IOWA DEPARTMENT OF
AGRICULTURE &
LAND STEWARDSHIP

Division of Soil Conservation and Water Quality

Cover Page: Pre-Bid Minutes, Questions, Addenda

To:	All plan holders	From:	Tracy Bruun, Division
Pages:	59 pages including this cover page.	Phone:	515-725-4119
Re:	Gre853235C Nutrient Reduction Wetland (Bid 23-05)	Date:	September 11, 2023

Comments:

- Addendum No. 1 with Attachments 1 and 2 (3 pages)
- Pre-Bid Meeting Minutes (9 pages)
- Pre-Bid meeting attendance list (1 page)
- Plan holders list (1 page)
- Geotechnical Engineering Report (44 pages)
- Electronic files for grading can be obtained by e-mail by contacting Andrew Schippers with Ducks Unlimited at 832-704-3286 or aschippers@ducks.org.

- END OF COVER PAGE -

IOWA DEPARTMENT OF
AGRICULTURE &
LAND STEWARDSHIP

Mike Naig
Secretary of Agriculture

Wallace State Office Building • 502 E 9th St, Des Moines, IA 502319 • (515) 281.5321 • www.IowaAgriculture.gov

September 8, 2023

Division of Soil Conservation and Water Quality
502 East 9th Street
Des Moines, IA 50319

TO: Prospective Bidders

Subject: **Addendum No. 1** to Bid Documents
Gre853235C Nutrient Reductionl Wetland Project – Bid No. 23-05
Greene County, Iowa

This addendum forms a part of the bidding contract documents and modifies the original bidding documents dated August 2023. An updated bidding form, Document CC.– Proposal and Schedule of Prices is attached with the addendum acknowledged. This updated bidding form must be used for 23-05 and all bidders must acknowledge this addendum on Page CC-2. **FAILURE TO DO SO WILL SUBJECT BIDDER TO DISQUALIFICATON.**

Description:

DOCUMENT AA– NOTICE TO BIDDERS

- The "Notice to Bidders", Document AA, has been modified as follows:
  - Sealed bids submission deadline is being extended to 3:00 PM, September 14, 2023.
  - Bid Opening date is being extended to 3:30 PM, September 14, 2023.

DOCUMENT CC– PROPOSAL AND SCHEDULE OF PRICES, 23-05 (See Attachment No.1)

- The "Notice to Bidders", Document AA, has been modified as follows:
  - Sealed bids submission deadline is being extended to 3:00 PM, September 14, 2023.
  - Bid Opening date is being extended to 3:30 PM, September 14, 2023.
- The table on CC-1, the Specified Completion dates are extended as follows (See Attachment No. 1):
  - All work except seeding extended to November 1, 2024.
  - Seeding extended to December 15, 2024.

SPECIFICATION CS-008 4.B.3

Add the following paragraph:

3. Subsidiary Item: Sign Installation
   This item shall include all labor, materials, equipment, and Iowa One Call notifications to install sign provided by Iowa Department of Agriculture and Land Stewardship, as shown on attachment.

Sincerely,

Michael L. Bourland, P.E.
Water Resources Bureau

MLB

Attachment No. 1 – Updated Document CC
Attachment No. 2 – Sign Installation Detail

End of Addendum No. 1

ATTACHMENT No. 1

Document CC (Page CC-1) is amended as follows:

Time and Date for Bid Submissions:	3:00 PM, September 14, 2023 Wallace State Office Building 502 East 9th Street Iowa Department of Agriculture and Land Stewardship Division of Soil Conservation and Water Quality-Water Resources Bureau Des Moines, Iowa 50319-0050
Time and Date of Bid Opening:	3:30 PM, September 14, 2023 Bid Opening Location: Wallace State Office Building 502 East 9th Street Des Moines, IA 50319-0050
Bid Opening Teleconference:	Call-in number: 1-877-304-9269 Access code: 519321
Project Description and Location:	Gre853235C Nutrient Reduction Wetland Project Section 35, Township 85 North, Range 32 West Greene County, Iowa

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PROPOSAL AND SCHEDULE OF PRICES

Proposal of _____
(Name of Bidder)

Located at _____(___)_____
(Address) (Telephone Number)

Amount of Proposal Guarantee	Description of Work	Specified Completion Date	Liquidated Damages
10% of Base Bid	All Work Except Seeding	November 1, 2024	$175.00 Per Day
	Seeding	December 15, 2024	$125.00 Per Day

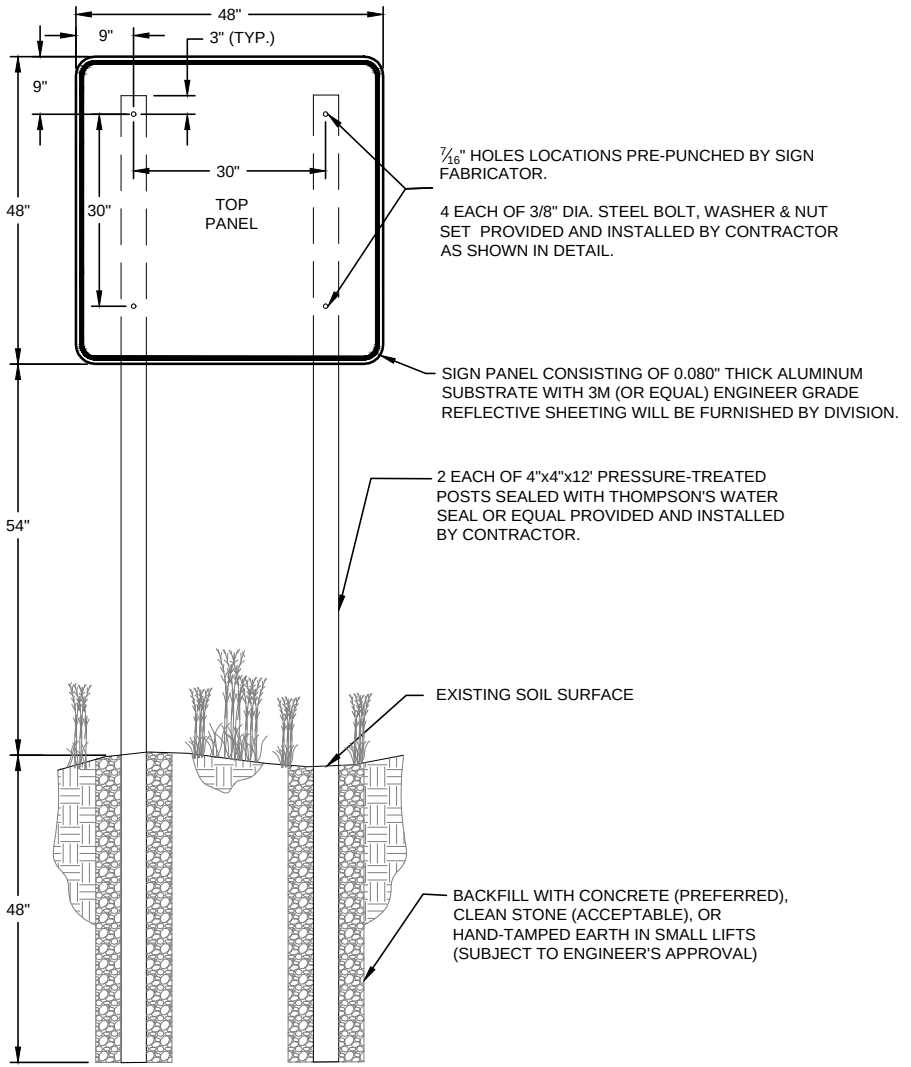
The undersigned hereby agrees, if awarded the contract, to execute the proposed contract and to furnish satisfactory Performance Bond in an amount not less than one hundred percent (100%) of the contract award within fourteen (14) days from the date when Notice-of-Award is received, and to provide all supervision, labor, materials, and equipment required to complete the project designated above, for the prices hereinafter set forth, in strict compliance with the Contract Documents prepared by the Division.

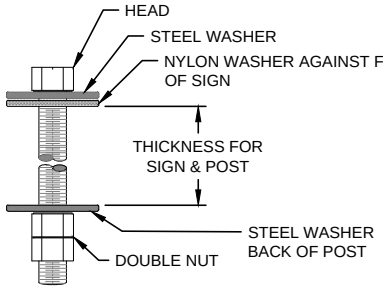
Further, the parties agree and acknowledge as follows:

- The amount of loss or damages likely to be incurred by Division are uncertain and said loss is incapable or very difficult to quantify and estimate;
- The amount specified for liquidated damages herein bear a reasonable relationship to, and are not plainly or grossly disproportionate to, the probable loss likely to be incurred by Division in connection with any delay on part of the Contractor;

End Attachment No. 1

ATTACHMENT No. 2





BOLT, WASHER, & NUT FASTENER DETAIL
NOT TO SCALE

SIGNAGE NOTES:

1. DIVISION WILL FURNISH SIGN PANEL. CONTRACTOR IS RESPONSIBLE FOR PROVIDING POSTS, HARDWARE, AND INSTALLATION .

2. ALL EXPOSED WOOD SHALL BE SEALED WITH THOMPSON'S WATER SEAL OR EQUAL MEETING ASTM D-4446-08.

3. ALL STEEL HARDWARE PIECES SHALL BE GALVANIZED OR RUST RESISTANT.

4. NYLON AND STEEL WASHERS SHALL BE USED AS SHOWN ON THE BOLT, WASHER, NUT FASTENER DETAIL ABOVE.

5. CLEAR UTILITIES WITH IOWA ONE-CALL AT 811 OR (800) 292-8989 BEFORE EXCAVATING FOR POSTS.

6. SECURE DIVISION AND LANDOWNERS APPROVAL FOR SIGN LOCATION BEFORE INSTALLATION.

7. COSTS FOR POSTS, HARDWARE, WOOD SEALANT AND SIGN INSTALLATION SHALL BE INCIDENTAL TO MOBILIZATION.

8. CONTRACTOR SHALL INSTALL SIGN POSTS USING A PLYWOOD OR OTHER SUITABLE TEMPLATE TO MAINTAIN ACCURATE POST SPACING AND ALIGNMENT DURING BACKFILLING OF THE POST HOLES. TO AVOID BENDING OF THE SIGN PANELS, POSTS SHALL NOT BE INSTALLED OR BACKFILLED WITH SIGN PANELS ATTACHED.

9. ONE (1) PROJECT SIGN SHALL BE INSTALLED UNLESS NOTED OTHERWISE.

STANDARD DETAIL FOR SIGN INSTALLATION

DIVISION OF SOIL CONSERVATION AND WATER QUALITY

End Attachment No. 2

GREENE COUNTY WETLAND PROJECT
GRE853235C - BID NO. 23-05
PREBID MEETING
August 28, 2023 - 1:00 PM

Introduction:

1. Tracy Bruun, Division of Soil Conservation and Water Quality (Division) opened the meeting and introduced:
    - Mike Bourland, Engineer with Division; Tracy Bruun, Contract Manager with Division
    - Andrew Schippers and Alonzo Barkley, Ducks Unlimited
    - Others: Aaron Crane, Aaron Crane Construction LLC; Matt Danner, Templeton Family Farms; Adam Benner, Benner Tiling & Dozing.

2. This wetland project is part of an CREP project that is also being funded as part of the Water Quality Initiative that is being used to help implement the Iowa Nutrient Reduction Strategy.

3. There are four projects being bid at this time. This one in Greene and one each in Guthrie, Butler and Black Hawk Counties. The Butler and Black Hawk projects will post Tuesday, August 29.

4. Please review all documents and let us know if you have any questions.

Bidder's Qualifications*:*

All Bidders shall meet the following qualifications:

1. Contractors are required to be registered with the Iowa Division of Labor.

2. Bidders shall, upon request of the Division, submit a statement of Bidder's qualifications including experience, any contracts that are in default, available equipment, personnel, and financial ability to perform the work as outlined in Section 2 of Document BB.

Method of Bidding:

This is a unit price contract and bidders shall submit unit price bids as required for the work items covered by the specifications. Prices shall cover complete work and include all costs incidental thereto unless otherwise indicated. The base bid includes all items **1 through 30**. A separate Document CC was provided with the bid package that is to be used for submitting the bid.

Any questions that should be considered as part of an addendum must be submitted to us by 3:00 PM, **September 5, 2023**. The Division will make every attempt to issue any necessary addenda no later than the day after the last date for questions. If an addendum is sent, please make sure to note on Page CC-2 that you have received and acknowledged the addendum.

If work is added to the contract by the Division after the contract execution which is not covered by a bid price set forth in the Proposal and Schedule of Prices (*Document CC*), a Change Order or Contract Amendment will be issued as required. If the additional work requires an extension of the contract completion date(s), a Contract Amendment will be issued.

Submission of Bids and Bid Security:

Bids should be submitted in two sealed envelopes. One envelope should include the Proposal and Schedule of Prices *(Document CC)* that must be signed by a legally authorized representative of the Bidder and notarized. All issued addenda shall be acknowledged as received by the Bidder. Do not submit Plans or Specifications with the bid. If this form is not accurately completed, this shall prevent the reading of that Bidder's bid.

