Appendix A

Taylor AML Geotechnical Report

ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

AUGUST 19, 2024 **PN 241175**

GEOTECHNICAL EXPLORATION

TAYLOR AML RECLAMATION PROJECT
SW 1/4 SECTION 11, T72N, R14W
WAPELLO COUNTY, IOWA

PERFORMED FOR

FRENCH RENEKER ASSOCIATES, INC.
1501 S MAIN STREET
PO BOX 135
FAIRFIELD, IA 52556

3660 109TH STREET • URBANDALE, IOWA 50322 • PHONE 515-252-1885 • FAX 515-252-1888

ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

August 19, 2024

French Reneker Associates, Inc.
1501 S Main Street
PO Box 135
Fairfield, IA 52556

RE: Geotechnical Exploration
Taylor AML Reclamation Project
SW 1/4 Section 11, T72N, R14W
Wapello County, Iowa
PN 241175

Attn: Mr. Steve Pedrick, P.E.

Dear Mr. Pedrick:

As authorized by you, Allender Butzke Engineers Inc. (ABE) has completed the geotechnical exploration for the above referenced project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of this project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and provides geotechnical engineering recommendations for this project.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience. We are also staffed and equipped to provide construction testing and inspection services on this project as well as environmental site assessments.

Respectfully submitted,
ALLENDER BUTZKE ENGINEERS INC.

Seth Hansen, P.E.
Project Engineer

Stacy G. Brocka, P.E.
Principal Engineer

LICENSED PROFESSIONAL ENGINEER SETH A. HANSEN 26401 IOWA	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. 8-19-24 Seth A. Hansen, P.E. License Number 26401 Date My license renewal date is December 31, 2025. Pages covered by this seal: All Pages.

1 Email Above

GEOTECHNICAL EXPLORATION

TAYLOR AML RECLAMATION PROJECT
SW 1/4 SECTION 11, T72N, R14W
WAPELLO COUNTY, IOWA

PN 241175

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TAYLOR AML RECLAMATION PROJECT
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WAPELLO COUNTY, IOWA

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August 19, 2024

PROJECT INFORMATION

Iowa Department of Agriculture and Land Stewardship, with design assistance from French Reneker Associates, is planning the construction of a new dam as part of the Abandoned Mine Land (AML) Reclamation project at this site. The purpose of this report is to evaluate subsurface conditions and provide design recommendations with respect to construction of the new dam. The following Figure No. 1 depicts the post-reclamation grading plan prepared by French Reneker.

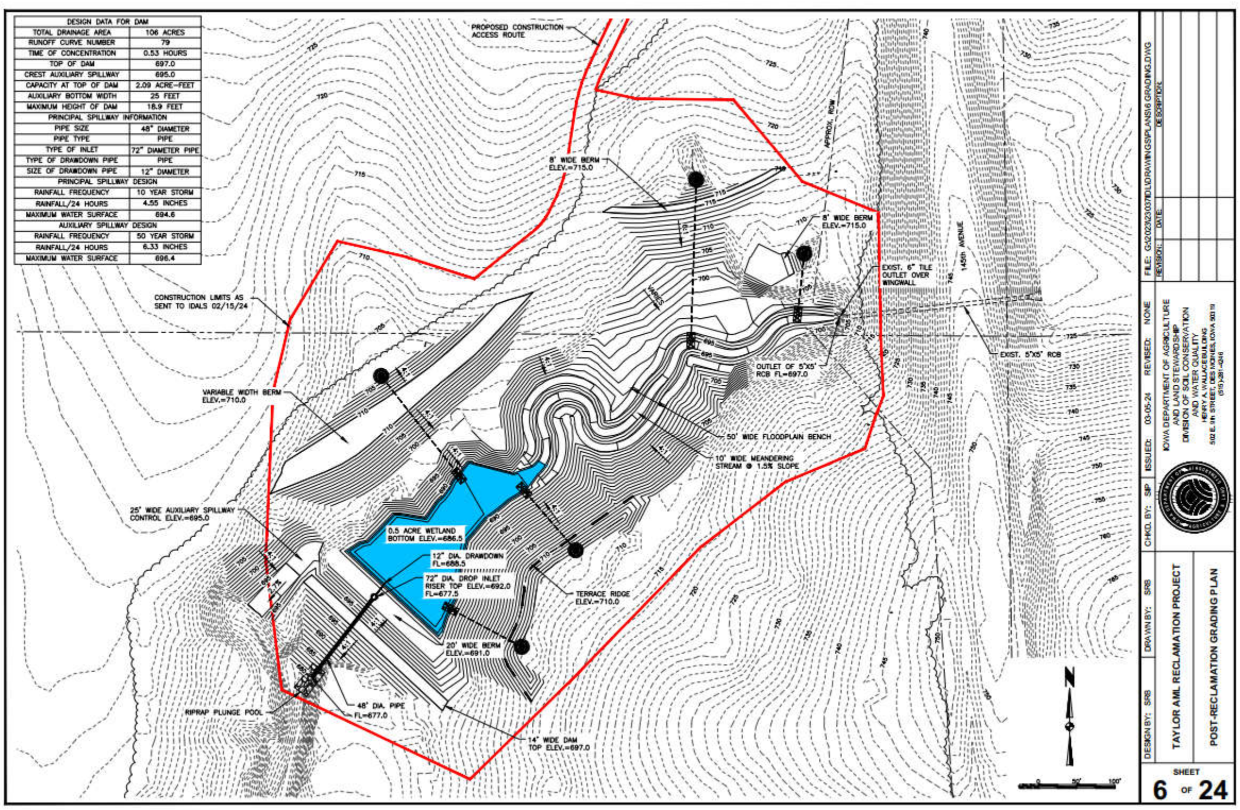


Figure No. 1 – Post-Reclamation Grading Plan

Plans indicate the new dam will be approximately 20 feet tall with dam side slopes of 4:1 (horizontal: vertical). The top of dam will be near elevation 697.0 feet and the maximum water level will be near elevation 694.6 feet. The emergency spillway will be located on the north side of the dam. A 72" diameter drop inlet and 48" diameter outlet pipe is also planned. The area where the new dam will be constructed is steeply incised and heavily wooded. It is our understanding a former coal mine operated near this site.

FIELD EXPLORATION

The requested six borings were conducted at this site to depths between 20 and 28.6 feet below existing grades on June 20, 2024. Approximate locations of test borings are shown on the enclosed Site Plan and were located and staked at the site by French Reneker Associates prior to field exploration. The boring surface elevations, indicated on the enclosed Boring Logs, were provided by French Reneker Associates for the surveyed boring locations. Methods of drilling, sampling, standard laboratory testing, and classifying of subsurface materials are discussed in the Boring Log Description/Legend pages of the Appendix.

