

GOVERNING SPECIFICATIONS

THE SPECIFICATIONS AS PREPARED BY IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP AND BOLTON & MENK, INC. SHALL BE CONSIDERED AS PART OF THIS DOCUMENT. NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATIONS SHALL APPLY.

THE CURRENT EDITION OF THE "IOWA STATEWIDE URBAN STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS" SHALL GOVERN.

IOWA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION" AND ALL CURRENT GENERAL SUPPLEMENTAL SPECIFICATIONS AND MATERIALS INSTRUCTIONAL MEMORANDUM SHALL GOVERN AS REFERENCED.

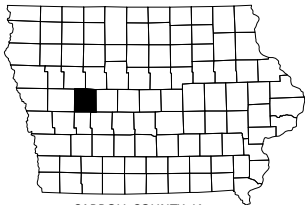
ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND ORDINANCES WILL BE COMPLIED WITH IN THE CONSTRUCTION OF THIS PROJECT.



THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA." THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING IOWA ONE CALL BY PHONE AT 811, OR ON THE WEB AT [HTTP://WWW.IOWAONECALL.COM/](http://www.iowaonecall.com/). THIS IS REQUIRED BY LAW.

TICKET#
TICKET NUMBER MUST BE PROVIDED TO THE ENGINEER AND IDALS PRIOR TO COMMENCEMENT OF WORK.

NRCS, IDALS, and the engineer make no representation as to the existence or nonexistence of any utility, public and/or private, buried or overhead, except as shown on the drawings. Where utilities are shown on the drawings, the location, depth and/or height are approximate. The exact location, depth and/or height must be determined by the utility company and/or the land owner prior to any construction within the project vicinity.



NOTES

- IF A CULTURAL RESOURCE IS IDENTIFIED DURING CONSTRUCTION, STOP WORK IMMEDIATELY AND NOTIFY THE LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE.
- THERE IS NO GUARANTEE THAT THE WETLAND WILL FILL OR REMAIN FILLED WITH WATER.



IOWA DEPARTMENT OF
**AGRICULTURE &
LAND STEWARDSHIP**



1519 BALTIMORE DRIVE
AMES, IA 50010
Phone: (515) 233-6100
Email: Ames@bolton-menk.com
www.bolton-menk.com

DESIGNED	REV	DESCRIPTION	DATE
BCS	1.0	PERMIT PLANS	05/29/2026
NVD			
JPR			
CLIENT PROJ. NO.			
25X.137945.000			

PROJECT DATUM: STATE PLANE
HORIZONTAL: IOWA NORTH
VERTICAL: NAVD 1988

IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
CAR833409A - THRILLS HILLS WETLAND

TITLE SHEET

SHEET

A.01

CONSTRUCTION PLANS FOR
IDALS NO. CAR833409A
NUTRIENT REDUCTION WETLAND
CARROLL COUNTY, IOWA
SEPTEMBER 2026

SHEET INDEX

SHEET NUMBER	SHEET TITLE
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A.02	PLAN OVERVIEW SHEET
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B.01	OUTLET STRUCTURE DETAIL
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C.01	ESTIMATED QUANTITIES
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D.03	EMBANKMENT (CONT.) & AUXILIARY SPILLWAY
D.04	DIVERSION BERMS
K.01	SEEDING PLAN
M.01	PUMPED INLET & OUTLET PIPES
M.02	POND OUTLET PIPE

PROJECT
LOCATION

CONSERVATION PRACTICE STANDARDS USED:
656 - CONSTRUCTED WETLAND

NRCS JOB CLASS: III
300 AC > WATERSHED AREA

TO THE BEST OF MY PROFESSIONAL KNOWLEDGE,
JUDGEMENT, AND BELIEF, THESE PLANS MEET APPLICABLE
NRCS STANDARDS AND APPLICABLE LAWS AND
REGULATIONS.



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.