A separate envelope attached (taped) to the front of the envelope containing the bid shall contain the Bid Security or bid bond, which is in the amount of ten percent (10%) of the base bid. It should be noted that the bid number, **Bid 23-05**, and the Bidder's name and address must appear on the exterior *of both envelopes*. If the Bidder elects to use a bid bond, the bidder shall complete Proposal Guarantee Bond (*Document EE*) and include it in the smaller envelope.

All bids are due no later than 3:00 PM at the Wallace State Office Building, 502 E. 9th Street, Des Moines, Iowa, Division of Soil Conservation and Water Quality on Tuesday, September 12, 2023. Bids must be dated and time stamped by a representative of the Division. Bids received after this time will be rejected and returned unopened to the Bidder. Bids for 23-05 will be opened beginning at 3:30 PM on that same day in Conference Room 2 of the Wallace State Office Building.

Bids may be mailed or hand delivered. Visitors are allowed into the Wallace Building, and should contact Tracy Bruun, (515) 344-6279 to be met in the lobby. We ask that you seal envelopes with tape instead of wetting the seal with saliva. If you are mailing a bid, be aware that it can take 2 days for next day deliveries.

Evaluation of bids and award of Construction Contract:

This Greene County Nutrient Reduction Wetland Project shall be awarded to the lowest responsible responsive bidder as determined by the Division. In evaluating the bids, the Division may consider such factors as alternates, bid price, experience, contracts in default, responsibility of the Bidder, and similar factors in determining which bid it deems to be in the best interest of the Division for the project. In comparing bid prices, the total bids of the various Bidders shall be determined by applying the unit prices bid for each work item against the estimated work item quantities set forth in the *Proposal and Schedule of Prices* (*Document CC*).

Bid tabulations for this Greene County Nutrient Reduction Wetland Project will be prepared the week following the Bid Opening and distributed to all Bidders. Other plan holders or interested parties must request bid tabulations.

Execution of Contract:

1. The party to whom this Greene County Nutrient Reduction Wetland Project is awarded shall be required to:
    - ✓ execute the Contract;
    - ✓ obtain the appropriate insurance coverage and Performance/Payment Bond;
    - ✓ provide their Iowa Division of Labor Public Registration Number;
    - ✓ and submit the Construction Progress Schedule (Document JJ)

    within fourteen (14) calendar days from the date of receipt of the Notice-of-Award. In case of failure of the Bidder to execute the Contract, the Division may, at its option, consider the Bidder in default, in which case the bid security accompanying the bid shall become the property of the Division.

2. The Division, within fourteen (14) days of receipt of an acceptable and properly executed Performance/Payment Bond, certification of acceptable insurance coverage, and properly executed Contract; shall sign the Contract and return to such party an executed copy of the Contract. Should the Division not execute the Contract within such period, the Contractor may, by submitting written notice, withdraw the signed Contract. Such notice of withdrawal shall be effective upon receipt of the notice.

3. The Notice-to-Proceed shall be issued within five (5) days of the execution of the Contract by the Division, provided that the Construction Progress Schedule has been accepted by the Division. Should there be additional time required to make adjustments to the Construction Progress Schedule, the time to issue the Notice-to-Proceed may be extended to allow for this. If the Notice-to-Proceed has not been issued within a thirty (30) day period, or within a greater period mutually agreed upon, the Contractor may terminate the Contract without further liability on the part of either party.

Taxes:

Since this is state contract, there is no sales tax for materials purchased. We will be providing a tax exemption certificate to the awarded contractor as indicated in the last page of the appendix of construction contract documents. This should be considered when determining the unit prices submitted in the bid.

Measurement and Payment:

The specifications describing the work to be accomplished under each particular work item, also describe the method to be used in measuring and calculating the payment quantities for each work item set forth in the proposal. Payments will be made on the basis of monthly estimates in amounts equal to ninety-five percent (95%) of the value of work completed. Mobilization will be paid at a percentage of the lump sum bid amount for this item equal to the overall percent complete of the project (less retainage). In preparing monthly estimates, advancement will be made therein for ninety-five percent (95%) of the cost of materials stored on site.

Time of Completion:

The final date for completion of all work except for seeding has been extended to November 1, 2024. The final date for completion of seeding has been extended to December 15, 2024. See Addendum No. 1.

Liquidated Damages:

There are liquidated damages provisions on this project. These damages reflect additional administrative, design, and inspection costs, as well as continued costs to the natural environment. If *all work except for seeding* is not completed by May 15, 2024 bu has been extended to November 1, 2024, absent a No-Fault Extension, the Contactor may be assessed damages in the amount of **$175 per day.** If the *seeding* is not subsequently completed by June 30, 2024 but has been extended to Decmber 15, 2024, absent a No-Fault Extension, the Contractor may be assessed damages in the amount of **$125 per day**.

Questions and Addenda:

Questions concerning interpretation or intent of the Plans and Construction Specifications should be directed to Andrew Schippers: aschippers@ducks.org with Ducks Unlimited and must copy Tracy Bruun:

tracy.bruun@iowaagriculture.gov with the Division. All other questions concerning the Contract Documents should be addressed to Tracy Bruun, Division: 515 344-6279 or tracy.bruun@iowaagriculture.gov.

Any oral interpretations given shall be valid only if confirmed by written addendum. All interpretation requests should be addressed in writing and received no later than 3**:00 PM September, 5 2023.**

The Division reserves the right to revise or amend the Contract Documents prior to the date set forth for receipt of bids. Such revisions and amendments, if any, shall be announced by an addendum or addenda to the Contract Documents. Copies of such addenda, as may be issued, shall be furnished to all plan holders. Bidders are required to acknowledge receipt of any addenda by listing such addenda in the *Proposal and Schedule of Prices (Document CC).*

Engineer's Discussion

General Comments

- A comprehensive tile investigation was performed. Ducks Unlimited (DU) can provide GPS data on found tile.
- DU has previously placed three (3) control points on-site and the Northing, Easting, and Elevations are called out on Sheet C051.
- Construction observation will be completed by DU. Andrew and/or an engineer's representative will be on-site for critical items. Please coordinate with us ahead of time on critical items, so that we can ensure we are present on-site during those items.
- DU will provide construction staking. Tile tie-inn locations may have to be shifted in the field to ensure proper tie-in elevations.
- Once a contract is signed, the Contractor shall provide shop drawings for items such as the sheet pile structure, draw-down structure(s), and Turf Reinforcing Mat (TRM).
- There are no bid items directly related to sediment and erosion control. The contractor is responsible to implement what is needed for sediment and erosion control, as stated in Specification IA-5.
- Tile #2 was eliminated from the plans, and the overall tile numbering was not changed. There is a note on plan sheet C205 that references tile #2 (18" pipe), however, that should be tile #3.
- Dewatering and water maintenance is the contractor's responsibility and is considered incidental to the project.
- DU indicated that an AutoCAD final surface could be provided to the Contractor.
- DU will provide As-built drawings at end of project and will need to shoot tile tie-in locations during construction.
- The geotechnical report completed for this project will be posted to the bidding site.
- Expectations for final grade tolerance is 0.1'.
- Potential aluminum structure suppliers include Contech, Wisconsin Flowgate, Energy Culvert, and Haala Industries.
- Please review all of the specifications to ensure you understand the requirements and what is subsidiary to each of the pay items.

Project Summary by Bid Item:

1. **Site Stripping -** This bid item will be paid out on a lump sum basis. Interim payments will be made based on estimated percent complete. The quantity of 5,100 cubic yards listed on plan sheet C002 is based on 6" removal from the areas located with the berm, borrow area, clay liner, channels, and wetland grading area. Please note that this also includes fence removal/reinstall, as necessary, as an incidental item. There are also

some trees that may need to be removed along the fence line where the 36" dual-wall tile routes. This tree removal shall be incidental to this bid item.

2. **Crop Damage –** Crop damages will be a pass-through cost by the contractor to the landowner. Relaying tile outside of the easement area will cause crop damage. Engineer will measure this area and IDALS will agree with the landowner on a unit cost. At this time, the bid item unit price is $0 on the schedule of prices as a place holder. Do not alter this value when submitting a bid.

3. **Structure Seeding –** This will consist of brome grass for the dike. Please note that fertilizer and mulch are to be included with this bid item.

4. **Buffer Seeding** – This will consist of all areas outside of the pool area and structure to be seeded with native grasses and flowers. The seed mix design must meet the minimum requirements outlined in the specifications. The contractor must submit the mix design
for approval prior to placement. This mix will be reviewed by the local NRCS office for suitability.

5. **Mobilization & Demobilization** – This item will be paid out on a percent complete basis as the project is completed.

6. **Drainage Tile Investigation** – There has been a comprehensive tile investigation complete during survey activities (reference plan sheet C051). This item shall account for any trench excavations to find known tile locations. This item shall also account for tile investigation to be performed during the excavation of the berm core trench (4' deep). Contractor/Engineer shall examine trench closely to ensure no other trench lines exist in the core trench beneath the berm (there are no anticipated tile other than the 30").
7. **Steel Sheet Piling** – The details for the steel sheet piling are shown on plan sheet C301. Note that the sheet piling installation will be paid out by the square feet to the neat lines on the plans. Extra length required for driving and cutoff are incidental, as well as the pile cap. Contractor is required to submit shop drawings for approval for this item. There was some discussion on the sheet pile cap details. Cap should be along entire sheet pile length.

8. **Excavation (General)** – This quantity is the amount of material required to be excavated to reach final grade after topsoil stripping. These areas include general grading in the pool, sedimentation basins, channels, and berm core trench.

9. **Excavation (Clay Liner)** – Sandy/gravelly soils are present within an isolated location on site where there used to be an old gravel pit. This material shall be moved to bottom of borrow pit. This item consists of excavation within the clay liner area shown on the plans to allow for 18" of compacted clay covered by 6 inches of topsoil. **Question:** What is the area of the clay liner? **Answer:** The clay liner area is approximately 2.5 acres.

10. **Earthfill (General)** – This is the material to be placed outside of the dam and clay liner area and consists of the submerged berms and additional fill to be placed over the tile to provide adequate cover of 3' minimum. This material requires Method 1 compaction, which is pass-over with loaded, hauling equipment. This quantity includes a 15% shrinkage factor.

11. **Earthfill (General Dam)** – The typical cross section for the embankment is shown on plan sheet C302. The general material is outside of the compacted clay core but should be good clay material. This quantity includes a 15% shrinkage factor. If good material is found during general excavation or clay liner excavation,

this would be a good place to use it. This material requires Method 1 compaction, which is pass-over with loaded, hauling equipment.

12. **Earthfill (Dam Core)** – This includes material located within the compacted clay core ash shown on the cross section on plan sheet C302. This material must be good clay material. This material requires Method 2 compaction, which requires two passes with a sheep's foot roller. It is anticipated that all of this material will come from the borrow area. This quantity includes a 15% shrinkage factor.

13. **Earthfill (Clay Liner)** – This includes 1.5 feet of compacted clay in the pool area shown as hatched on plan sheet C101 and C207. This material requires Method 3 compaction, which requires density testing to verify 90% standard Proctor. A new proctor will be required from testing agency. We will also want to make sure that the water content is at or above optimum to make sure it has adequate moisture creating the seal. Several tests shall be performed in the clay liner area. It is anticipated that all of this material will come from the borrow area. The density testing will be part of the contractor's responsibility and is incidental to this bid item. There was discussion that 15% shrinkage is included in the plan quantity for this item. Contractors discussed among themselves that with Compaction Method 3, there may be 25% shrinkage. Contractors were directed to bid accordingly knowing how the bid item quantity is calculated.

14. **Drainfill (Sand)** – This item is only the sand required for placement of the toe drain and will be paid by the ton. The sand needed for the diaphragm is not included with this quantity. See toe drain detail on plan sheet C302. IDALS indicated gradation is not critical and that a clean sand shall suffice.

15. **Topsoil Placement** – This item includes placing 6 inches of stockpiled topsoil over the embankment and clay liner and borrow area. Excess topsoil should be wasted on site outside of the pool area.

16. **Toe Drain (6" Perforated CPP)** – Toe drain is shown on embankment plan on plan sheet C201. Detail sheet C302. Provide 10' length of 8" CMP at each outlet end of toe drain (separate bid item).

17. **6" HDPE Dual-Wall** – Reference plan sheet C205 – Overall Tile Modification Plan. This is tile #4.

18. **8" HDPE Dual-Wall -** Reference plan sheet C205 – Overall Tile Modification Plan. This is tile #5, 6, 7, 8., and 9.

19. **18" HDPE Dual-Wall -** Reference plan sheet C205 – Overall Tile Modification Plan. This is tile #3.

20. **36" HDPE Dual-Wall -** Reference plan sheet C205 – Overall Tile Modification Plan. This is tile #1. It was discussed that this bid item includes the gravel, as specified on plan sheet C206. **Question**: Can perforated HDPE dual-wall pipe be provided? **Answer**: The Engineers will ask the drainage district if a perforated pipe would be allowed and issue an Addendum, if necessary. *Inserta Tee* connections shall be provided for tying tile into the new tile main.

