HARD HAT SERVICES™
Engineering, Construction and Management Solutions

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www.hardhatinc.com

VIA EMAIL

October 30, 2020

Mr. Jeffrey Maxted
Alliant Energy – Environmental Services Manager
4902 North Biltmore Lane
Madison, WI 53718-2148

Re: Unstable Areas Determination CCR Surface Impoundments - §257.64
Interstate Power and Light Company (IPL)
Lansing Generating Station
Lansing, Iowa

Mr. Jeffrey Maxted,

This Unstable Areas Determination has been prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) published Final Rule for Hazardous and Solid Waste Management System – Disposal of Coal Combustion Residual (CCR) from Electric Utilities (40 CFR Parts 257 and 261, also known as the CCR Rule) published on April 17, 2015 (effective October 19, 2015) and subsequent amendments. This letter assesses the factors of one CCR unit at Interstate Power and Light Company (IPL), Lansing Generating Station (LAN) in Lansing, Iowa in accordance with the CCR Rule §257.64 Unstable Areas. For purposes of this Report, "CCR unit" refers to an existing or inactive CCR surface impoundment.

Background Information

In accordance with the requirements set forth in §257.64 of the CCR Rule a CCR unit must not be located in an unstable area. The owner or operator must consider all the following factors:

- On-site or local soil conditions that may result in significant differential settling,
- On-site or local geologic or geomorphologic features; and,
- On-site or local human-made features or events (both surface and subsurface).

Facility Specific Information

LAN is located at 2320 Power Plant Drive, Lansing, Iowa. Figure 1 provides both a topographic map and an aerial of the LAN facility location, with the approximate property boundary of the facility identified. LAN has one existing CCR surface impoundment (Figure 2), which is the LAN Upper Ash Pond.

Differential Settling

The LAN Upper Ash Pond was constructed in 1974 in a valley directly south of the LAN generating station. The construction took place within the valley with the east and south side of the Upper Ash Pond being constructed against naturally occurring ground surface. The north and west sides of the impoundment were constructed of dredge spoil medium to fine sand from Mississippi River maintenance dredging.

To allow construction of the impoundment, the Unnamed Creek #1 was rerouted to run along the west side of the valley between the impoundment and a County Road on the east side slope of the valley, Figure 1. Soil investigations completed at the time of construction indicate the valley is underlain by a medium dense deposit of sand and gravel over the full valley floor with loose to very loose river silt laying on top of the sand and gravel at the north end of the planned Upper Ash Pond. Only organic topsoil was removed prior to constructing the two embankment sides of the LAN Upper Ash Pond and the river silt remains in the foundation at the northern end of the LAN Upper Ash Pond. The details of the LAN Upper Ash Pond construction are shown in drawings prepared by Sargent & Lundy in 1974, Exhibit A.

The LAN Upper Ash Pond was constructed on foundation soils that are medium dense sand and gravel in the southern part of the Pond and are suitable foundation soils. In the northern end of the pond the sand and gravels have an overlying river silt deposit that is loose to very loose and is saturated due to the Mississippi River. The original construction of the LAN Upper Ash Pond was completed over the top of the river silt which has no clay-like properties (Exhibit B) and supported the embankment without substantial settlement after construction.

In 2015, a subsurface soil investigation was undertaken to collect soil samples and determine the in-situ density of the north and west embankments and the underlying foundation soil. The soil borings were undertaken with hollow stem augers and sampling was completed with a standard split spoon (Figure 2). The density information along with soil test results for water content, grain size, and Atterberg limits (Exhibit B) indicate the current conditions of the embankments as they were constructed in 1974.

The test results indicate that the embankment is constructed of uniform, fine to medium sand (SP). The sand was compacted to medium dense to dense consistency as shown by the SPT results. Below the embankment, the two northern borings SB-1 and SB-7 (Figure 2) show that a very loose to loose silt is present under the embankment overlying a medium dense gravel. In borings SB-3 and SB-5 (Figure 2) the silt is thin and overlies the same gravel. The silt deposit in the two northern borings is from backwater deposition by the Mississippi River prior to the installation of the LAN Upper Ash Pond and the thin silt layer to the south is natural deposition from flooding of the Unnamed Stream #1.

The silt layer under the northern embankment of the LAN would have compressed under the load from installing the embankment in 1974. Annual inspections of the embankment and topographic surveys completed in 2015 show the northern embankment was built to its design elevation and has not settled since the embankment was installed. The loose silt is susceptible to liquefaction settlement from an earthquake. However, the LAN site is not in an area of strong ground motion to induce liquefaction.

The Iowa Bedrock Survey Map (Exhibit C), available from the Iowa Geology and Water Survey, July 2013 indicates that bedrock is at an approximate elevation of 560 feet (depth of 90 feet below top of embankment) in the northern part of the LAN Upper Ash Pond and rises in elevation moving south up the valley of the Unnamed Stream #1.

Based on the known geotechnical information, LAN impoundments are not susceptible to significant differential settlement from liquefaction of the silt layer. Additionally, annual inspections of the embankments for the last 4 years have indicated no observable areas of differential settlement on the embankments.

Geologic and Geomorphologic Features

The Bedrock Geologic Map of Iowa (Exhibit C) shows that the site contains up to five types of bedrock formations: Prairie du Chien Group, St. Peter Sandstone, Jordan Sandstone, St. Lawrence, and Lone Rock Formations. The formations are comprised of dolomite and siltstone. The Iowa Bedrock Survey Map available from the Iowa Geology and Water Survey, July 2013 indicates that bedrock is at an approximate elevation of 560 feet (depth of 90 feet below top of embankment) in the northern part of the LAN Upper Ash Pond and rises in elevation moving south up the valley of the Unnamed Stream #1.

Karst formations in Iowa are predominately in the northeast part of the state, see Exhibit D, which is where LAN is located. An Iowa Department of Natural Resources map of known and potential karst terrain and/or paleosinks (sinkholes) near LAN has also been included in Exhibit D. This map shows that the LAN is located inside an area potentially susceptible to karst formations. A sinkhole has been identified approximately 2,000 feet east of the LAN Upper Ash Pond. The mapped location of the sinkhole is approximately 300 feet higher than the impoundment. As presented within the SCS Engineers Unstable Areas Compliance Demonstration[1] for the onsite landfill, The Galena Group, which consists of limestone and dolostone, has identified paleosinks within Allamakee County and is stratigraphically above the weathered sandstone unit observed in many borings installed throughout the LAN Upper Ash Pond and the landfill site. As a result, it is unlikely that karst conditions are present below the impoundment.

Several figures and tables have been included in Exhibit E which have been provided by SCS Engineers. These figures show that the local shallow groundwater direction descends from the bluffs as well as generally moving northward to the Mississippi River. The measurement of occasional downward gradient in the nested wells likely results from the silt layer discussed above acting as an aquitard separating the upper ground water in the valley from the deeper ground water of the Mississippi River elevation. Additionally, water recharging the valley groundwater from operations at LAN is at or above a pH of 7. As a result, there is no risk for the formation of paleosinks.

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[1] Unstable Areas Demonstration Lansing Landfill, SCS Engineers, October 2018

Human-made Features or Events

Generally, man-made risks to the stability of CCR impoundments can include such events as: large dam failure, failure due to improper cut and fill during construction, excessive drawdown of groundwater, extreme fluctuations in flooding from human-made changes, or failure due to underground mining. Based on the information provided herein, the LAN Upper Ash Pond are is not susceptible to anthropogenic activities.

Unstable Areas Determination

After review of the reasonably and readily available documentation, we determine that the LAN Upper Ash Pond is not located in unstable area.

Qualified Professional Engineer Certification

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer attesting that the documentation as to whether a CCR unit meets the requirements 40 CFR 257.64(b).

To meet the requirements of 40 CFR 257.64(c), I Mark W. Loerop hereby certify that I am a licensed Professional Engineer in the State of Iowa; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in 40 CFR 257.64.

MARK W. LOEROP
22197

By:
Name: MARK LOEROP
Date: OCT 30, 2020

cc: Tony Morse, Alliant Energy
Robert Solak, Hard Hat Services

att: Figure 1 – Site Location
Figure 2 – Soil Boring Locations
Exhibit A – 1974 Drawings
Exhibit B – 2015 Investigation
Exhibit C – Iowa Bedrock Map
Exhibit D – Iowa Karst Maps
Exhibit E – Groundwater Info from SCS Engineers

MWL/tjh/MWL
Z:\Shared\Projects\154 - Alliant Energy\154.018 - CCR Projects\023 - 2020 LAN and BGS UCD\002 - LAN UAD\Unstable Area Determination\LAN Unstable Areas - DRAFT.doc

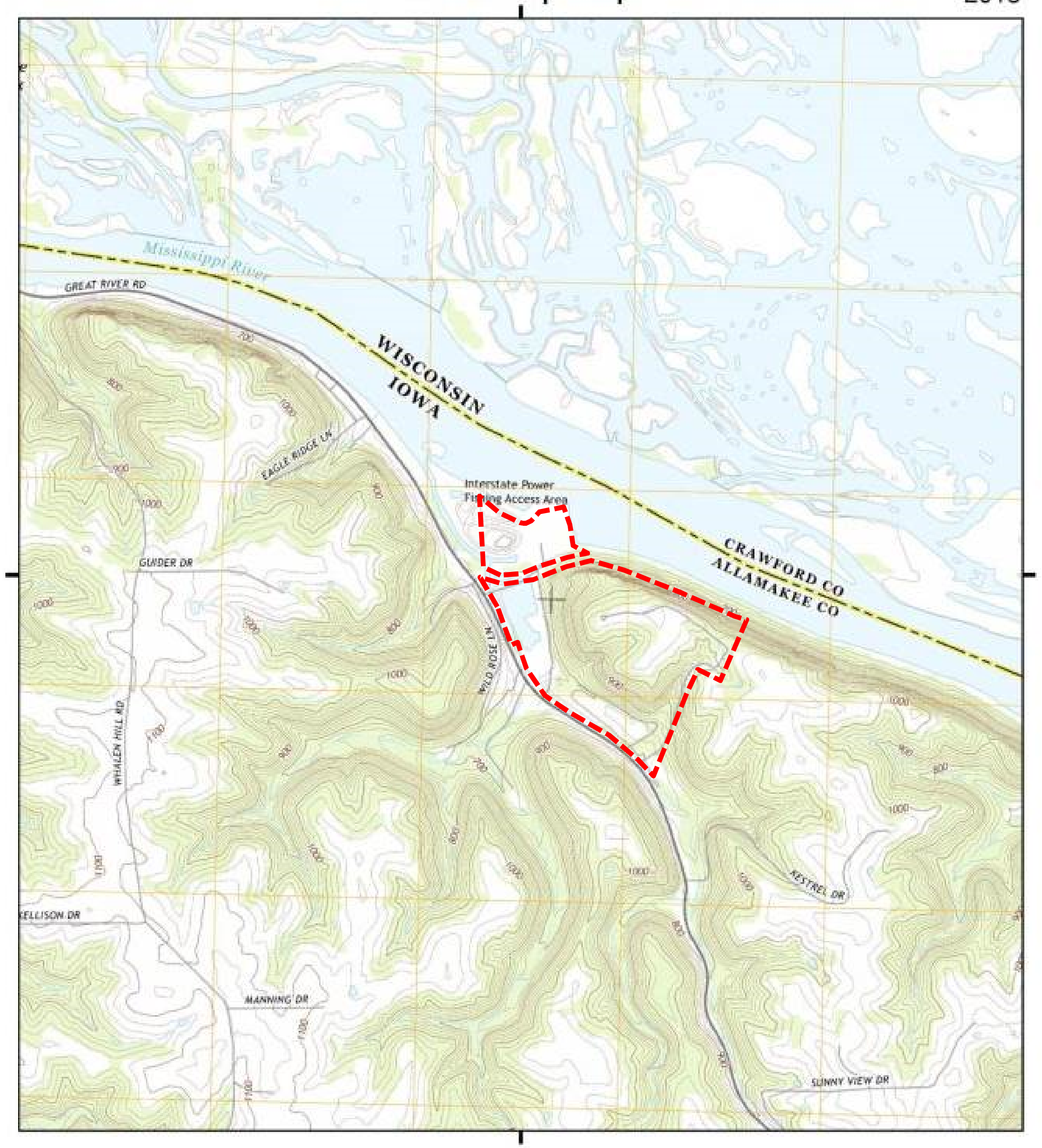
FIGURES

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

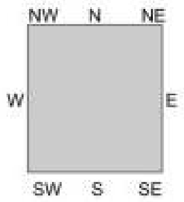
Unstable Area Determination

Historical Topo Map

2013



This report includes information from the following map sheet(s).



TP, Lansing, 2013, 7.5-minute

SITE NAME: Lasing Generating Station
ADDRESS: 2364-2366 Power Plant Dr
Lansing, IA 52151
CLIENT: Environmental Site Assessors

N

4555570 - 1 page 5

Historical Aerial Photo

--- Approximate Property Boundary

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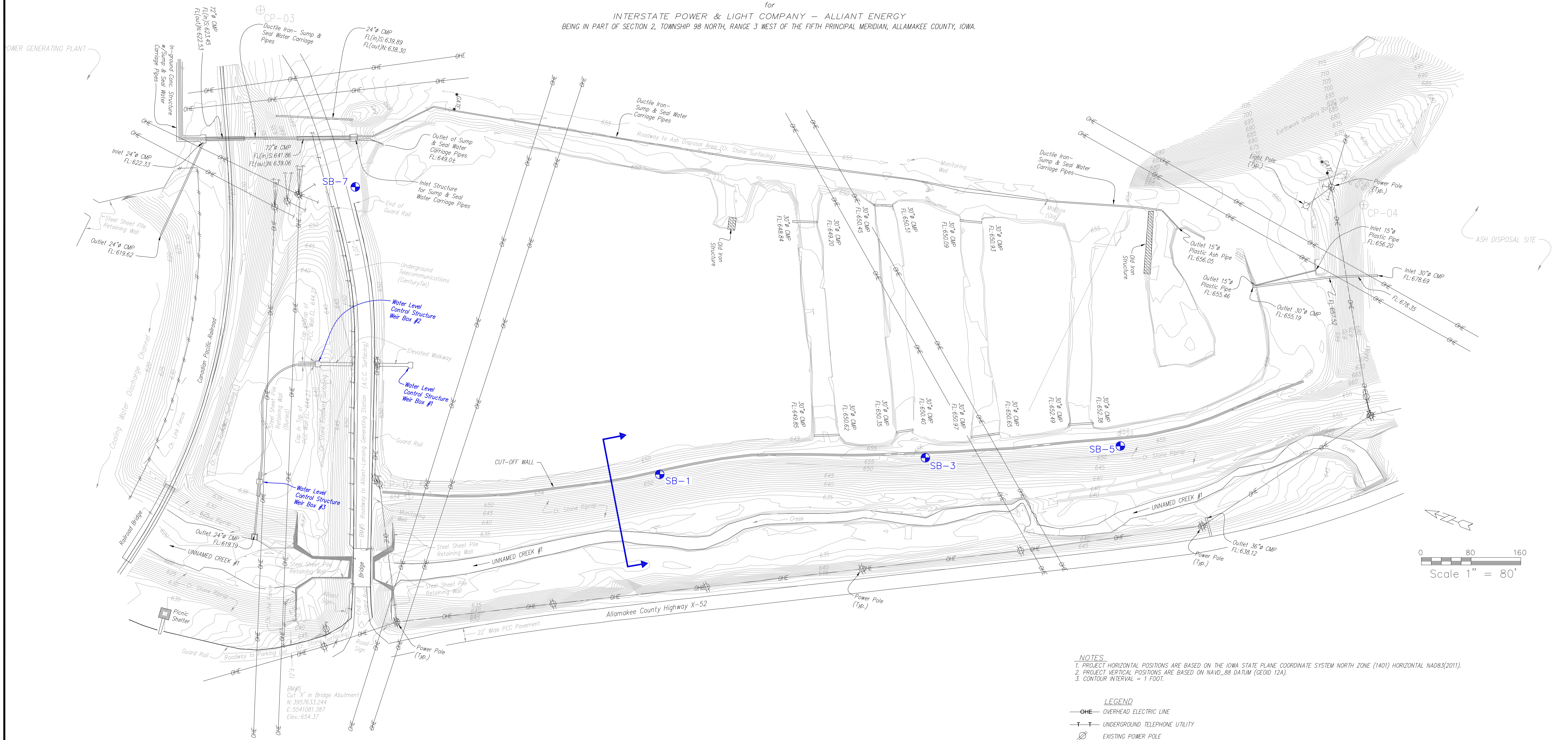
Site Location
Lansing Generating Station
Intersate Power and Light Company

Drawing
Figure 1

Date
6/7/2016

UPPER AND LOWER CCR POND TOPOGRAPHIC SURVEY AND LOWER CCR POND BATHYMETRY
at
ALLIANT LANSING POWER GENERATING STATION
for
INTERSTATE POWER & LIGHT COMPANY – ALLIANT ENERGY
BEING IN PART OF SECTION 2, TOWNSHIP 98 NORTH, RANGE 3 WEST OF THE FIFTH PRINCIPAL MERIDIAN, ALLAMAKEE COUNTY, IOWA.



NOTES
1. PROJECT HORIZONTAL POSITIONS ARE BASED ON THE IOWA STATE PLANE COORDINATE SYSTEM NORTH ZONE (1401) HORIZONTAL NAD83(2011).
2. PROJECT VERTICAL POSITIONS ARE BASED ON NAVD_88 DATUM (GEOID 12A).
3. CONTOUR INTERVAL = 1 FOOT.

LEGEND

—OHE—	OVERHEAD ELECTRIC LINE
—T—T—	UNDERGROUND TELEPHONE UTILITY
ø	EXISTING POWER POLE
SB ⊕	SOIL BORING LOCATION
↑__↑	ANALYSIS CROSS-SECTION

NOTE:
1. SURVEY INFORMATION PROVIDED ABOVE WAS COMPILED BY MOHN SURVEYING, INC. 1890 GREAT RIVER ROAD LANSING, IOWA 52151, APRIL 2015.
2. ALLIANT ENERGY REQUIRES 20 FEET OVERHEAD SEPARATION DISTANCE FOR EQUIPMENT OPERATING UNDER POWERLINES.

REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1				

SCALE: AS SHOWN
DATE: 5-19-16
DRAWN BY: JFD
CHECKED BY: CTS
APPROVED BY: MWL

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Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SOIL BORING AND
SLOPE STABILITY CROSS-SECTION LOCATION

JOB 154.018.012.002
SHT. FIGURE 2
DWG. 154.018.012.002-D2

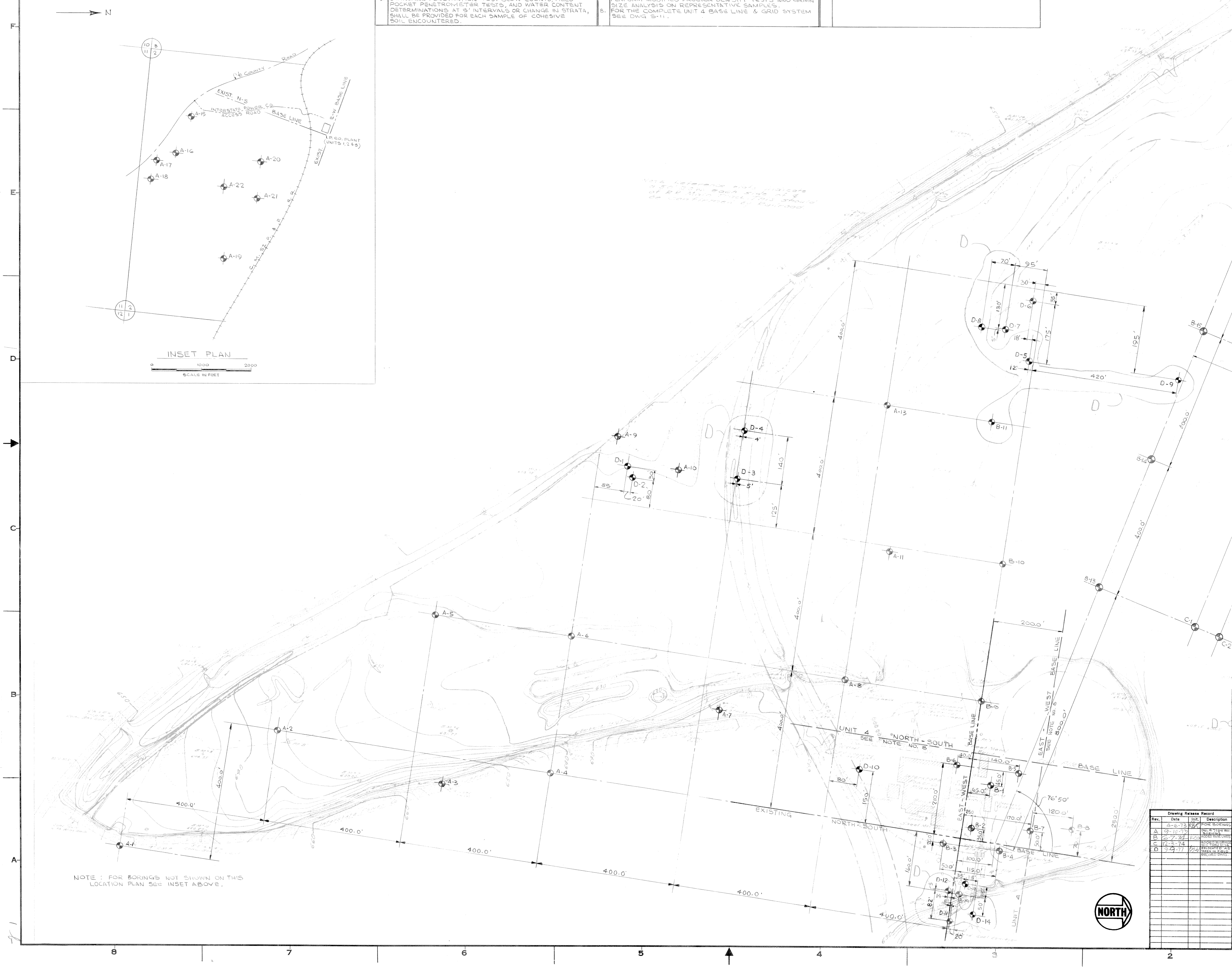
EXHIBIT A – 1974 Drawings

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Unstable Area Determination

NOTES

1. A-1 THRU A-22 25' MAXIMUM OR TO ROCK.
2. B-1 AND B-2 CORE 10' INTO SOLID ROCK, B-3 THRU B-19 TO ROCK.
3. C-1 THRU C-6 25' MAXIMUM BELOW WATER LEVEL OR TO ROCK.
4. STANDARD PENETRATION TEST BLOW COUNTS AT 5' INTERVALS OR CHANGE IN STRATA SHALL BE PROVIDED FOR EACH SAMPLE OF GRANULAR SOIL ENCOUNTERED.
5. STANDARD PENETRATION TEST BLOW COUNTS, FIELD POCKET PENETROMETER TESTS, AND WATER CONTENT DETERMINATIONS AT 5' INTERVALS OR CHANGE IN STRATA, SHALL BE PROVIDED FOR EACH SAMPLE OF COHESIVE SOIL ENCOUNTERED.
6. THE TYPE, CONSISTENCY, RECOVERY RATIO, ROCK QUALITY DESIGNATION AND LABORATORY UNCONFINED COMPRESSION TESTS ON REPRESENTATIVE ROCK SAMPLES SHALL BE PROVIDED FOR EACH ROCK CORE.
7. OBTAIN REPRESENTATIVE SOIL SAMPLES FROM THE RIVER BOTTOM, BORINGS NO. C-1 THRU C-6 AND THE SOUTHERN HALF OF THE SITE, BORINGS NO. A-1 THRU A-11, A-14, A-15 & A-18. PERFORM MODIFIED PROCTOR DENSITY TESTS AND GRAIN SIZE ANALYSIS ON REPRESENTATIVE SAMPLES.
8. FOR THE COMPLETE UNIT 4 BASE LINE & GRID SYSTEM SEE DWG S-11.
9. D-1 THRU D-14 TO ROCK.



NOTE: FOR BORINGS NOT SHOWN ON THIS LOCATION PLAN SEE INSET ABOVE.

SEE TOP OF DRAWING FOR NOTES

REFERENCE DRAWINGS

S-3	SOIL BORING LOGS - SHEET 1
S-4	SOIL BORING LOGS ~ SHEET 2
S-5	SOIL BORING LOGS ~ SHEET 3
S-6	SOIL BORING LOGS - SHEET 4
S-10	SITE DEVELOPMENT - COFFERDAM AND DREDGING PLAN
S-11	SITE DEVELOPMENT - PLANT FILL

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

Signed
R.N. Bergstrom, P.E., Iowa Reg. No. 4480

Date 9-10 1973

R. N. BERGSTROM 4480

Drawing Release Record

Rev.	Date	Init.	Description
	4-6-73	RBK	FOR BORINGS
A	9-10-73		DELETED REV. BORINGS
B	6-7-74	RCO	ADDED BASE LINES
C	12-3-74		ADDED BORINGS D-1 THRU D-14
D	9-9-77		RELOCATED AS TAKEN IN FIELD RECORD DWG.