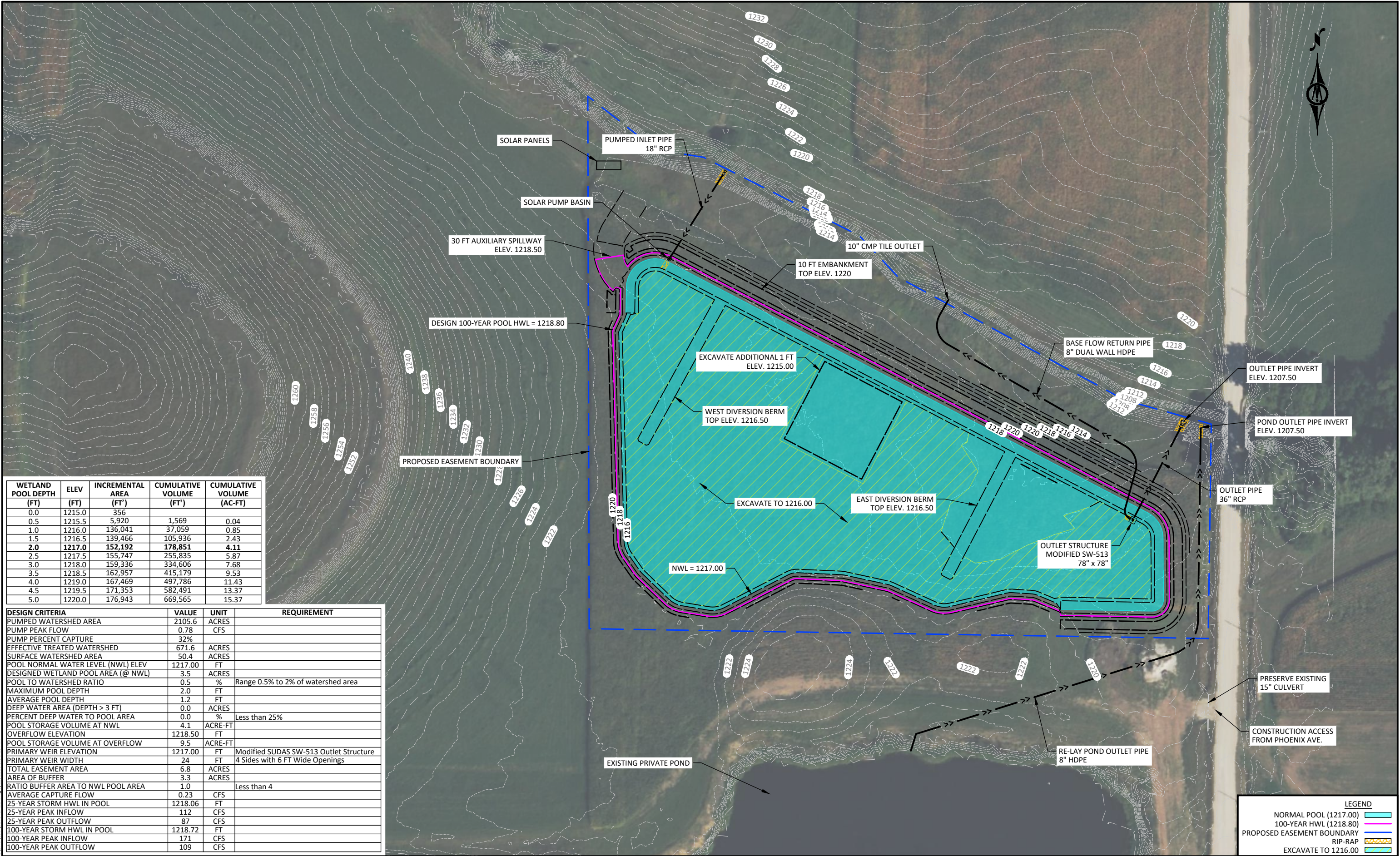
BRANDON C. SHORT, PE

LICENSE NUMBER: 29449 DATE: 9/29/2026

MY LICENSE RENEWAL DATE IS 12/31/2026

PAGES OR SHEETS COVERED BY THIS SEAL:

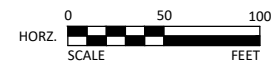
ALL SHEETS



WETLAND POOL DEPTH (FT)	ELEV (FT)	INCREMENTAL AREA (FT²)	CUMULATIVE VOLUME (FT³)	CUMULATIVE VOLUME (AC-FT)
0.0	1215.0	356		
0.5	1215.5	5,920	1,569	0.04
1.0	1216.0	136,041	37,059	0.85
1.5	1216.5	139,466	105,936	2.43
2.0	1217.0	152,192	178,851	4.11
2.5	1217.5	155,747	255,835	5.87
3.0	1218.0	159,336	334,606	7.68
3.5	1218.5	162,957	415,179	9.53
4.0	1219.0	167,469	497,786	11.43
4.5	1219.5	171,353	582,491	13.37
5.0	1220.0	176,943	669,565	15.37