21. **Aluminum CMP Draw-Down Structure –** Reference details on plan sheet C303 and 304. This is a fully aluminum structure. Contractor shall ensure lifting hooks are provided in top end of concrete base for lifting. It was discussed that the concrete could be cast in the field with the riser. Flange ends shall be provided in CMP pipe out of structure. Example photos of this structure and details can be provided upon request.

22. **Aluminum CMP Draw-Down Inlet/Outlet -** Reference details on plan sheet C303 and 304. This is a fully aluminum CMP. Flange ends shall be provided every 20' in CMP pipe with gaskets. Example photos of this piping and details can be provided upon request.

23. **CMP Outlet – 8"** – This item shall account for 20' lengths of CMP provided at the last 20' of tile modification #5, 6, and 7, and 10' at each end of the toe drain outlets. All outlets shall be provided with a stainless-steel rat guard.

24. **CMP Outlet – 36" –** This item shall account for 20' length of CMP at the last 20' of the 36" tile. All outlets shall be provided with a stainless-steel rat guard.

25. **Riprap (IA DOT Class C)** – This material will be paid out on the ton used and approved at the site. This material will be placed at the upstream and downstream sides of the sheet pile weir. Non-woven filter fabric is required beneath all riprap and shall be secured to slopes and bottom using pins, which is incidental to riprap installation. Some riprap will be placed up to the road culvert and will be in the County Road ROW. IDALS will work with the contractor to get permission and will pay for any fees related to a permit as required.
Q: Can Class E be used this? A: Initial meeting discussion called for Class C only. After additional review, Class E riprap will be allowed for this bid item.
Q: Where will this material come from? A: Likely from the Ames quarry, but other suppliers could be used if they meet the IDOT requirements.

26. **Riprap (IA DOT Class E) -** This material shall be paid out on the ton used and approved at the site. This material will be placed at the downstream mounds of the auxiliary spillway, 36" CMP draw down structure, and at all tile outlets.

27. **Cement Grout** – This item is grout to be placed over the riprap above the sheet pile and stilling basin and outlet channel. The mix design should be submitted for approval.

28. **Turf Reinforcing Mat, TRM (SUDAS Type 4)** – This item shall consist of furnishing and placing the Turf Reinforcement Mat (SUDAS Type 4) at the auxiliary spillway. A recommended product is Propex Armormax 75, however, substitutions may be requested. Contractor shall provide shop drawings from manufacturer showing anchorage locations, spacing, lap configuration, and terminations. Quantity is based on "neat lines" as shown on the plans. Additional material needed for laps, trench installations, and waste shall be accounted for in this bid item and considered incidental.

29. **36" Aluminum CMP Riser Inlet (at wetland) -** Reference details on plan sheet C202 and 303. This is a fully aluminum structure. Contractor shall ensure lifting hooks are provided in top end of concrete base for lifting. It was discussed that the concrete could be cast in the field with the riser. Flange ends shall also be provided in CMP pipe out of structure. It was discussed that filter fabric shall not be provided beneath the riprap mounded around this structure.

30. **36" Aluminum CMP Riser Inlet (at stilling basin)** - Reference details on plan sheet C202. This is a fully aluminum structure. Contractor shall ensure lifting hooks are provided in top end of concrete base for lifting. It was discussed that the concrete could be cast in the field with the riser. The 30" HDPE dual-wall pipe from this structure to the existing 30" tile (and all necessary connections) shall be part of this bid item.

Q: Is it possible to use a waler instead of a pile cap for the sheet pile installation?
A: No, this is the standard detail used by DU.

Q: Does all the tile receive the gravel bedding requirements?
A: No, only the 36-inch tile receives the gravel bedding. Ther is a note that rock bedding is also required for the 18-inch tile installation where fill heights exceed 9 feet. This may occur along a small portion of the pipe. Please refer to not on Sheet C205 and profile on C207.

Q: What type of dual wall pipe is required for the 36-inch tile?
A: this tile should be ADS N-12 WT (watertight) IB HDPE Dual Wall (or equivalent).

Q: Can the 36-inch tile be perforated to prevent potential of floating?
A: Perforations can be placed in the bottom quarter of the tile but the number and size of the holes should be limited to prevent soil migration into the pipe. The perforations can come from the manufacturer of field installed but must be made in accordance with manufacturer's recommendations.

Q: Can a color cut-fill map be provided?
A: Yes. It has been added with this submittal.

PAGE 4 OF 5
required from testing agency. We will also want to make sure that the water content is at or above optimum to make sure it has adequate moisture creating the seal. Several tests shall be performed in the clay liner area. It is anticipated that all of this material will come from the borrow area. The density testing will be part of the contractor's responsibility and is incidental to this bid item. There was discussion that 15% shrinkage is included in the plan quantity for this item. Contractors discussed among themselves that with Compaction Method 3, there may be 25% shrinkage. Contractors were directed to bid accordingly knowing how the bid item quantity is calculated.

DESIGN CRITERIA			
DESIGN CRITERIA	VALUE	UNIT	REQUIREMENT/NOTES
WATERSHED AREA	1966	ACRES	500 MIN.
POOL NORMAL WATER LEVEL (NWL) ELEVATION	1090	FT.	
DESIGNED WETLAND POOL AREA (@ NWL)	12.2	ACRES	
PERCENT POOL AREA TO WATERSHED AREA	0.62	%	>=0.50%
MAX. POOL DEPTH	5.0	FT.	
AVG. POOL DEPTH	1.9	FT.	
DEEP WATER AREA (DEPTH >3 FT)	1.7	ACRES	
PERCENT DEEP WATER TO POOL AREA	13.9	%	<25%
POOL STORAGE VOLUME AT NWL	22.807	ACRE-FT	
BERM ELEVATION	1096.00	FT.	
POOL STORAGE VOLUME AT TOP OF BERM	152.622	ACRE-FT	
MAX BERM HEIGHT	11	FT.	
AVG. BERM HEIGHT	6.8	FT.	
BERM LENGTH	768	FT.	
PRIMARY WEIR ELEVATION	1090	FT.	
PRIMARY WEIR LENGTH	60	FT.	
AUXILIARY SPILLWAY WEIR ELEVATION	1094.2	FT.	
AUXILIARY SPILLWAY WEIR LENGTH	100	FT.	
25-YEAR STORM HWL IN POOL	1094.15	FT.	
25-YEAR PEAK INFLOW	1994.94	CFS	
25-YEAR PEAK OUTFLOW	1841.10	CFS	
100-YEAR STORM HWL IN POOL	1094.96	FT.	
100-YEAR PEAK INFLOW	2821.61	CFS	
100-YEAR PEAK OUTFLOW	2679.99	CFS	

WETLAND POOL CHARACTERISTICS			
WETLAND POOL DEPTH (FT.)	ELEV. (FT.)	INCREMENTAL AREA (ACRE)	CUMULATIVE VOLUME (ACRE-FT)
0.0	1085.0	0.006	-
1.0	1086.0	0.150	0.156
2.0	1087.0	0.991	1.148
3.0	1088.0	3.010	4.158
4.0	1089.0	7.360	11.518
5.0	1090.0	11.289	22.807
6.0	1091.0	13.010	35.816
7.0	1092.0	15.181	50.998
8.0	1093.0	18.457	69.454
9.0	1094.0	22.658	92.112
10.0	1095.0	30.068	119.629
11.0	1096.0	35.919	152.622

CUT-FILL REFERENCE SHEET

PROPOSED INTERCEPT POINT OF EXISTING 26"Ø CONCRETE COUNTY TILE; INTERCEPT EXISTING TILE AT INVERT ELEVATION 1092.23' WITH NEW 36"Ø DUAL-WALL PIPE (TILE #1) INVERT ELEVATION AT 1091.98'; EXISTING 26"Ø TILE TO BE BROKEN AND CAPPED AT SEVERAL LOCATIONS

TILE #1 - PROPOSED 36"Ø HDPE DUAL-WALL PIPE; APPROX. 1920 L.F. AT 0.05% SLOPE

TILE #1 - 36"Ø DUAL-WALL HDPE PIPE W/ OUTLET INVERT ELEVATION 1091.0'

PROPOSED SEDIMENTATION BASIN; BOTTOM OF BASIN ELEVATION 1087' W/ 3:1 SIDE SLOPES; BASIN BOTTOM DIMENSIONS 15' WIDE BY 30' LONG

PROPOSED BORROW AREA FOR CLAY CORE AND LINER; ESTIMATED DEPTH OF 6' AFTER REMOVAL OF CLAY MATERIAL TO BE BACKFILLED WITH WASTE MATERIAL AND COMPACTED

PROPOSED INLET CHANNEL #1

PROPOSED GRADING AREA; GRADE DOWN TO 1089.0' FROM EXISTING 1089.0' CONTOUR TO EDGE OF WETLAND AS SHOWN

WETLAND PROFILE #3 (ACROSS GRADING)

100-YEAR STORM ELEVATION AT 1094.96

PROPOSED EDGE OF NWL ELEVATION (APPROX. 12.2 ACRES @ 1090' FSL)

SUBMERGED BERM; 10' WIDE TOP W/ 3:1 SIDE SLOPES; TOP OF BERM ELEVATION 1089.5'

WETLAND PROFILE #2 (ACROSS CLAY LINER)

PROPOSED BERM WITH TOP ELEVATION 1096.0'

PROPOSED CMP RISER WCS

PROPOSED SHEET PILE STRUCTURE W/ PRIMARY WEIR ELEVATION AT 1090.0' (FSL)

PROPOSED AUXILIARY SPILLWAY TOP ELEVATION 1094.2'; 100' LONG WITH 12' WIDE TOP

REMOVE SANDY/GRAVELLY MATERIAL IN THIS HATCH AREA AND CONSTRUCT CLAY LINER BY GRADING DOWN 24" RELATIVE TO EXISTING GRADE. THEN PROVIDE 18" COMPACTED CLAY AND 6" TOPSOIL OVER CLAY. SANDY/GRAVELLY MATERIAL SHALL BE WASTED ON-SITE AS DESIGNATED BY CONSTRUCTION MANAGER

REMOVE SANDY/GRAVELLY MATERIAL IN THIS HATCH AREA AND CONSTRUCT CLAY LINER BY GRADING DOWN TO ELEVATION 1087.5'. THEN PROVIDE 18" COMPACTED CLAY AND 6" TOPSOIL OVER CLAY. SANDY/GRAVELLY MATERIAL SHALL BE WASTED ON-SITE AS DESIGNATED BY CONSTRUCTION MANAGER

WETLAND PROFILE #1 (ALONG FLOW PATH)

PROVIDE APPROXIMATELY 1.0' FILL THIS AREA, AS DIRECTED BY ENGINEER.

PROPOSED SEDIMENT BASIN; BOTTOM OF BASIN ELEVATION 1087' W/ 3:1 SIDE SLOPES; BASIN BOTTOM DIMENSIONS 15' WIDE BY 30' LONG

EASEMENT BOUNDARY

PROVIDE APPROXIMATELY 1.0' FILL THIS AREA, AS DIRECTED BY ENGINEER.

FENCELINE

REMOVE & REPLACE FENCING AS NECESSARY TO COMPLETE WORK

PROPOSED EASEMENT BOUNDARY

APPROX. PROPERTY FENCELINE

FLOW

N

GRAPHIC SCALE

175 0 87.5 175 350 700

1 inch = 175feet

LEGEND

- APPROXIMATE PROPERTY LINE
- AGRICULTURAL TILE (PIPE)
- PROPOSED CHANNEL/DITCH
- (000) PROPOSED MAJOR CONTOUR
- (000) PROPOSED MINOR CONTOUR
- PROPOSED PIPE
- 0.00 PROPOSED SPOT ELEVATION
- PROPOSED FULL SERVICE LEVEL (FSL)
- PROPOSED RIPRAP
- PROPOSED SPOIL AREA
- PROPOSED BORROW AREA

NOTE:
CONTRACTOR SHALL REMOVE SANDY/GRAVELLY MATERIALS AS DESCRIBED ABOVE, HOWEVER, IF SANDY/GRAVELLY MATERIALS PERSIST TO CLAY LINER OUTLINE AS SHOWN, CONTRACTOR SHALL CONTINUE TO EXTEND THE CLAY LINER OUTLINE AS NECESSARY WITHIN NORMAL POOL AREAS. ADDITIONAL GRADING/CLAY LINER REQUIRED WILL BE PAID FOR AS AN ADDITIONAL EXPENSE TO THE CONTRACTOR BASED ON THEIR UNIT PRICES.

GREAT LAKES/ATLANTIC REGIONAL OFFICE
7322 NEWMAN BOULEVARD, BUILDING 1
DEXTER, MICHIGAN 48130
(734) 623-2000 www.ducks.org
DUCKS UNLIMITED

SITE PLAN
PROJECT NO. GRE853235C
GREENE COUNTY
IOWA

Revision	Sheet	Revisions	Date	By
1		IDALS REVIEW REVISIONS	10-18-2022	A.S.
2		NRCS REVIEW REVISIONS	5-1-2023	A.S.
3		SHEET PILE & SEEDING REVISIONS	5-31-2023	A.S.
4		BERM & SHEET PILE REVISIONS	7-14-2023	A.S.