SUBSURFACE CONDITIONS

Soil Profile

Detailed descriptions of soils encountered by this exploration are provided on the Boring Logs enclosed in the Appendix. The Profile of Borings (Plates A-1 (Dam) and A-2 (Borrow)) presented in the Appendix depicts the relative deposit elevations in the borings. Following is a discussion of the subsurface materials encountered in the borings. Unless otherwise indicated, the depths of soil stratum and groundwater levels are referenced from below existing grade at the individual boring locations at the time of drilling.

Fill consisting of dark gray and gray shaley fat clay (CH) was present at the ground surface in Boring No. 5 which was conducted over an existing stockpile. The shaley fat clay extended to a depth of 8.5 feet. Mine spoils were encountered between depths of 8.5 and 15.5 feet. The mine spoils were light gray and brown in color, very moist, and medium stiff.

Topsoil consisting of dark brown lean clay (CL) with trace amounts of sand and organics was present at the ground surface in Boring Nos. 1, 2, 3, and 4. The topsoil was approximately 1.5 to 2 feet thick. Trace organics were present primarily in the upper 6 to 8 inches.

Very dark gray and dark gray lean clay (CL) and lean to fat clay (CL-CH) cohesive alluvium was present below the topsoil in Boring No. 2, 3, and 5, below the mine spoils in Boring No. 5, and at the ground surface in Boring No. 6. Random layers of clayey sand (SC) granular alluvium were encountered between cohesive alluvium layers in Boring Nos. 2 and 6. The granular alluvium consisted of clayey fine to medium sand (SC). Boring No. 5 terminated in cohesive alluvium near a depth of 25 feet.

Glacial outwash consisting brown-gray clayey fine sand (SC) to very sandy lean clay (CL) was encountered below the topsoil in Boring No. 1 conducted near the north abutment of the proposed dam. The glacial outwash was damp to moist and loose to medium dense.

Pre-Illinoian glacial till consisting of brown-gray sandy lean clay (CL) underlaid the glacial outwash in Boring No. 1 and the cohesive alluvium in Boring No. 3. Boring No. 1 terminated in very stiff Pre-Illinoian glacial till near a depth of 26 feet.

Weathered bedrock consisting of shale is present below the over-burden soil at this site. Shale was encountered between depths of 13.5 and 24.5 feet. The shale was stiff to very stiff and moist to very moist. Boring Nos. 2, 3, 4, and 15 terminated in shale between depths of 20 and 28.6 feet.

Groundwater Level Observations

The borings were monitored during and shortly after drilling operations to detect moisture seepage and groundwater accumulation. The results of our groundwater level observations are noted on the Boring Logs enclosed in the Appendix.

During drilling operations, moisture seepage or saturated sand was noted near depths of between 13.5 and 17 feet below existing grades in Boring Nos. 1, 2, 3 and 6. Groundwater accumulation was observed between depths of 7 and 15.5 feet in Boring Nos. 1, 2, and 3 shortly after the completion of drilling operations while no groundwater accumulation was observed in Boring Nos 4, 5, and 6. These short-term water levels are not necessarily a true indication of the groundwater table. Long-term observations would be necessary to accurately define the groundwater variations at this site. Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, surface drainage, subsurface drainage, site topography, irrigation practices, and ground cover (pavement or vegetation).

ANALYSIS AND RECOMMENDATIONS

Site Preparation

Stripping – Prior to placement of fill for the dam embankment and excavation of material from borrow areas, organic and loose materials in addition to all vegetation must be stripped. We expect that a minimum stripping depth of 6 inches will be required. Deeper stripping on the order of 1 to 2 feet may be necessary in these lower lying areas to remove thicker organic deposits or unstable surficial soils (if present) before placement of fill.

Stripped soil could be used for landscaping purposes in non-critical areas. Root balls from large mature trees should be completely removed from below the dam and backfilled with engineered compacted fill. Existing dam abutment slopes and steep creek side slopes to receive new fill should be adequately benched and deeply scarified to fully incorporate the new fill into the existing terrain. Subgrade should be proof-rolled prior to placing embankment fill to delineate zones of soft soils present near the surface which may require additional removal or compaction.

Key Trench – We recommend that a key trench be installed below the center of the new embankment in order to integrate the embankment into the underlying soils and provide discontinuity for any shallow flow of water below the embankment. The key trench should have a bottom width on the order of 6 to 8 feet with side slopes no steeper than 1:1 (horizontal to vertical), extend 3 to 5 feet below existing grades, and extend up the abutments to the normal pool elevation. The key trench should be backfilled with cohesive (clay) soils such as the on-site lean clay (CL) and lean to fat clay (CL-CH) cohesive alluvium or sandy lean clay (CL) Pre-Illinoian glacial till or other suitable clay borrow materials.

The grading contractor should also be aware that it may be necessary to control groundwater seepage as well as surface water drainage during excavation of the key trench. Temporary dewatering in the early phases of site grading, as discussed later in this section, may help to improve subgrade support for shallow excavations.

Site Drainage and Dewatering –The groundwater table tends to be a subdued reflection of the ground surface. In our opinion, excavation of temporary drainage trenches or sumps to lower groundwater levels prior to or in the very early stages of grading will be beneficial to facilitate site stripping, site grading, construction of the key trench, and installation of the outlet structure.

Site Grading

We recommend that low plasticity cohesive (Liquid Limit of 45 or less and Plasticity Index of 23 or less) or cohesionless soils, free of rubble and organics, be used as compacted fill. Inorganic existing soil such as the sandy lean clay (CL) Pre-Illinoian glacial till and lean clay (CL) cohesive alluvium would be suitable soil types for general fill applications. The fat clay (CH) fill and mine spoils encountered in Boring No. 5 would not be suitable for use as embankment fill but could be wasted in deeper fill areas upstream of the dam.

The following Table A lists recommended minimum compaction requirements for cohesive and cohesionless fill materials in specific applications. For cohesive soils, moisture contents within a range of 0 to +4 percent of the material's optimum moisture content are necessary to achieve the desired fill qualities. Soils compacted closer to optimum moisture content would exhibit greater stability under repeated construction traffic loading.

The on-site soils can be excavated utilizing conventional excavation equipment. Granular soils can generally be suitably compacted with vibratory compaction equipment whereas cohesive soils are more suitable for compaction with sheepsfoot or pneumatic type compactors. Care should be exercised in properly backfilling and compacting all trenches, especially utility trenches under or adjacent to the pavement. Loosely compacted or sand backfilled trenches can collect surface water and inadvertently direct it to the pavement subgrade and cause softening of the soil as well as increasing frost heave potential.