DESIGN CRITERIA	VALUE	UNIT	REQUIREMENT
PUMPED WATERSHED AREA	2105.6	ACRES	
PUMP PEAK FLOW	0.78	CFS	
PUMP PERCENT CAPTURE	32%		
EFFECTIVE TREATED WATERSHED	671.6	ACRES	
SURFACE WATERSHED AREA	50.4	ACRES	
POOL NORMAL WATER LEVEL (NWL) ELEV	1217.00	FT	
DESIGNED WETLAND POOL AREA (@ NWL)	3.5	ACRES	
POOL TO WATERSHED RATIO	0.5	%	Range 0.5% to 2% of watershed area
MAXIMUM POOL DEPTH	2.0	FT	
AVERAGE POOL DEPTH	1.2	FT	
DEEP WATER AREA (DEPTH > 3 FT)	0.0	ACRES	
PERCENT DEEP WATER TO POOL AREA	0.0	%	Less than 25%
POOL STORAGE VOLUME AT NWL	4.1	ACRE-FT	
OVERFLOW ELEVATION	1218.50	FT	
POOL STORAGE VOLUME AT OVERFLOW	9.5	ACRE-FT	
PRIMARY WEIR ELEVATION	1217.00	FT	Modified SUDAS SW-513 Outlet Structure
PRIMARY WEIR WIDTH	24	FT	4 Sides with 6 FT Wide Openings
TOTAL EASEMENT AREA	6.8	ACRES	
AREA OF BUFFER	3.3	ACRES	
RATIO BUFFER AREA TO NWL POOL AREA	1.0		Less than 4
AVERAGE CAPTURE FLOW	0.23	CFS	
25-YEAR STORM HWL IN POOL	1218.06	FT	
25-YEAR PEAK INFLOW	112	CFS	
25-YEAR PEAK OUTFLOW	87	CFS	
100-YEAR STORM HWL IN POOL	1218.72	FT	
100-YEAR PEAK INFLOW	171	CFS	
100-YEAR PEAK OUTFLOW	109	CFS	