CAD FILE:
IA-340-5 C101 Site Plan

DESIGNED BY: A.S.

DRAWN BY: A.S.

SURVEYED BY: A.S. & R.V.

BIOLOGIST: M.S.

DATE:
7-14-23

PROJECT NUMBER:
US-IA-340-5

C101

Pre-Bid Meeting Sign-in Sheet

August 28, 2023 at the Jefferson USDA Service Center Greene County

Bid No.: 23-05

Project ID: Gre853235C Nutrient Reduction Wetland

1:00 PM

	Name	Company/Affiliation	Address	Email	Phone
1	Tracy Bruun	Division	502 E. 9th St., Des Moines IA 50309	tracy.bruun@iowaagriculture.gov	515-344-6279
2	Mike Bourland	Division	502 E. 9th St., Des Moines IA 50309	mike.bourland@iowaagriculture.gov	515-242-6130
3	Aaron Crane	Aron Crane Construction LLC	1833 120th Ave Manchester IA	arcrane1250@gmail.com	563-920-1250
4	Andrew Schipper	Ducks Unlimited	209 Eugene St Radcliffe IA	aschippers@ducks.org	832-704-3286
5	Alonzo Barkley	Ducks Unlimited	505 Dear Ridge, Bondurant IA	abarkley@duck.org	575-570-9276
6	Matt Danner	Templeton Family Farms	33501 Kittyhwak Ave Templeton IA	matt@templetonff.com	712-210-6230
7	Adam Brenner	Benner Tilin & Dozing	3215 248th Trail Panora IA	bennerxc@gamil.com	641-757-1719
8					

Plan Holders List for Bid: 23-05 **Bid # Project ID Gre853235C**

Key: Y = on plan holders list, submitted bid; **X** = on plan holders list, did not submit bid; **NP** = not on plan holders list, submitted bid

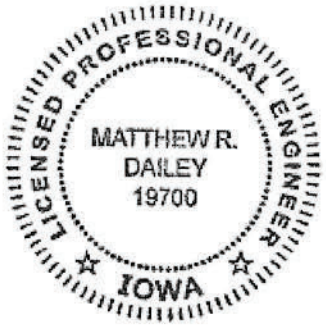
23-06	Name	Company	Street Address	City	State	Zip code	Phone	Email
X	Aaron Crane	Aaron Crane Construction LLC	1833 120th St	Manchester	IA	52057	563-920-1250	arcrane1250@gmail.com
X	Aaron Vonnahme	Leroy and Sons, Inc.	405 Dunlap Street	Arcadia	IA	51430	712-790-9956	vonateam@netins.net
X	Adam Benner	Benner Tiling & Dozing	3215 248th Trail	Panora	IA	50216	641-757-1719	bennerxc@gmail.com
X	Alnoz Barkley	Ducks Unlimited	505 Dear Ridge	Bondurante	IA		575-570-9276	abarkley@ducks.org
X	Andre Schipper	Ducks Unlimited	209 Eugene St	Radcliffe	IA		832-704-3286	aschippers@ducks.org
X	Ben Neal	Lakeside Environmental Inc					641-220-3917	ben.neal@laksideconstruction.net
X	Brent Baskerville	Contech Engineered Solutions LLC	1112 SE Lorenx Dr	Ankeny	IA	50021	515-344-0422	Brent.Baskerville@conteches.com
X	Brian Whitehead	Neea, Inc.	2407 297th Ave	Sidney	IA	51652	712-828-0444	neeainc7@gmail.com
X	Bruce Vonnahme	Leroy and Sons, Inc.	405 Dunlap Street	Arcadia	IA	51430	712-790-9956	aaronvohhahme@gmail.com
X	Cindy Adams	Construction Update Network	4100 Westown Pkwy	West Des Moines	IA	50266	515-402-9858	CAdams@mbi.build
X	Cindy Adams	Master Builders of Iowa	221 Park Street	Des Moines	IA	50309	515-288-7339	Cadams@mbi.build
X	Cory Lamprecht	RP Constructors, LLC	1270 S Derby LN, PO Box 195	North Sioux City	SD	57049	712-389-0772	coryl@rpconstructors.com
X	Gene Blazek	Blazek Corporation	2005 Union Avenue	Lawler	IA	52154	563-238-7150	blazekcorp@msn.com
X	Jake Schulte	Metal Culverts, inc.					573-636-7312	jacob.schulte@metalculverts.com
X	Jean Cornelius	Bedrock Gravel & Concrete Produts					712-676-3752	bedrockconcrete@gmail.com
X	John Healy	Healy Excavating	3483 Perkins Avenue	Lakeview	IA	51450	712-830-9179	johnhealy@netins.net
X	Julie Knutson	Construction Update Network	4100 Westwon Pkwy	West Des Moines	IA	50266	712-276-3681	jknudson@mbi.build
X	Kenton Benner	Benner Tiling & Dozing						bennersol@gmail.com
X	Mason Tieskoetter	JB Holland	2092 State Highway 9	Decorah	IA	52101	563-382-2901	mtieskoetter@jbhc.biz
X	Matt Danner	Templeton Family Farms	33501 Kittyhawk	Templeton	IA		712-210-6230	matt@templetonff.com
X	Mike Lanphier	Lanphier Excavating, LLC						lanphierexcavating@gmail.com
X	Tine Bockholt	ZipBonds	3737 Woodland Ave, Ste 505	West Des Moines	IA	50266	515-400-1318	tbockholt@zipbonds.com

CERTIFIED TESTING SERVICES, INC.

GEOTECHNICAL ENGINEERING REPORT

WALLACE WETLAND PROJECT
PROJECT GRE853235C
GREENE COUNTY, IOWA

CTS PROJECT NO. G6648



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

Signature: 5-13-2022

Name: Matthew R. Dailey, P.E. (date)

License Number: 19700

My license renewal date is December 31, 2023.

Pages or sheets covered by this seal:

This bound report contains 37 pages, including this page.
CTS File Number G6648

Certified Testing Services, Inc.
419 W. 6th Street • P.O. Box 1193 • Sioux City, Iowa 51102 • Phone (712) 252-5132

May 13, 2022

Attn: Mr. Andrew Schippers, P.E.
Regional Engineer
Ducks Unlimited
Great Lakes Atlantic Regional Office
3300 SE Glenstone Drive, Unit 1
Grimes, Iowa 50111

RE: Geotechnical Engineering Report
Wallace Wetland Project
Project Gre853235C
Greene County, Iowa
CTS Job No. G6648

Dear Mr. Schippers:

Certified Testing Services, Inc. is pleased to transmit our Geotechnical Engineering Report for the referenced project. This report includes the results of field and laboratory testing, recommendations for berm construction, general site development recommendations, and groundwater information.

We appreciate the opportunity to perform this Geotechnical Study and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report or if we may be of further service, please contact our office.

Respectfully submitted,
CERTIFIED TESTING SERVICES, INC.

James A. Bertsch, P.E. IA 12121
Senior Geotechnical Engineer

Matthew R. Dailey, P.E. IA 19700
Geotechnical Department Manager

JAB/MRD/md

GEOTECHNICAL ENGINEERING REPORT

WALLACE WETLAND PROJECT
PROJECT GRE853235C
GREENE COUNTY, IOWA

CTS PROJECT NO. G6648

PREPARED FOR

ATTN: MR. ANDREW SCHIPPERS, P.E.
REGIONAL ENGINEER
DUCKS UNLIMITED
GREAT LAKES ATLANTIC REGIONAL OFFICE
3300 SE GLENSTONE DRIVE, UNIT 1
GRIMES, IOWA 50111

MAY 13, 2022

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PROJECT INFORMATION

Project Authorization

Certified Testing Services, Inc. has completed a subsurface exploration for the DD75 Wetland Project. Our work was authorized through Ducks Unlimited's Consultant Agreement dated April 11, 2022. This work was performed in general accordance with CTS Proposal Number 5933 dated March 24, 2022.

Project Description

Mr. Andrew Schippers, P.E., Regional Engineer for Great Lakes Atlantic Regional Office of Ducks Unlimited, presented project information through telephone conversations on March 22, 2022, and April 28, 2022, and emails on March 22 and 23, 2022, and April 28, 2022. The email on March 22, 2022, included a "Schedule B", Drawing IA-340-5 that was titled, "Soil Boring Locations", Google Earth® Map showing the location of the site and Google Earth® Map showing the location of the borings. The email on April 28, 2022, included a drawing that was titled, "Sheet Pile Details" and a drawing titled, "Construction Details". CTS understands that the project will consist of the construction of a wetland northeast of the intersection of E Avenue and 160th Street in Greene County, Iowa. It is also understood that the proposed embankment will be constructed to an elevation of 1094 feet, which will require up to 8 feet of fill material, with the top of the sheet piling weir being at elevation 1090 feet.

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If the noted information is incorrect, please inform CTS in writing so that we may amend the recommendations presented in this report, if appropriate. CTS will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to provide soil design parameters for the sheet pile construction and to provide recommendations for berm and core trench construction, as well as provide our opinion on the suitability of the material in the borrow area for dike construction. Our original scope of services included performing three soil test borings in the dike area to depths of 25 feet below the existing grade and five auger borings to depths of 5 feet below the existing grade in the borrow areas at locations chosen by Ducks Unlimited personnel, however, the representative of Ducks Unlimited on the site requested that another 5 feet auger boring be performed. The scope of work also included select laboratory testing and preparation of this geotechnical report. It should be noted that the permeability testing on the borrow material has not been completed at this time and the results will be provided in an addendum at a later date. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, presents soils design parameters, and presents recommendations regarding the following:

- Site preparation and grading recommendations for the berm area
- Recommendations for construction of the berm, including suitability of the material in the borrow area and in the pond area
- Provide soil information for design of the sheet piling
- Comments regarding factors that will impact construction and performance of the proposed construction

The scope of services does not include an environmental assessment of the site.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site for the proposed wetland is located northeast of the intersection of E Avenue and 160th Street in Greene County, Iowa. The site is bordered by agricultural fields to the north and east, 160th Street to the south and Avenue E to the west. At the time of drilling, the site surface consisted of tall grass. The site was firm at the time of our site visit and the drill rig did experience some difficulty moving around the site.

Subsurface Conditions

The site subsurface conditions were explored with three soil test borings sampled to depths of 25 feet below the existing ground surface in the berm area and five soil test borings augered to depths of 5 feet below the existing ground surface in the borrow and pond area. The boring locations and depths were chosen by Ducks Unlimited personnel. The following table presents the approximate GPS coordinates and elevations for the boring locations and the approximate locations of the borings are also presented on the "Boring Location Plan" included in the Appendix, which is a modified copy of drawing titled, "Soil Boring Locations". The elevation information was supplied by Mr. Shippers in an email on April 28, 2022.

BORING NUMBER	BORING LOCATION	BORING ELEVATIONS
B1	42.12480° N; -94.55160° W	1085.79'
B2	42.12467° N; -94.55160° W	1085.88'
B3	42.12431° N; -94.55160° W	1086.33'
B4	42.12396° N; -94.55058° W	1090.00'
B5	42.12591° N; -94.54822° W	1099.47'
B6	42.12549° N; -94.54623° W	1110.15'
B7	42.12394° N; -94.54383° W	1089.40'
B8	42.12430° N; -94.55054° W	1089.40'

The borings were advanced utilizing flight auger and hollow stem auger drilling methods and soil samples were routinely obtained during the drilling process. Select soil

samples were later tested in the laboratory to determine the material's engineering properties for our evaluation. Soil sampling and laboratory testing were accomplished generally in accordance with ASTM procedures. The borings were backfilled with on-site material after performing our work; however, it should be noted that some settlement of the backfill material may occur and it is the client's responsibility to backfill the borings once we have left the site.

The subsurface conditions below the surface material generally consisted of lean clay with roots fill, lean clay fill, lean clay with sand fill, sandy lean clay with cobbles and brick debris fill, clayey sand fill, lean clay with sand alluvium/possible fill, lean clay alluvium, sandy lean clay alluvium, clayey sand alluvium, poorly graded sand with clay and gravel alluvium, poorly graded sand with clay alluvium, lean clay with sand glacial sediment, lean clay with sand leached till, lean clay with sand glacial till, clayey sand glacial sand, and poorly grade sand with clay poorly cemented sandstone. It should be noted that the sand materials encountered below the water table were not tested for natural moisture content in the laboratory.

The boring logs included in the Appendix should be reviewed for specific information at the individual boring locations. The boring logs include soil/rock descriptions, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected at locations other than the boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on the boring logs. Samples that were not altered by laboratory testing will be retained for 30 days from the date of this report and then will be discarded.

Water Level Measurements

Free water was encountered in Borings B1, B2 and B3 at depths ranging from 7.3 feet to 8.5 feet below the existing grade at the time of drilling. Water levels should be expected to fluctuate with changes in climatic conditions. The water level measurements presented in this report are the levels that were measured at the time of our field activities and are presented in the following table.