At the time of this geotechnical exploration, moisture contents of the cohesive alluvium and Pre-Illinoian glacial till was near to slightly above the recommended moisture contents for compaction. Adjustment of soil moisture content may be required in order to lower or raise the moisture to within the recommended moisture content range. Discing and aeration is generally the most economical method to lower soil moisture content, if climatic conditions allow. Chemical modification (drying) of very moist soils with Class C fly ash, Portland cement, or quicklime can be accomplished if construction scheduling does not permit field drying. Common chemical modification methods may not be reactive when temperatures are near or below 40° Fahrenheit if grading or fill placement at the site will be conducted during colder weather.

TABLE A
RECOMMENDED DEGREE OF COMPACTION GUIDELINES

Construction Application	Standard Proctor (ASTM D698) Cohesive Soil	Standard Proctor (ASTM D698) Cohesionless Soil	*Relative Density (D4253 & D4254) Cohesionless Soil
Class 1	95%	98%	70%
Class 2	90%	93%	45%
Class 3	85%	88%	20%

Class 1 - Subgrade for building foundations, slabs-on-grade, pavements and other critical backfill areas.
Class 2 - Backfill adjacent to structures not supporting other structures - Minor subsidence possible.
Class 3 - Backfill in non-critical areas - Moderate subsidence possible.

*Use Relative Density technique (ASTM D4253 & D4254) where Standard Proctor technique (ASTM D698) does not result in a definable maximum dry density and optimum moisture content.

The contractor should be aware that saturated clayey sand (SC) soils such as encountered in Boring No. 2 are easily disturbed by construction traffic and may not provide adequate support for heavy construction equipment, especially in deeper cut areas under repeated traffic loading. Therefore, low impact excavation methods, such as top loading with excavators may be required in deeper cut areas to reduce disturbance and deterioration of these softer soils. High construction traffic areas will require periodic repair of disturbed or loosened soils.

Sand left exposed and unprotected will be subject to erosion. We recommend that sand be covered with a minimum of one foot of cohesive soil where left exposed in order to reduce erosion. This cohesive soil layer should be compacted according to Table A. It should be recognized that the sand may be difficult to compact when wet and is easily disturbed by construction traffic.

Excavation Stability and Dewatering

The overburden soils and weathered clay shale bedrock can be excavated utilizing conventional excavation equipment. Although not encountered in the borings, excavations encountering deeper unweathered shale bedrock and harder sandstone layers may be present in other unexplored areas and will likely require rippers or heavier excavation equipment.

Boring information indicates excavations will encounter both cohesive and granular soils with the possibility of saturated sand. Random sand seams and thicker glacial outwash sand layers may also be encountered in other unexplored areas of the site. It is expected that the water seepage can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations. Although not anticipated at this site, more extensive dewatering such as sand points and wells may be required for excavations which extend down into water bearing sand layers. We recommend that prior to excavating in saturated sand, water levels be maintained 2 feet or more below the bottom of excavations in saturated sand to prevent upward seepage forces which could reduce subgrade support.

The extent of bracing or sloping of open cut excavations will be dependent upon depth of cut, groundwater conditions, soils encountered, length of time the excavation will be open, area available for excavation and local governing regulations. Predominately cohesive soils may appear to stand nearly vertical in shallow excavations for short periods of time. However, soil creep, surcharge loads, precipitation, subsurface moisture seepage, construction activity vibrations and other factors may cause these soils to cave within an unpredictable period of time. Excavations encountering sand may tend to cave rapidly, especially if water is flowing through the sand. Unstable granular excavation walls may also cause surrounding cohesive soils to become unstable. Temporary shoring, flattening of the excavation slopes or use of trench boxes may be required to maintain a safe condition. Determining the appropriate OSHA classifications of the soil types encountered and implementing the required provisions for sloping, shoring, and bracing of excavations throughout the project during construction are the responsibility of the contractor per OSHA.

Clay Liner Considerations

Granular (sand) alluvium, sand seams and very sandy zones within the glacial till, glacial outwash sand layers, or more permeable bedrock layers such as sandstone or coal exposed on the upstream side of the basin may provide an avenue for water flow below the dam resulting in reduced stability. We recommend that during construction ABE have the opportunity to observe the bottom and sides lopes of the new basin. Where highly permeable materials are present, such as the glacial outwash encountered in Boring No. 1 near the emergency spillway, it may be necessary to cap the more permeable layers with 2 feet of lower permeable clay soils to reduce seepage through these layers below and around dam.

Cut Slope Stability and Subsurface Drainage

Plans indicate the proposed cut slopes will be configured at 4:1 (H:V). Boring information suggests the cut slopes will encounter glacial outwash, glacial till, and possibly weathered shale. Harder shale bedrock as well as sandstone and coal layers could be present in other unexplored areas of the site. In our experience, flattening of cut slopes in shale (weathered and harder) would be advisable since shale slopes steeper than 4.5:1 (H:V) may be subject to shallow sloughing due to frost action, seasonal moisture content fluctuations, and downhill creep movements.

In our opinion, based on soil boring information the recommended cut slopes would be generally stable if not subject to moisture seepage. In our experience, seepage commonly occurs near the over burden soil and shale interface, through more permeable bedrock layers such as sandstone and coal seams. Coal seams, if exposed on side slopes, may significantly decrease stability of cut slopes especially if water is flowing through them. In our experience coal seams can provide an avenue for upgradient groundwater flow which can result in significant pore water pressures when surrounded by relatively impervious shale bedrock.

Where moisture seepage is encountered during earthwork operations or where cuts extend below the seasonal high groundwater table, it may be necessary to install subsurface drain lines uphill of the potential seepage areas in order to intercept groundwater before it exits the slope. The following Figure No. 2 depicts a typical interceptor drainline cross-section. Where more permeable layers are exposed on side slopes interceptor drain lines should be installed upgradient and extend through the permeable layers, if possible. Ongoing, unmitigated moisture seepage on the slopes can lead to erosion, sloughing, and wet areas that can be difficult to build on as well as mow and maintain.