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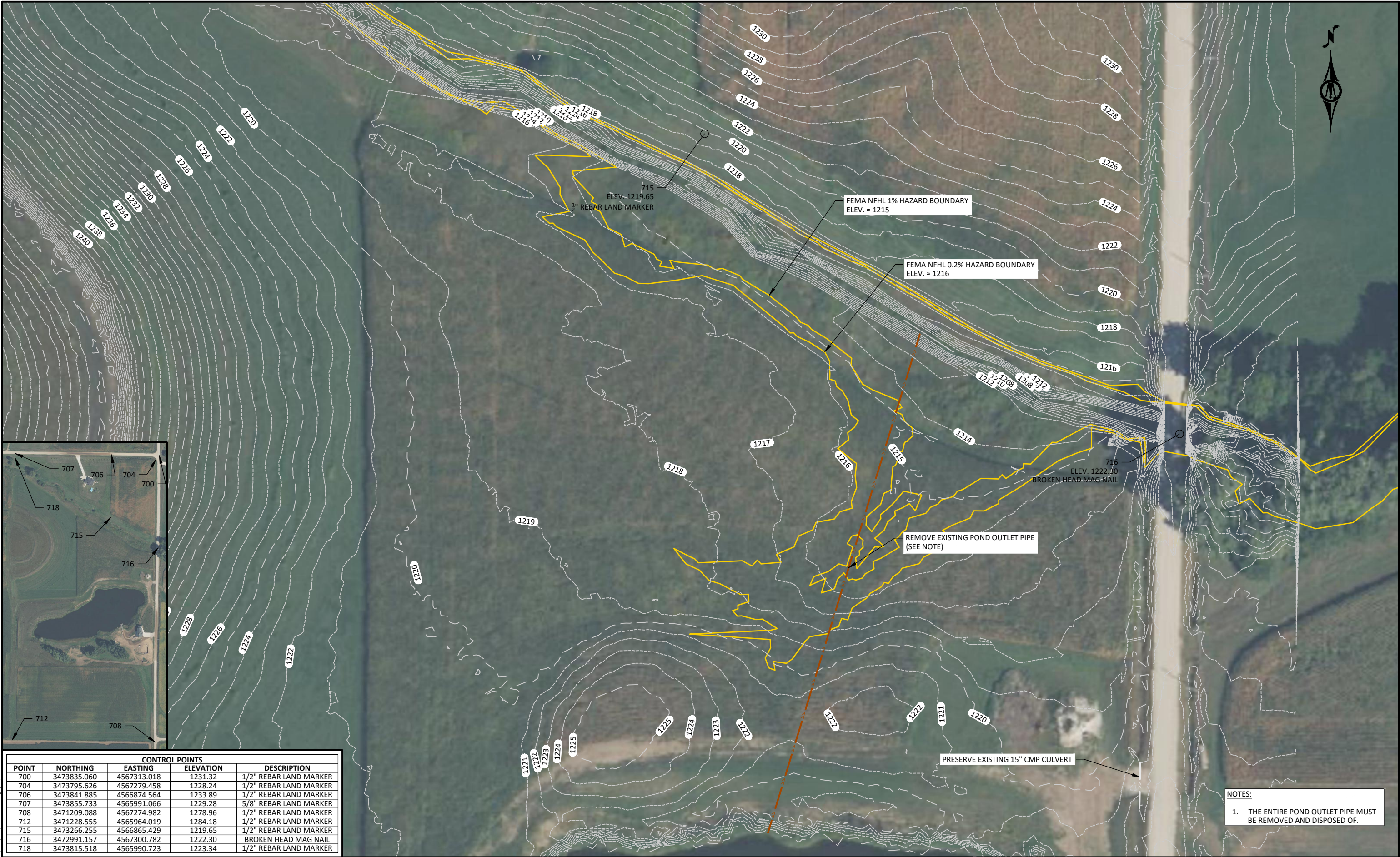
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Phone: (515) 233-6100
Email: Ames@bolton-menk.com
www.bolton-menk.com

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CLIENT PROJ. NO.	25X.137945.000			

IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
CAR833409A - THRILLS HILLS WETLAND
PLAN OVERVIEW SHEET

LEGEND	
NORMAL POOL (1217.00)	
100-YEAR HWL (1218.80)	
PROPOSED EASEMENT BOUNDARY	
RIP-RAP	
EXCAVATE TO 1216.00	

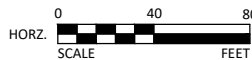
SHEET
A.02



CONTROL POINTS				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
700	3473835.060	4567313.018	1231.32	1/2" REBAR LAND MARKER
704	3473795.626	4567279.458	1228.24	1/2" REBAR LAND MARKER
706	3473841.885	4566874.564	1233.89	1/2" REBAR LAND MARKER
707	3473855.733	4565991.066	1229.28	5/8" REBAR LAND MARKER
708	3471209.088	4567274.982	1278.96	1/2" REBAR LAND MARKER
712	3471228.555	4565964.019	1284.18	1/2" REBAR LAND MARKER
715	3473266.255	4566865.429	1219.65	1/2" REBAR LAND MARKER
716	3472991.157	4567300.782	1222.30	BROKEN HEAD MAG NAIL
718	3473815.518	4565990.723	1223.34	1/2" REBAR LAND MARKER

NOTES:
1. THE ENTIRE POND OUTLET PIPE MUST BE REMOVED AND DISPOSED OF.