Boring Number	Elevation of Water at Time of Drilling	Seasonal High Water Level*
B1	1078.3 Feet	1079.8 Feet
B2	1078.6 Feet	1079.9 Feet
B3	1077.8 Feet	1080.3 Feet

* Based on discoloration of soils and groundwater level encountered

EVALUATIONS AND RECOMMENDATIONS

Geotechnical Discussion

The main concern for the site is the sand material encountered below the to 6 feet of clay material. In that the sand extended to depths of 13.5 feet to 20 feet below the existing grade, it would not be economical to extend the core trench down to the glacial till below the sand. Based on emails with Mr. Schippers, CTS would recommend that the core trench not extend below elevation 1082.0. The core trench may consist of the lean clay material removed to create the core trench that does not contain organics and the lean clay material encountered in the borrow and pond auger borings. The existing lean clay material in the berm has natural permeability rates that vary from $1.3x10^{-8}$ cm/sec to $3.5x10^{-8}$ cm/sec. The results of the laboratory testing, with the exception of the borrow permeabilities, are presented in the "Laboratory Test Data" section of the Appendix. As previously discussed, the borrow area permeabilities will be provided in an addendum once the testing has been completed.

The second concern is the amount of total settlement that is anticipated in the berm area due to up to 8 feet of fill being placed on the glacial outwash material. Based on our settlement analysis using empirical formulas, empirical soil data, past experience with similar soils and field and laboratory testing, CTS anticipates that the amount of settlement will be on the order of 1.5 inches with approximately one half of the settlement occurring during the fill placement. It is recommended that the top of berm elevation should be adjusted accordingly.

The third concern is the sandy lean clay fill material that contained debris in the area of Boring B4 and clayey sand fill encountered in Boring B8 in the pond area. It is CTS's opinion that these materials would not be suitable use as fill material in the core and dike area and it should be noted that these fill materials may extend down to the sand alluvial material, which could provide for an avenue for water to drain from the pond area. CTS would recommend that these materials either be removed and replaced with a clay liner or a clay liner placed over the fill materials.

Based on the field and laboratory testing, the properties of the materials for sheet pile design are presented in the following tables:

BORING B-1

Material	Moist Unit Weight (PCF)	Saturated Unit Weight (PCF)	Standard Penetration Value (N)	Internal Friction Angle (deg)	Cohesion (PSF)	K_a/K_p	Allowable Side Friction (PSF)	Allowable End Bearing (PSF)
Lean Clay Fill (0’ to 3.5’)	120.0	121.8	7	10	1,095	0.7/1.4	275	N/A
Lean Clay (3.5’ to 6’)	113.5	120.6	-	10	750	0.7/1.4	190	N/A
Sandy Lean Clay (6’ to 9’)	122.8	124.4	3	20	500	0.5/2.0	125	N/A
Clayey Sand (9’ to 13.5’)	127.7	127.7	-	32	-	0.3/3.3	565	6,000
Poorly Graded Sand (13.5’ to 17’)	126.0	126.0	28	34	-	0.28/3.5	625	16,800
Glacial Till (17’ to 24’)	141.1	141.1	16	25	2,500	0.4/2.5	620	7,500
Clayey Sand (24’ to 25’)	127.7	127.7	57	35	-	0.27/3.7	985	34,200

BORING B-2

Material	Moist Unit Weight (PCF)	Saturated Unit Weight (PCF)	Standard Penetration Value (N)	Internal Friction Angle (deg)	Cohesion (PSF)	K_a/K_p	Allowable Side Friction (PSF)	Allowable End Bearing (PSF)
Lean Clay Fill (0’ to 3.5’)	109.0	116.2	-	10	600	0.7/1.4	150	N/A
Lean Clay (3.5’ to 6’)	120.5	123.7	6	10	940	0.7/1.4	235	N/A
Poorly Graded Sand (6’ to 15’)	120.0	120.0	4	30	-	0.33/3.0	560	2,400
Poorly Graded Sand (15’ to 20’)	126.0	126.0	24	34	-	0.28/3.5	660	14,400
Glacial Till (20’ to 23.5’)	141.1	141.1	25	25	3,900	0.4/2.5	975	11,700
Poorly Cemented Sandstone (24’ to 25’)	127.7	127.7	76	36	-	0.26/3.9	985	45,600

BORING B-3

Material	Moist Unit Weight (PCF)	Saturated Unit Weight (PCF)	Standard Penetration Value (N)	Internal Friction Angle (deg)	Cohesion (PSF)	K_a/K_p	Allowable Side Friction (PSF)	Allowable End Bearing (PSF)
Lean Clay Fill (0' to 3.5')	113.5	116.1	8	10	1,250	0.7/1.4	310	N/A
Lean Clay Fill (3.5' to 6')	109.2	116.1	-	10	750	0.7/1.4	190	N/A
Clayey Sand (6' to 13.5')	120.0	120.0	4	30	-	0.33/3.0	660	2,400
Glacial Till (13.5' to 24')	141.1	141.1	14	25	2,200	0.4/2.5	550	4,400
Clayey Sand (24' to 25')	127.7	127.7	55	32	-	0.27/3.3	1,353	33,000

Site Preparation

CTS recommends that the top 6 inches to 12 inches of organic topsoil material, vegetation, roots larger than ¼-inch, and soft soils in the construction areas be stripped from the construction area and used on the outside of the berm area. The lean clay fill and lean clay alluvial materials encountered in the borings, that do not contain organics, are suitable for use as fill material in the core and berm areas; however, the sandy lean clay containing a large amount of sand and the sand materials would not be suitable for construction of the core and berm; however, if the sandy lean clay is mixed with on-site lean clay, it would be suitable for berm construction on the back side of the berm. The depth of the removal should be determined by a representative of the geotechnical engineer at the time of construction.

After stripping and excavating to the proposed subgrade level, as required, the core and berm area should be proofrolled with a loaded tandem axle dump truck, similar piece of heavy rubber-tired vehicle (typically with an axial load greater than 9-tons) or the heaviest rubber-tired equipment that will be used on the site. Soils that are observed to rut or deflect excessively (typically greater than 1-inch) under the moving load should be undercut and replaced with properly compacted fill. The proofrolling and undercutting activities should be witnessed by a representative of the geotechnical engineer and should be performed during a period of dry weather. If excessive movement is observed during the proofrolling, the proofrolling should be stopped immediately and the site evaluated by the geotechnical engineer.

Once the subgrade is prepared, lean clay material may be used for the core and berm material and sandy lean clay mixed with lean clay material can be used on the back side of the berm. The subgrade materials encountered at the core bottom and berm area should be scarified to a depth of 8 inches to 12 inches, moisture conditioned and compacted to a minimum of 95 percent of ASTM D 698 at a moisture content of between a minus 2 percent to a plus 4 percent over optimum.

Every other layer of core and berm fill material should be placed in a relatively uniform horizontal lift and be adequately keyed into the previously compacted subgrade material to minimize lateral movement of water. Fill materials should be free of organic or other deleterious materials and have a maximum particle size less than 3 inches. Close moisture content control will be required in the placement of fill to achieve the recommended degree of compaction.

Fill should be placed in maximum loose lifts of 4 inches for hand compaction equipment and 8 inches for riding equipment and should be compacted within the range of 2 percentage points below to 4 percentage points above the optimum moisture content as determined by ASTM D 698. Every other lift of compacted-engineered fill should be tested prior to placement of subsequent lifts.

The lean clay encountered in Borings B1, B2, B3, B5, B6 and B7 would provide for an adequate seal for the bottom of the pond. It should be noted that based on the color of the subgrade soil in Borings B1, B2 and B3 that the seasonal high water table in this area is at an elevation of 1080.0 feet, which is approximately 6 feet below the existing ground surface. A representative of the geotechnical engineer should be present to inspect the borrow material during its removal from the borrow areas to confirm the materials encountered are consistent with the materials encountered in the soil borings.

CONSTRUCTION CONSIDERATIONS

CTS should be retained to provide observation and testing of construction activities involved in the earthwork, and related activities of this project. CTS cannot accept responsibility for conditions that deviate from those described in this report, nor for the performance of the berm if not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils and Weather Related Concerns

The fine-grained soils encountered at this site will be sensitive to disturbances caused by construction activities and to changes in moisture content. Based on this, CTS recommends that the work be performed with low bearing track equipment. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork activities during dry weather.

Drainage and Groundwater Considerations

Free water was encountered at depths varying from 7.3 feet to 8.5 feet below the existing grade at the time the field exploration was conducted and may cause construction difficulties, including unstable subgrade problems, depending on the depth of the excavations. It is possible that seasonal variations will cause fluctuations or a water table to be present in the upper soils.

Additionally, perched water may be encountered in discontinuous zones within the overburden.

Excavations

In Federal Register, Volume 54, Number 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better enhance the safety of workers entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. The lean clay site materials are a Class B material and the sand site materials are a Class C material in accordance with OSHA criteria.

We are providing this information solely as a service to our client. CTS does not assume responsibility for construction site safety or the contractor's or other party's compliance with local, state, and federal safety or other regulations.

REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by CTS and design details furnished by Mr. Andrew Schippers, P.E., Regional Engineer for Great Lakes Atlantic Regional Office of Ducks Unlimited. If deviations from the subsurface conditions noted in this report are encountered during construction, CTS should be notified immediately to determine if changes in the recommendations are required. If CTS is not retained to perform these functions, CTS will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

This report has been prepared for the exclusive use of Ducks Unlimited and their consultants for the specific application to the proposed Wallace Wetland Project Gre853235C in Greene County, Iowa.

APPENDIX

BORING LOCATION PLAN


E Ave
B5
B6
B1
B2
B3
B8
B4
B7
E26
E26
E Ave
Google Earth
N

BORING LOGS

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-1**
Boring Location: **Greene County, IA**
Drill Type: **Hollow Stem**
Ground Elev.: **1085.8**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			6-Inch Root Zone											
			FILL, Lean Clay with Roots, Dark Brown, Very Moist		2-3-4 N= 7	27								
			LEAN CLAY, Dark Brown, Moist, Alluvium	CL		22	93	75	4.00					
5														
			SANDY LEAN CLAY, Grayish Yellow Brown and Medium Gray, Very Moist to Wet, Soft, Alluvium	CL	1-1-2 N= 3	24					32	14	18	
			CLAYEY SAND, Light Brownish Gray, Wet, Alluvium	SC		23	103	100						
10														
			POORLY GRADED SAND WITH CLAY AND GRAVEL, Grayish Yellow Brown, Wet, Medium Dense, Alluvium (Gravel/Cobble)	SP-SC	4-10-18 N= 28									
15														
			LEAN CLAY WITH SAND, Medium Gray, Very Moist, Very Stiff, Glacial Till	CL										
20					3-6-10 N= 16	12								
			CLAYEY SAND, Medium Gray, Wet, Very Dense, Glacial Sand	SC	2-20-37 N= 57									
25			END OF BORING AT 25 FEET FREE WATER WAS ENCOUNTERED AT 7.5 FEET AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-2**
Boring Location: **Greene County, IA**
Drill Type: **Hollow Stem**
Ground Elev.: **1085.9**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			6-Inch Root Zone											
			FILL, Lean Clay, Dark Brown, Moist			27	86	77	2.50					
			LEAN TO FAT CLAY, Dark Brown, Moist, Medium, Alluvium	CL-CH	3-3-3 N= 6	23					48	18	30	
5			POORLY GRADED SAND WITH CLAY AND GRAVEL, Light Gray Brown, Wet, Very Loose to Medium Dense, Alluvium	SP-SC	1-1-2 N= 3									
					1-2-2 N= 4									
10														
			(Gravel/Cobble)		4-9-15 N= 24									
15														
20			LEAN CLAY WITH SAND, Medium Gray, Very Moist, Very Stiff, Glacial Till	CL	5-9-16 N= 25	12								
			POORLY GRADED SAND WITH CLAY, Light Brown, Moist, Very Dense, Poorly Cemented Sandstone	SP-SC	4-26-50 N= 76									
25			END OF BORING AT 25 FEET FREE WATER WAS ENCOUNTERED AT 7.3 FEET AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-3**
Boring Location: **Greene County, IA**
Drill Type: **Hollow Stem**
Ground Elev.: **1086.3**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
	6-Inch Root Zone											
	FILL, Lean Clay with Roots, Black, Very Moist		2-4-4 N= 8	32								
	FILL, Lean Clay with Sand, Dark Brown, Moist			27	86	77	4.00					
5												
	WELL-GRADED SAND WITH CLAY, Light Brownish Gray, Very Moist to Wet, Very Loose to Loose, Alluvium	SW-SC	2-1-1 N= 2	13								
			3-3-2 N= 5									
10												
	LEAN CLAY WITH SAND, Medium Gray, Very Moist, Stiff to Very Stiff, Glacial Till	CL	2-4-5 N= 9	15								
15												
			3-7-12 N= 19	12								
20												
	CLAYEY SAND, Light Gray Brown, Wet, Very Dense, Glacial Sand	SC	4-11-44 N= 55									
25	END OF BORING AT 25 FEET FREE WATER WAS ENCOUNTERED AT 8.5 FEET AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-4**
Boring Location: **Greene County, IA**
Drill Type: **Flight Auger**
Ground Elev.: **1090.0**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			6-Inch Root Zone											
			FILL, Sandy Lean Clay with Cobbles and Brick Debris, Medium Brown, Very Moist			14					20	17	3	
			(Roots)			13								
5			END OF BORING AT 5 FEET FREE WATER WAS NOT ENCOUNTERED AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-5**
Boring Location: **Greene County, IA**
Drill Type: **Flight Auger**
Ground Elev.: **1090.2**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			12-Inch Root Zone											
			FAT CLAY WITH SAND, Dark Brown, Very Moist, Alluvium/Possible Fill	CH		20					54	22	32	
5			SANDY LEAN CLAY, Light Brown, Very Moist, Alluvium	CL		14								
			END OF BORING AT 5 FEET FREE WATER WAS NOT ENCOUNTERED AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-6**
Boring Location: **Greene County, IA**
Drill Type: **Flight Auger**
Ground Elev.: **1099.5**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			12-Inch Root Zone											
			LEAN CLAY WITH SAND, Medium Brown, Very Moist, Glacial Sediment	CL		19					33	18	15	
5			CLAYEY SAND, Grayish Yellow Brown, Very Moist, Glacial Sand	SC		11								
			END OF BORING AT 5 FEET FREE WATER WAS NOT ENCOUNTERED AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-7**
Boring Location: **Greene County, IA**
Drill Type: **Flight Auger**
Ground Elev.: **1110.2**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			12-Inch Root Zone											
			LEAN CLAY WITH SAND, Light Brown, Very Moist, Glacial Sediment	CL		23					38	17	21	
5			LEAN CLAY WITH SAND, Yellow Brown and Gray, Very Moist, Leached Till	CL		16								
			END OF BORING AT 5 FEET FREE WATER WAS NOT ENCOUNTERED AT TIME OF DRILLING											