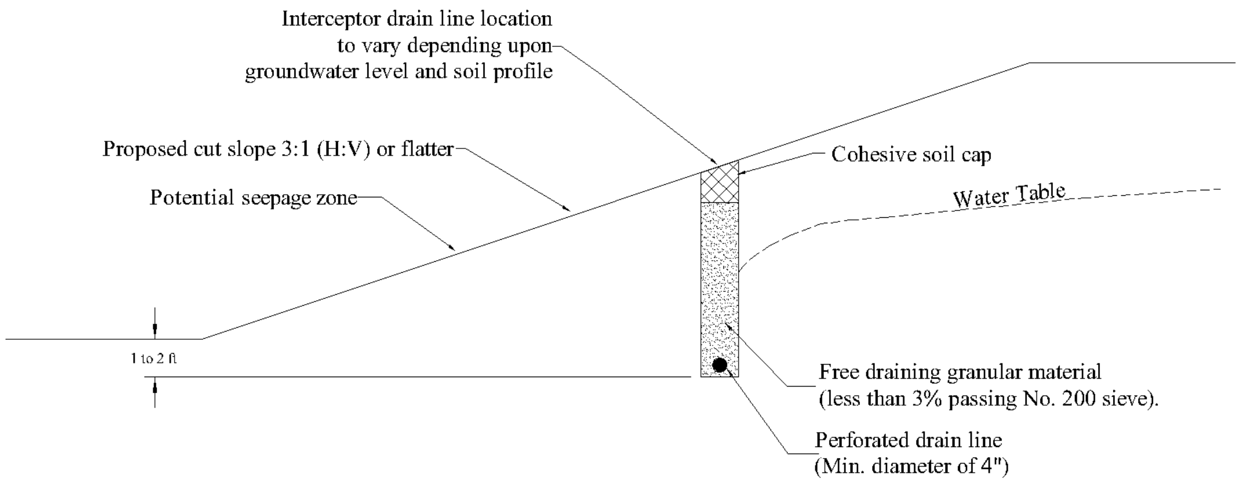


Figure No. 2 – Typical interceptor drainline cross-section

Outlet Pipe Considerations

The post-reclamation grading plan sheet indicates the approximately 130 lineal feet long outlet pipe will be located near the center of the proposed dam. The upstream and downstream flow lines are planned near elevations 677.5 and 677.0 feet. Using boring information from Boring No. 2 we anticipate the eastern portion of the pipe will be constructed in stiff cohesive alluvium or medium dense granular alluvium soils. Assuming the outlet pipe will be constructed during fill placement or shortly after fill placement with new fill depths of 10 to 15 feet above the outlet pipe we estimate the new pipe may experience total settlements on the order of 1 to 2 inches. We assume the estimated magnitude of total and differential settlement would be tolerable for this type of structure.

Erosion Control

We recommend the downstream toe near the outlet pipe, or other areas of intense water erosion, be protected from erosion with rip rap revetment. Embankment slopes and other areas subject to erosion from surface water should be protected with suitable erosion control measures, such as vegetation.

Construction Observation

We recommend that site grading operations such as stripping, key trench excavations, borrow material and embankment construction be observed and monitored under direction of a geotechnical engineer or other qualified engineer.

GENERAL

The analyses and recommendations in this report are based in part upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during earthwork and foundation construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, expressed or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by the geotechnical engineer.

The scope of our service was not intended to include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air on, below or adjacent to this site.

APPENDIX

BORING LOG DESCRIPTION/LEGEND

The material types encountered during the drilling operations were recorded on field logs. The profile represented on the Boring Log is based on final classification performed by a geotechnical engineer using the field logs, laboratory observation and testing. The material stratigraphy demarcation lines shown on the Boring Logs indicate changes in soil characteristics, however, actual soil changes or variations may occur as a gradual transition. Soil profile discussion, Log Boring information, water levels and recommendations presented in this report are based upon measured depths below ground levels existing at time of the field exploration, unless otherwise specified.

DRILLING AND SAMPLING

The borings were conducted with either a truck or all-terrain rotary drill rig using the drilling methods indicated on each Boring Log. Soil sampling and/or in-situ testing such as Shelby Tube (ST), split-spoon (SS), drive cone (DC), or core (C) was conducted at depth intervals which were selected in consideration of the characteristics of the proposed construction. Generally undisturbed soil samples are taken at 5 foot depth intervals or change in soil types. Disturbed soil samples from the auger, either jar size or bulk size samples, may be taken at intermediate intervals for the purpose of soil classification or laboratory testing. Borings conducted for soil classification only, will show no designation of sampling although disturbed sampling is performed. Soil samples obtained in the field were identified and sealed for transportation to the laboratory for performance of pertinent physical testing and engineering classification.

Drilling Methods

CFA - Continuous Flight Auger: 4, 6, or 8-inch diameter (ASTM D1452).
RD - Rotary Drilling: Using drilling fluid in cased or uncased boring (ASTM D2113).
HSA - Hollow Stem Auger: 6 or 8-inch diameter, continuous flight auger remains in boring with soil removed from the hollow stem through which undisturbed sampling is conducted.
HA - Hand Auger: 4-inch or less diameter.

Sample Types

ST - Shelby Tube: Thin-walled tube samples of cohesive soils (ASTM D1587).
SS - Split Spoon with 140 lb. manual hammer: Standard penetration test and split-barrel samples (ASTM D1586).
SSA - Split Spoon with 140 lb. automatic hammer: Standard penetration test and split-barrel samples (ASTM D1586).
DC - Drive Cone: Dynamic in-place testing of soil using a 2-inch diameter cone with a 60 degree point driven into the soil for continuous 1-foot intervals in the same manner as Split Spoon, no sample is obtained.
C - Core: Sampling hard soil or bedrock with a diamond core barrel in a rotary drill boring (ASTM D2113).
SPT - Standard Penetration Test: Number of blows required to drive sampler (split spoon or drive cone) into the soil with a 140-pound weight dropping a distance of 30-inches (ASTM D1586), number of blows recorded for each 6-inch interval in an 18-inch (or more) penetration depth, values shown are for each 6-inch interval (if series of number sets are shown) or a total of the last two 6-inch intervals (if only one number is shown) which is commonly referred to as "N" in blows per foot. High resistance is indicated by a high number of blows for a lesser penetration depth listed in inches.
BS - Bulk Sample: Disturbed.
CPT - Cone Penetration Test: Quasi-static in-place testing of soils using a 60 degree cone and friction sleeve which are steadily pushed into the soil and measure skin friction and end bearing (ASTM D3441).

STANDARD LABORATORY TESTING

Representative undisturbed soil samples obtained by the Shelby Tube sampler were tested for moisture content (ASTM D2216), density (dry) and unconfined compressive strength (ASTM D2166) in the laboratory. Results of these tests appear on the respective Boring Logs. Additional soil testing including particle size analysis (ASTM D422) and Atterberg Limits (ASTM D4318) may be conducted, if necessary, to define in more detail pertinent soil characteristics for classification in accordance with the Unified Soil Classification System. Specialized laboratory tests (if conducted) to determine pertinent soil characteristics are discussed in the "Laboratory Testing" section of the report.

WATER LEVEL MEASUREMENT

Water levels indicated on the Boring Logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with short term observations.