BORING LOCATION PLAN
UNIT 4
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

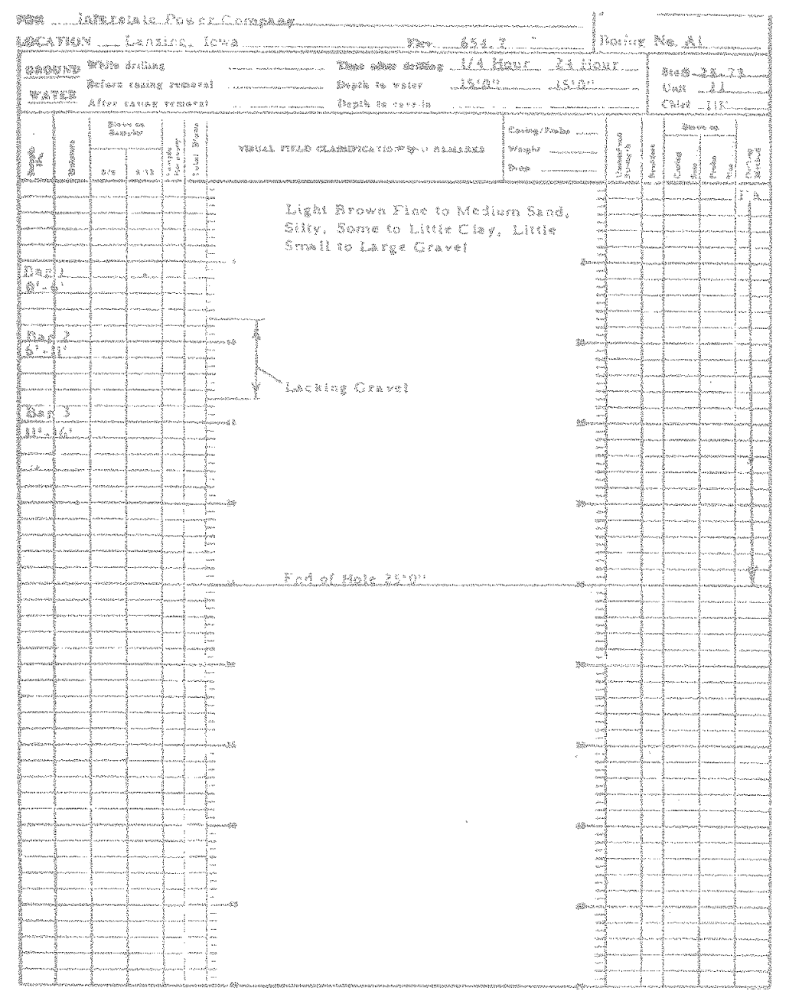
SCALE 1" = 100'
DRAWN WM. L. VOLK 4-3-73
CHECKED R.C. ODEGARD 9-7-73
ENGINEER W. L. Groh 9-10-73
APPROVED R.N.Bergstrom 9-10-73
JOB NO. 4644-03

SARGENT & LUNDY
ENGINEERS
CHICAGO

DRAWING NO.
S-1

1/8" 0 4 8

BORING A-1



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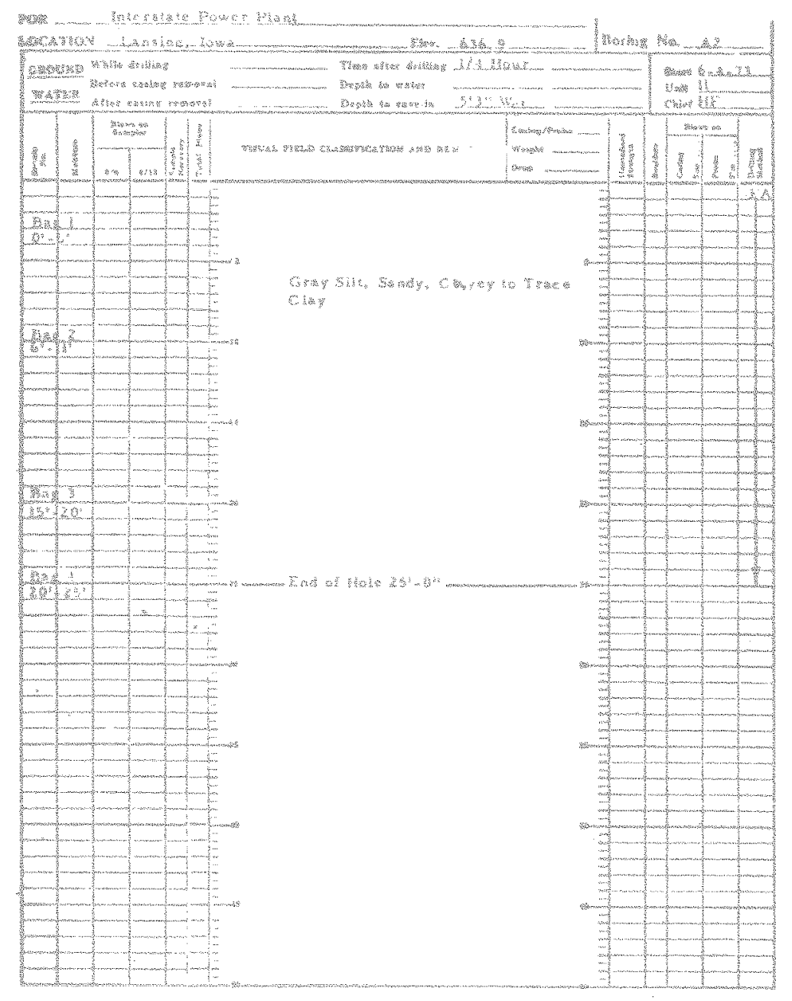

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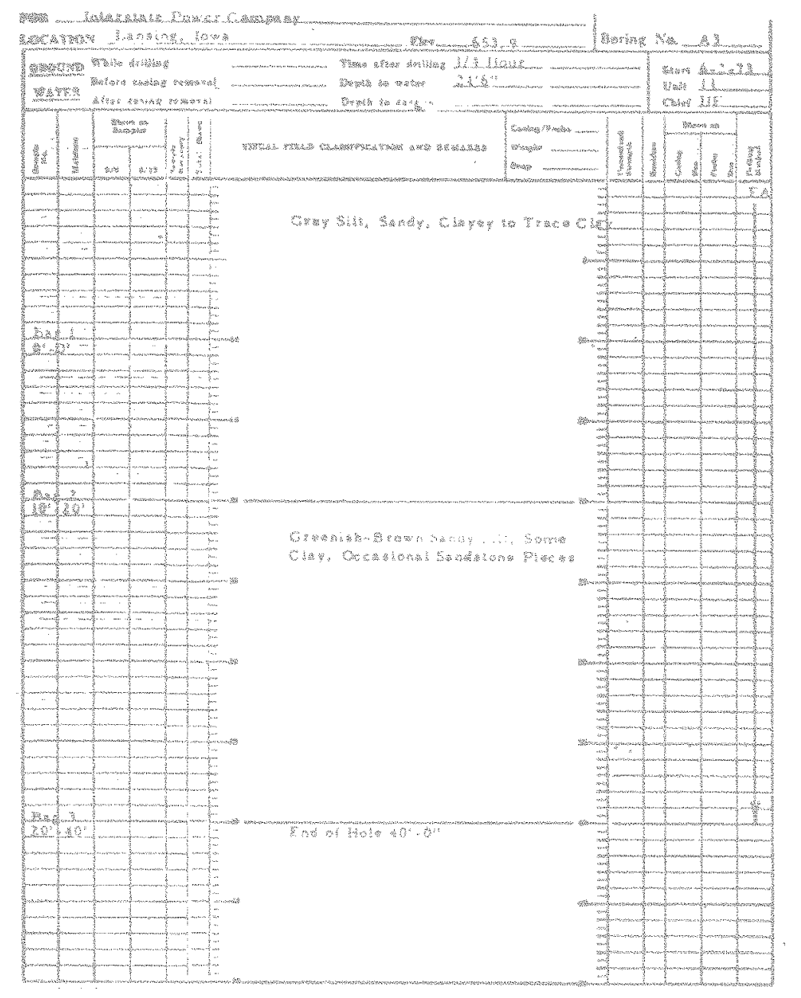

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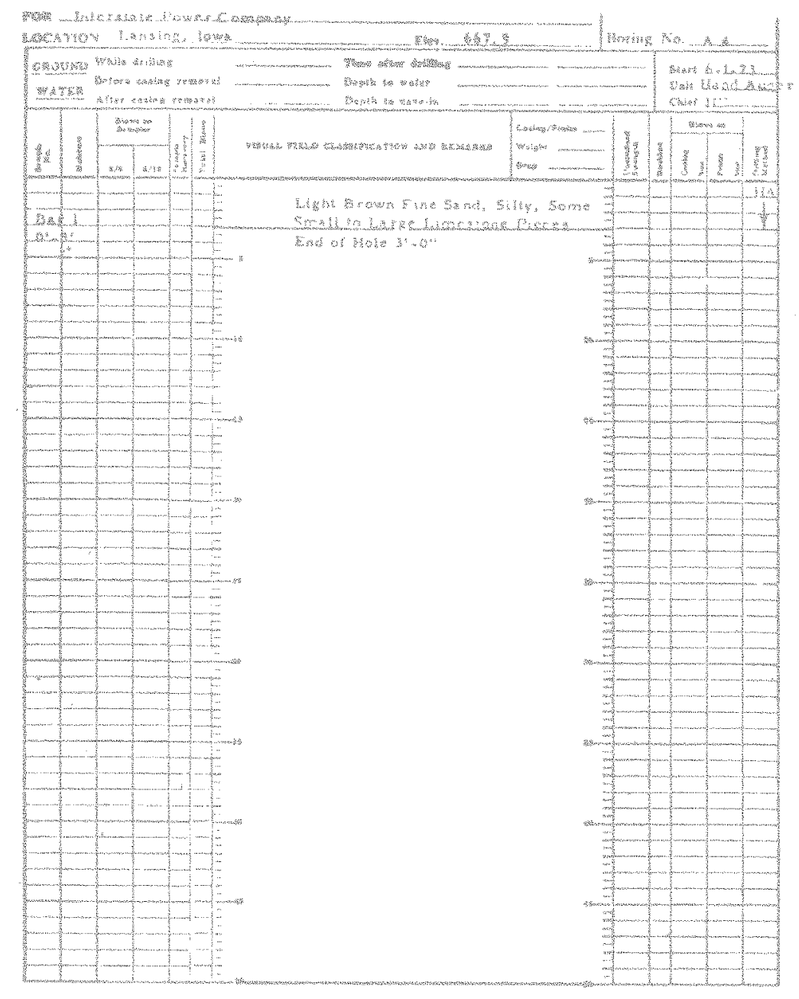

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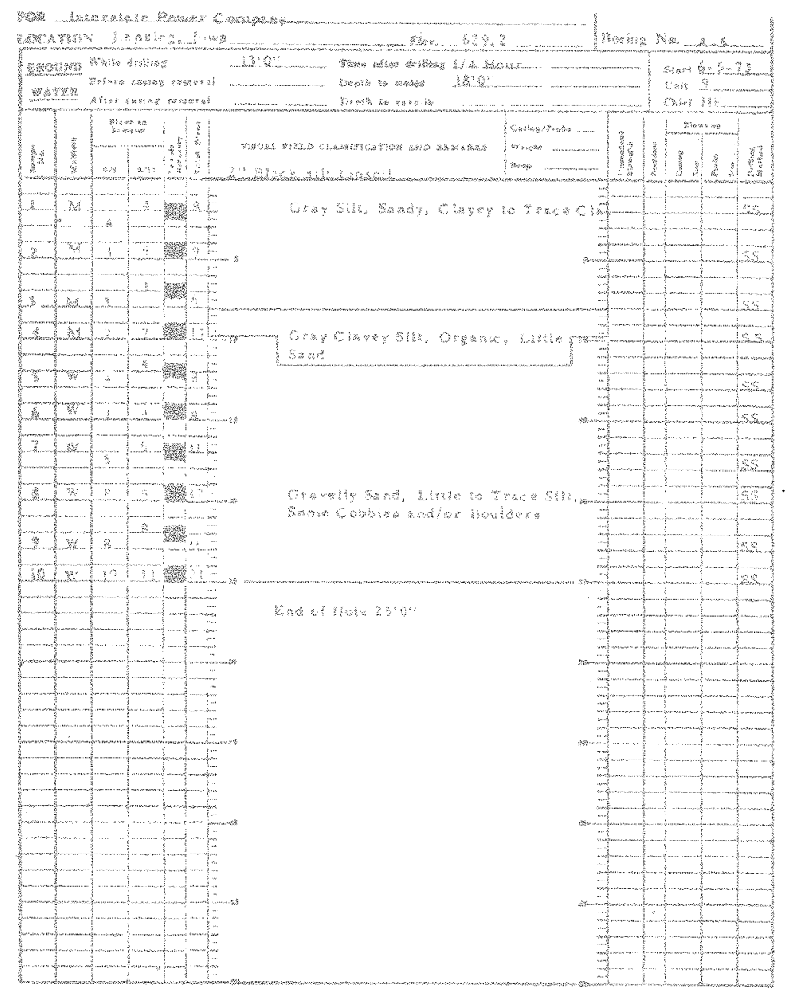

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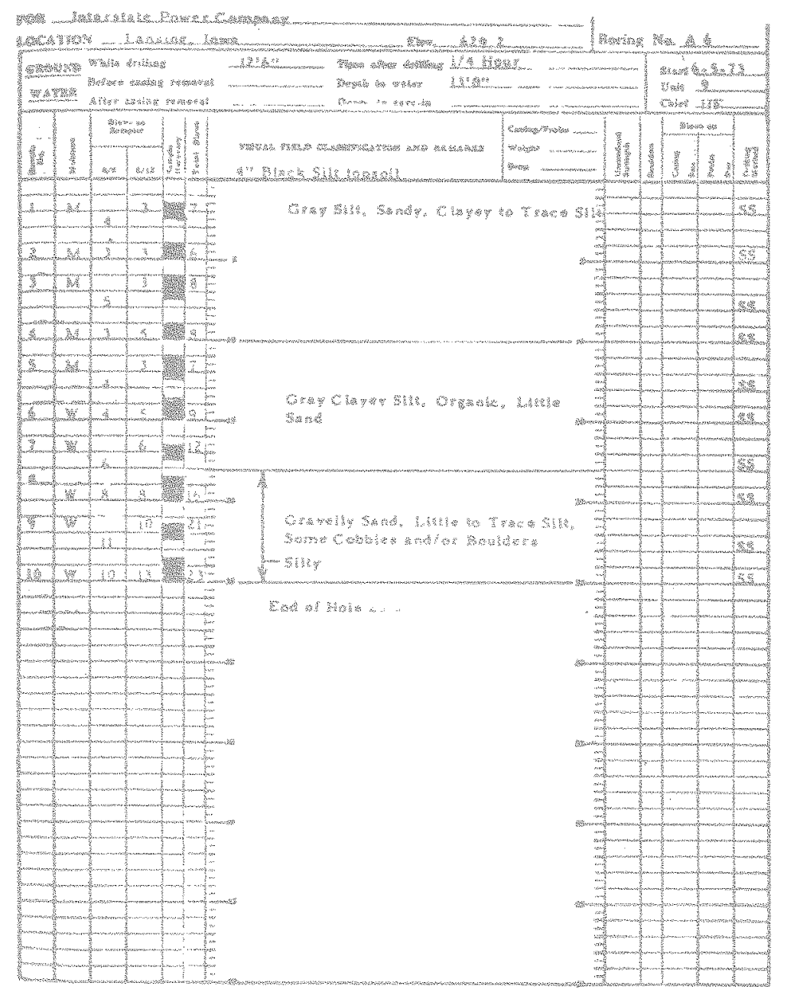

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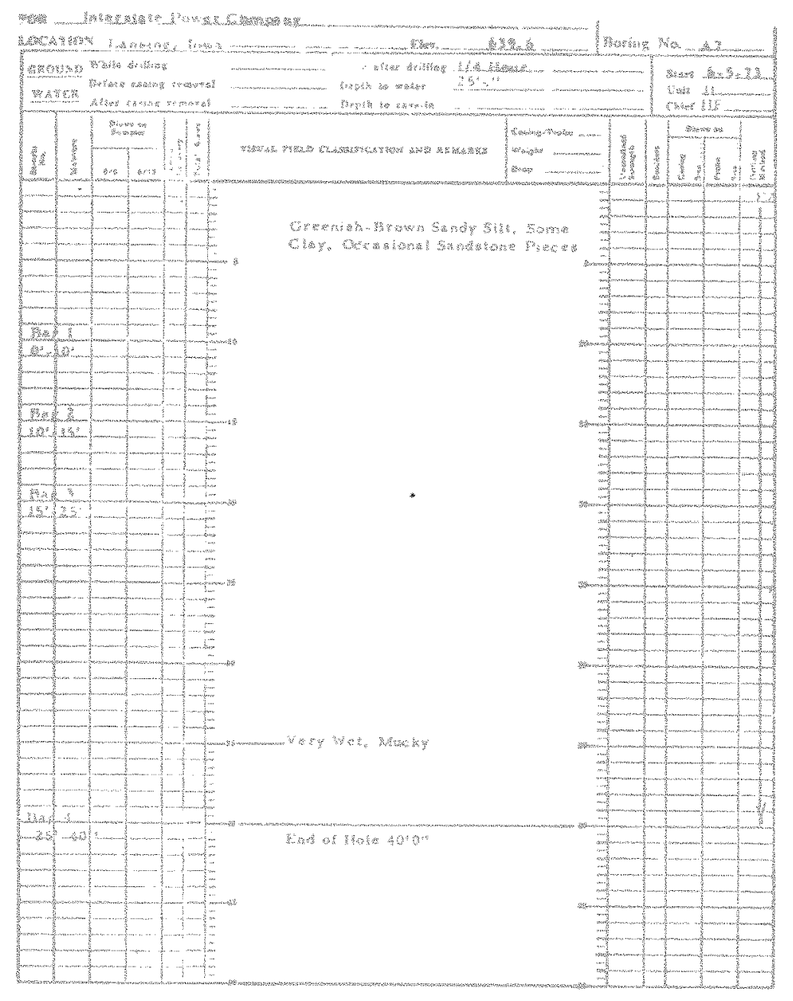

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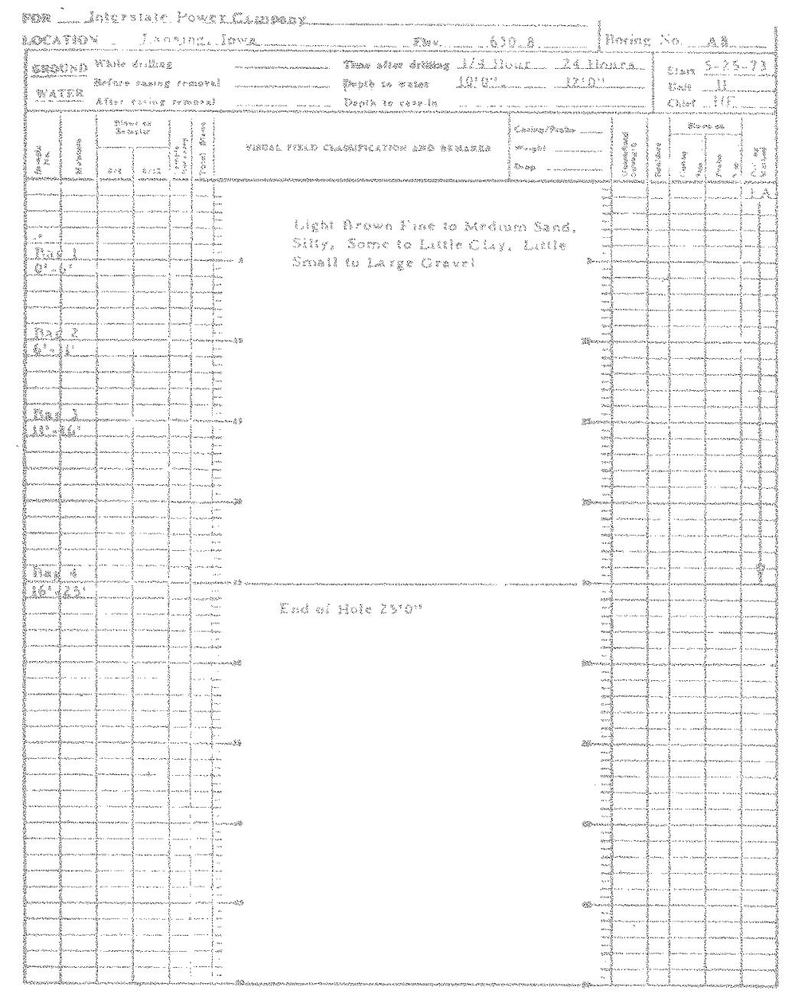

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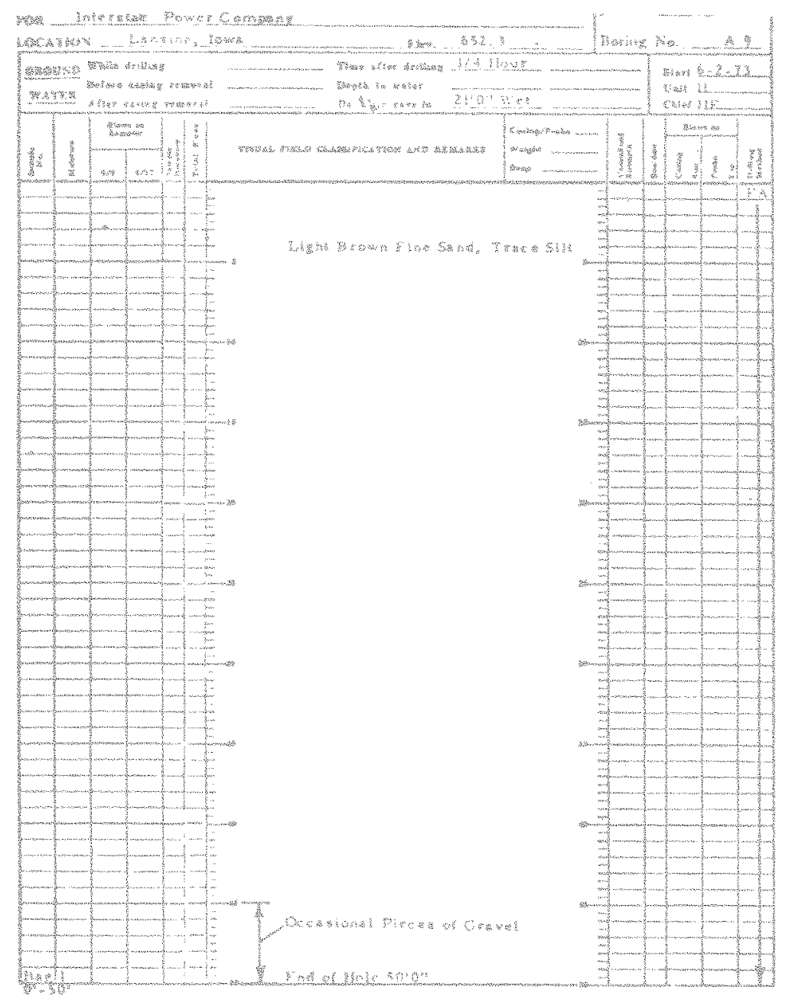

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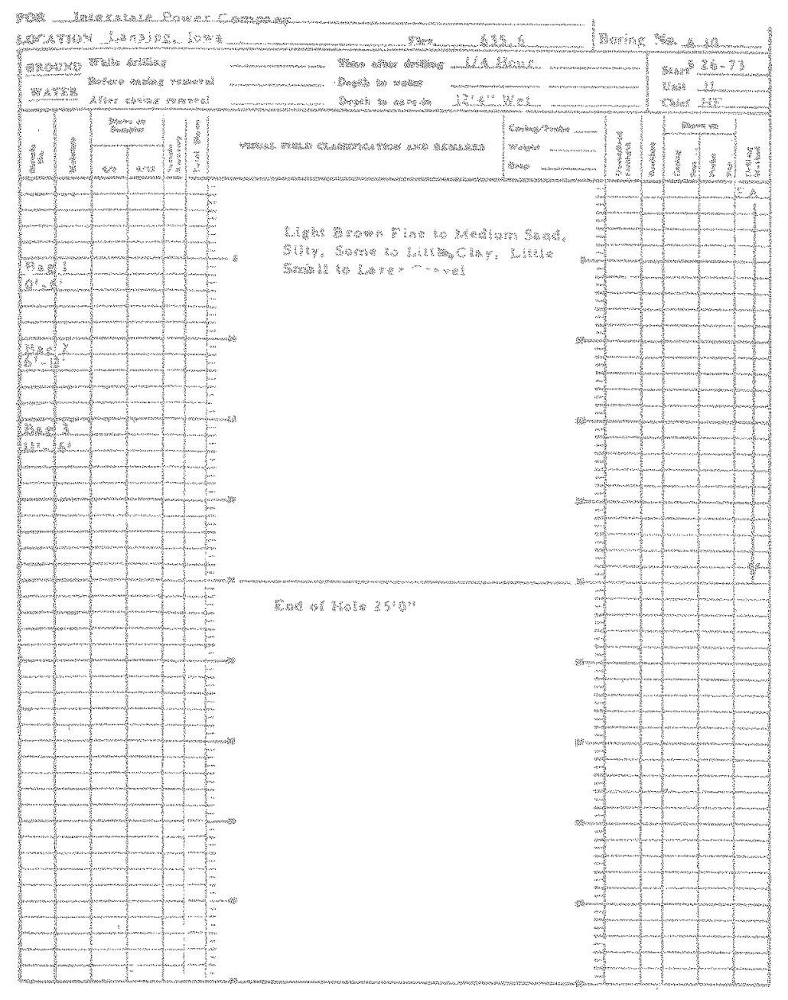