LOG OF EXPLORATORY BORING

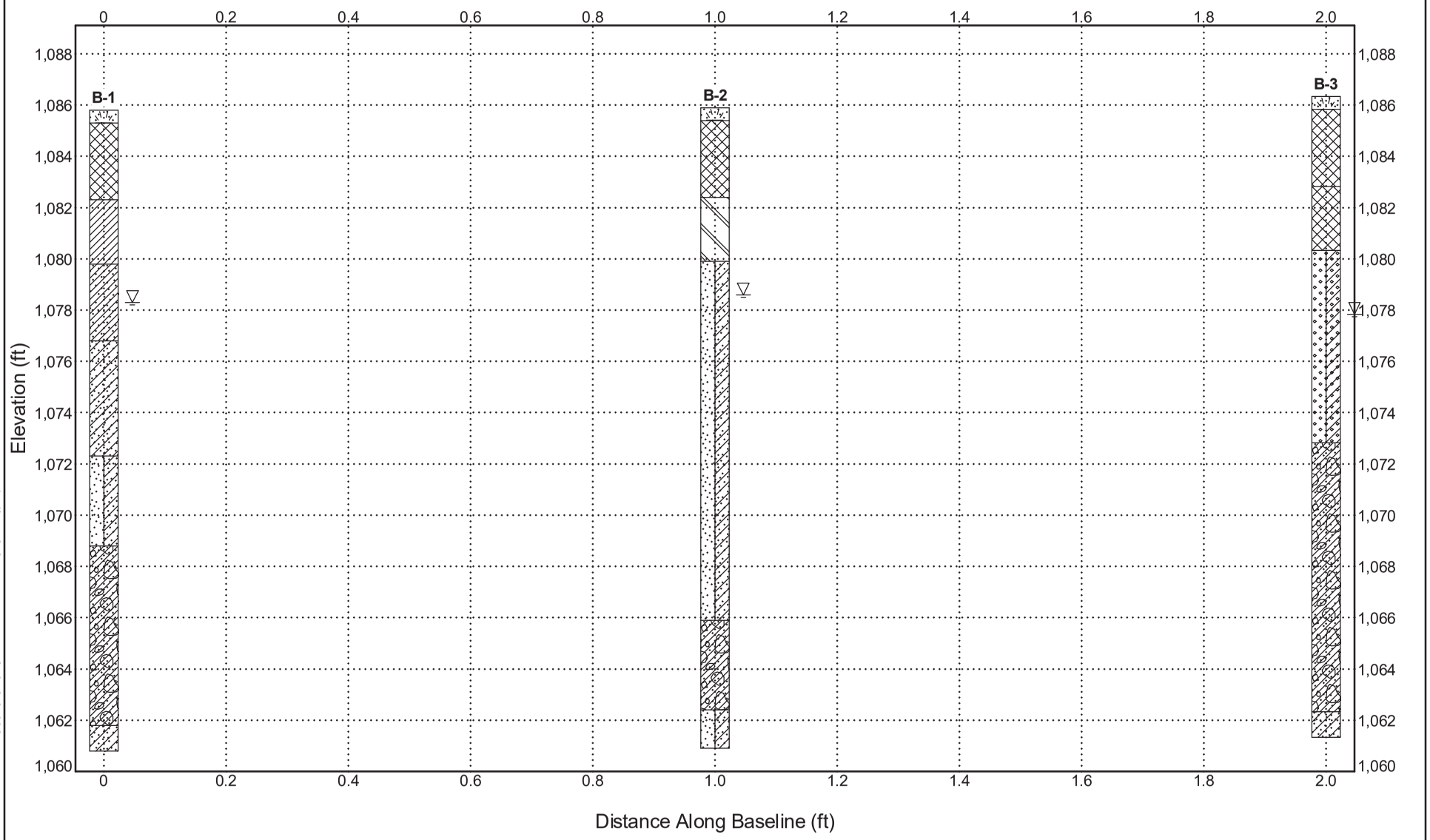
Job Number: **G6648**
Project: **Wallace Project Gre853235C Wetland**
Date Started: **4/18/22**
Date Completed: **4/18/22**

Boring No.: **B-8**
Boring Location: **Greene County, IA**
Drill Type: **Flight Auger**
Ground Elev.: **1089.4**

Shelby Tube | Standard Split Spoon | Water Level ATD
Modified California | Grab Sample | Water Level After 24-Hours

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	USCS	Blow Counts SPT (N) Blows/Foot	Moisture Content, %	Dry Density (PCF)	% Saturation	Hand Penetrometer (TSF)	Unconfined Comp. Strength (TSF)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cone Penetrometer (Blows/ 1-3/4")
			6-Inch Root Zone											
			FILL, Clayey Sand, Light Brown, Very Moist			9								
			(Gravel)			11								
5			END OF BORING AT 5 FEET FREE WATER WAS NOT ENCOUNTERED AT TIME OF DRILLING											

BORING PROFILES



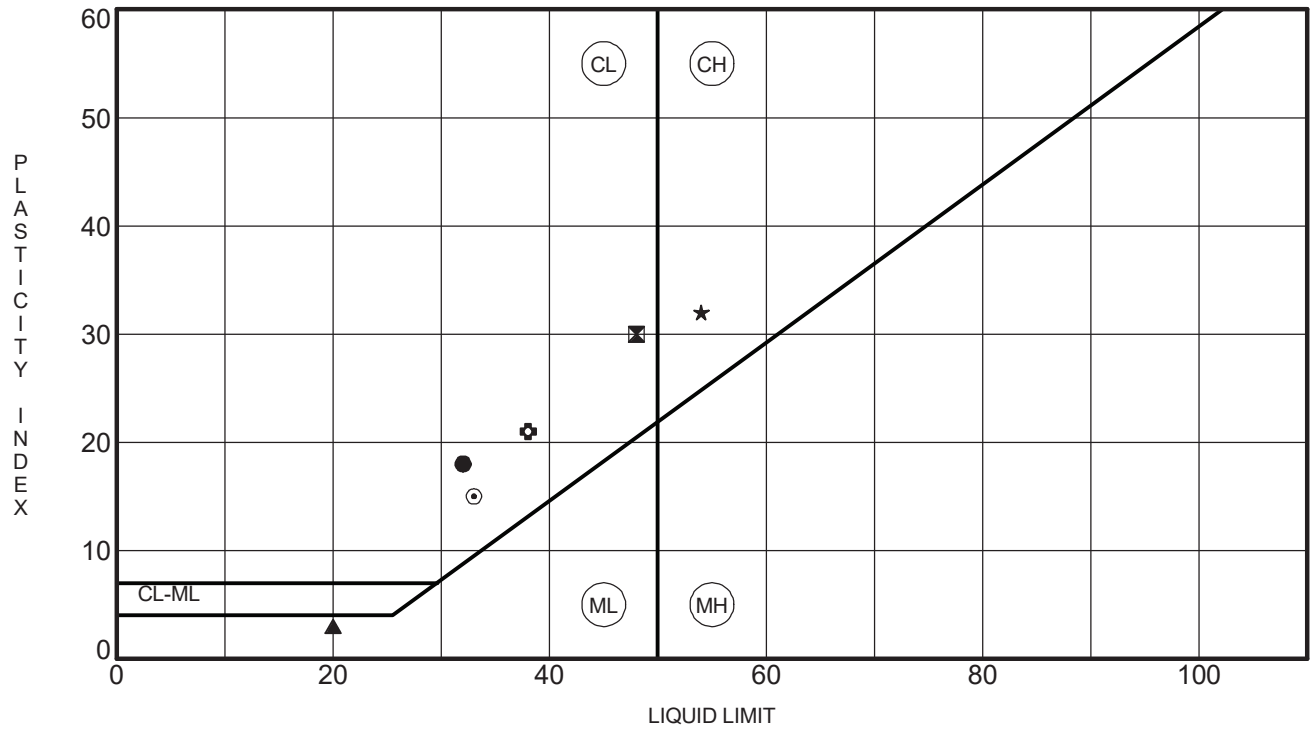
Certified Testing Services, Inc.
419 W. 6th Street, PO Box 1193
Sioux City, Iowa 51102
Telephone: 712-252-5132
Fax: 712-252-0110

Wallace Project Gre853235C Wetland
Greene County, IA

Project Number: G6648

LITHOLOGY AND WATER LEVELS - A SIZE G6648.GPJ CERTIFIED TESTING.GDT 5/12/22

LABORATORY TEST DATA



Specimen Identification			LL	PL	PI	Fines	Classification
●	B-1	6.8	32	14	18		SANDY LEAN CLAY(CLS)
⊠	B-2	4.3	48	18	30		LEAN TO FAT CLAY(CL-CH)
▲	B-4	2.0	20	17	3		SANDY LEAN CLAY(CLS)
★	B-5	2.0	54	22	32		FAT CLAY WITH SAND(CH)
⊙	B-6	2.0	33	18	15	16	CLAYEY SAND(SC)
✿	B-7	2.0	38	17	21		LEAN CLAY WITH SAND(CL)

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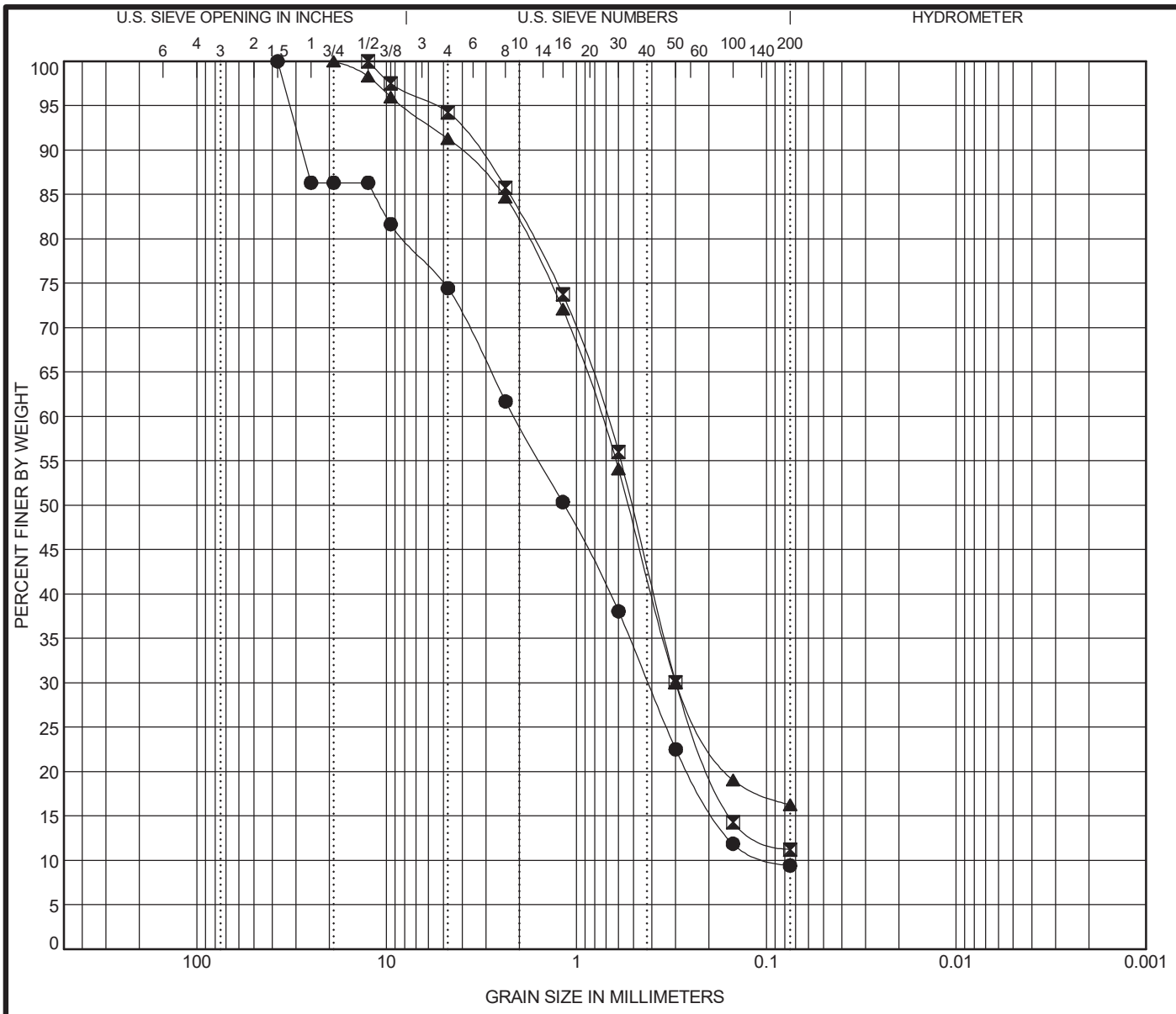
Fax: 712-252-0110