BORING LOG DESCRIPTION/LEGEND

DESCRIPTIVE SOIL CLASSIFICATION

Soil description is based on the Unified Classification System as outlined in ASTM Designations D-2487 and D-2488. This classification is primarily based upon visual and apparent physical soil characteristics, comparison with other soil samples, and our experience with the soil. Additional laboratory testing may be conducted, if necessary to define in more detail pertinent soil characteristics. The Unified Soil Classification group symbol shown on the boring logs corresponds with the group names listed below. The description includes soil constituents, moisture conditions, color and any other appropriate descriptive terms.

Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name
GW	Well-Graded Gravel	SW	Well-Graded Sand	CL	Lean Clay	CH	Fat Clay
GP	Poorly-Graded Gravel	SP	Poorly-Graded Sand	ML	Silt	MH	Elastic Silt
GM	Silty Gravel	SM	Silty Sand	OL	Organic Clay Organic Silt	OH	Organic Clay Organic Silt
GC	Clayey Gravel	SC	Clayey Sand			PT	Peat

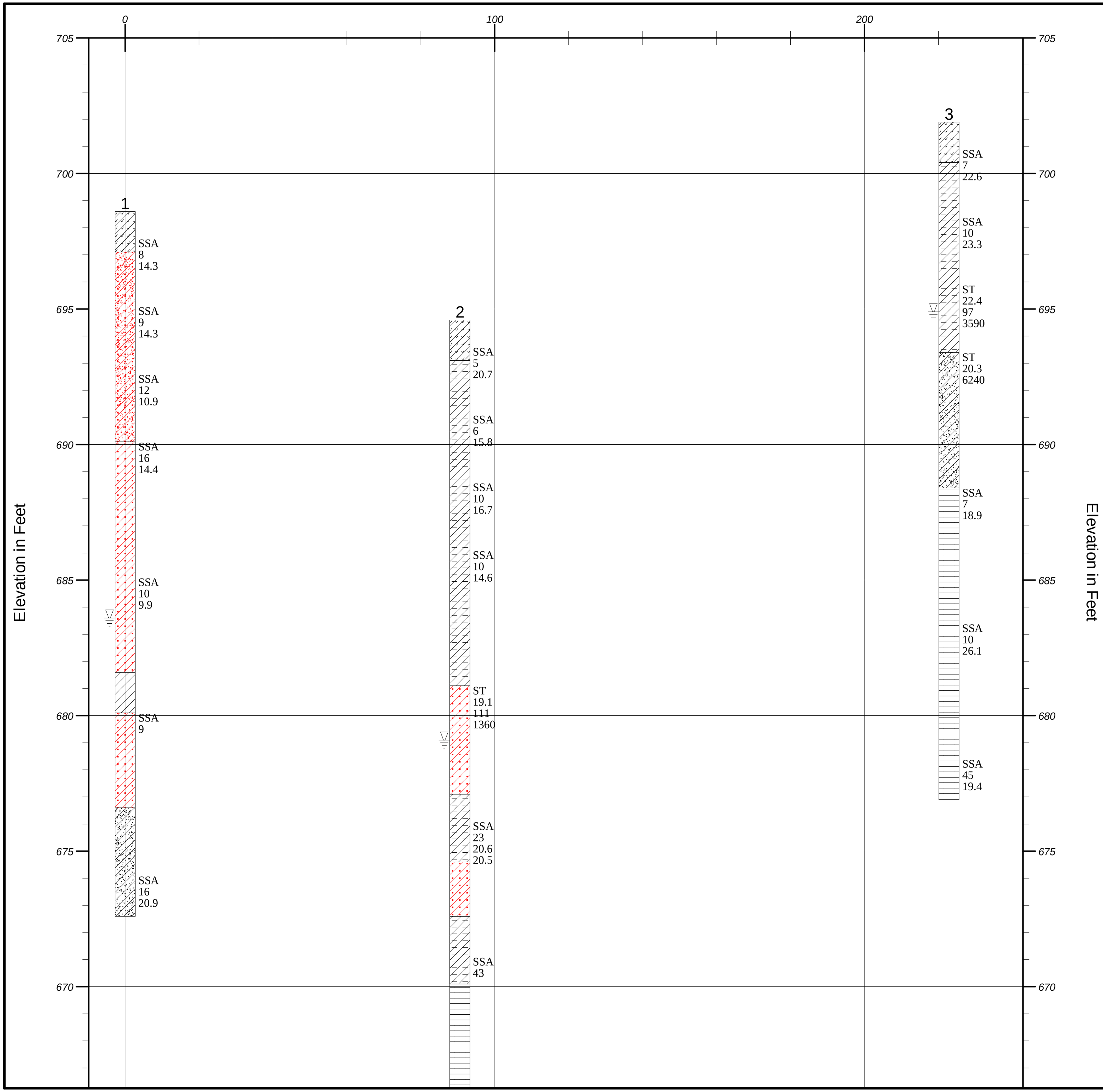
RELATIVE PROPORTIONS			GRAIN SIZE TERMINOLOGY	
Descriptive Term(s) (Of components also present in sample)	Sand and Gravel % of Dry Weight	Fines % of Dry Weight	Major Component of Sample	Size Range
Trace	<15	<5	Cobbles	12 in. to 3 in. (300mm to 75mm)
With	15-30	5-12	Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Modifier	>30	>12	Sand	#4 to #200 sieve (4.75mm to 0.074mm)
			Silt or Clay	Passing #200 sieve (.074 mm)

CONSISTENCY OF FINE-GRAINED SOILS			RELATIVE DENSITY OF COARSE-GRAINED SOILS	
Unconfined Compressive Strength, Qu, psf	Consistency	SPT, bpf	SPT, bpf	Relative Density
< 500	Very Soft	0-2	0-4	Very Loose
500-1,000	Soft	2-4	4-10	Loose
1,000-2,000	Medium Stiff	4-8	10-30	Medium Dense
2,000-4,000	Stiff	8-15	30-50	Dense
4,000-8,000	Very Stiff	15-30	50-80	Very Dense
8,000-16,000	Hard	30-100	80+	Extremely Dense
> 16,000	Very Hard	>100		

BORING LOG DESCRIPTION/LEGEND

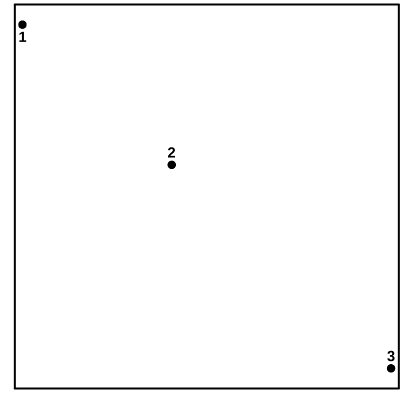
ABBREVIATIONS

COMMONLY USED ABBREVIATIONS	
ft. or ' - feet	elev. - Elevation
in. or " - inches	% - Percent
psf - pounds per square foot	No. - Number
plf - pound per lineal foot	TB - Test Boring
pcf - pounds per cubic feet	N - blow count (SPT, bpf)
kip - 1000 pounds	USCS - Unified Soil Classification System
ksf - 1000 pounds per square foot	LL - Liquid Limit
klf - 1000 pounds per lineal foot	PL - Plastic Limit
tsf - tons per square foot	PI - Plasticity Index
bpf - blows per foot (SPT, N)	



PROFILE OF BORINGS

Plan View (NORTH)



Profile of Borings Legend

Symbol	Description
Strata symbols	
	Lean Clay Topsoil
	Clayey sand to very sandy clay
	Clayey Sand
	Lean Clay
	Sandy Lean Clay
	Lean Clay Alluvium
	Clay Shale
Misc. Symbols	
	Water table at completion

ALLENDER BUTZKE ENGINEERS, INC.