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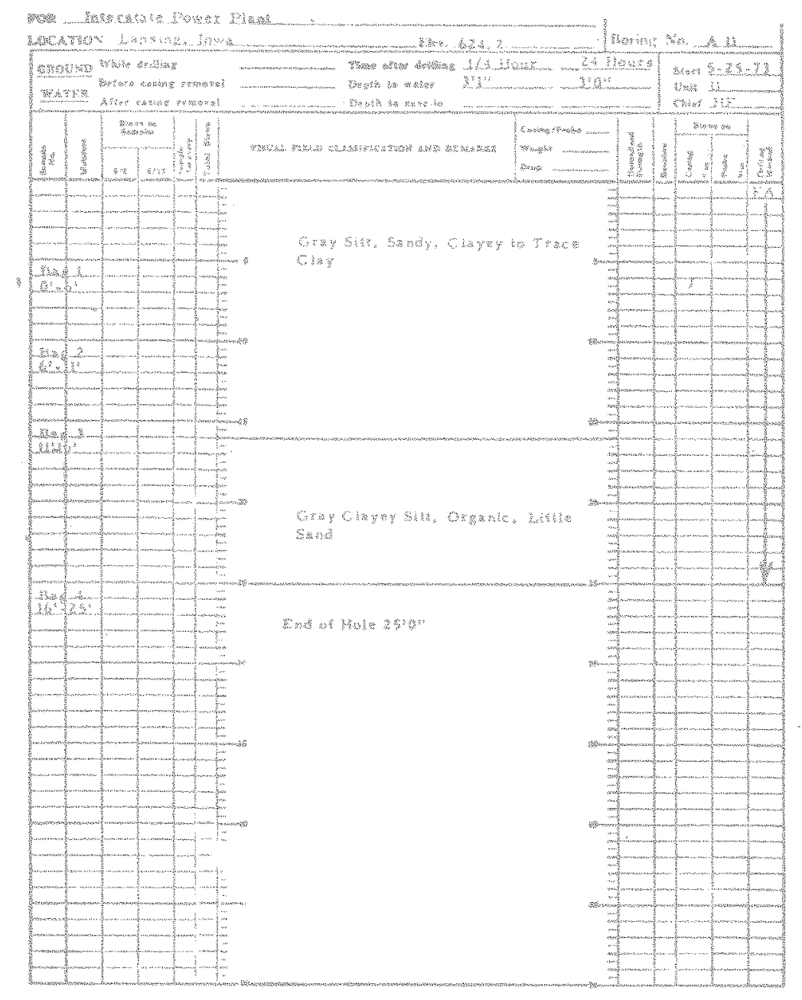

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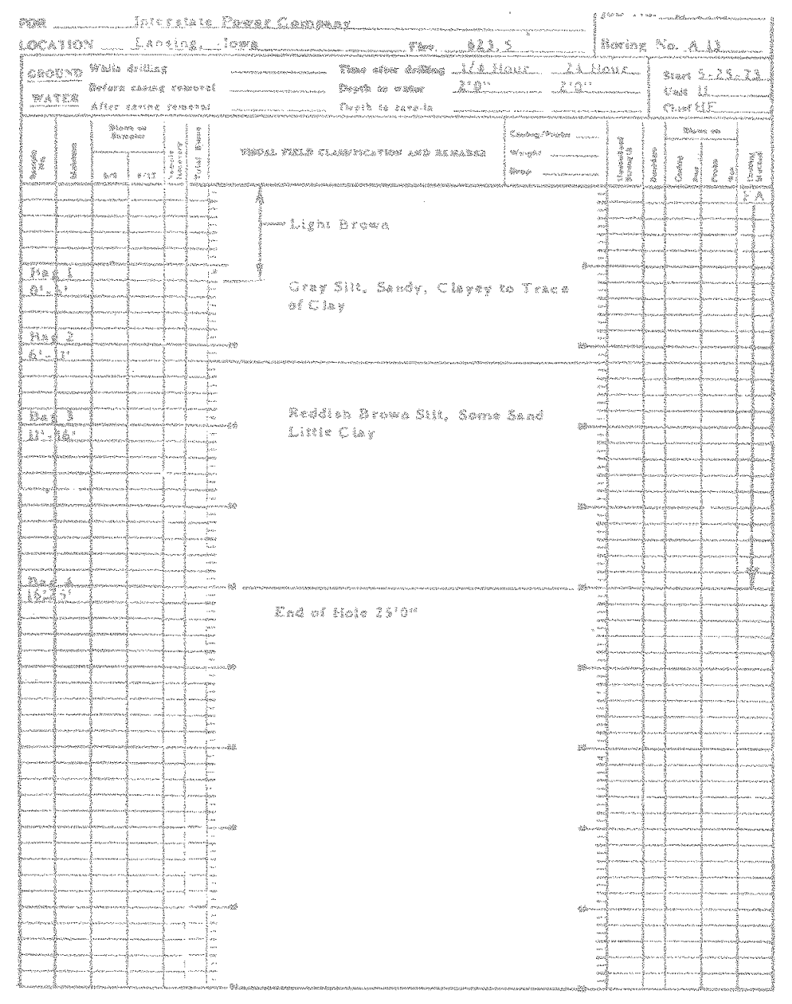

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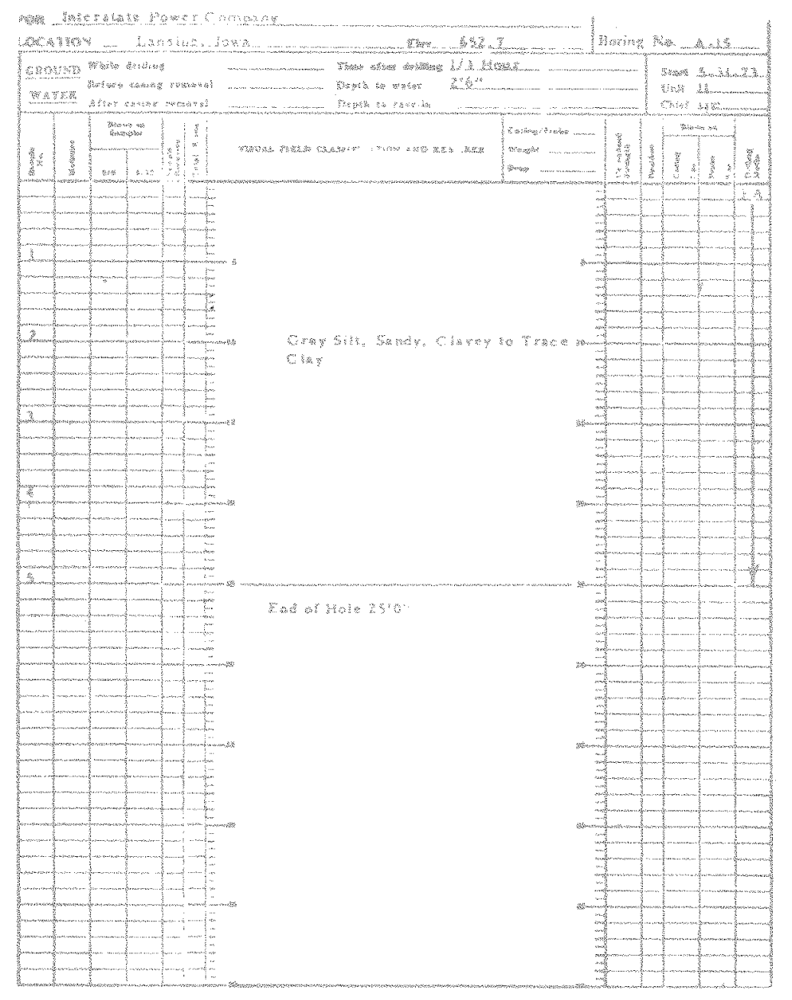

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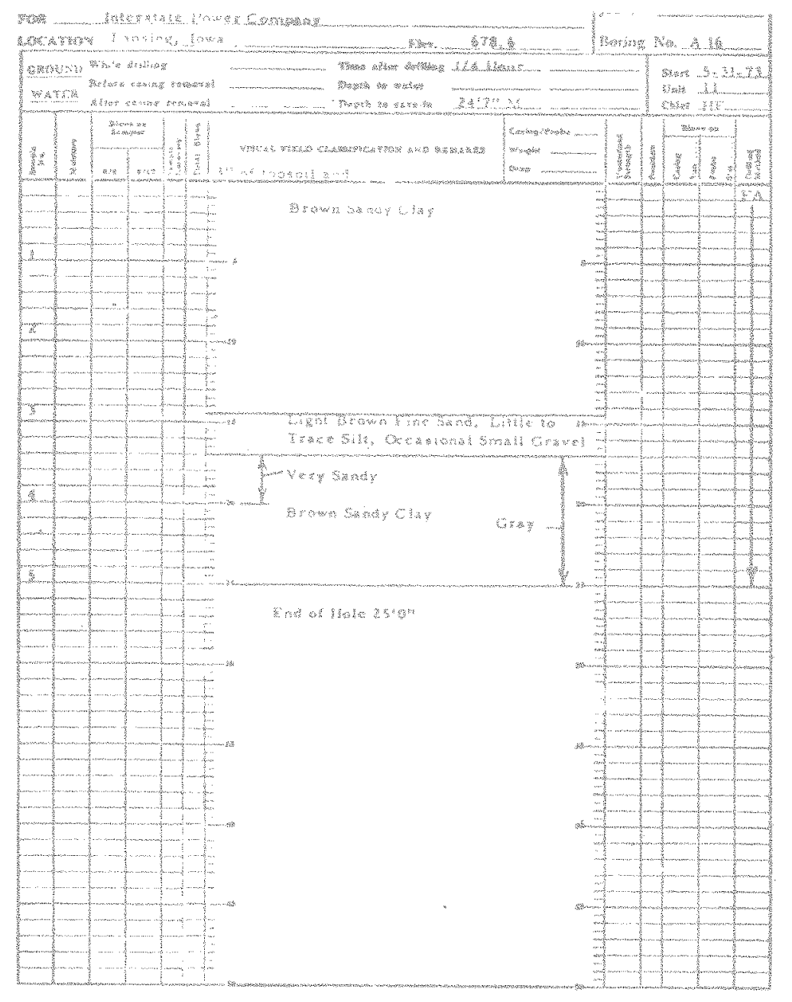

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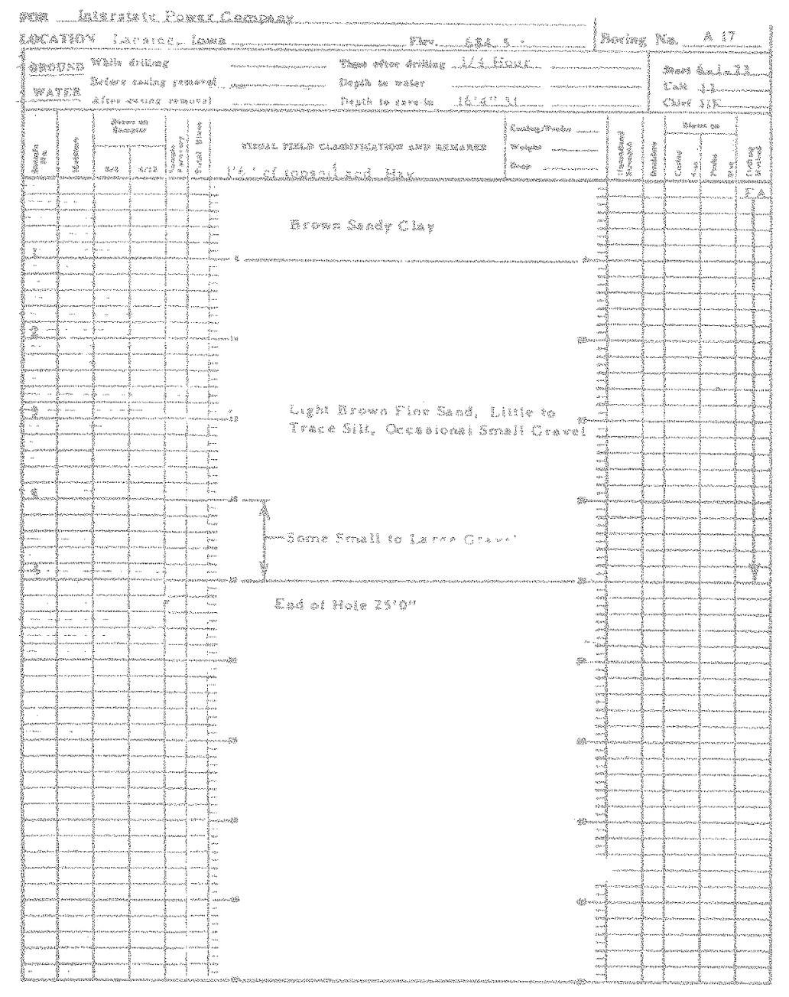

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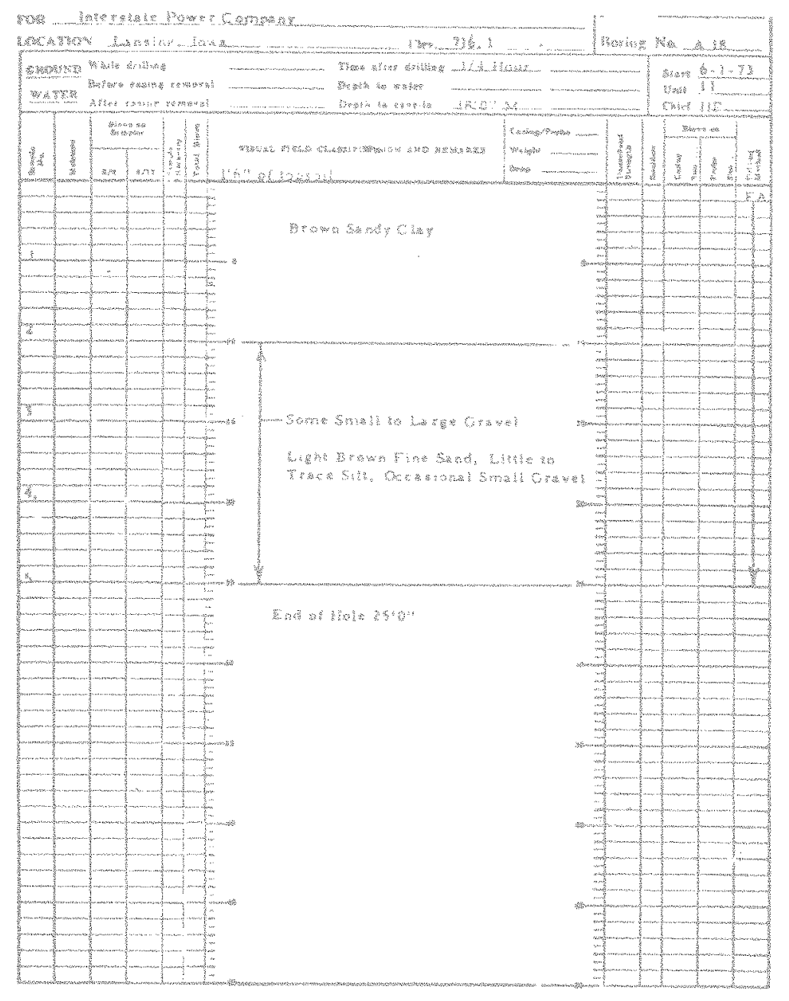

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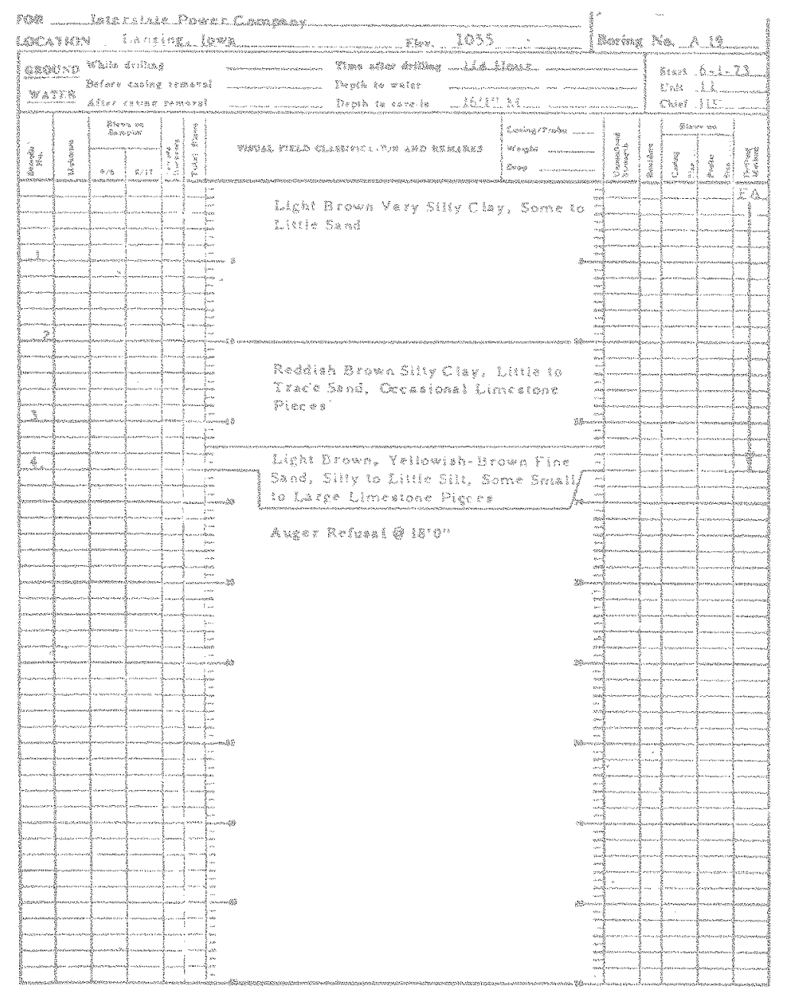

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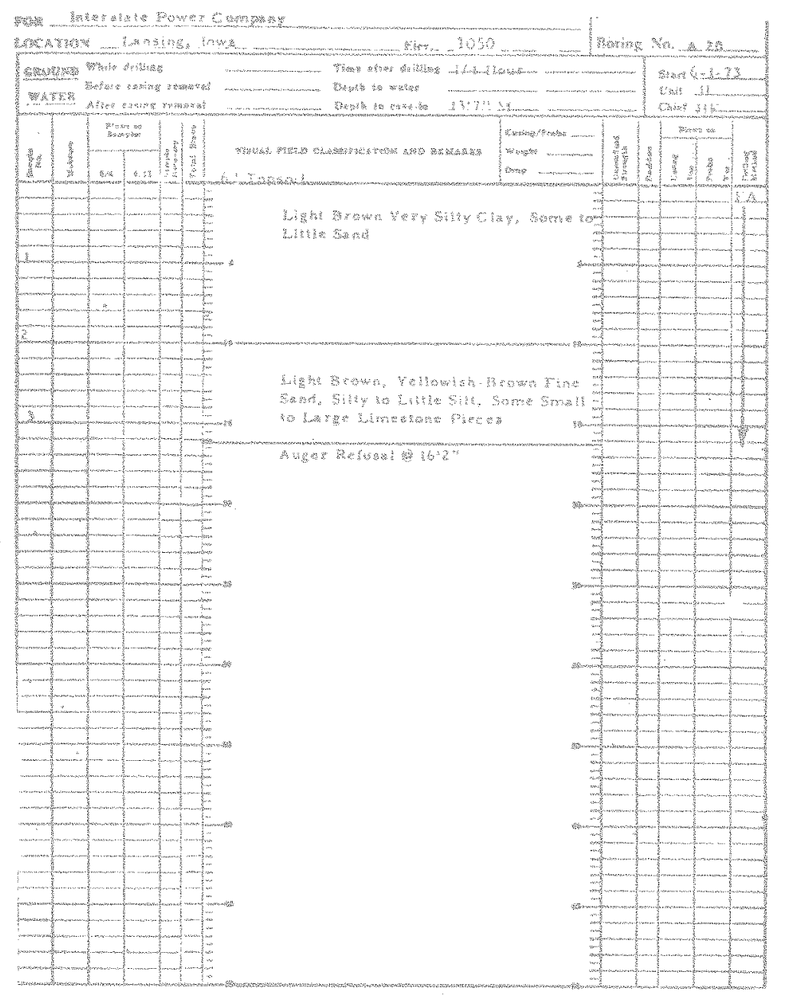

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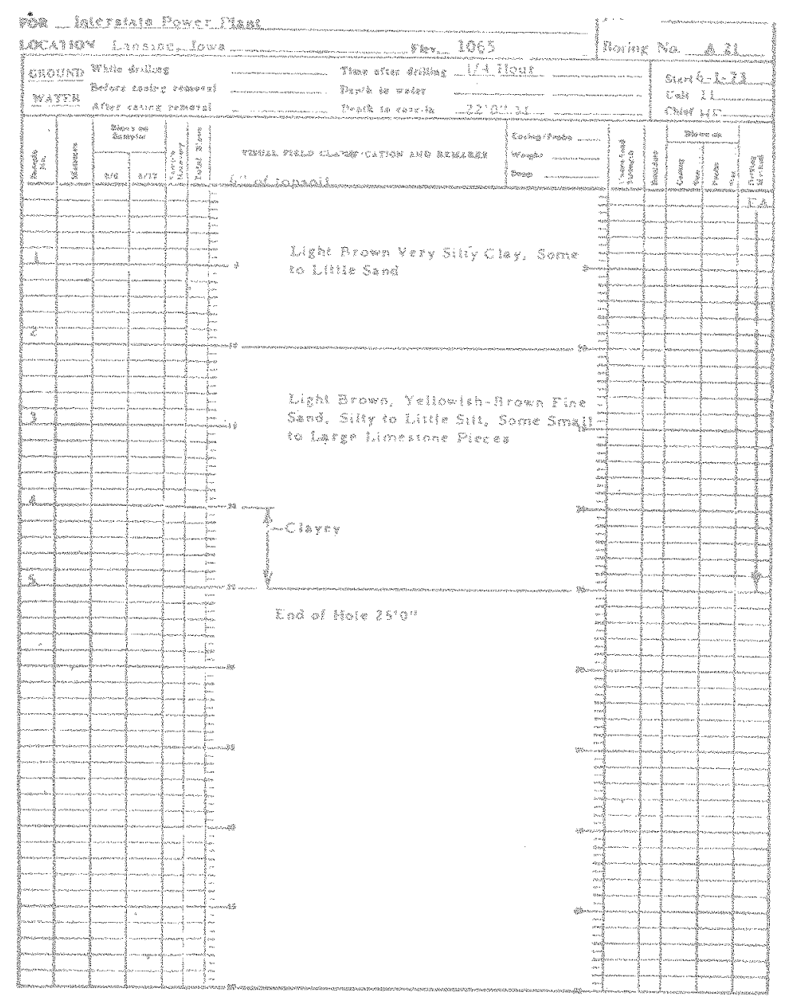

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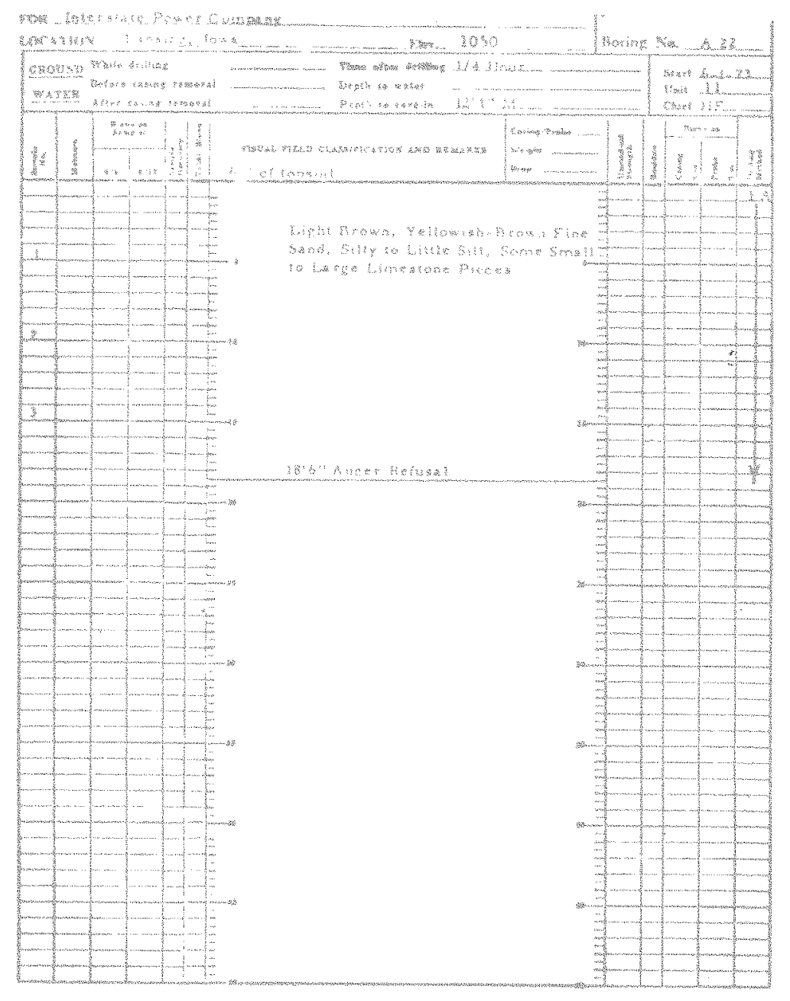