ATTERBERG LIMITS' RESULTS

Project: Wallace Project Gre853235C Wetland

Location: Greene County, IA

Number: G6648



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-2	14.3	POORLY GRADED SAND W/ CLAY & GRAVEL(SP-SC)				0.93	24.10
⊠	B-3	9.3	WELL-GRADED SAND WITH CLAY(SW-SC)				2.25	12.24
▲	B-6	2.0	CLAYEY SAND(SC)	33	18	15		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	14.3	37.5	2.128	0.419	0.088	25.6	65.0	9.4	
⊠	B-3	9.3	12.5	0.699	0.299		5.7	83.0	11.2	
▲	B-6	2.0	19	0.749	0.299		8.7	75.0	16.3	

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Sioux City, Iowa 51102
Telephone: 712-252-5132
Fax: 712-252-0110

GRAIN SIZE DISTRIBUTION

Project: Wallace Project Gre853235C Wetland

Location: Greene County, IA

Number: G6648

Certified Testing Services, Inc.
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Laboratory Permeability Test

Fixed Wall - ASTM D5856

Project No.:	G6648 Date: 05/10/22	Sample Type:	In-Place (Shelby)
		Sample Description:	Dark Brown Lean Clay
Client Name:	Ducks Unlimited		Sample No. 1
	Great Lakes Atlantic Reg. Office	Sampled By:	CTS
	3300 SE Glenstone Drive, Unit 1	Date Sampled:	04/18/22
	Grimes, Iowa 50111	Dates Tested:	04/27/22 - 05/03/22
Project Name:	Wallace Wetland Project	Compaction Method:	N/A
	Project Gre853235C	Permeant Liquid:	De-Aired Water
Location:	Greene County, Iowa	Reviewed by:	Matthew R. Dailey, P.E.

Laboratory Results	
Moisture Content, % (ASTM D2216)	22.0
Dry Density, PCF (ASTM D698)	92.9
Percent Compaction, %	N/A
Permeabilty, cm/sec	3.5×10^{-8}
Permeability, in/day	0.0012
Pass/Fail*	N/A

Sample Location: Boring B1: 3.5'-5'

* Pass/Fail rate not provided

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Laboratory Permeability Test

Fixed Wall - ASTM D5856

Project No.:	G6648 Date: 05/10/22	Sample Type:	In-Place (Shelby)
		Sample Description:	Dark Brown Lean Clay with Sand
Client Name:	Ducks Unlimited		Sample No. 2
	Great Lakes Atlantic Reg. Office	Sampled By:	CTS
	3300 SE Glenstone Drive, Unit 1	Date Sampled:	04/18/22
	Grimes, Iowa 50111	Dates Tested:	04/27/22 - 05/03/22
Project Name:	Wallace Wetland Project	Compaction Method:	N/A
	Project Gre853235C	Permeant Liquid:	De-Aired Water
Location:	Greene County, Iowa	Reviewed by:	Matthew R. Dailey, P.E.

Laboratory Results	
Moisture Content, % (ASTM D2216)	25.0
Dry Density, PCF (ASTM D698)	96.5
Percent Compaction, %	N/A
Permeabilty, cm/sec	1.3×10^{-8}
Permeability, in/day	0.0004
Pass/Fail*	**N/A**

Sample Location: Boring B3: 3.5'-5'

* Pass/Fail rate not provided

CERTIFIED TESTING SERVICES, INC.
419 W. 6th Street
P.O. Box 1193
Sioux City, Iowa 51102

Laboratory Compaction Characteristics of Soil

Client Name: Ducks Unlimited
3300 SE Glenstone Drive, Unit 1
Grimes, Iowa 50111
Project Name: Wallace Wetland Project
Location: Greene County, Iowa
Source Material: On Site:(B5 1'-4')
Sample Description: Dark Brown Fat Clay with Sand
Soil ID. No. 1
Material Designation: CH Sample date: 04/18/22
Test Method: ASTM D698
Test Procedure: A
Sample Preparation: Dry Method
Rammer: ___ Mechanical X Manual

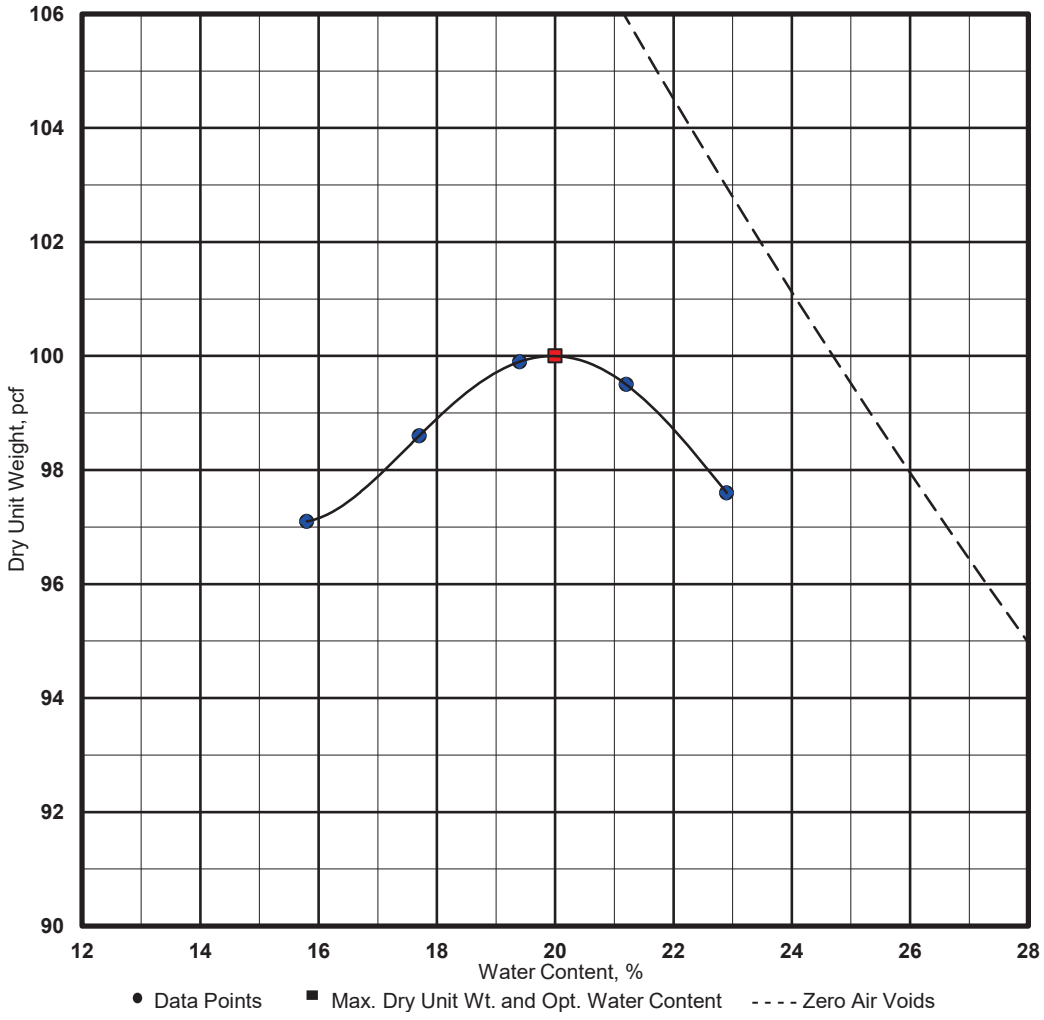
Project No.: G6648 Date: 05/12/22

TEST RESULTS
Maximum Dry Unit Wt.: 100.0 pcf
Optimum Water Content: 20.0 %

Test performed date: 05/09/22
Liquid Limit: 54 Plastic Limit: 22
Plasticity Index: 32 ASTM D4318
% passing # 200 sieve: --- ASTM D1140

Reviewed by: Matthew R. Dailey, P.E.

Zero air voids for specific gravity of 2.65 Assumed



CERTIFIED TESTING SERVICES, INC.
419 W. 6th Street
P.O. Box 1193
Sioux City, Iowa 51102

Laboratory Compaction Characteristics of Soil

Client Name: Ducks Unlimited
3300 SE Glenstone Drive, Unit 1
Grimes, Iowa 50111
Project Name: Wallace Wetland Project
Location: Greene County, Iowa
Source Material: On Site:(B7 1'-5')
Sample Description: Light Brown and Yellow Brown Lean Clay with Sand, Soil ID. No. 2
Material Designation: CL Sample date: 04/18/22
Test Method: ASTM D698
Test Procedure: A
Sample Preparation: Dry Method
Rammer: ___ Mechanical X Manual

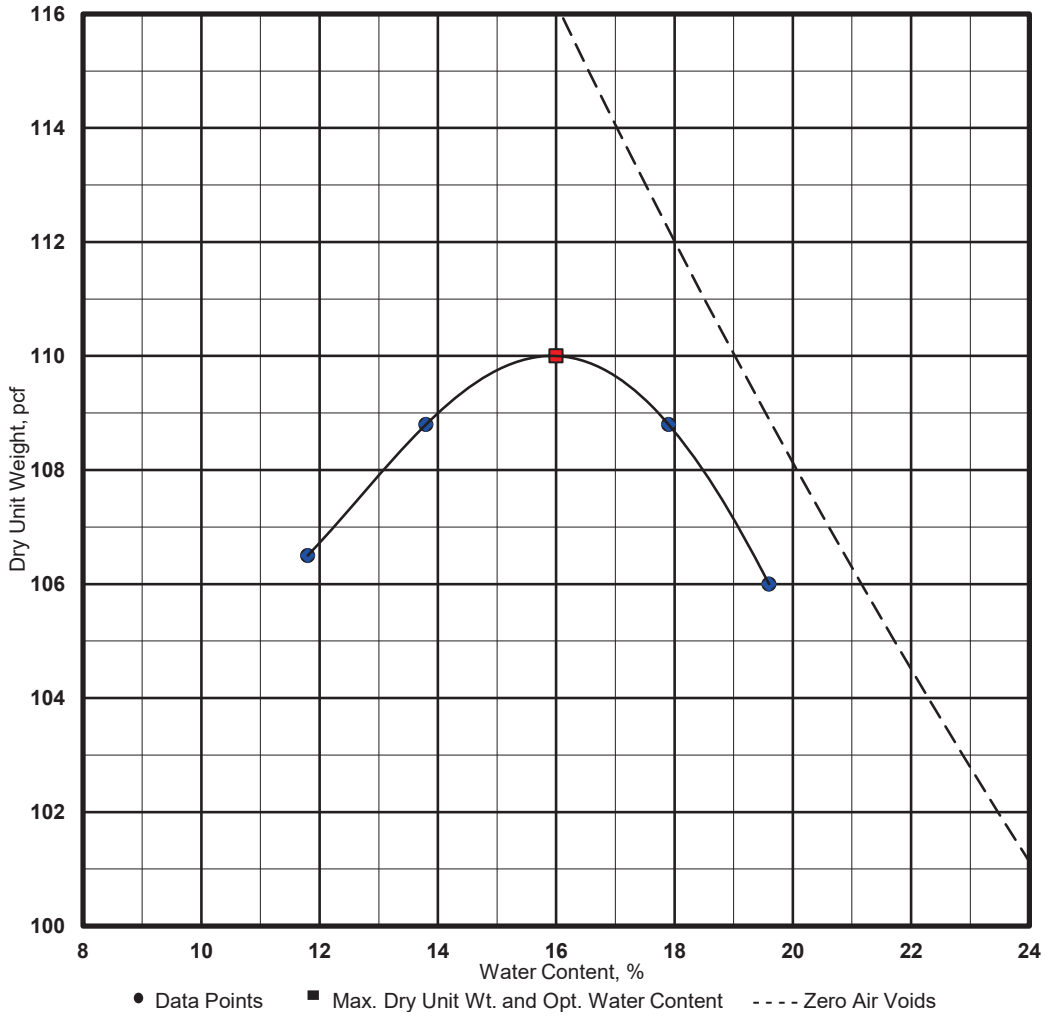
Project No.: G6648 Date: 05/12/22

TEST RESULTS
Maximum Dry Unit Wt.: 110.0 pcf
Optimum Water Content: 16.0 %

Test performed date: 05/11/22
Liquid Limit: 38 Plastic Limit: 17
Plasticity Index: 21 ASTM D4318
% passing # 200 sieve: --- ASTM D1140