Taylor AML Reclamation Project
SW 1/4 Section 11, T72N, R14W
Wapello County, Iowa

PN 241175

Vertical Scale: 1 inch = 5 feet

Plate A-1

BORING LOG NO. 1

Project No.: **241175**

Project: **Taylor AML Reclamation Project**
SW 1/4 Section 11, T72N, R14W
Wapello County, Iowa

Client: **French Reneker Associates Inc.**
1501 S. Main Street
Fairfield, Iowa 52556

Surface Elevation: **698.6'**
Datum: **Site Survey**
Date Drilled: **6-20-2024**
Drilling Depth, ft.: **26**
Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							Dark brown lean clay, trace sand and organics, damp **TOPSOIL**		CL		1.5 / 697.1
		1	SSA	8	14.3			Dark brown-gray clayey fine sand to very sandy lean clay, damp to moist		SC/ CL		
695	5	2	SSA	9	14.3							
		3	SSA	12	10.9							
690	10	4	SSA	16	14.4			Brown clayey fine to medium sand, damp after 8.5' **GLACIAL OUTWASH**		SC		
685	15	5	SSA	10	9.9			Saturated after 16'			▽	
								Light gray lean clay from 17' to 18.5'		CL		
680	20	6	SSA	9								22 / 676.6
675								Brown-gray sandy lean clay, moist **PRE-ILLINOIAN GLACIAL TILL**		CL		
	25	7	SSA	16	20.9							26 / 672.6
670	30							End of Boring				
665	35											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion ______ hrs. ______ days

Depth to water: 15 ft. ▽ ______ ft. ______ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 2

Project No.: 241175

Project: Taylor AML Reclamation Project, SW 1/4 Section 11, T72N, R14W, Wapello County, Iowa	Client: French Reneker Associates Inc., 1501 S. Main Street, Fairfield, Iowa 52556
Surface Elevation: 694.6'	Date Drilled: 6-20-2024
Datum: Site Survey	Drilling Depth, ft.: 28.6
Drilling Method: 4" CFA	Page: 1 of 1

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	USCS	Water Level	Depth / Elevation ft.
	0							Dark brown lean clay, trace sand, damp **TOPSOIL**	CL		1.5
		1	SSA	5	20.7			Dark gray lean clay, damp	CL		693.1
690	5	2	SSA	6	15.8						
		3	SSA	10	16.7			**COHESIVE ALLUVIUM**			
685	10	4	SSA	10	14.6						13.5
680	15	5	ST		19.1	111	1360	Dark gray clayey fine to medium sand, very moist	SC		681.1
								Saturated after 15.5'		▽	
								Gray lean clay between 17.5' and 19'	CL		
675	20	6	SSA	23	20.6 20.5			**GRANULAR ALLUVIUM**			
								Very dark gray lean clay, very moist after 22'	CL		24.5
670	25	7	SSA	43				Very dark gray to black shale, moist			670.1
								WEATHERED BEDROCK			28.6
665	30	8	SSA	50/1.5"				End of Boring			666
660	35										

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time:	at completion	____ hrs.	____ days
Depth to water:	15.5 ft. ▽	____ ft.	____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 3

Project No.: **241175**

Project: **Taylor AML Reclamation Project** **SW 1/4 Section 11, T72N, R14W** **Wapello County, Iowa**	Client: **French Reneker Associates Inc.** **1501 S. Main Street** **Fairfield, Iowa 52556**	
Surface Elevation: **701.9'** Datum: **Site Survey**	Date Drilled: **6-20-2024** Drilling Depth, ft.: **25**	Drilling Method: **4" CFA** Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							Dark brown lean clay, trace sand and organics, damp **TOPSOIL**		CL		1.5
700		1	SSA	7	22.6			Dark gray lean clay, trace sand, damp		CL		700.4
		2	SSA	10	23.3							
	5							**COHESIVE ALLUVIUM** Gray and moist after 5'				
695		3	ST		22.4	97	3590				▽	8.5
		4	ST		20.3		6240	Brown-gray sandy lean clay, trace gravel, moist		CL		693.4
	10							**PRE-ILLINOIAN GLACIAL TILL**				
690								Moisture seepage near 13.5'				13.5
		5	SSA	7	18.9			Gray-brown clay shale with coal fragments, moist				688.4
	15											
685								Very dark gray after 17.5'				
		6	SSA	10	26.1			**WEATHERED BEDROCK**				
	20											
680								Gray and dark sandy shale after 23.5'				
		7	SSA	45	19.4							25
	25							End of Boring				676.9
675												
	30											
670												
	35											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion ______ hrs. ______ days

Depth to water: 7 ft. ▽ ______ ft. ______ ft.