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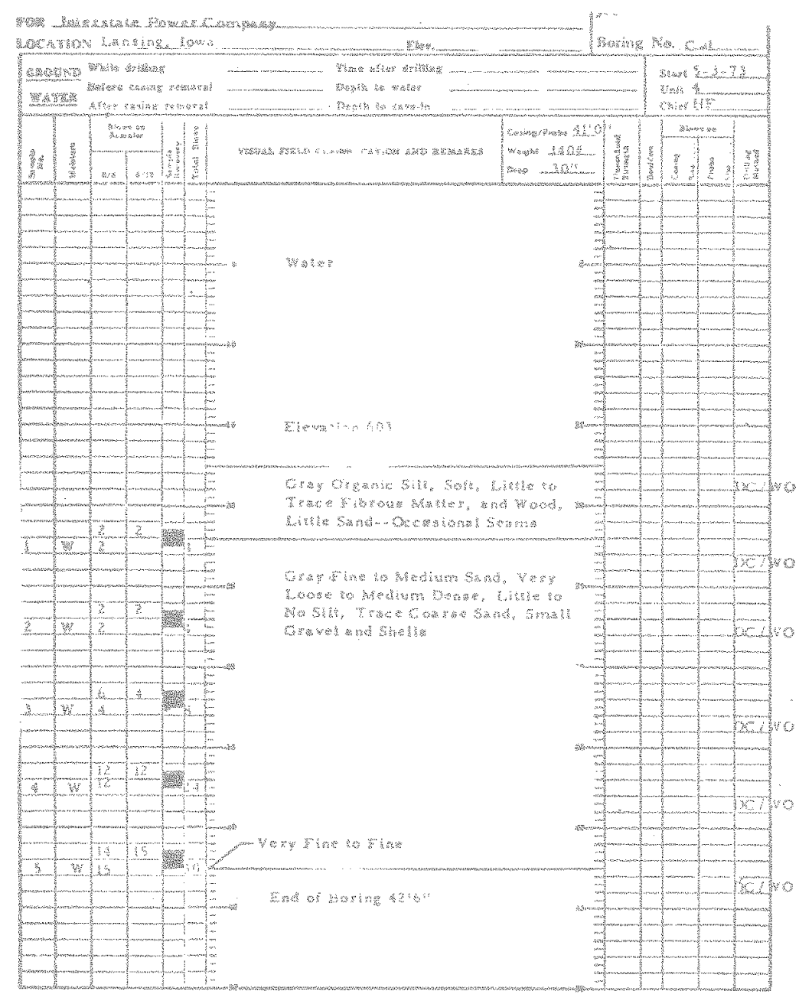

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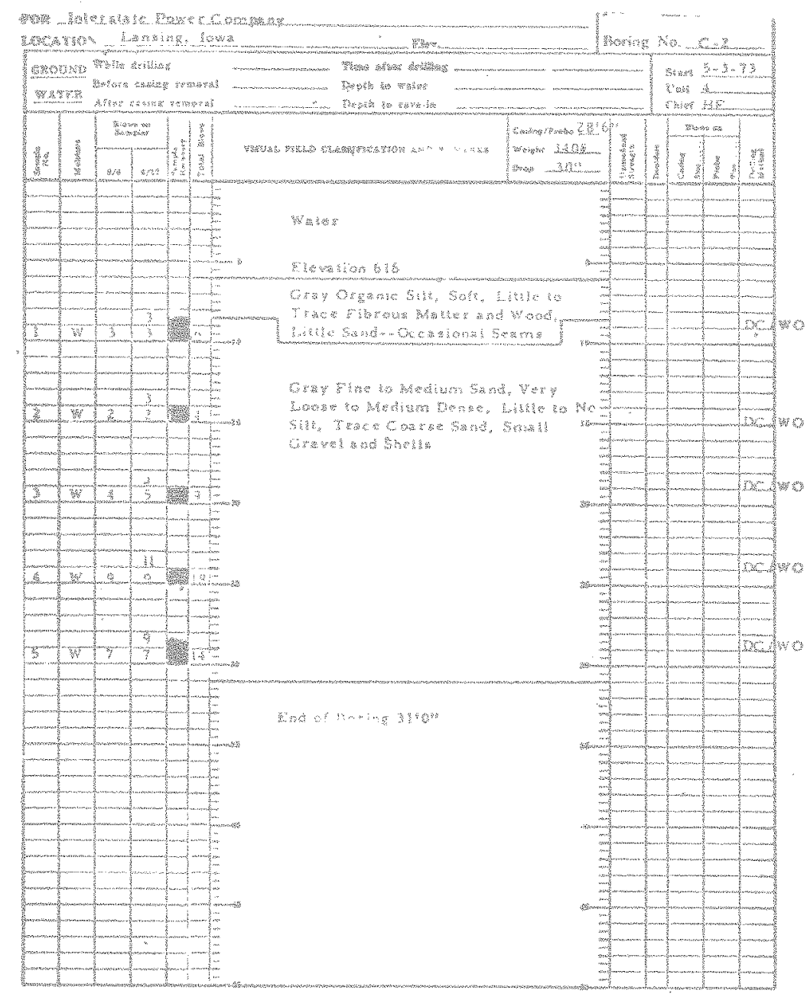

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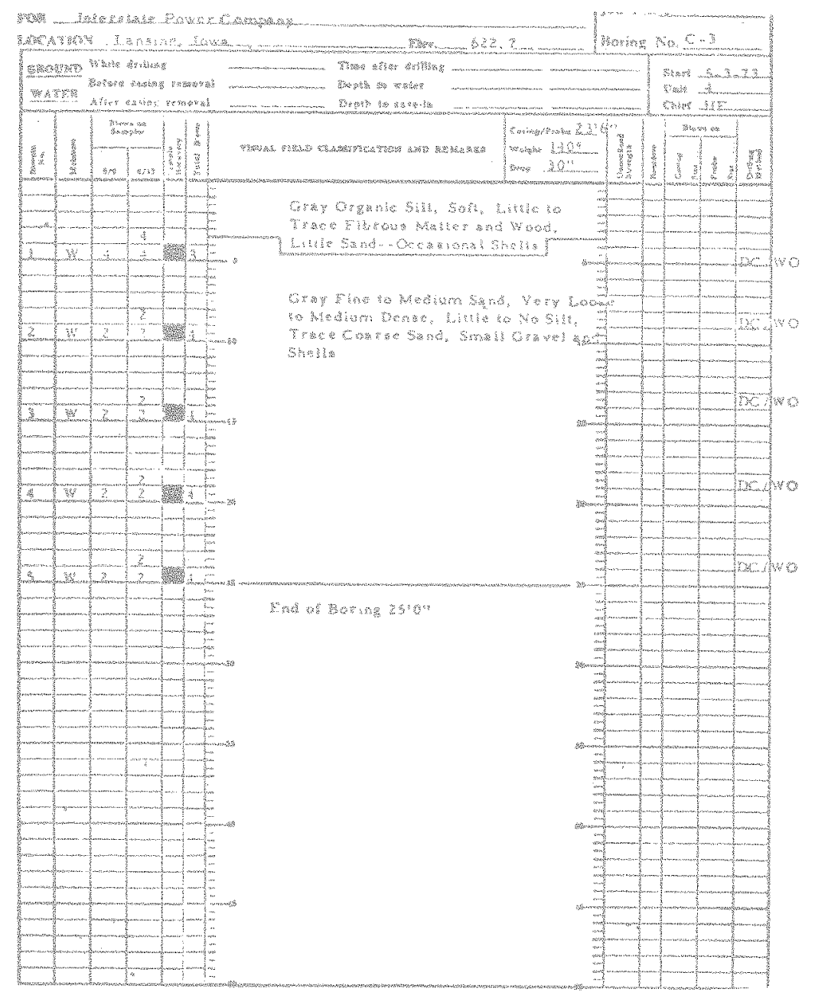

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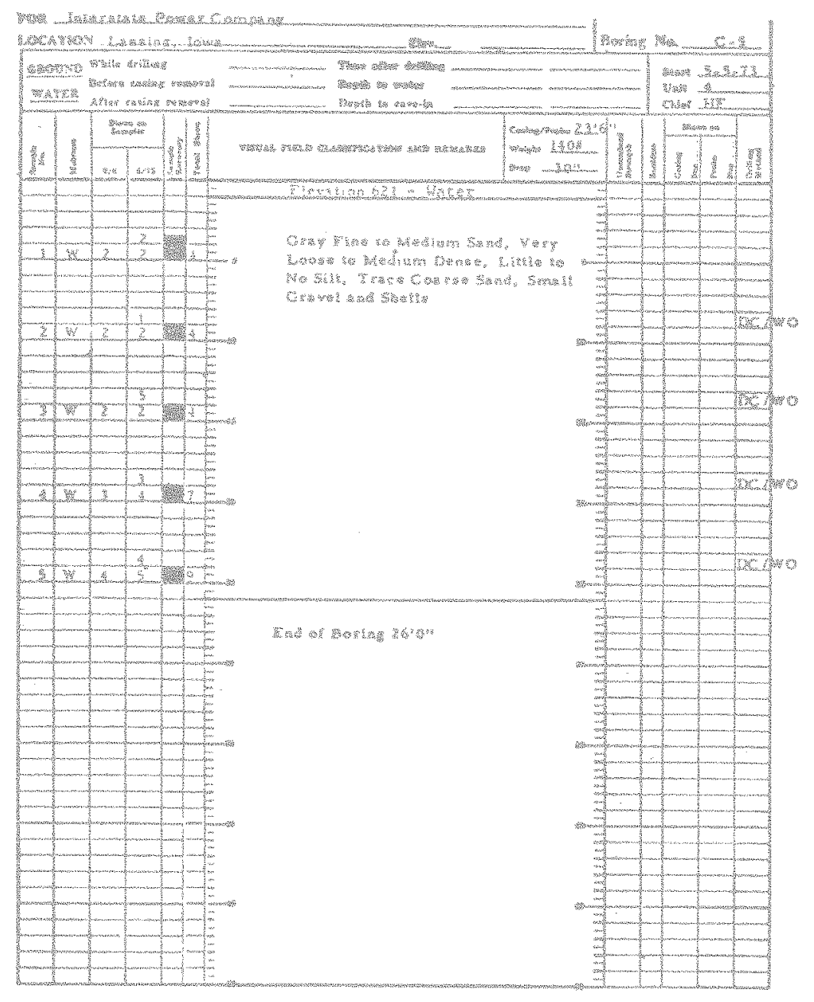

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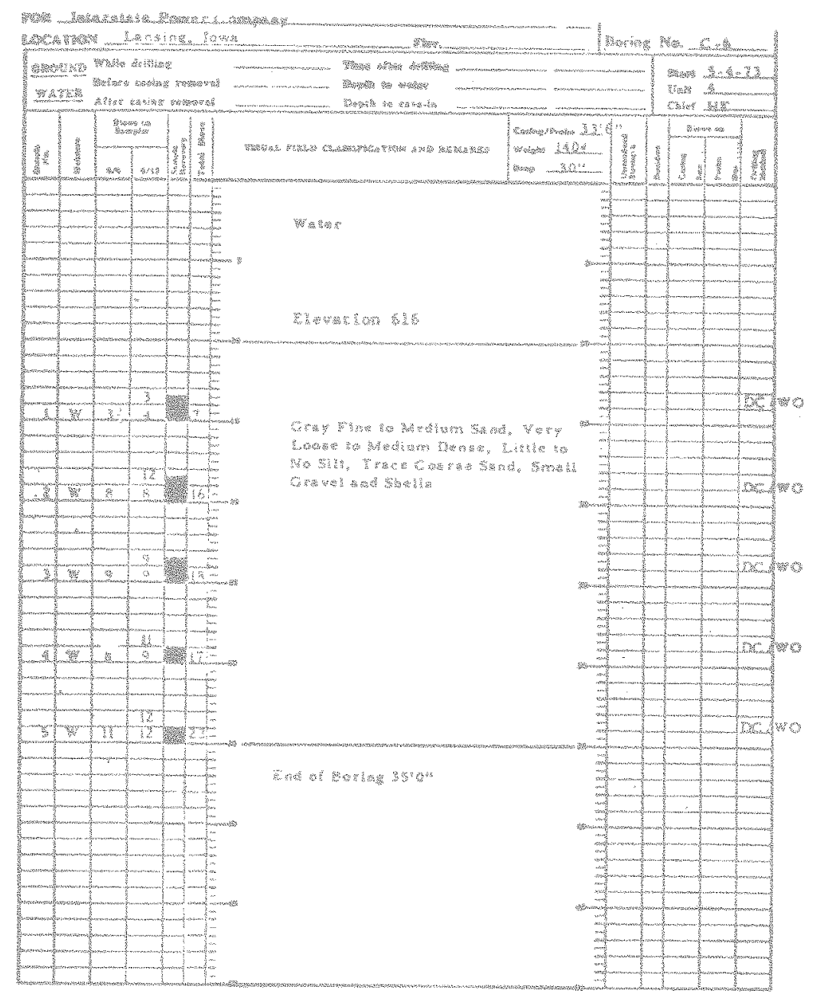

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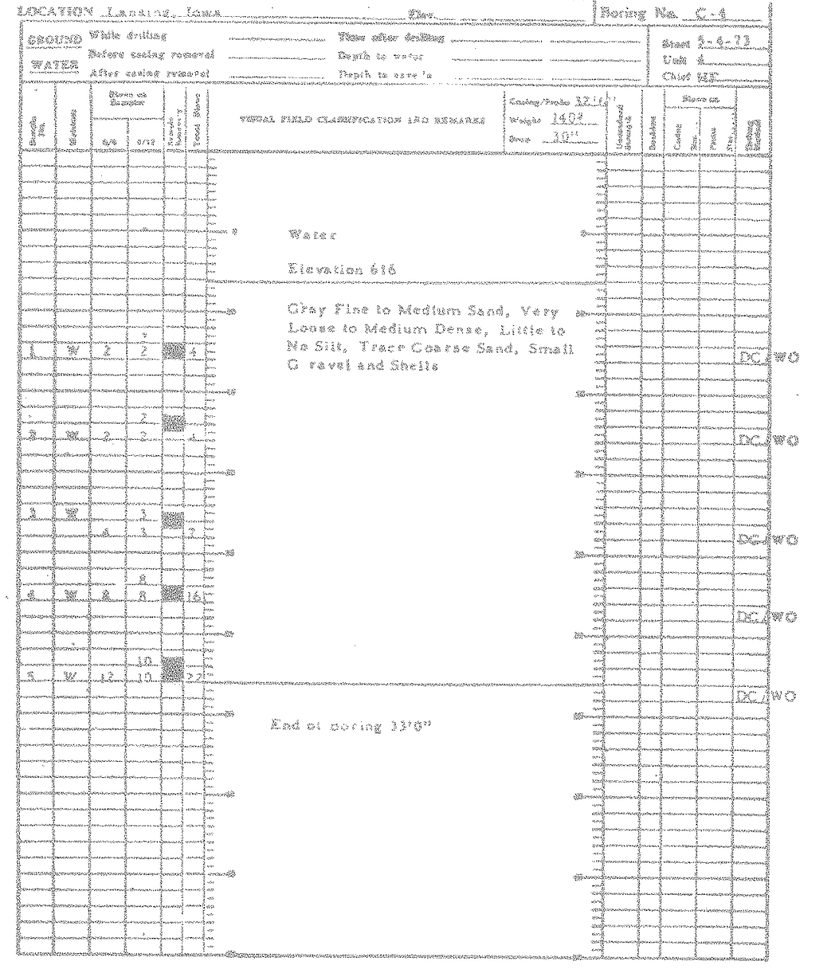


REFERENCE
BID SPEC. G-3105
1-21-74

NOTES

1 LEGEND FOR DRILLING METHODS

SS: Split--Spoon--2" O.D.
DC: Drove Casing--$2\frac{1}{2}$" I.D., except where noted
WO: Washed Out
RC: Rock Coring
RQD: Rock Quality Designator
FA: Flight Auger
HA: Hand Auger

REFERENCE DRAWINGS

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

Signed RNBergstrom Date 9-10 1973
R. N. Bergstrom, P. E., Iowa Reg. No. 4480

4480

Drawing Release Record

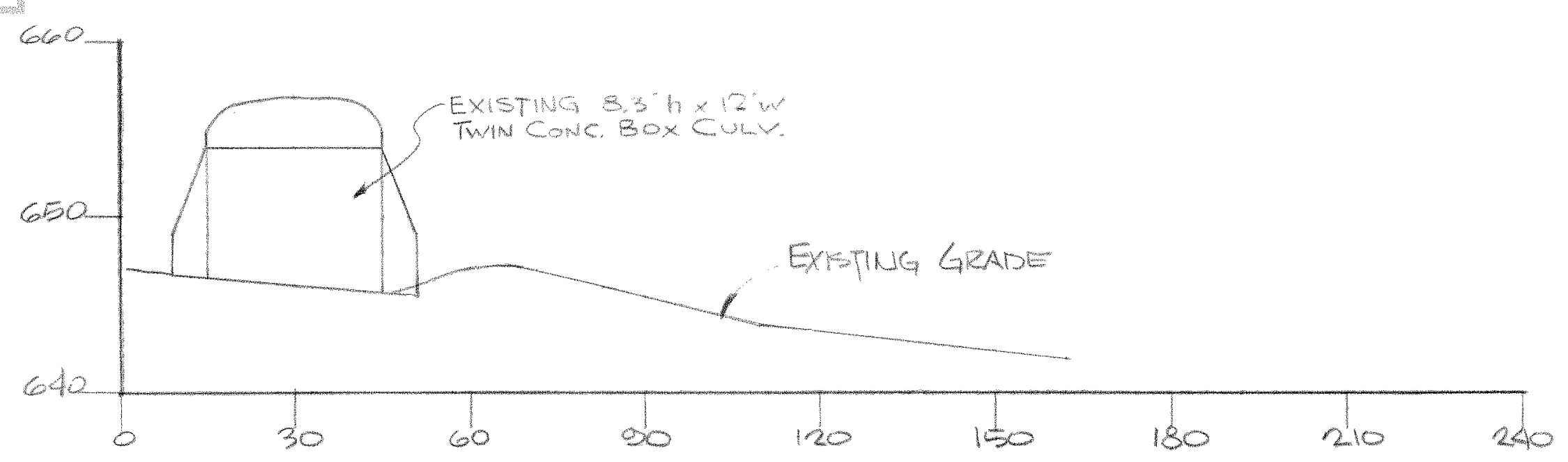
Rev.	Date	Init.	Description
1	9-10-73		CONSTR

SOIL BORING LOGS
SHEET 1
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

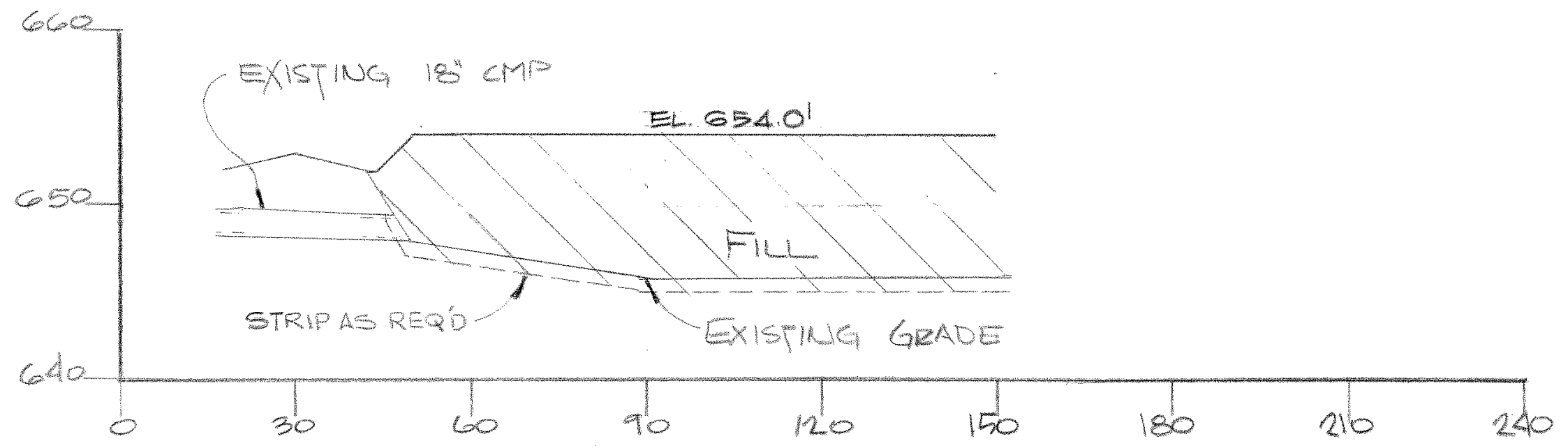
SCALE NONE
DRAWN J. CASTRO 8-24-73
CHECKED R.C. ODEGARD 9-7-73
ENGINEER W A Groh 9-7-73
APPROVED RNBergstrom 9-10-73
JOB NO. 4644-03