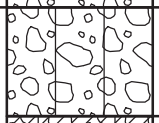
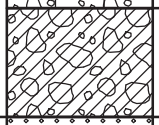
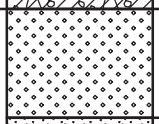
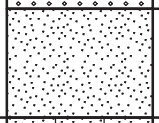
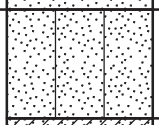
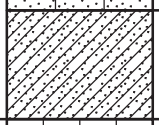
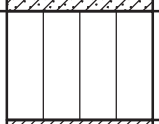
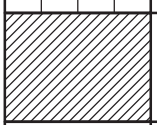
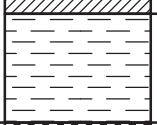
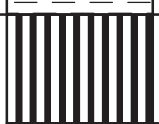
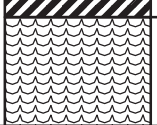
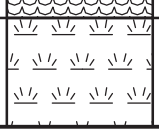
Reviewed by: Matthew R. Dailey, P.E.

Zero air voids for specific gravity of 2.65 Assumed



SOIL CLASSIFICATION CHART AND GENERAL NOTES

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

GENERAL NOTES

SAMPLING SYMBOLS:

	STANDARD PENETRATION TEST – 1 3/8: I.D., 2" O.D.
	SHELBY THIN-WALLED TUBE – 3" O.D. UNDISTURBED SAMPLE
	GRAB SAMPLE
	ROCK CORE
	AUGER SAMPLE
	NO RECOVERY

WATER LEVEL MEASUREMENT SYMBOLS:

▽	WATER LEVEL AT TIME OF DRILLING
▼	WATER LEVEL AFTER 7 DAYS

CONSISTENCY OF FINE-GRAINED SOILS	
UNCONFINED COMPRESSIVE STRENGTH, QU, PSF	CONSISTENCY
< 500	VERY SOFT
500 - 1,000	SOFT
1,001 - 2,000	MEDIUM
2,001 - 4,000	STIFF
4,001 - 8,000	VERY STIFF
8,001 - 16,000	HARD
> 16,000	VERY HARD

RELATIVE DENSITY OF COARSE GRAINED SOILS	
N-BLOWS/FT.	RELATIVE DENSITY
0 - 3	VERY LOOSE
4 - 9	LOOSE
10 - 29	MEDIUM DENSE
30 - 49	DENSE
50 - 80	VERY DENSE
80 +	EXTREMELY DENSE

RELATIVE PROPORTIONS OF SAND AND GRAVEL	
DESCRIPTIVE TERM(S) (OF COMPONENTS ALSO PRESENT IN SAMPLE)	PERCENT OF DRY WEIGHT
WITH	15 - 29
MODIFIER	> 30

GRAIN SIZE TERMINOLOGY	
MAJOR COMPONENT OF SAMPLE	SIZE RANGE
BOULDERS	OVER 12 IN. (300MM)
COBBLES	12 IN. TO 3 IN. (300 MM TO 75 MM)
GRAVEL	3 IN. TO #4 SIEVE (75MM TO 4.75MM)
SAND	#4 TO #200 SIEVE (4.75MM TO 0.075 MM)
SILT OR CLAY	PASSING #200 SIEVE (0.075MM)

RELATIVE PROPORTIONS OF FINES	
DESCRIPTIVE TERM(S) (OF COMPONENTS ALSO PRESENT IN SAMPLE)	PERCENT OF DRY WEIGHT
WITH	15 - 29
MODIFIER	> 30

Certified Testing Services, Inc.
419 W. 6th Street • P.O. Box 1193 • Sioux City, Iowa 51102 • Phone (712) 252-5132

May 24, 2022

Attn: Mr. Andrew Schippers, P.E.
Regional Engineer
Ducks Unlimited
Great Lakes Atlantic Regional Office
3300 SE Glenstone Drive, Unit 1
Grimes, Iowa 50111

RE: Addendum
Geotechnical Engineering Report
Wallace Wetland Project
Project Gre853235C
Greene County, Iowa
CTS Job No. G6648A

Dear Mr. Schippers:

This letter is an addendum to our original report. This addendum provides the results of the permeability testing that was performed on remolded samples obtained from the borrow area. Please attach a copy of this addendum to your original report

Between the dates of May 13 and 24, 2022, CTS performed two permeability testing on remolded samples obtained from the top 4 feet of the material in Boring B5 and from the top 5 feet of Boring B7. The rate of permeability for the samples varied from $2.4x10^{-8}$ cm/sec from the sample obtained in Boring B5 to $6.9x10^{-9}$ cm/sec from the sample obtained from Boring B7. These rates indicate that the materials compacted in accordance with the "Site Preparation" section of the original report would produce a suitable liner material.

With the exception of the above recommendations, the recommendations presented in our original report should be followed. If you have any questions pertaining to this addendum or if we may be of further service, please contact our office.

Respectfully submitted,
CERTIFIED TESTING SERVICES, INC.

Matthew R. Dailey P.E. IA 19700
Geotechnical Department Manager

MRD/md

Attachments: Permeability Test Reports

Certified Testing Services, Inc.
419 W. 6th Street • P.O. Box 1193 • Sioux City, Iowa 51102 • Phone (712) 252-5132

Laboratory Permeability Test

Fixed Wall - ASTM D5856

Project No.:	G6648 Date: 05/24/22	Sample Type:	Remolded
		Sample Description:	Dark Brown Fat Clay with Sand
Client Name:	Ducks Unlimited		Soil I.D. No. 1, Perm. Sample No. 3
	Great Lakes Atlantic Reg. Office	Sampled By:	CTS
	3300 SE Glenstone Drive, Unit 1	Date Sampled:	04/18/22
	Grimes, Iowa 50111	Dates Tested:	5/13/22 - 5/24/22
Project Name:	Wallace Wetland Project	Compaction Method:	N/A
	Project Gre853235C	Permeant Liquid:	De-Aired Water
Location:	Greene County, Iowa	Reviewed by:	Matthew R. Dailey, P.E.

Laboratory Results	
Moisture Content, % (ASTM D2216)	21.4
Dry Density, PCF (ASTM D698)	93.0
Percent Compaction, %[1]	93.0
Permeability, cm/sec	2.4×10^{-8}
Permeability, in/day	0.0008
Pass/Fail	**N/A**

Sample Location Description: Boring B5 (1'-4')

1. Percent compaction calculated based on maximum dry unit weight of 100.0 pcf at 20.0% optimum moisture content (standard Proctor ASTM D698)

Certified Testing Services, Inc.
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Laboratory Permeability Test

Fixed Wall - ASTM D5856

Project No.:	G6648 Date: 05/24/22	Sample Type:	Remolded
		Sample Description:	Light Brown/Yellow Brown Lean Clay
Client Name:	Ducks Unlimited		Soil I.D. No. 2, Perm. Sample No. 4
	Great Lakes Atlantic Reg. Office	Sampled By:	CTS
	3300 SE Glenstone Drive, Unit 1	Date Sampled:	04/18/22
	Grimes, Iowa 50111	Dates Tested:	5/13/22 - 5/24/22
Project Name:	Wallace Wetland Project	Compaction Method:	N/A
	Project Gre853235C	Permeant Liquid:	De-Aired Water
Location:	Greene County, Iowa	Reviewed by:	Matthew R. Dailey, P.E.

Laboratory Results	
Moisture Content, % (ASTM D2216)	17.3
Dry Density, PCF (ASTM D698)	105.0
Percent Compaction, %[1]	95.5
Permeability, cm/sec	6.9×10^{-9}
Permeability, in/day	0.0002
Pass/Fail	**N/A**

Sample Location Description: Boring B7 (1'-5')

1. Percent compaction calculated based on maximum dry unit weight of 110 pcf at 16.0% optimum moisture content (standard Proctor ASTM D698)

Certified Testing Services, Inc.
419 W. 6th Street • P.O. Box 1193 • Sioux City, Iowa 51102 • Phone (712) 252-5132

June 1, 2022

Attn: Mr. Andrew Schippers, P.E.
Regional Engineer
Ducks Unlimited
Great Lakes Atlantic Regional Office
3300 SE Glenstone Drive, Unit 1
Grimes, Iowa 50111

RE: Addendum 2
Geotechnical Engineering Report
Wallace Wetland Project
Project Gre853235C
Greene County, Iowa
CTS Job No. G6648A2

Dear Mr. Schippers:

This letter is an addendum to our original report. This addendum provides the soil design data that included the adhesion as requested by Mr. Schippers in a conversation on May 31, 2022. Please attach a copy of this addendum to your original report

BORING B-1

Material	Moist Unit Weight (PCF)	Saturated Unit Weight (PCF)	Standard Penetration Value (N)	Internal Friction Angle (deg)	Cohesion (PSF)	Adhesion (PSF)	K_a/K_p	Allowable Side Friction (PSF)	Allowable End Bearing (PSF)
Lean Clay Fill (0’ to 3.5’)	120.0	121.8	7	10	1,095	750	0.7/1.4	275	N/A
Lean Clay (3.5’ to 6’)	113.5	120.6	-	10	750	500	0.7/1.4	190	N/A
Sandy Lean Clay (6’ to 9’)	122.8	124.4	3	20	500	350	0.5/2.0	125	N/A
Clayey Sand (9’ to 13.5’)	127.7	127.7	-	32	-	-	0.3/3.3	565	6,000
Poorly Graded Sand (13.5’ to 17’)	126.0	126.0	28	34	-	-	0.28/3.5	625	16,800
Glacial Till (17’ to 24’)	141.1	141.1	16	25	2,500	1,000	0.4/2.5	620	7,500
Clayey Sand (24’ to 25’)	127.7	127.7	57	35	-	-	0.27/3.7	985	34,200

BORING B-2

Material	Moist Unit Weight (PCF)	Saturated Unit Weight (PCF)	Standard Penetration Value (N)	Internal Friction Angle (deg)	Cohesion (PSF)	Adhesion (PSF)	K_a/K_p	Allowable Side Friction (PSF)	Allowable End Bearing (PSF)
Lean Clay Fill (0' to 3.5')	109.0	116.2	-	10	600	400	0.7/1.4	150	N/A
Lean Clay (3.5' to 6')	120.5	123.7	6	10	940	700	0.7/1.4	235	N/A
Poorly Graded Sand (6' to 15')	120.0	120.0	4	30	-	-	0.33/3.0	560	2,400
Poorly Graded Sand (15' to 20')	126.0	126.0	24	34	-	-	0.28/3.5	660	14,400
Glacial Till (20' to 23.5')	141.1	141.1	25	25	3,900	1,500	0.4/2.5	975	11,700
Poorly Cemented Sandstone (24' to 25')	127.7	127.7	76	36	-	-	0.26/3.9	985	45,600

BORING B-3

Material	Moist Unit Weight (PCF)	Saturated Unit Weight (PCF)	Standard Penetration Value (N)	Internal Friction Angle (deg)	Cohesion (PSF)	Adhesion (PSF)	K_a/K_p	Allowable Side Friction (PSF)	Allowable End Bearing (PSF)
Lean Clay Fill (0' to 3.5')	113.5	116.1	8	10	1,250	800	0.7/1.4	310	N/A
Lean Clay Fill (3.5' to 6')	109.2	116.1	-	10	750	500	0.7/1.4	190	N/A
Clayey Sand (6' to 13.5')	120.0	120.0	4	30	-	-	0.33/3.0	660	2,400
Glacial Till (13.5' to 24')	141.1	141.1	14	25	2,200	950	0.4/2.5	550	4,400
Clayey Sand (24' to 25')	127.7	127.7	55	32	-	-	0.27/3.3	1,353	33,000

With the exception of the above recommendations, the recommendations presented in our original report and previous addendums should be followed. If you have any questions pertaining to this addendum or if we may be of further service, please contact our office.

Respectfully submitted,
CERTIFIED TESTING SERVICES, INC.

James A. Bertsch, P.E. IA 12121
Senior Geotechnical Engineer

Matthew R. Dailey P.E. IA 19700
Geotechnical Department Manager

JAB/MRD/jb