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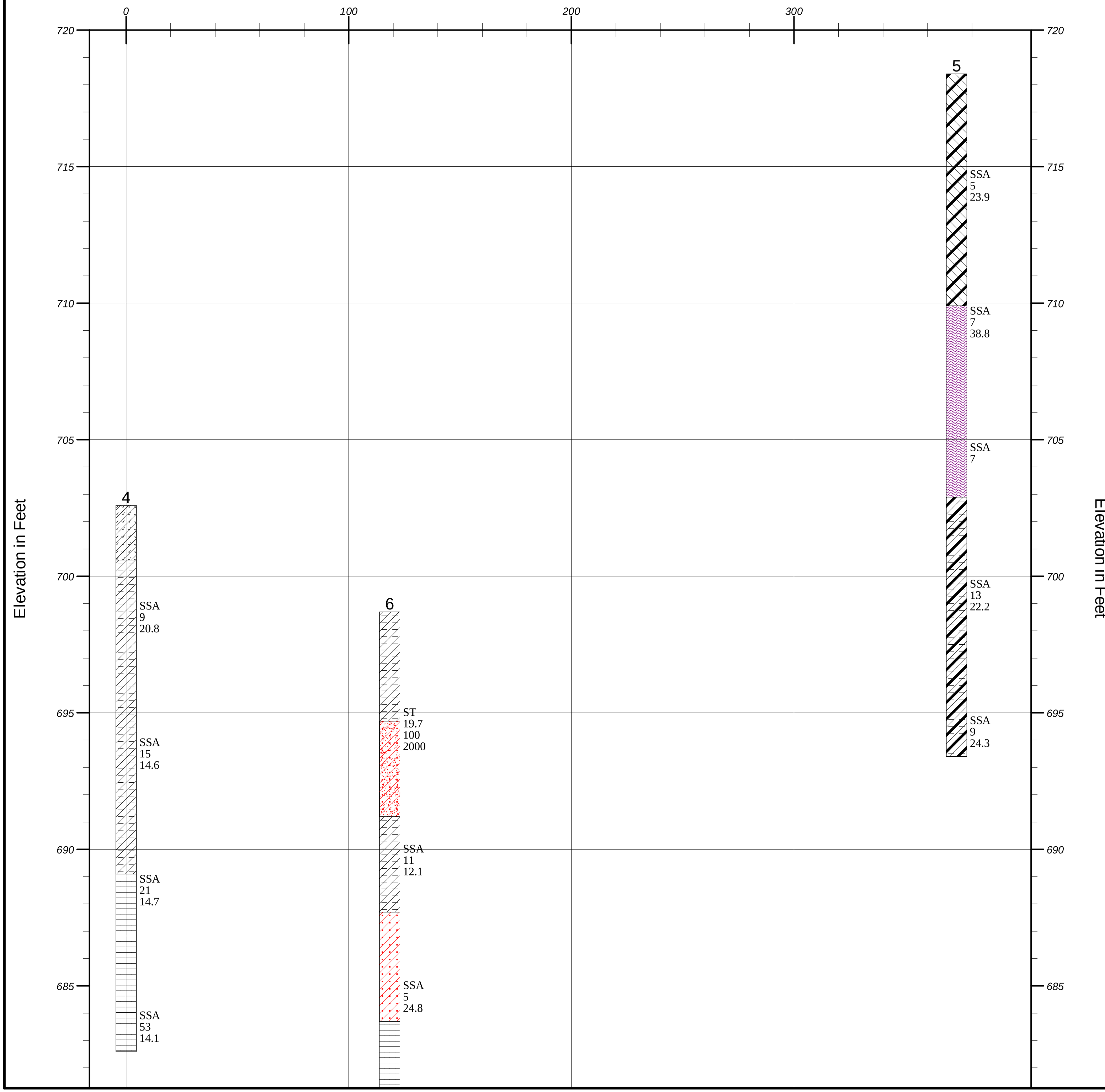
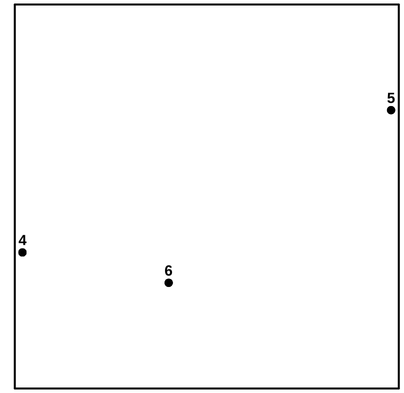
PROFILE OF BORINGS



Plan View (NORTH)



Profile of Borings Legend

Symbol	Description
Strata symbols	
	Lean Clay Topsoil
	Lean Clay Alluvium
	Clay Shale
	Clayey sand to very sandy clay
	Clayey Sand
	Fat Clay Fill
	Mine Spoils
	Lean to Fat Clay Alluvium

ALLENDER BUTZKE ENGINEERS, INC.

Taylor AML Reclamation Project
SW 1/4 Section 11, T72N, R14W
Wapello County, Iowa

PN 241175

Vertical Scale: 1 inch = 5 feet

Plate A-2

BORING LOG NO. 4

Project No.: **241175**

Project: **Taylor AML Reclamation Project** **SW 1/4 Section 11, T72N, R14W** **Wapello County, Iowa**	Client: **French Reneker Associates Inc.** **1501 S. Main Street** **Fairfield, Iowa 52556**

Surface Elevation: **702.6'**
Datum: **Site Survey**
Date Drilled: **6-20-2024**
Drilling Depth, ft.: **20**
Drilling Method: **4" CFA**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							Dark brown silty clay, trace sand, dry **TOPSOIL / COHESIVE ALLUVIUM**		CL		2
700								Gray lean clay, damp to moist Dark gray, moist after 3.5		CL		700.6
		1	SSA	9	20.8							
	5											
695								**COHESIVE ALLUVIUM**				
		2	SSA	15	14.6							
	10											
690												13.5
		3	SSA	21	14.7			Gray-brown clay shale, moist				689.1
	15							**WEATHERED BEDROCK**				
685												
		4	SSA	53	14.1							20
	20							End of Boring				682.6
680												
	25											
675												
	30											
670												
	35											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion ______ hrs. ______ days

Depth to water: **Dry** ft. ______ ft. ______ ft.

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BORING LOG NO. 5

Project No.: 241175

Project: Taylor AML Reclamation Project SW 1/4 Section 11, T72N, R14W Wapello County, Iowa	Client: French Reneker Associates Inc. 1501 S. Main Street Fairfield, Iowa 52556

Surface Elevation: 718.4'	Date Drilled: 6-20-2024	Drilling Method: 4" CFA
Datum: Site Survey	Drilling Depth, ft.: 25	Page: 1 of 1

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							Dark gray and gray mixed shaley fat clay, very moist **FILL**		CH		
715		1	SSA	5	23.9							
	5											8.5 / 709.9
710		2	SSA	7	38.8			Light gray and brown mine spoils, very moist **MINE SPOILS**				
	10											
705		3	SSA	7								
	15											15.5 / 702.9
700		4	SSA	13	22.2			Very dark gray lean to fat clay, trace sand, moist **COHESIVE ALLUVIUM**		CL-CH		
	20											
695		5	SSA	9	24.3							25 / 693.4
	25							End of Boring				
690	30											
685	35											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion ____ hrs. ____ days

Depth to water: Dry ft. ____ ft. ____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 6

Project No.: 241175

Project: Taylor AML Reclamation Project
SW 1/4 Section 11, T72N, R14W
Wapello County, Iowa

Client: French Reneker Associates Inc.
1501 S. Main Street
Fairfield, Iowa 52556

Surface Elevation: 698.7'
Datum: Site Survey
Date Drilled: 6-20-2024
Drilling Depth, ft.: 20
Drilling Method: 4" CFA
Page: 1 of 1

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Unconfined Compressive Strength psf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
	0							Dark gray lean clay, trace sand, damp to moist **COHESIVE ALLUVIUM**		CL		4
695	5	1	ST		19.7	100	2000	Brown clayey sand to very sandy lean clay, moist **GRANULAR ALLUVIUM**		SC/CL		694.7 7.5
690	10	2	SSA	11	12.1			Dark gray lean clay, moist Gray after 8.5' **COHESIVE ALLUVIUM**		CL		691.2 11
685	15	3	SSA	5	24.8			Brown clayey fine to medium sand, trace gravel, moist **GRANULAR ALLUVIUM**		SC		687.7 15
680	20	4	SSA	9	25.2			Very dark gray clay shale, moist to very moist Moisture seepage noted at 17' **WEATHERED BEDROCK**				683.7 20
675	25							End of Boring				678.7
670	30											
665	35											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation

Time: at completion ____ hrs. ____ days

Depth to water: Dry ft. ____ ft. ____ ft.