SARGENT & LUNDY
ENGINEERS
CHICAGO

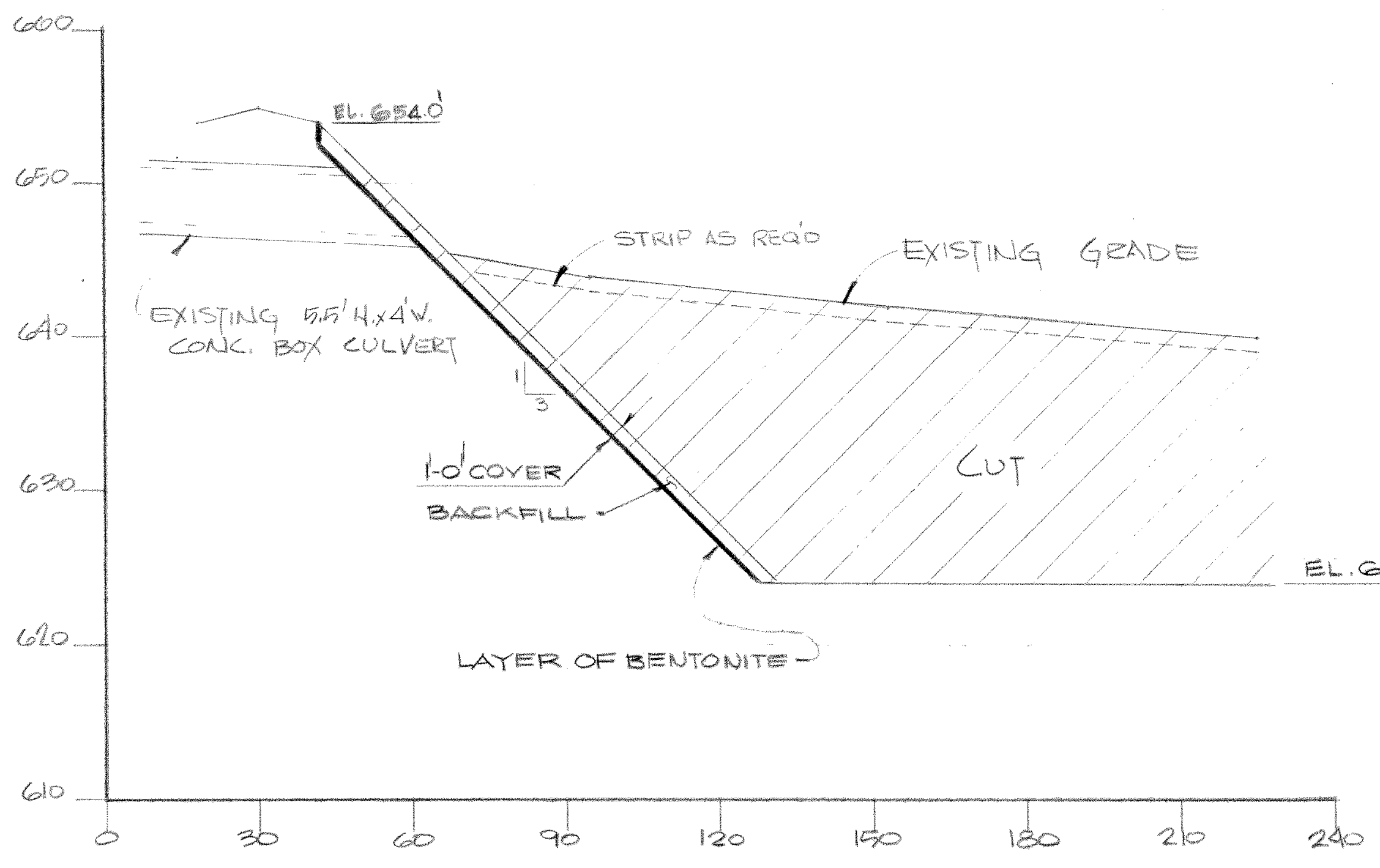
DRAWING NO.
S-3



SECTION 1-1



SECTION 2-2



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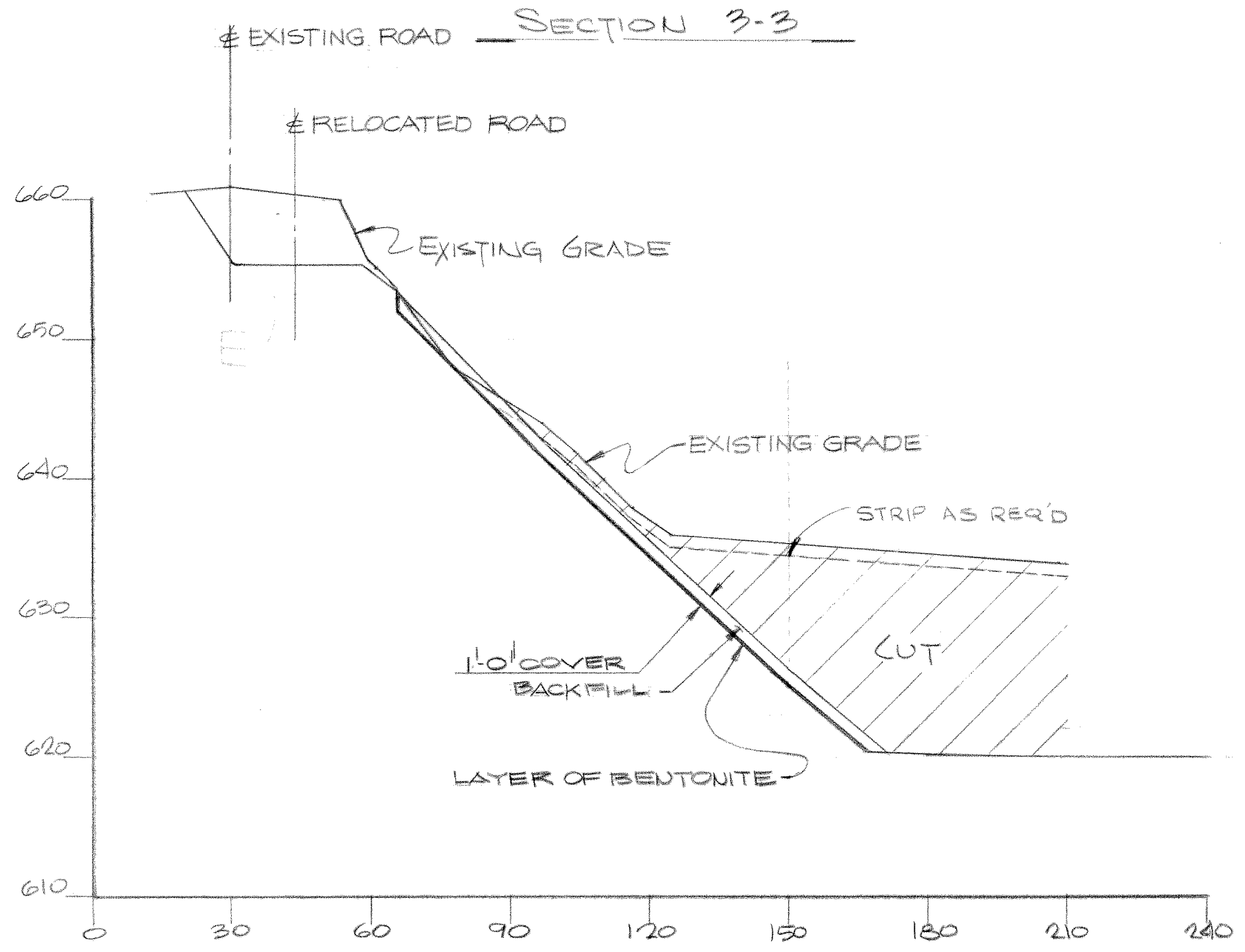

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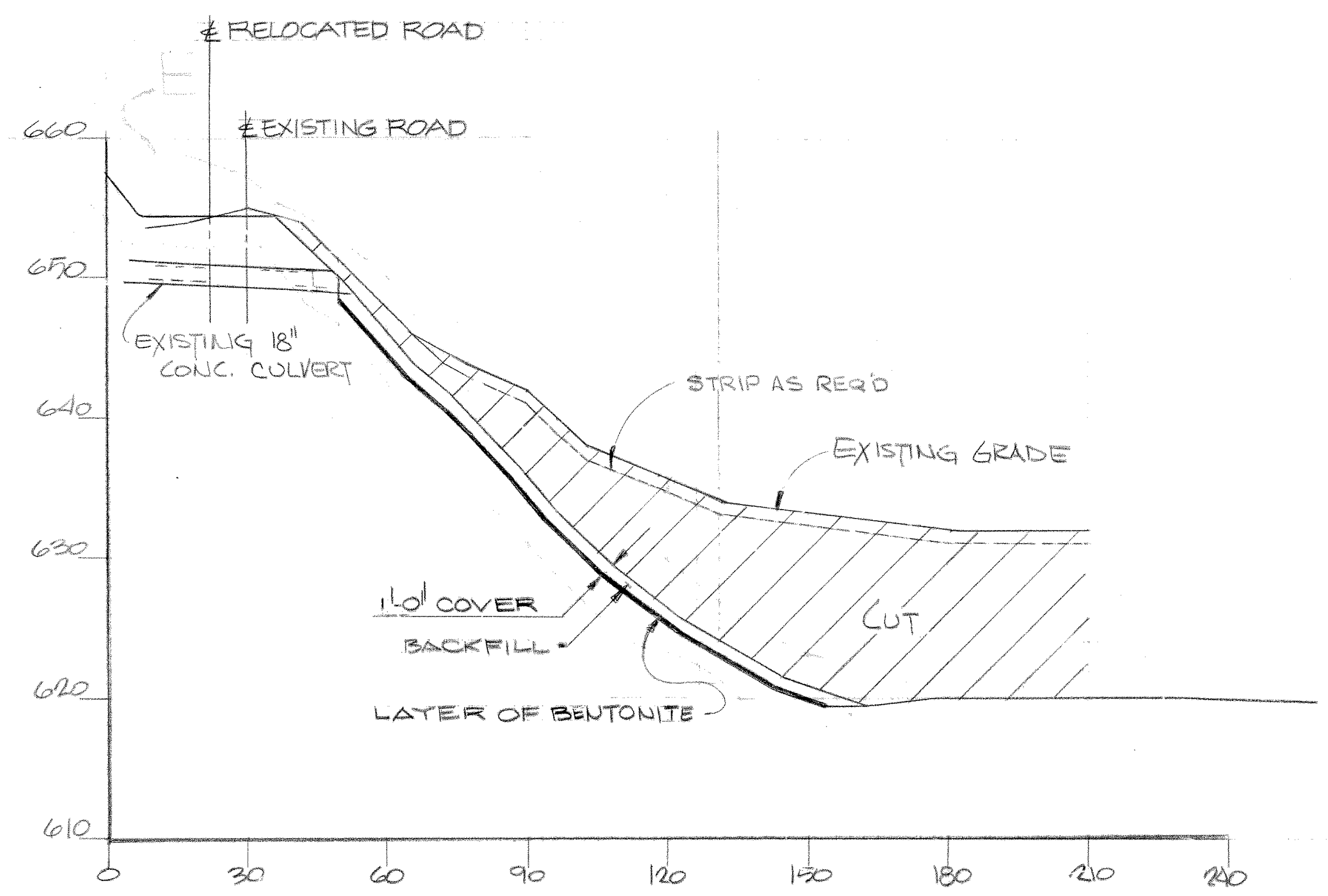

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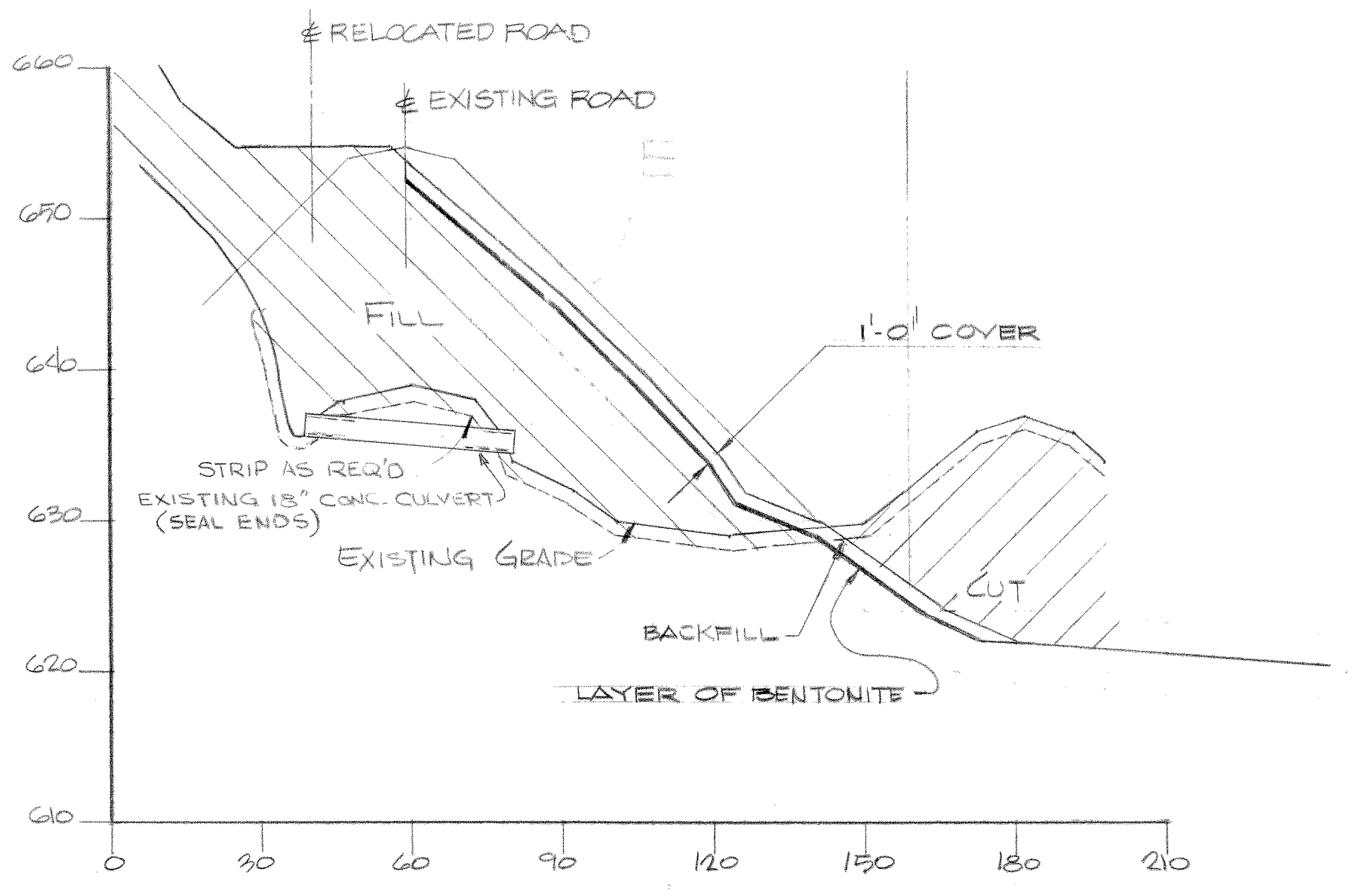

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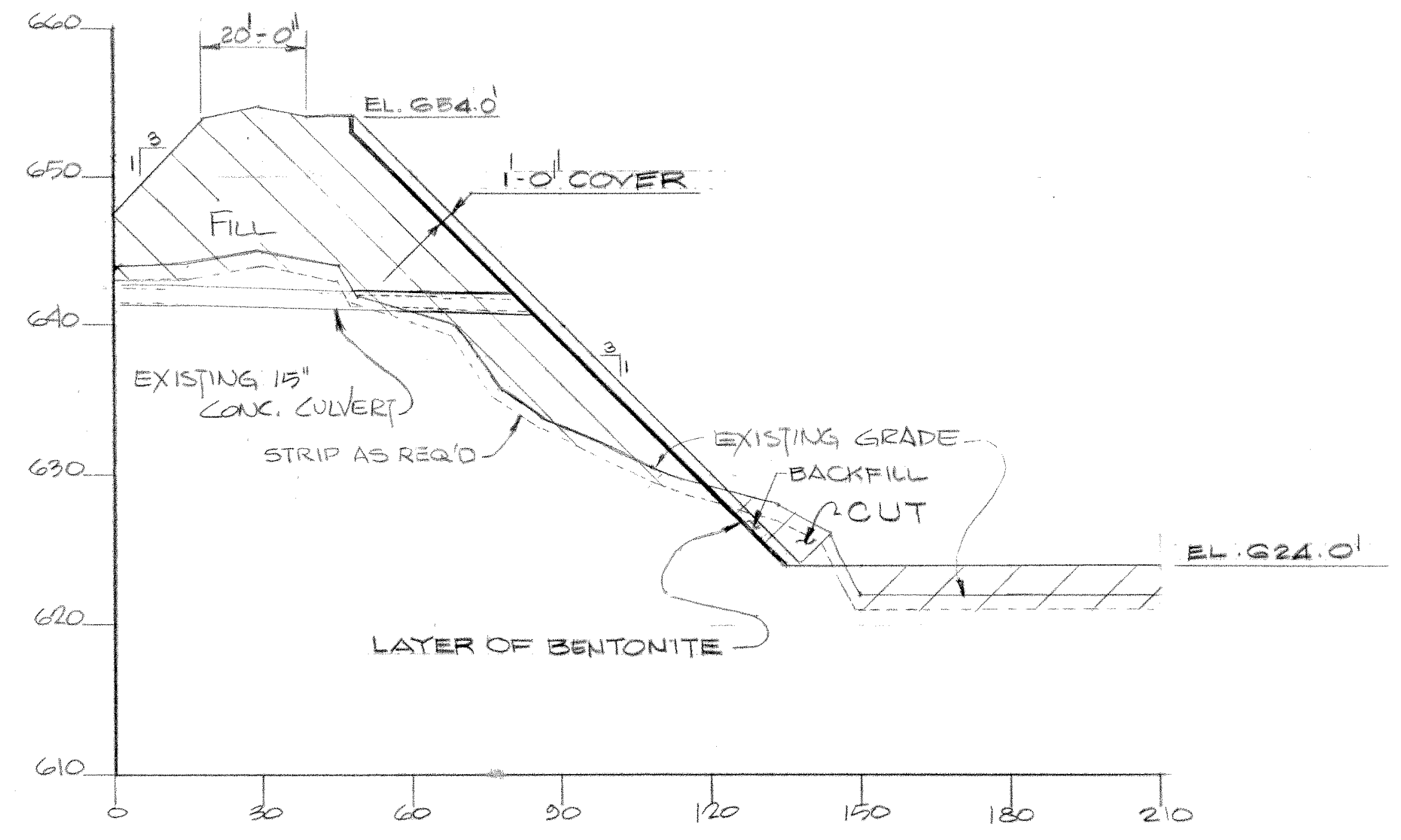

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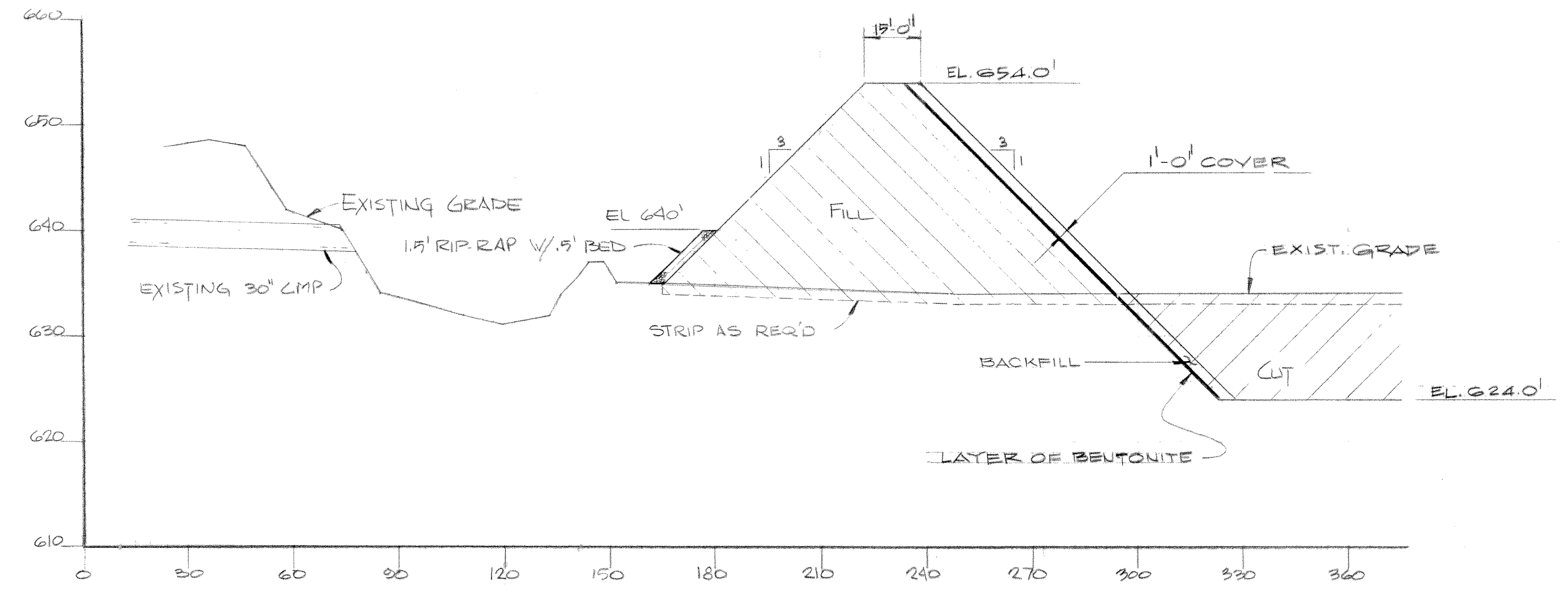

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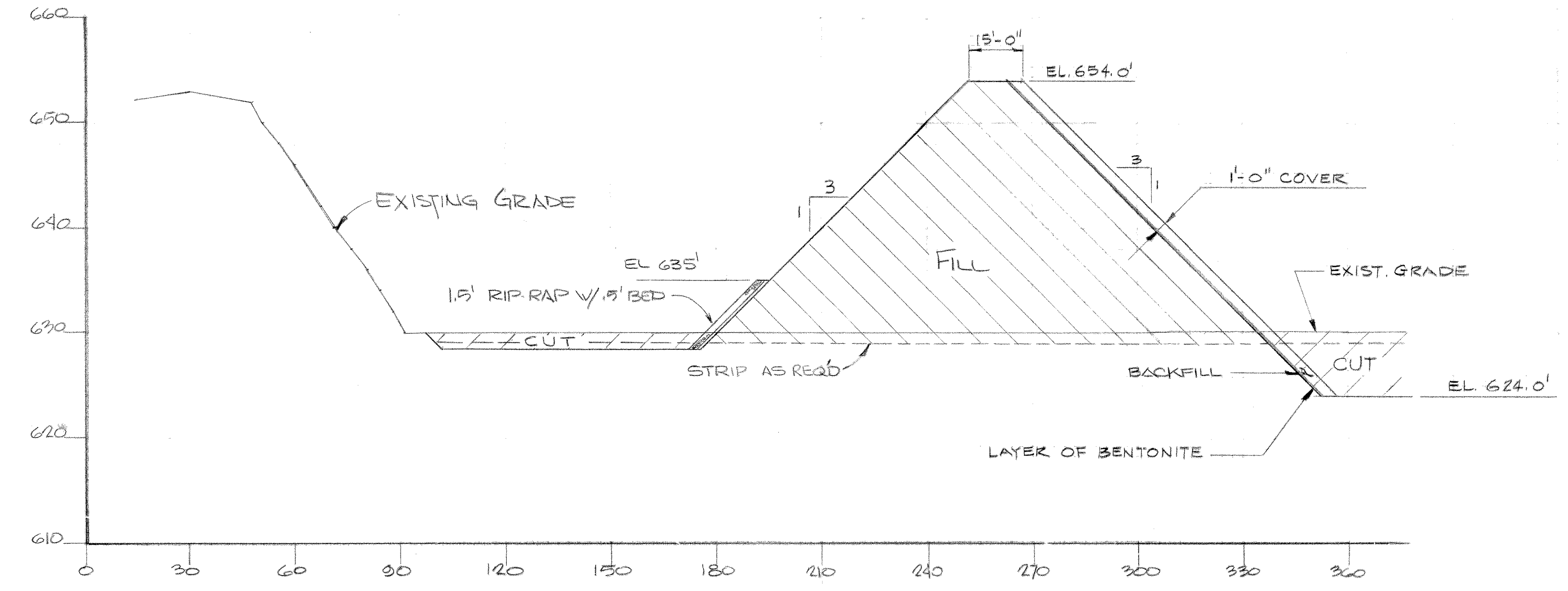

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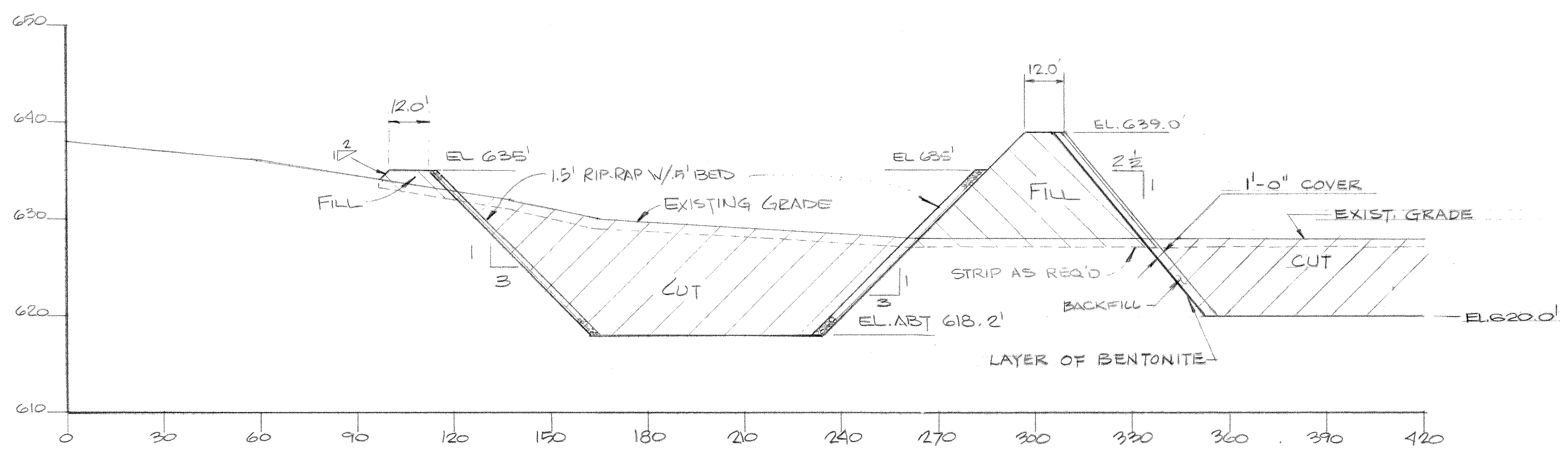

