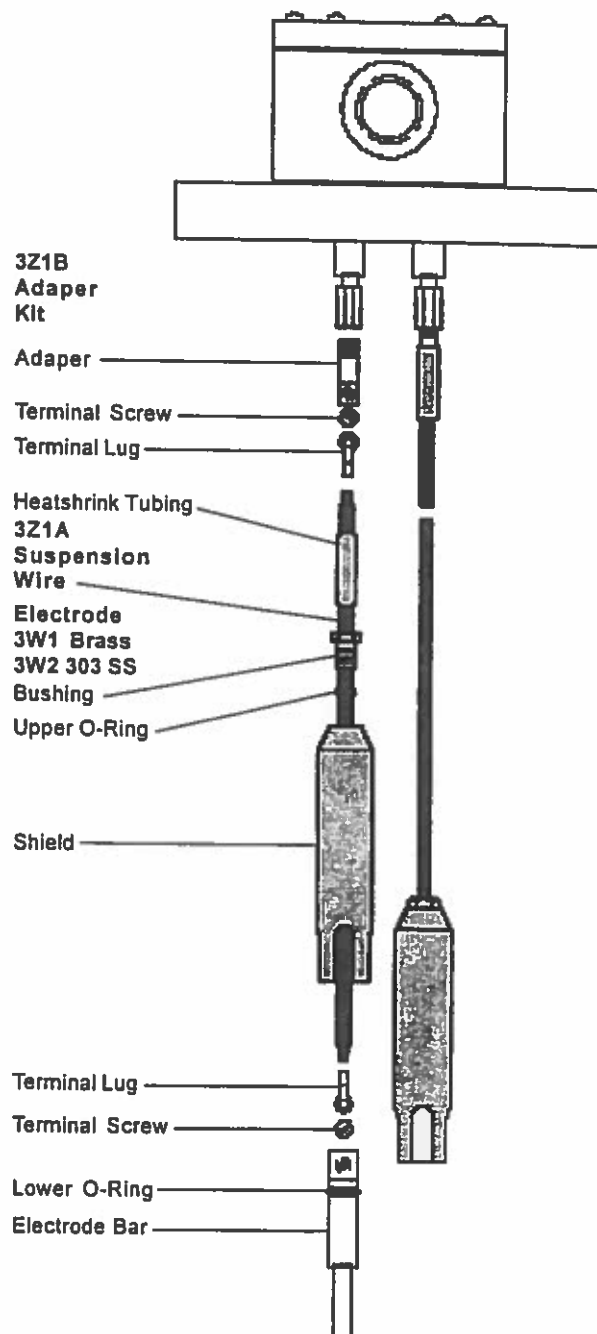
1. Slide heatshrink tubing over wire.
2. Strip insulation from wire (.25 in) and insert into terminal lug. Crimp terminal lug on wire to form electrical connection.
3. Thread adapter into 1/4"-20 coupling until hand tight plus 1-2 turns.
4. Screw terminal lug to electrode bar using terminal screw provided.
5. Slide shring tubing over assembly. Use hairdryer or heat gun to shrink tubing.

3W1/3W2 Wire Suspended Electrodes

The wire suspended electrode consists of seven parts. These are illustrated in the diagram. The lower O-ring and electrode bar are the only pre-assembled parts. Assembly is performed in the field prior to installation of the electrode in the well or tank.

Assemble as shown in the diagram.

1. Slip the bushing, upper O-ring and shield over the end of the suspension wire before the terminal lug is crimped onto the stripped end of the wire. Otherwise it will be necessary to pull the entire length of wire through those parts after the terminal lug has been fastened to the electrode bar.
2. Strip insulation from wire (.25 in) and insert into terminal lug. Crimp terminal lug on wire to form electrical connection.
3. Screw terminal lug to electrode bar using terminal screw provided.
4. Press the electrode bar, now attached to the suspension wire, into the shield. This is an interference fit and will require some pressure. Please note that the electrode bar will be flush with the end of the shield when fully seated.
5. Seat upper O-ring into shield and screw bushing into shield to seat.



ATTACHMENT # 5:
PRE-BID MEETING SIGN-IN SHEET

PLEASE SIGN-IN

PRE-BID MEETING for REQUEST FOR PROPOSAL # WW 24-04

Construction of Nicholson Landfill GWTF Upgrades

Wednesday, January 17th, 2024 @ 10:00 a.m.

Name	Company & Address	Email	Phone
Duncan Gordon	Pact Two, LLC	duncan@pactconstruction.com	267-566-1660
Daniel Yue	EA Engineering	dyue@eaest.com	410 493-4695
Alexander Alverio	Johnston	bids@jcc-ri.com	717-292-3606
Eric Grubb	BEARING CONST	e.grubb@bearingconstruction.net	410.708.6903
Jamie Yoder	BEARING CONST	Jamie@bearingconstruction.net	410-990-7547
RON EDEJER	W.M. SCHLOSSER CO.	bids@wmschlosser.com	(301) 773-1300
RICK MAZOL	CHESAPEAKE TURF, LLC	RICK@CHESAPEAKETURF.com	302-722-1317
DARL KOLAR	EA ENGINEERING	dkolar@eaest.com	410 641 5341
Rahul Gupta	AVISTA REALTIME	RGUPTA@AVISTAREALTIME.com	667 967 0831

PLEASE PRINT CLEARLY