ALLENDER BUTZKE ENGINEERS, INC.

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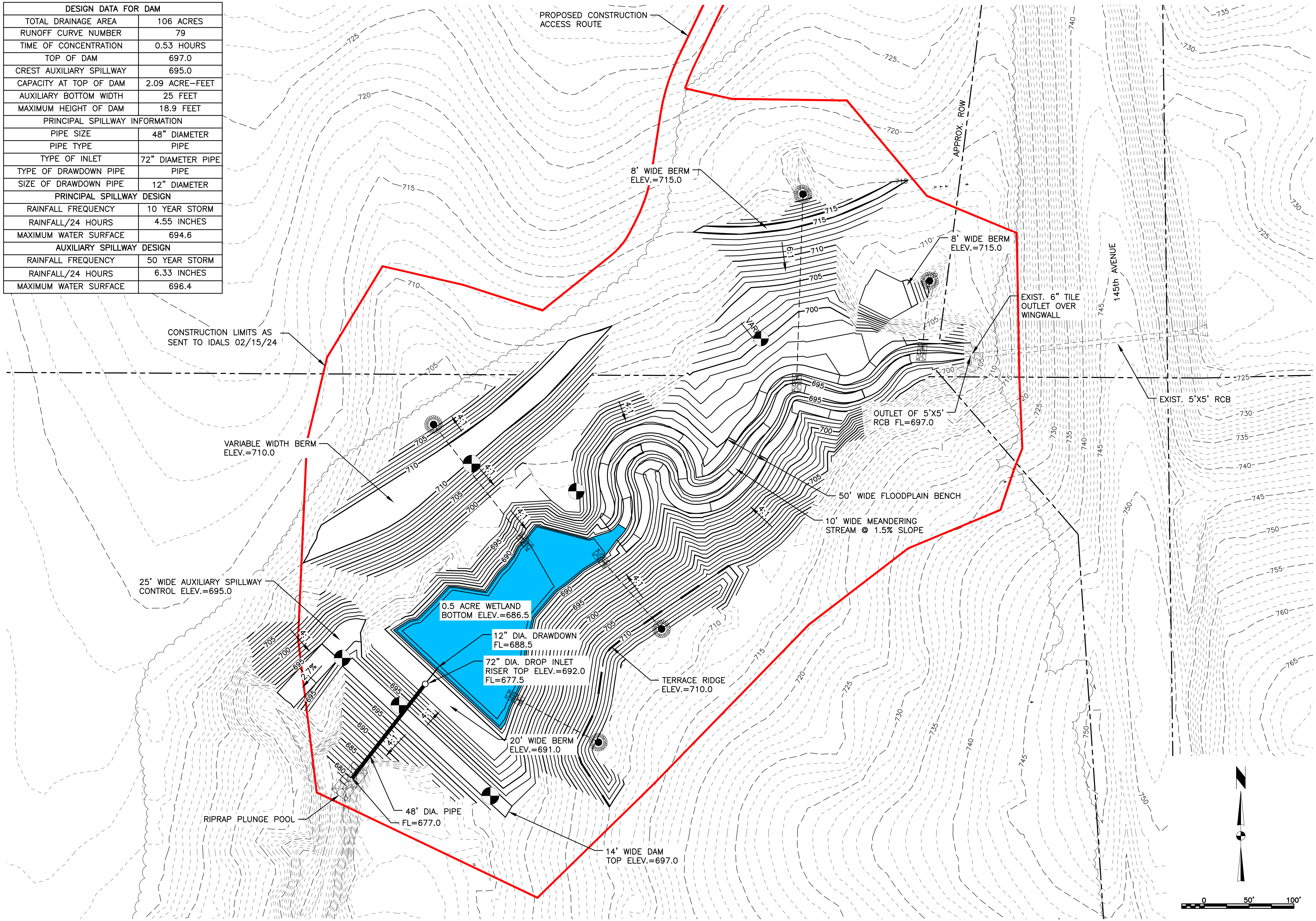
DESIGN DATA FOR DAM	
TOTAL DRAINAGE AREA	106 ACRES
RUNOFF CURVE NUMBER	79
TIME OF CONCENTRATION	0.53 HOURS
TOP OF DAM	697.0
CREST AUXILIARY SPILLWAY	695.0
CAPACITY AT TOP OF DAM	2.09 ACRE–FEET
AUXILIARY BOTTOM WIDTH	25 FEET
MAXIMUM HEIGHT OF DAM	18.9 FEET
PRINCIPAL SPILLWAY INFORMATION	
PIPE SIZE	48" DIAMETER
PIPE TYPE	PIPE
TYPE OF INLET	72" DIAMETER PIPE
TYPE OF DRAWDOWN PIPE	PIPE
SIZE OF DRAWDOWN PIPE	12" DIAMETER
PRINCIPAL SPILLWAY DESIGN	
RAINFALL FREQUENCY	10 YEAR STORM
RAINFALL/24 HOURS	4.55 INCHES
MAXIMUM WATER SURFACE	694.6
AUXILIARY SPILLWAY DESIGN	
RAINFALL FREQUENCY	50 YEAR STORM
RAINFALL/24 HOURS	6.33 INCHES
MAXIMUM WATER SURFACE	696.4



FILE: G:\2023\23037\DL\DRAWINGS\PLANS\6 GRADING.DWG

REVISION:	DATE:	DESCRIPTION:

CHKD. BY: SIP | ISSUED: 03-05-24 | REVISED: NONE

IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
DIVISION OF SOIL CONSERVATION AND WATER QUALITY
HENRY A. WALLACE BUILDING
502 E. 9th STREET, DES MOINES, IOWA 50319
(515)-281-4246

DESIGN BY: SRB | DRAWN BY: SRB

TAYLOR AML RECLAMATION PROJECT

POST-RECLAMATION GRADING PLAN

NOTES