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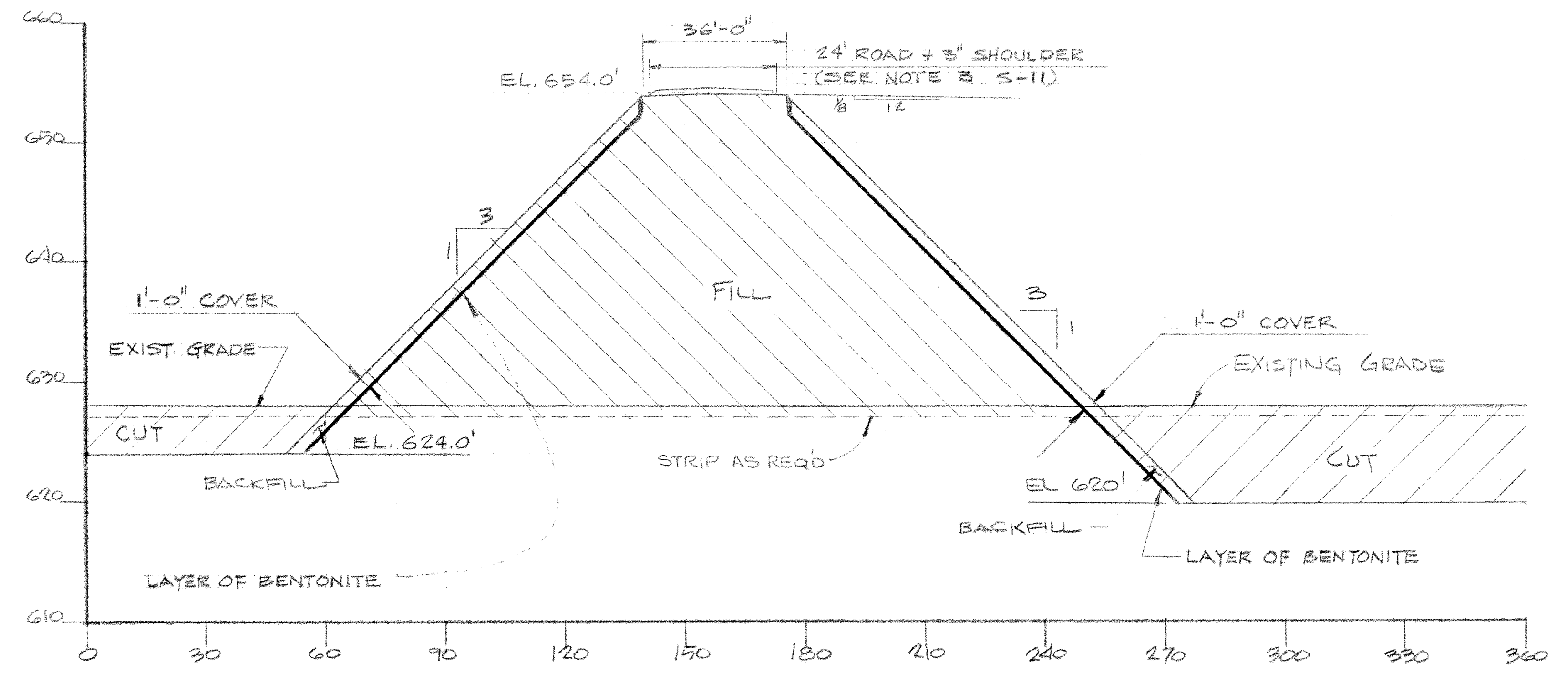

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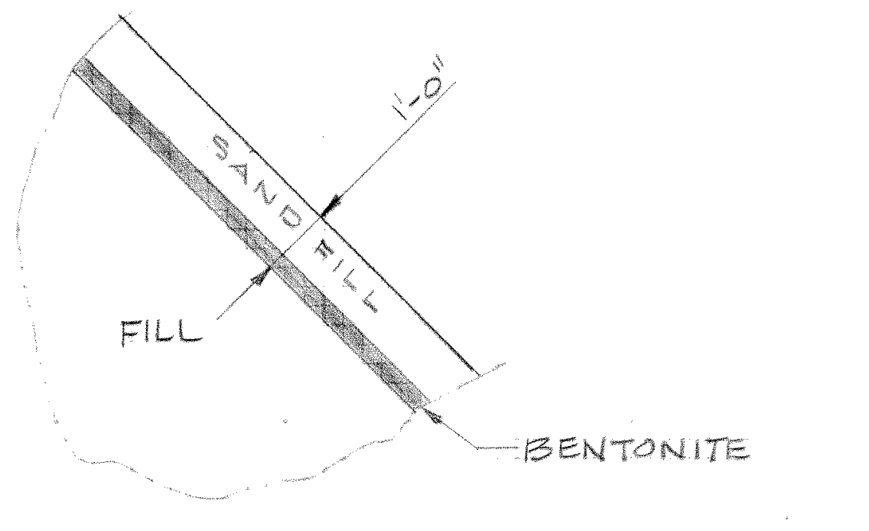
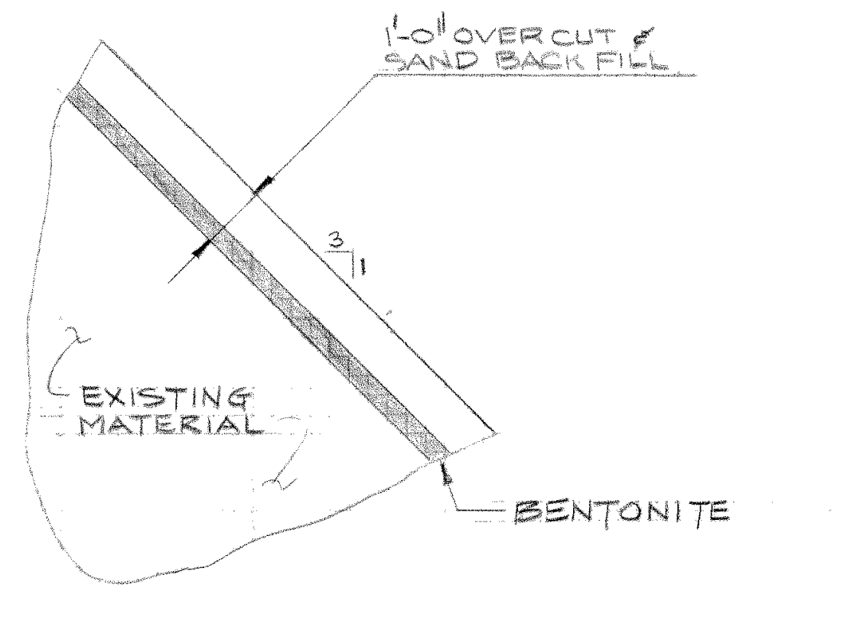


TYPICAL NEW SLOPED DIKE SECTION



TYPICAL EXISTING SLOPED DIKE SECTION

NOTES

1. WORK THE DWG. WITH DWG'S S-10 & S-11
2. ALL FILL SHALL CONFORM TO SPEC G-3105.
3. ASH DIKE SECTIONS 4, 5 & 6 REVISED AS PER FIELD INFORMATION DATED 7/30/76.

REFERENCE DRAWINGS

S-10	SITE DEVELOPMENT - COFFERDAM & DREDGING PLAN
S-11	SITE DEVELOPMENT - PLANT FILL - UNIT 4

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

Signed R.N.Bergst Date 6-5 1974

R. N. Be[illegible] Iowa Reg. No. 4460

Drawing Release Record

Rev.	Date	Init.	Description
	6-7-74	RCO	FOR CONST.
A	12-23-74		REV. ASH POND ELEV
B	2-3-75	GHV	REV. BOT. COVER
C	8-5-75	GHV	REV SEC 10-10
D	9-30-75	GHV	REMOVE BENTONITE FROM BOTT. OF AREA
E	9-9-77	GHV	RECORD DRAWING

SITE DEVELOPMENT
ASH DIKE SECTIONS - SHEET 1
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

SCALE VERT 1" = 10' HORIZ 1" = 30'
DRAWN G. R. BOLE 5-20-74
CHECKED R. C. ODEGARD 5-28-74
ENGINEER 5-31-74
APPROVED R.N.Bergst 6-5-74
JOB NO. 4644-65

SARGENT & LUNDY
ENGINEERS
CHICAGO

DRAWING NO.
S-14

EXHIBIT B – 2015 Investigation

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Unstable Area Determination

CABENO Environmental Field Services, LLC
More Than Just A Probing Company

BORING LOG

CLIENT: Hard Hat

PROJECT: Lansing, IA

COORDINATES: *N NOT SURVEYED*
E NOT SURVEYED

BORING NO.: *SB1*

page 1 of 1

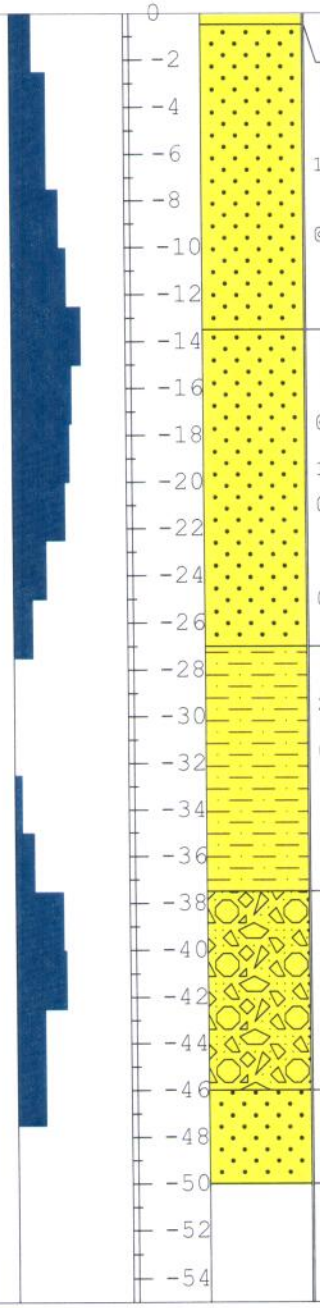
LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/22/15*
DATE FINISHED: *1/2213/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	4 4 5	9.0
	SS2	18"	4 5 10	15.0
	SS3	18"	3 6 9	15.0
	SS4	18"	7 9 11	20.0
	SS5	18"	7 10 13	23.0
▽	SS6	18"	7 11 18	29.0
	SS7	18"	8 11 14	25.0
	SS8	18"	8 11 13	24.0
	SS9	18"	8 11 11	22.0
	SS10	18"	4 7 7	14.0
	SS11	18"	2 3 6	8.0
	SS12	18"	0 0 0	0.0
	SS13	18"	0 0 0	0.0
	SS14	18"	1 1 2	3.0
	SS15	18"	3 4 4	8.0
	SS16	18"	0 9 11	20.0
	SS17	18"	5 11 10	21.0
	SS18	18"	4 5 7	12.0
	SS19	18"	3 4 8	12.0

SOIL CONSISTENCY HISTOGRAM

DEPTH IN FEET

PROFILE



DESCRIPTION

SILT; brown; plastic; moist; trace clay

SAND; brown; fine grained; poorly graded; well sorted; dry to moist

1'-5' sample collected for geotech analysis

@ 9'2" black stained with plant matter

SAND; gray; fine to medium grained; moist; graded; trace gravel and snail shells

@ 15' grades wet

15'-20' sample collected for geotech analysis

@17.5' grades brown

@23.5' grades fine to coarse, well graded

SILT; gray; non plastic; wet; trace clay

28'-32' sample collected for geotech analysis

@29' grades trace plant matter and snail shells

GRAVEL; brown; coarse; poorly graded; wet; trace cobbles

40'-50' sample collected for geotech analysis

SAND; light gray; coarse grained; poorly graded; wet

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

CABENO
Environmental Field Services, LLC
More Than Just A Probing Company

BORING LOG

CLIENT: Hard Hat

PROJECT:Lansing, IA

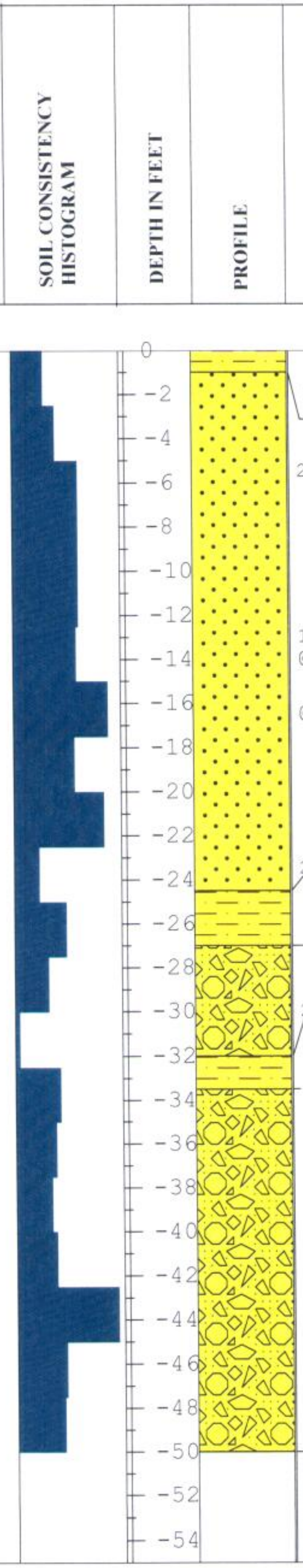
COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

BORING NO.: ***SB3***

page 1 of 1

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/22/15*
DATE FINISHED: *1/22/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	6 7 7	14.0
	SS2	18"	4 9 10	19.0
	SS3	18"	5 10 19	29.0
	SS4	18"	7 13 16	29.0
	SS5	18"	6 12 17	29.0
∇	SS6	18"	6 12 16	28.0
	SS7	18"	12 21 21	42.0
	SS8	18"	8 12 15	27.0
	SS9	18"	8 19 21	40.0
	SS10	18"	8 5 6	11.0
	SS11	18"	6 8 15	23.0
	SS12	18"	5 5 10	15.0
	SS13	18"	3 1 1	2.0
	SS14	18"	6 10 10	20.0
	SS15	18"	4 6 12	18.0
	SS16	18"	10 9 7	16.0
	SS17	18"	6 8 10	18.0
	SS18	18"	22 24 21	45.0
	SS19	18"	10 10 12	22.0
	SS20	18"	14 9 12	21.0



DESCRIPTION

SILT; gray to black; non plastic; moist; some bottom ash

SAND; brown; fine grained; poorly graded; moist
2'-5' sample collected for geotech analysis

13'-20' sample collected for geotech analysis
@13.5' grades wet and trace snail shells

@16' grades fine to medium grained; graded

24'-27' sample collected for geotech analysis

SILT; gray; non plastic to low plasticity; wet; some clay; trace organic plant matter

GRAVEL; gray; coarse to cobbles; poorly graded; wet; trace to some sand
27'-32' sample collected for geotech analysis

SILT; gray to black; non plastic; wet; trace to some clay and organic plant matter

GRAVEL; gray; coarse to cobbles; poorly graded; wet; trace to some sand

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

CABENO
Environmental Field Services, LLC
More Than Just A Probing Company

BORING LOG

CLIENT: Hard Hat

PROJECT:Lansing, IA

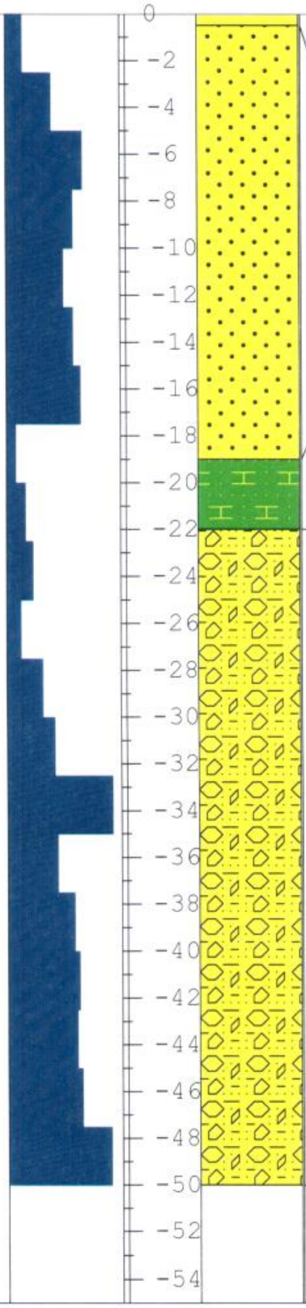
COORDINATES: *N NOT SURVEYED*
E NOT SURVEYED

BORING NO.: ***SB5***

page 1 of 1

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/23/15*
DATE FINISHED: *1/23/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	4 4 3	7.0
	SS2	18"	5 7 12	19.0
	SS3	18"	5 13 19	32.0
	SS4	18"	5 13 15	28.0
▽	SS5	18"	5 11 13	24.0
	SS6	18"	6 12 16	28.0
	SS7	18"	12 14 17	31.0
	SS8	18"	3 2 2	4.0
	SS9	18"	4 4 4	8.0
	SS10	18"	14 9 2	11.0
	SS11	18"	2 2 4	6.0
	SS12	18"	6 7 8	15.0
	SS13	18"	9 10 10	20.0
	SS14	18"	10 36 8	44.0
	SS15	18"	15 12 9	21.0
	SS16	18"	20 14 14	28.0
	SS17	18"	11 12 18	30.0
	SS18	18"	17 14 15	29.0
	SS19	18"	13 14 17	31.0
	SS20	18"	18 19 24	43.0



DESCRIPTION

SILT; black; non plastic; dry to moist

SAND; brown; fine grained; poorly graded; moist; trace to some bottom ash
5' bottom ash grades out
10'-16' sample collected for geotech analysis
@12' grades wet and trace snail shells
@ 16' grades gray to olive

Silty CLAY; black to dark gray; low plasticity; moist; trace fine sand and organic plant matter
18.5'-20' sample collected for geotech analysis

SAND & GRAVEL; black; fine to coarse; well graded; wet; trace to some silt
22'-27.5' sample collected for geotech analysis
40'-45' sample collected for geotech analysis
@43.5' grades brown

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

CABENO
Environmental Field Services, LLC
More Than Just A Probing Company

BORING LOG

CLIENT: Hard Hat

PROJECT: Lansing, IA

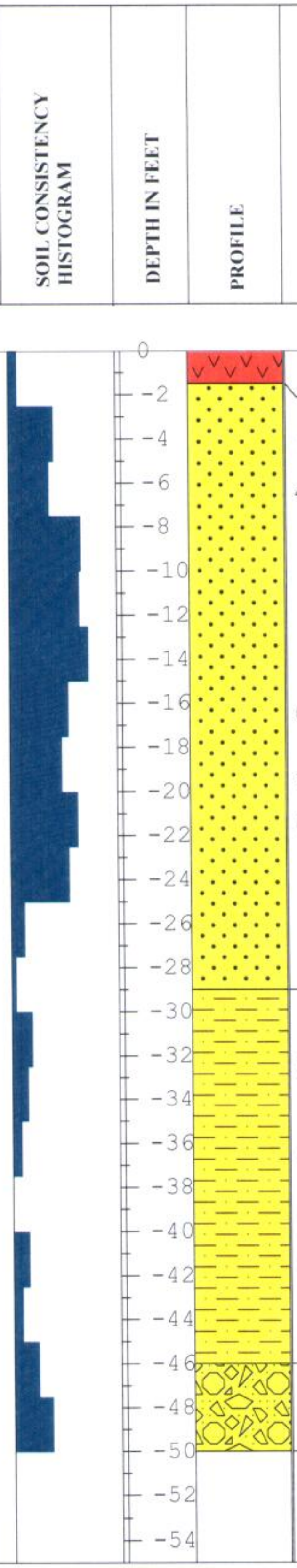
COORDINATES: *N NOT SURVEYED*
E NOT SURVEYED

BORING NO.: *SB7*

page 1 of 1

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loerop*
DATE BEGAN: *1/23/15*
DATE FINISHED: *1/23/15*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION BLOW COUNTS	N-VALUE
	SS1	18"	3 2 2	4.0
	SS2	18"	9 11 19	20.0
	SS3	18"	4 5 13	18.0
	SS4	18"	7 14 18	32.0
	SS5	18"	5 11 20	31.0
	SS6	18"	8 15 20	35.0
▽	SS7	18"	7 12 14	26.0
	SS8	18"	7 9 14	23.0
	SS9	18"	11 13 17	30.0
	SS10	18"	8 12 14	26.0
	SS11	18"	2 3 3	6.0
	SS12	18"	1 1 1	2.0
	SS13	18"	3 3 6	9.0
	SS14	18"	2 3 4	7.0
	SS15	18"	1 2 2	4.0
	SS16	18"	0 0 0	0.0
	SS17	18"	2 3 4	7.0
	SS18	18"	3 2 2	4.0
	SS19	18"	8 4 7	11.0
	SS20	18"	2 8 9	17.0



DESCRIPTION

Bottom ASH; black; fine grained; poorly graded

SAND; brown; fine grained; poorly graded; moist

4'-10' sample collected for geotech analysis

@16' grades wet

19'-25' sample collected for geotech analysis

@ 21' grades gray

SILT; black to gray; no plasticity; moist to wet; trace clay

29'-32.5' sample collected for geotech analysis

36'-40' sample collected for geotech analysis

@ 41' grading trace organic plant matter and trace intermittent 1/16" sand seams

@ 44' is a thin, 1" gravel seam

GRAVEL; brown; coarse; poorly graded; wet; trace to some silt and sand
46'-50' sample collected for geotech analysis
last spoon blocked with large gravel

Bottom of boring @ 50'
1" PVC temp well installed @ 50'.
10' screen, natural sand pack

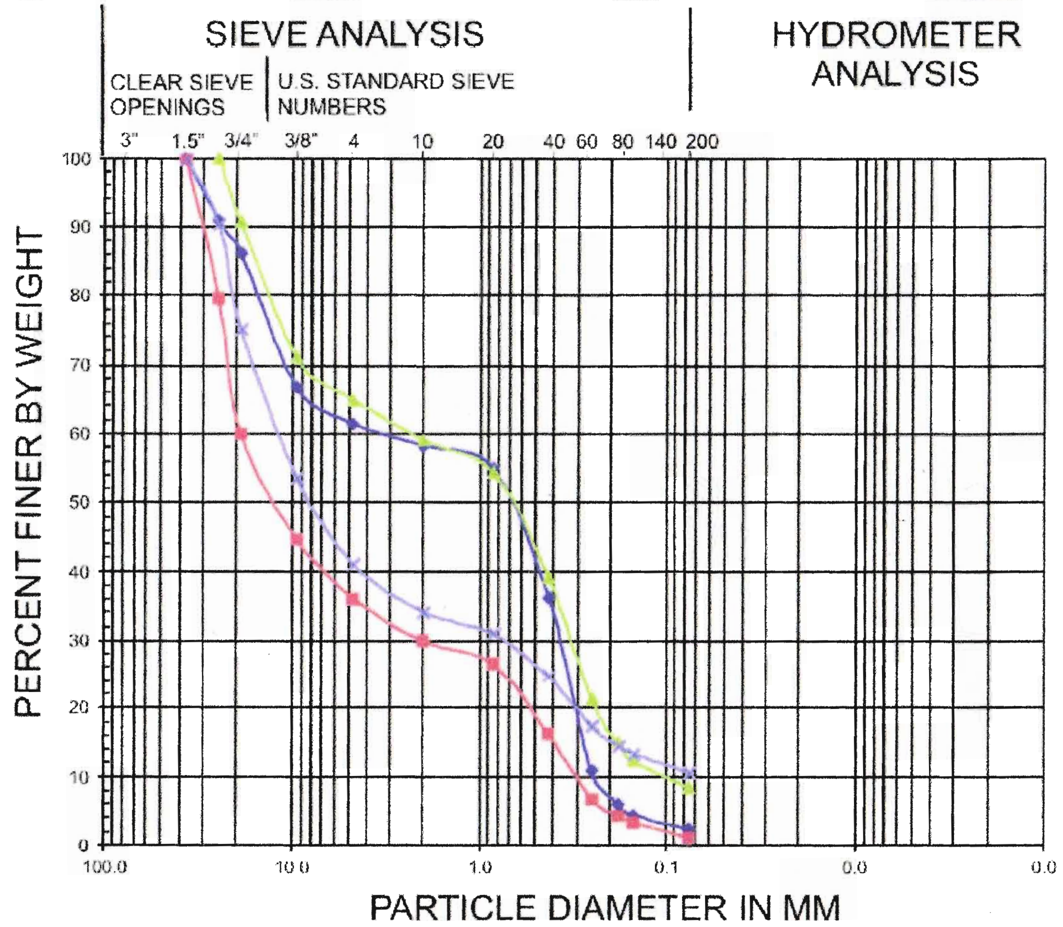
APPENDIX B

UPDATE TO ADD SB-7
· SEPARATE 8½x11

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project IPL - Lansing Generating Station Tested By Test America Date 2/3/2015
Boring No. SB-1, SB-3 & SB-5 "SAND & GRAVEL"



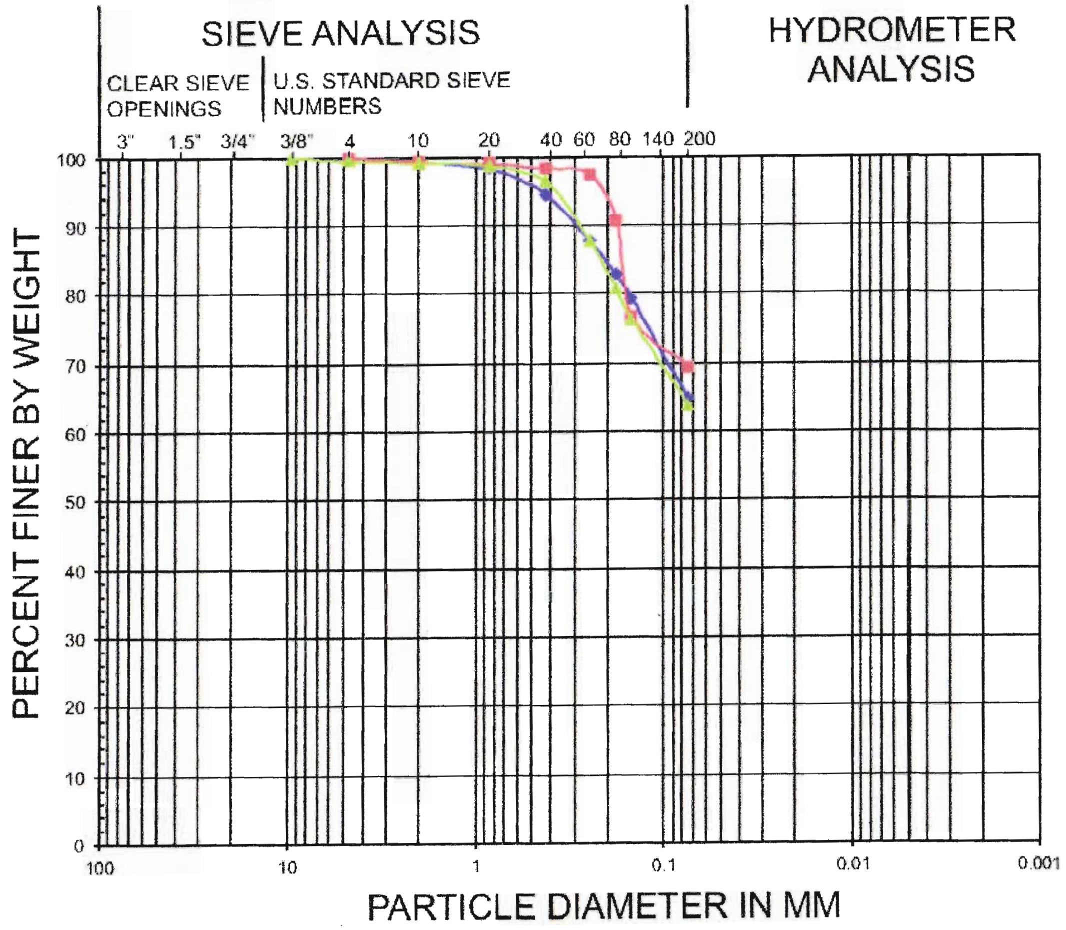
COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	W %
◆	SB-1	40 - 50	SAND & GRAVEL	SW / GW	16.5
■	SB-3	27 - 32	SAND & GRAVEL	SW / GW	13.4
▲	SB-5	22 - 27.5	SAND & GRAVEL	SW / GW	32.1
×	SB-5	44 - 45	SAND & GRAVEL	SW / GW	9.8

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project IPL – Lansing Generating Station Tested By Test America Date 2/3/2015
Boring No. SB-1, SB-3 & SB-5 "SANDY SILT"



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W %
◆	SB-1	28 - 32	Sandy Silt	ML	28	26	36.1
■	SB-3	24.5 - 27	Sandy Silt	ML	27	23	25.4
▲	SB-5	18.5 - 20	Sandy Silt	ML	24	20	21.8

NOTICE
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REV	DATE	BY	APP	DESCRIPTION
△				
△				
△				
△				
△	6-15-15	TJH	MWL	INCORPORATE IPL COMMENTS

SCALE: NONE DATE: 5-14-15
DRAWN BY: JFD CHECKED BY: TJH APPROVED BY: MWL

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SEEPAGE CONTROL CUT-OFF WALL
PARTICLE SIZE DISTRIBUTION
SB-1 & SB-3

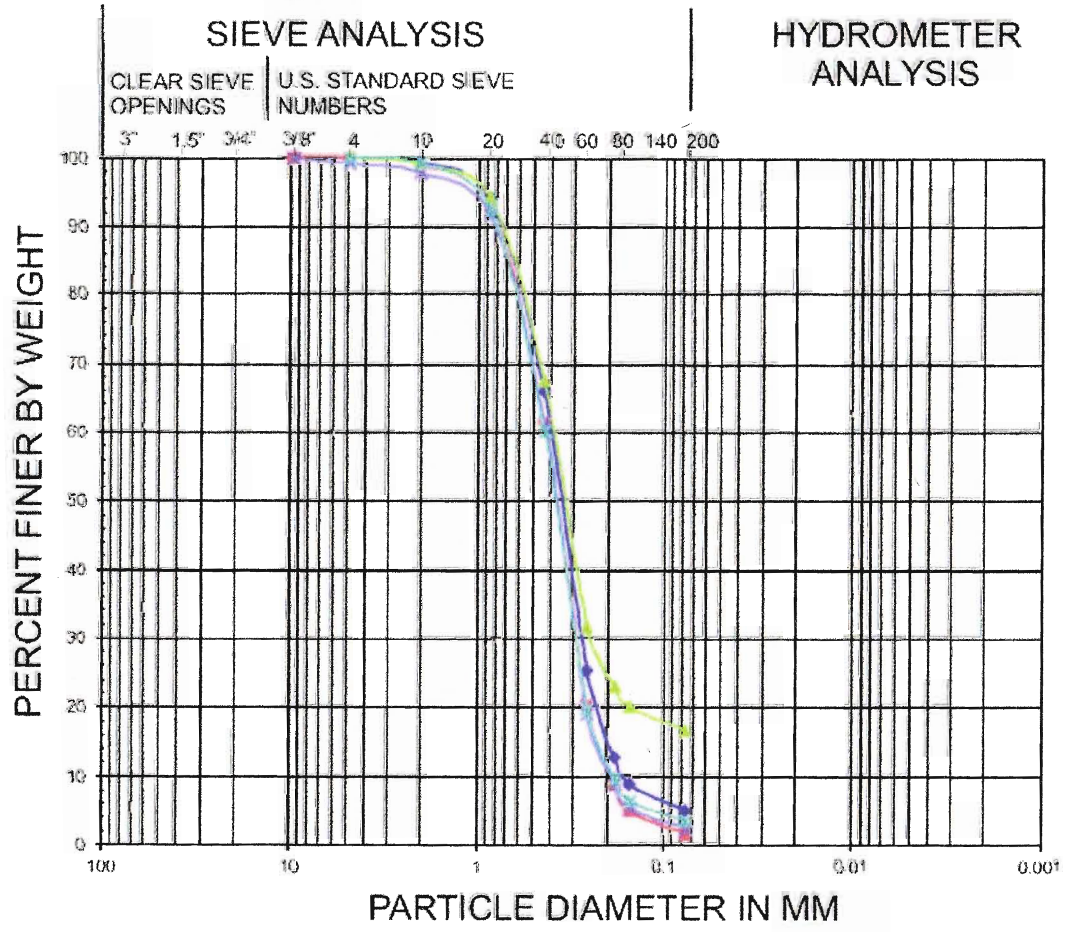
JOB 154.021.003
SHT. 8
DWG. 154021SW-08-12

APPENDIX B
UPDATE TO ADD SB-7
SEPARATE 8½x11

HARD HAT SERVICES
Engineering, Construction and Management Solutions

Particle Size Distribution

Project IPL - Lansing Generating Station Tested By TestAmerica Date 2/3/2015
Boring No. SB-1, SB-3 & SB-5 "UPPER SAND"



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (FT.)	SOIL DESCRIPTION	U.S.C.S.	W %
◆	SB-1	1 - 5	Medium - Fine Sand	SP	4.1
■	SB-1	15 - 20	Medium - Fine Sand	SP	20.1
▲	SB-3	2 - 5	Silty Medium - Fine Sand	SM	3.1
×	SB-3	13 - 20	Medium - Fine Sand	SP	19.0
✱	SB-5	10 - 16	Medium - Fine Sand	SP	13.3

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REV	DATE	BY	APP	DESCRIPTION
5				
4				
3				
2				
1	6-15-15	TJH	MWL	INCORPORATE IPL COMMENTS

SCALE: NONE DATE: 5-14-15
DRAWN BY: JFD CHECKED BY: TJH APPROVED BY: MWL

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

CLIENT / LOCATION
INTERSTATE POWER AND LIGHT (IPL)
LANSING GENERATING STATION PROJECT
2320 POWER PLANT DR
LANSING, IA 52151

DRAWING DESCRIPTION
SEEPAGE CONTROL CUT-OFF WALL
PARTICLE SIZE DISTRIBUTION
SB-5

JOB 154.021.003
SHT. 9
DWG. 154021SW-08-12

HE&C

Harrington Engineering & Construction, Inc.

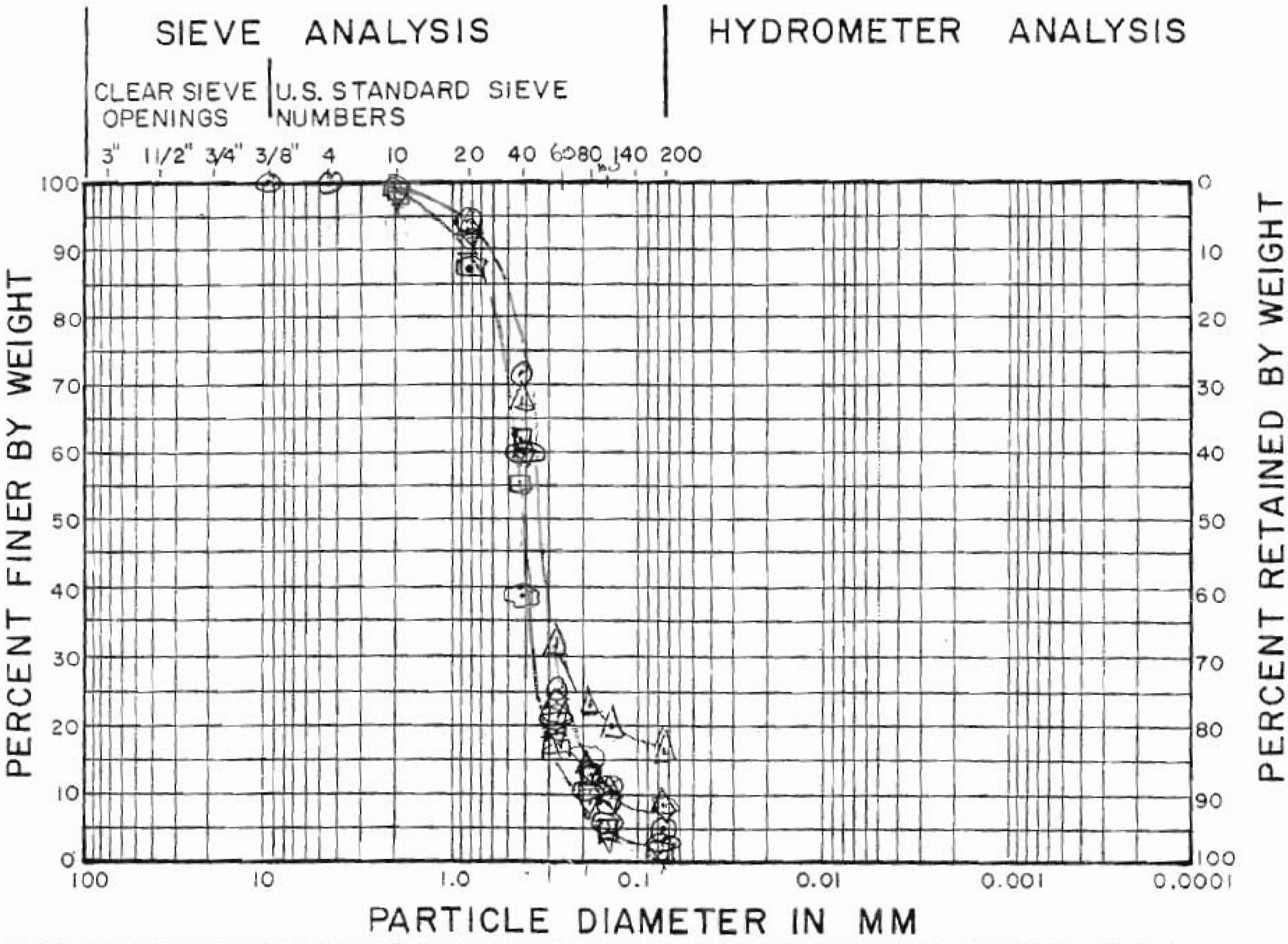
Particle Size Distribution

" UPPER SAND "

PROJECT ____________________ TESTED BY ____________ DATE ____________

PROJECT NO. ____________________ CALC BY ____________ DATE ____________

BORING NO. ____________________ CHKD BY ____________ DATE ____________



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
⊙	SB-1		1-5	MED-FINE SAND	SP			4.1
⊡	SB-1		15-20	"	SP			20.1
◬	SB-3		2-5	SILTY MED-FINE SAND	SM			3.1
▽	SB-3		13-20	MED - FINE SAND	SP			19.0
⊖	SB-5		10-16	"	SP			13.3
◈	SB-7		4-10	"	SP-SM			3.1
▭	SB-7		19-25	"	SP			17.1

HE&C
Harrington Engineering & Construction, Inc.

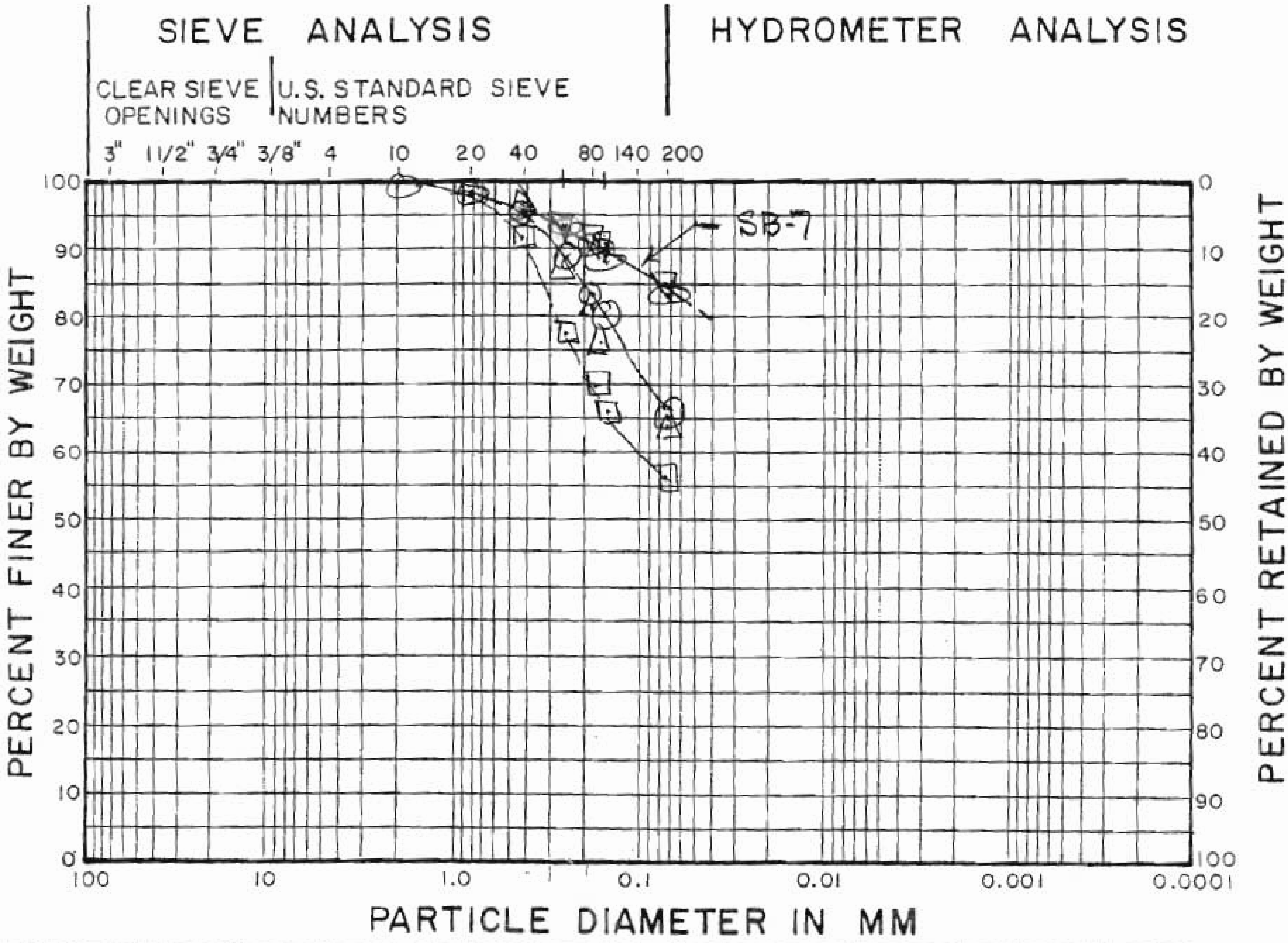
Particle Size Distribution

"SANDY SILT"

PROJECT__________ TESTED BY__________ DATE__________

PROJECT NO.__________ CALC BY__________ DATE__________

BORING NO.__________ CHKD BY__________ DATE__________



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

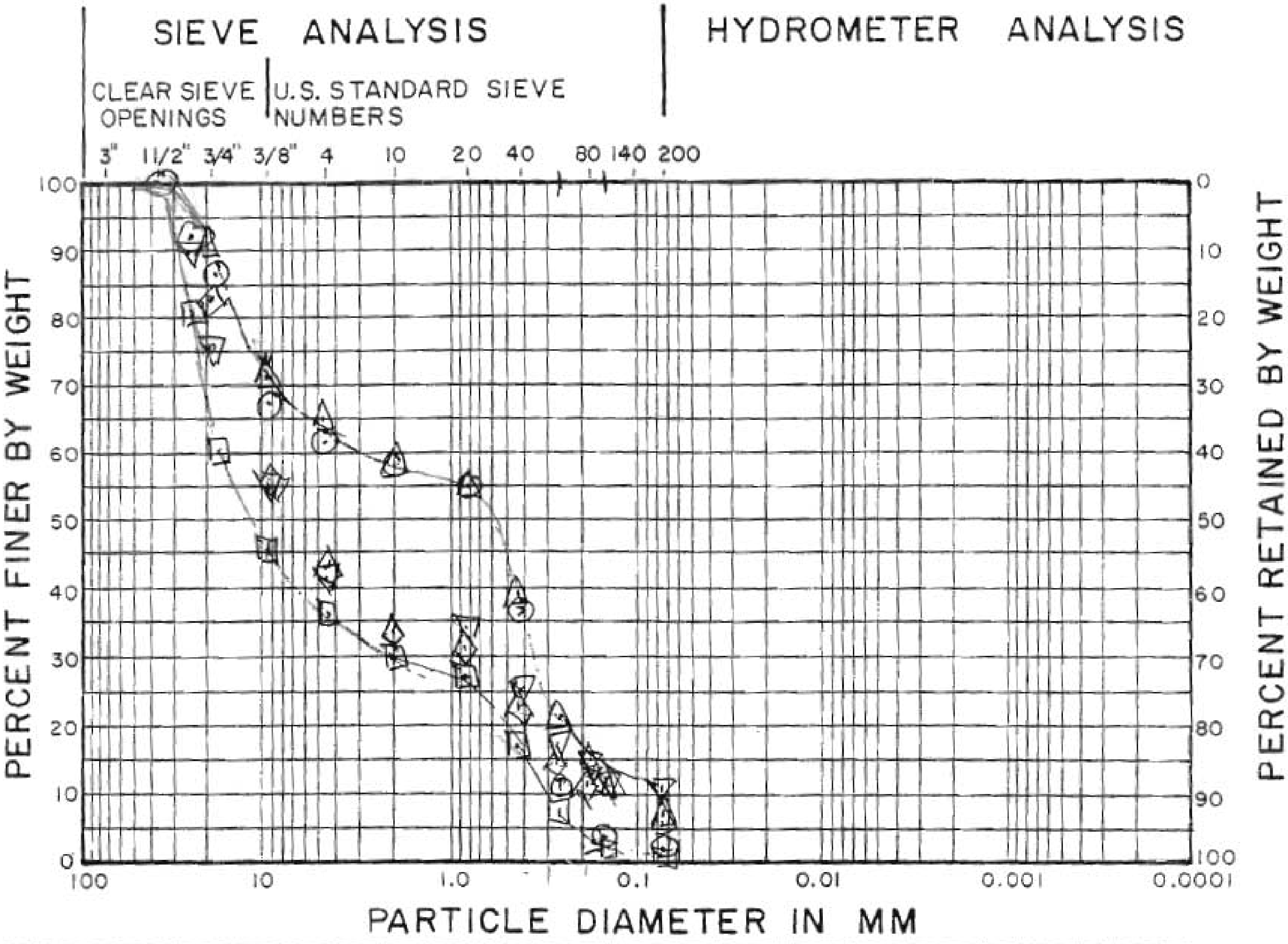
SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W%
⊙	SB-1		28-32	SANDY SILT	ML	28	26	36.1
⊡	SB-3		24.5-27	SANDY SILT	ML	27	23	23.4
△	SB-5		18.5-20	SANDY SILT	ML	24	20	21.8
▽	SB-7		29-32.5	SANDY SILT	ML	29	25	27.0
⊙	SB-7		36-40	SANDY SILT	ML	31	26	35.7

HEC
Harrington Engineering & Construction, Inc.

Particle Size Distribution

"SANDY GRAVEL"

PROJECT ______________________ TESTED BY ____________ DATE ____________
PROJECT NO. ______________________ CALC BY ____________ DATE ____________
BORING NO. ______________________ CHKD BY ____________ DATE ____________



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<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT AND CLAY FRACTION</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W %
⊙	SB-1		40-50	SAND & GRAVEL	SW/GW			16.5
□	SB-3		27-32	"	"			13.4
△	SB-5		22-27.5	"	"			32.1
▽	SB-3		44-45	"	"			9.8
◇	SB-7		46-50	"	"			35.7

EXHIBIT C – Iowa Bedrock Map

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Unstable Area Determination

BEDROCK GEOLOGIC MAP OF IOWA

1:500,000

Iowa Geological and Water Survey
Open File Map OFM-2010-01
March 2010

Primary Map Compilation By

Brian J. Witzke, Raymond R. Anderson and John P. Pope
Iowa Geological and Water Survey, Iowa City, Iowa

Iowa Geological and Water Survey
Robert D. Libra, State Geologist

Iowa Department of Natural Resources
Richard Leopold, Director

ACKNOWLEDGEMENTS

Recognized for significant contributions to the map's production: Bill J. Bunker, James D. Giglierano, Greg A. Ludvigson, Robert M. McKay, Huaibao P. Liu, and Thomas R. Marshall.

Supported in part with funding from the U.S. Geological Survey - National Cooperative Geologic Mapping Program.

Lansing Generating Station

Bedrock Formations Surrounding Lansing Generating Station

EXPLANATION

CRETACEOUS

- Kmt — Manson Impact Structure, Terrace Terrane (breccia)
- Kmm — Manson Impact Structure, Crater Moat (shaly breccia)
- Kmc — Manson Impact Structure, Central Peak (breccia; basement-rock megabreccia)
- Kn — Niobrara Formation (shale)
- Kf — Fort Benton Group (shale, chalk)
- Kd — Dakota and Windrow Formations (sandstone, shale)

JURASSIC

- Jf — Fort Dodge Formation (gypsum, redbeds)

PENNSYLVANIAN

- Pw — Wabaunsee Group (shale, limestone)
- Ps — Shawnee Group (limestone, shale)
- Pd — Douglas Group (shale, limestone, sandstone)
- Pl — Lansing Group (limestone, shale)
- Pk — Kansas City Group (limestone, shale)
- Pb — Bronson Group (limestone, shale)
- Pm — Marmaton Group (shale, limestone)
- Pcu — Upper Cherokee Group (shale, sandstone, limestone)
- Pcl — Lower Cherokee Group and Raccoon Creek Group (shale, sandstone)

MISSISSIPPIAN

- Ms — "St. Louis" and Pella Formations (dolomite, limestone, sandstone)
- Ma — Augusta Group (dolomite, limestone, chert)
- Mg — Gilmore City Formation (limestone, dolomite)
- Mk — Kinderhookian Formations (dolomite, limestone, siltstone)

DEVONIAN

- Df — Famennian Formations (shale, siltstone, dolomite)
- Dl — Lime Creek and Sweetland Creek Formations (shale, limestone)
- Dc — Cedar Valley Group (dolomite, limestone)
- Dw — Wapsipinicon Group (dolomite, limestone, anhydrite)

SILURIAN

- Sg — Gower Formation (dolomite)
- Ss — Scotch Grove Formation (dolomite, chert)
- Sh — Hopkinton, Blanding, Tete des Morts, Mosalem Formations (dolomite, chert)
- Sl — LaPorte City Formation (limestone, chert)
- Sw — Waucoma Formation (limestone)

ORDOVICIAN

- Om — Maquoketa Formation (shale, dolomite)
- Og — Galena Group and Platteville Formation (dolomite, shale, chert)
- Op — Prairie du Chien Group and St. Peter Sandstone (dolomite, sandstone)

CAMBRIAN

- Cj — Jordan Sandstone, St. Lawrence and Lone Rock Formations (sandstone, dolomite)
- Cw — Wonewoc Formation (sandstone)
- Ce — Eau Claire Formation (sandstone, shale)
- Cm — Mt. Simon Sandstone (sandstone)

PRECAMBRIAN

- Xs — Sioux Quartzite (quartzite)

U
D
fault (U - upside, D - downside)

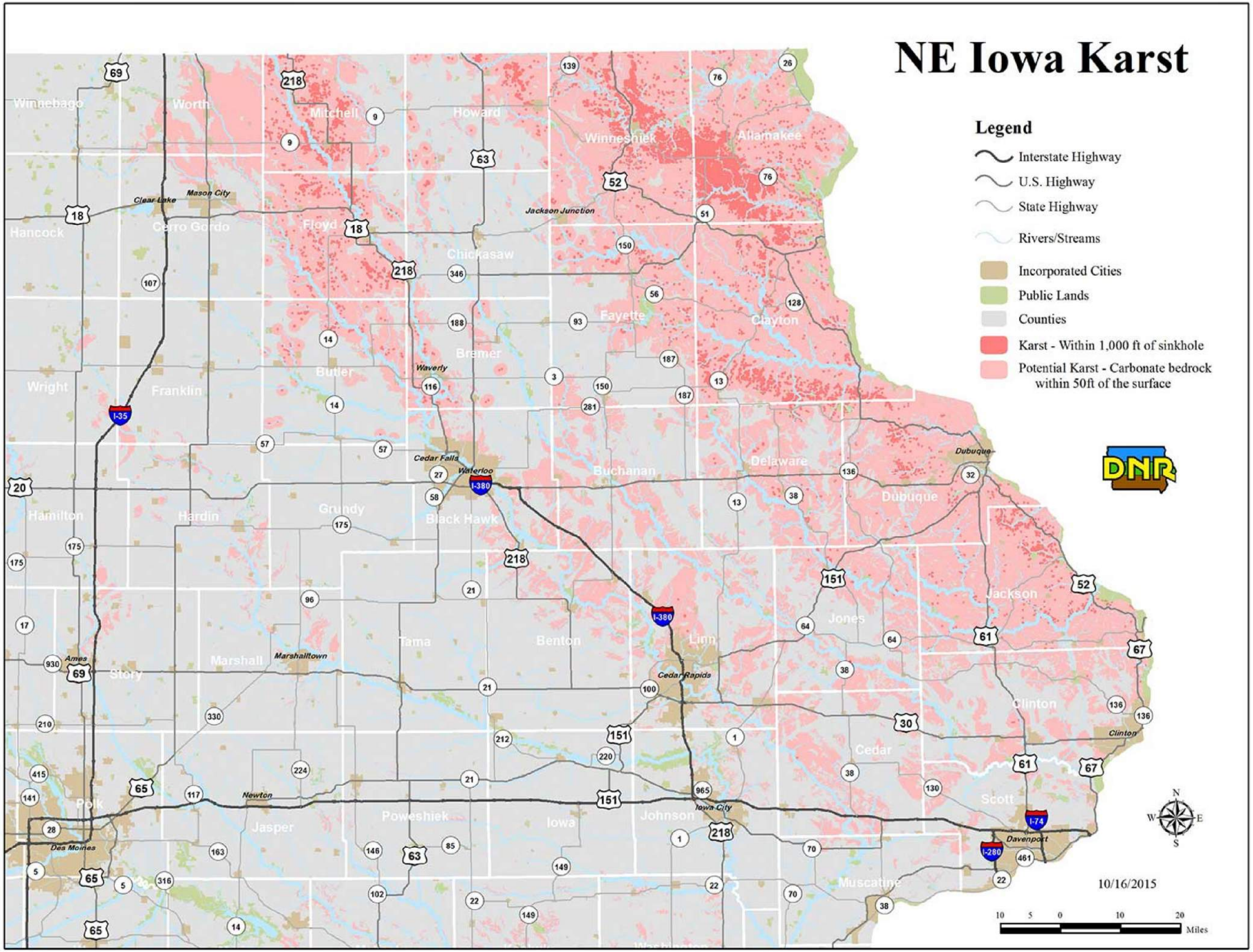
fault buried by Kd

Transparent shades of gray show the bedrock surface as it would be illuminated by an artificial light source coming from the NW direction.

EXHIBIT D – Iowa Karst Maps

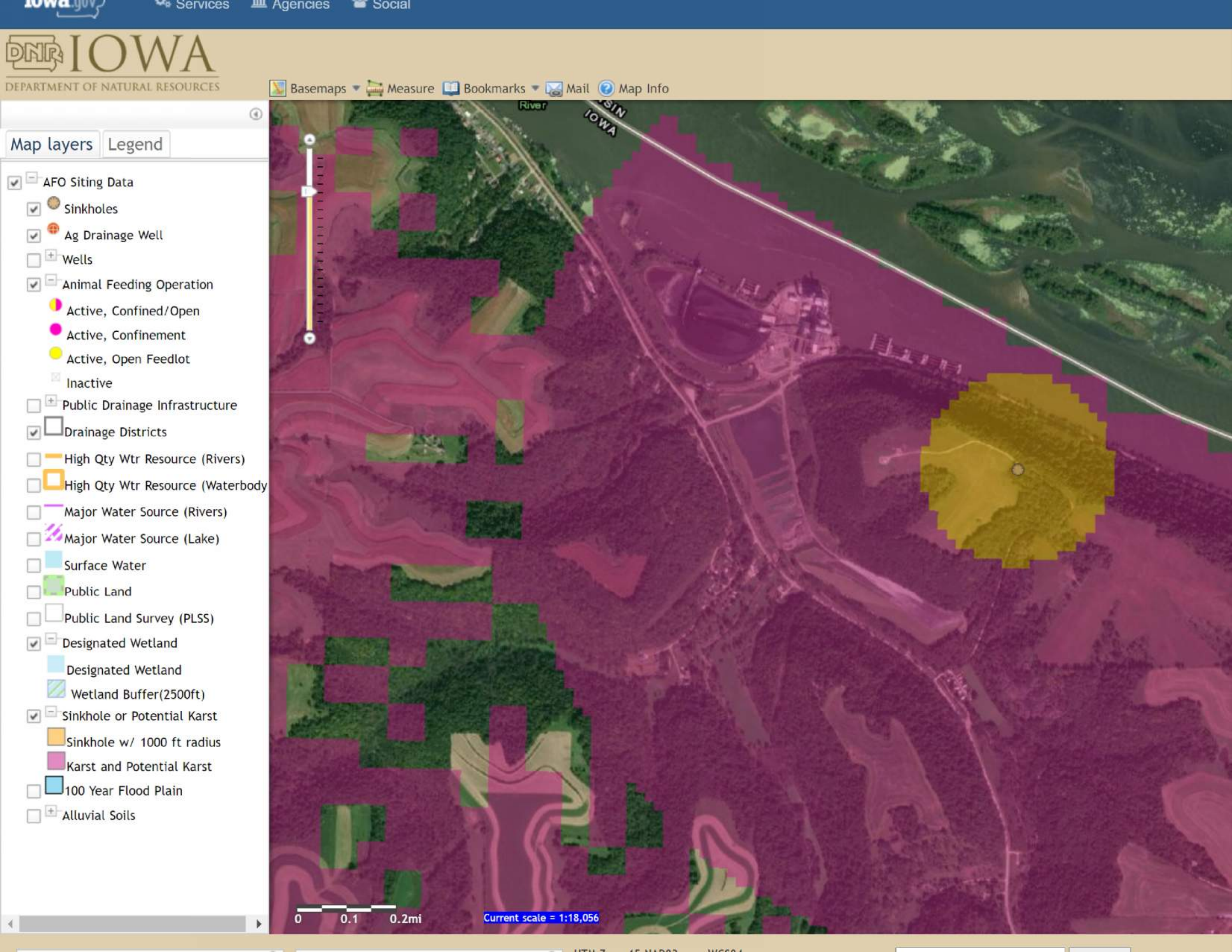
Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Unstable Area Determination



NE Iowa Karst

10/16/2015



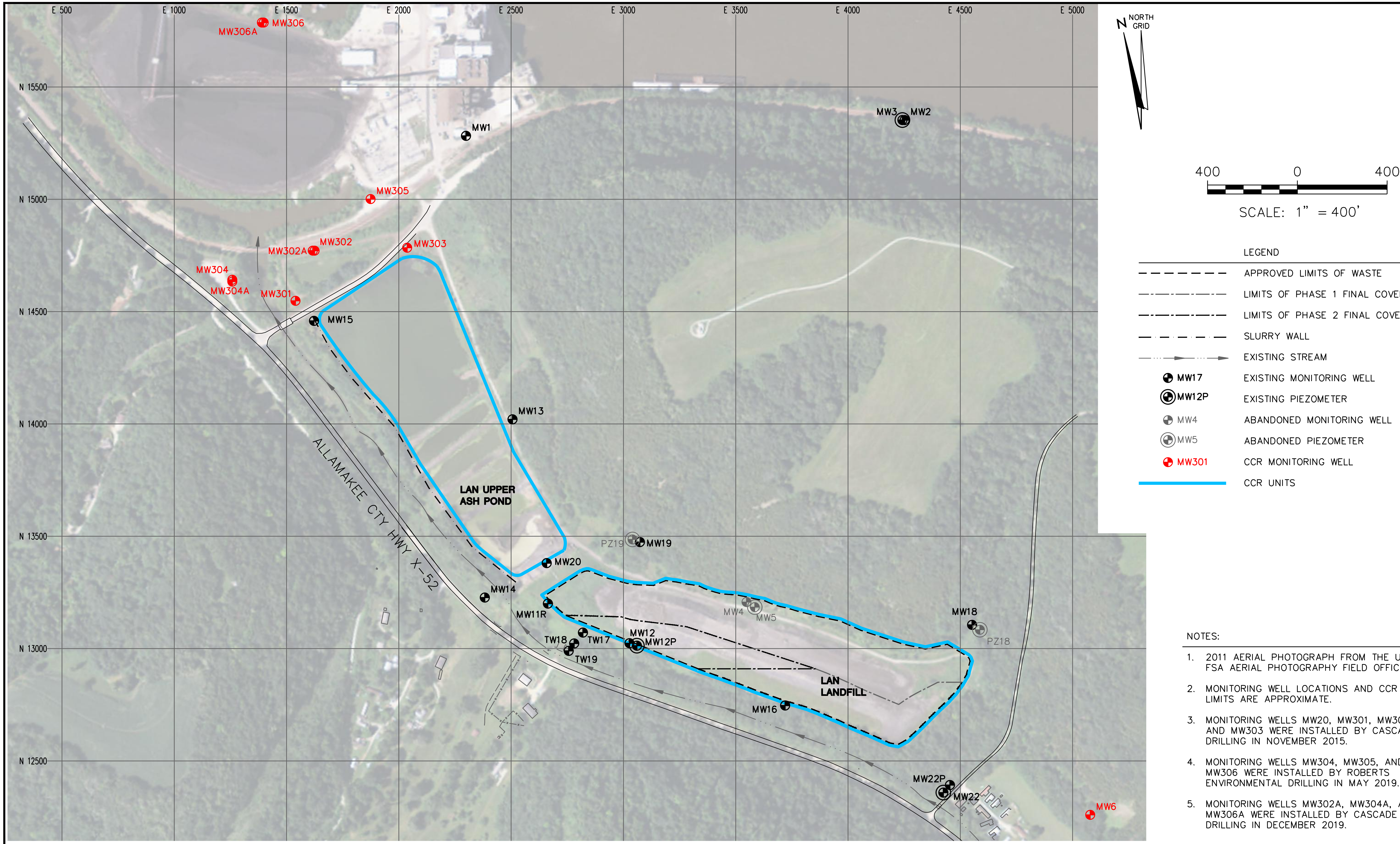
Current scale = 1:18,056

☑ AFO Siting Data
- ☑ Sinkholes
- ☑ Ag Drainage Well
- ☐ Wells
- ☑ Animal Feeding Operation
  - Active, Confined/Open
  - Active, Confinement
  - Active, Open Feedlot
  - Inactive
- ☐ Public Drainage Infrastructure
- ☑ Drainage Districts
- ☐ High Qty Wtr Resource (Rivers)
- ☐ High Qty Wtr Resource (Waterbody
- ☐ Major Water Source (Rivers)
- ☐ Major Water Source (Lake)
- ☐ Surface Water
- ☐ Public Land
- ☐ Public Land Survey (PLSS)
- ☑ Designated Wetland
  - Designated Wetland
  - Wetland Buffer(2500ft)
- ☑ Sinkhole or Potential Karst
  - Sinkhole w/ 1000 ft radius
  - Karst and Potential Karst
- ☐ 100 Year Flood Plain
- ☐ Alluvial Soils

EXHIBIT E – Groundwater Info from SCS Engineers

Alliant Energy
Interstate Power and Light Company
Lansing Generating Station
Lansing, Iowa

Unstable Area Determination



LEGEND

— — — — —	APPROVED LIMITS OF WASTE
—·—·—·—	LIMITS OF PHASE 1 FINAL COVER
—·—·—·—	LIMITS OF PHASE 2 FINAL COVER
— · — · —	SLURRY WALL
···►···►	EXISTING STREAM
● MW17	EXISTING MONITORING WELL
◉ MW12P	EXISTING PIEZOMETER
● MW4	ABANDONED MONITORING WELL
◉ MW5	ABANDONED PIEZOMETER
● MW301	CCR MONITORING WELL
━━━━	CCR UNITS

NOTES:

1. 2011 AERIAL PHOTOGRAPH FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE.
2. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
3. MONITORING WELLS MW20, MW301, MW302, AND MW303 WERE INSTALLED BY CASCADE DRILLING IN NOVEMBER 2015.
4. MONITORING WELLS MW304, MW305, AND MW306 WERE INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING IN MAY 2019.
5. MONITORING WELLS MW302A, MW304A, AND MW306A WERE INSTALLED BY CASCADE DRILLING IN DECEMBER 2019.

PROJECT NO.	25220070.00	DRAWN BY:	BSS
DRAWN:	11/27/2019	CHECKED BY:	MDB
REVISED:	03/12/2020	APPROVED BY:	TK 03/12/2020

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PHONE: (608) 224-2830

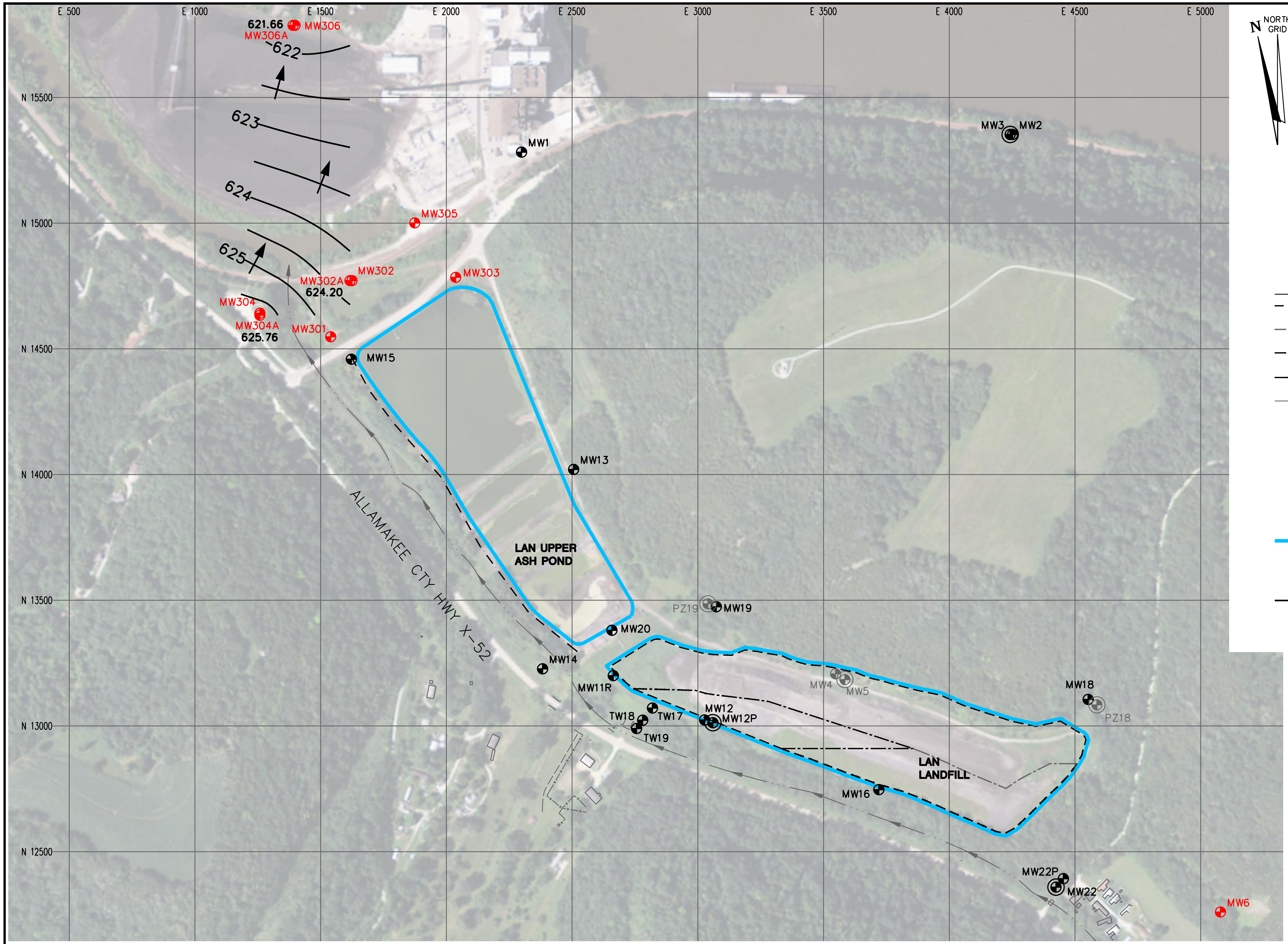
CLIENT
INTERSTATE POWER AND LIGHT
2320 POWER PLANT DRIVE
LANSING, IA 52151-9733

SITE
ALLIANT ENERGY
LANSING POWER STATION
LANSING, IOWA

SITE PLAN AND MONITORING
WELL LOCATIONS

FIGURE
2

I:\25220070.00\Drawings\Site Plan and Monitoring Well Locations.dwg, 3/12/2020 10:31:38 AM



N NORTH GRID

400 0 400

SCALE: 1" = 400'

LEGEND

— — — — —	APPROVED LIMITS OF WASTE
—·—·—·—	LIMITS OF PHASE 1 FINAL COVER
—··—··—	LIMITS OF PHASE 2 FINAL COVER
— · — · —	SLURRY WALL
··→··→	EXISTING STREAM
● MW17	EXISTING MONITORING WELL
◉ MW12P	EXISTING PIEZOMETER
● MW4	ABANDONED MONITORING WELL
◉ MW5	ABANDONED PIEZOMETER
● MW301	CCR MONITORING WELL
━━━	CCR UNITS
624.20	WATER TABLE ELEVATION MEASURED ON 07/06/2020
———	WATER TABLE CONTOUR
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. 2011 AERIAL PHOTOGRAPH FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE.
2. MONITORING WELL LOCATIONS AND CCR UNIT LIMITS ARE APPROXIMATE.
3. MONITORING WELLS MW20, MW301, MW302, AND MW303 WERE INSTALLED BY CASCADE DRILLING IN NOVEMBER 2015.
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PROJECT NO.	25220070.00	DRAWN BY:	BSS
DRAWN:	07/31/2020	CHECKED BY:	MDB
REVISED:	07/31/2020	APPROVED BY:	

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INTERSTATE POWER AND LIGHT
2320 POWER PLANT DRIVE
LANSING, IA 52151-9733

SITE

ALLIANT ENERGY
LANSING POWER STATION
LANSING, IOWA

POTENTIOMETRIC SURFACE MAP
JULY 6, 2020

FIGURE
2

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Table 3. Vertical Hydraulic Gradient Summary

Interstate Power & Light - Lansing, Iowa / SCS Engineers Project #25220070.00

Vertical Hydraulic Gradients	MW4/MW5		MW2/MW3		MW12/MW12P		MW22/MW22P	
Monitoring Well	MW4		MW2		MW12		MW-22	
screen bottom (feet amsl)	640.00		610.50		642.70		650.27	
Piezometer	MW5		MW3		MW12P		MW-22P	
effective screen midpoint (feet amsl)	625.00		595.00		625.48		622.64	
Measurement Date	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**
May 11, 2001	21.8	0.055	24.5	0.031	NI	NI	NI	NI
March 8, 2002	20.3	0.061	20.4	0.036	NI	NI	NI	NI
February 19, 2004	19.4	0.064	NM	NM	NI	NI	NI	NI
May 26, 2004	21.4	0.059	NM	NM	NI	NI	NI	NI
August 23, 2004	21.1	0.058	NM	NM	NI	NI	NI	NI
November 18, 2004	20.4	0.060	NM	NM	NI	NI	NI	NI
May 5, 2005	20.2	0.062	NM	NM	NI	NI	NI	NI
May 19, 2006	20.2	0.061	NM	NM	NI	NI	NI	NI
May 30, 2007	20.1	0.061	NM	NM	NI	NI	NI	NI
April 16, 2008	22.0	0.057	NM	NM	NI	NI	NI	NI
April 3, 2009	22.9	0.054	NM	NM	NI	NI	NI	NI
April 21, 2010	21.1	0.059	NM	NM	NI	NI	NI	NI
May 4, 2011	21.8	0.057	NM	NM	NI	NI	NI	NI
April 25, 2012	20.9	0.060	NM	NM	NI	NI	NI	NI
October 17, 2012	20.4	0.061	NM	NM	NI	NI	NI	NI
February 19-20, 2013	20.4	0.061	20.3	0.061	NI	NI	NI	NI
April 1, 2013	21.1	0.058	20.6	0.054	NI	NI	NI	NI
July 1, 2013	25.6	0.046	23.2	0.034	NI	NI	NI	NI
April 29, 2014	22.1	0.057	NM	NM	21.7	-0.013	NI	NI
May 29, 2014	21.8	0.013	22.4	0.006	21.4	-0.015	NI	NI
April 20, 2015	21.0	0.059	20.3	0.034	21.0	-0.013	NI	NI
April 28, 2016	20.8	0.060	20.4	0.028	20.9	-0.002	NI	NI
April 19-21, 2017	24.4	0.048	21.3	-0.001	22.7	-0.012	36.7	-0.025
April 16-17, 2018	ABANDONED		20.7	-0.161	22.0	-0.016	NM	NM
April 26, 2018	ABANDONED		20.7	-0.156	21.7	0.036	35.6	-0.031
April 15-16, 2019	ABANDONED		26.3	-0.143	23.0	-0.016	38.0	-0.048
June 20, 2019	ABANDONED		NM	NM	NM	NM	NM	NM
October 2, 2019	ABANDONED		NM	NM	NM	NM	NM	NM
December 5, 2019	ABANDONED		NM	NM	NM	NM	NM	NM
February 5, 2020	ABANDONED		NM	NM	NM	NM	NM	NM
May 20-21, 2020	ABANDONED		20.6	0.037	23.1	-0.018	38.6	-0.044
July 6, 2020	ABANDONED		NM	NM	NM	NM	NM	NM
August 19-21, 2020	ABANDONED		NM	NM	NM	NM	NM	NM
October 19-20, 2020	ABANDONED		20.4	0.041	22.8	-0.016	38.1	-0.044

Notes:

1: A positive vertical gradient indicates upward groundwater flow. A negative gradient indicates downward flow.

2: The screen midpoint for water table wells is calculated as the midpoint between the water table elevation and screen bottom elevation.

NM: Not Measured

NI: Not Installed

Created by:	MDB	Date: 8/9/2013
Last revision by:	ACW	Date: 10/22/2020
Checked by:	RM	Date: 10/22/2020

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Table 2. Vertical Hydraulic Gradient Summary

Interstate Power & Light - Lansing, Iowa / SCS Engineers Project #25220070.00

Vertical Hydraulic Gradients	MW302/MW302A		MW304/MW304A		MW306/MW306A	
Monitoring Well	MW302		MW304		MW306	
screen bottom (feet amsl)	616.90		620.43		611.48	
Piezometer	MW302A		MW304A		MW306A	
effective screen midpoint (feet amsl)	592.43		591.10		587.06	
Measurement Date	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**	**Distance between screen midpoints (feet)**	**Vertical Gradient (ft/ft) (1)**
May 20-21, 2020	29.9	-0.150	29.9	0.111	28.9	-0.001
July 6, 2020	NM	NM	NM	NM	NM	NM
August 19-21, 2020	29.8	-0.135	30.0	NM	28.9	0.009
October 19-20, 2020	29.6	-0.139	29.8	0.101	28.6	0.009

Notes:

1: A positive vertical gradient indicates upward groundwater flow. A negative gradient indicates downward flow.

2: The screen midpoint for water table wells is calculated as the midpoint between the water table elevation and screen bottom elevation.

NM: Not Measured

NI: Not Installed

Created by:	TK	Date:	10/23/2020
Last revision by:	TK	Date:	10/23/2020
Checked by:	NDK	Date:	10/23/2020

I:\25220070.00\Data and Calculations\Tables\[LAN_wlstat.xls]gradient (CCR Wells)