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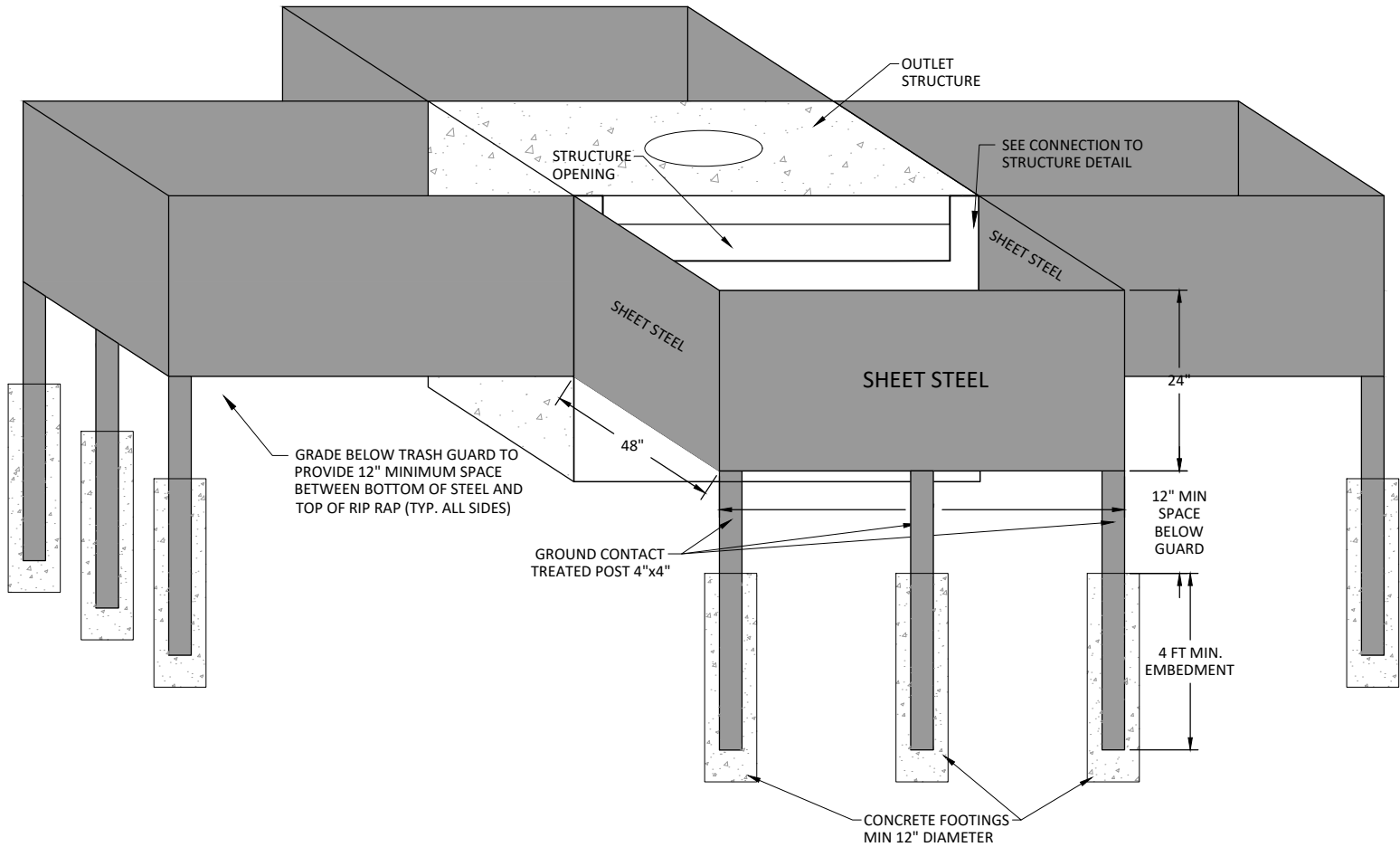
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CAR833409A - THRILLS HILLS WETLAND
EXISTING CONDITIONS

SHEET

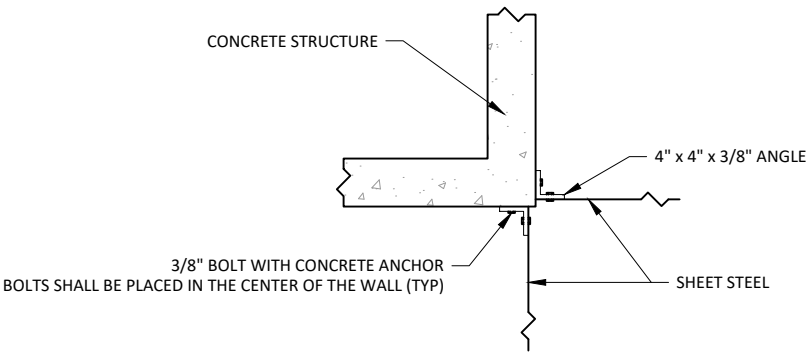
A.03

TRASH GUARD FOR WETLAND OUTLET STRUCTURE

NOT TO SCALE



TRASH GUARD CONNECTION TO STRUCTURE



NOTE: TRASH GUARD AND APPURTENANCES ARE TYPICAL FOR ALL SIDES OF OUTLET STRUCTURE. QUANTITIES AND DIMENSIONS FOR STEEL SHEETS PER SIDE OF STRUCTURE ARE AS FOLLOWS:

- 1 - STEEL SHEET - 90" x 24" x 3/8"
- 2 - STEEL SHEETS - 48" x 24" x 3/8"

ANGLE IRON--EITHER WELDED OR BOLTED--ON TOP AND BOTTOM OF EACH SHEET AS BRACE.
BOLT TRASH GUARD ONTO ANGLE IRON ANCHORED TO OUTLET STRUCTURE.
PROVIDE THREE POSTS WITH CONCRETE FOOTINGS ON EACH SIDE
GRADE AS NECESSARY TO ALLOW FLOW OF WATER UNDER TRASH GUARD WITH 12" MINIMUM CLEARANCE.

ALL FASTENERS SHALL BE GALVANIZED OR STAINLESS STEEL

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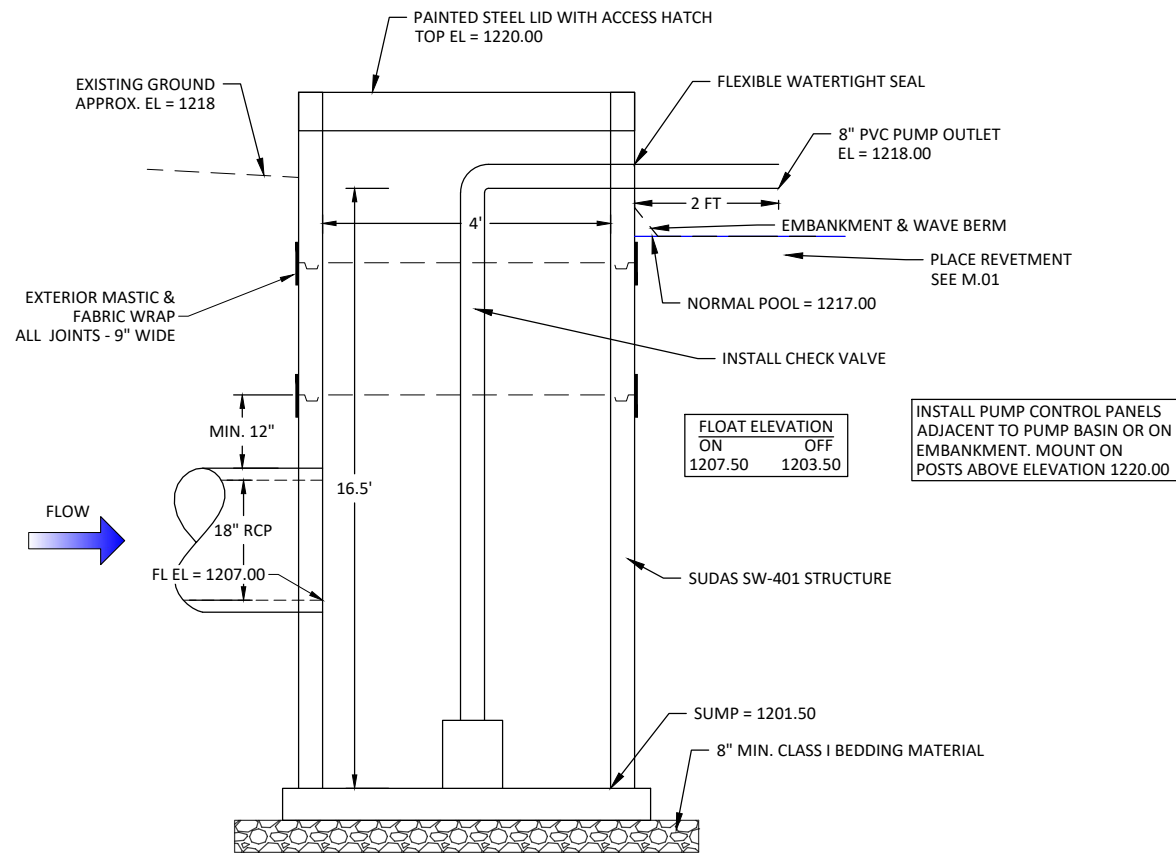
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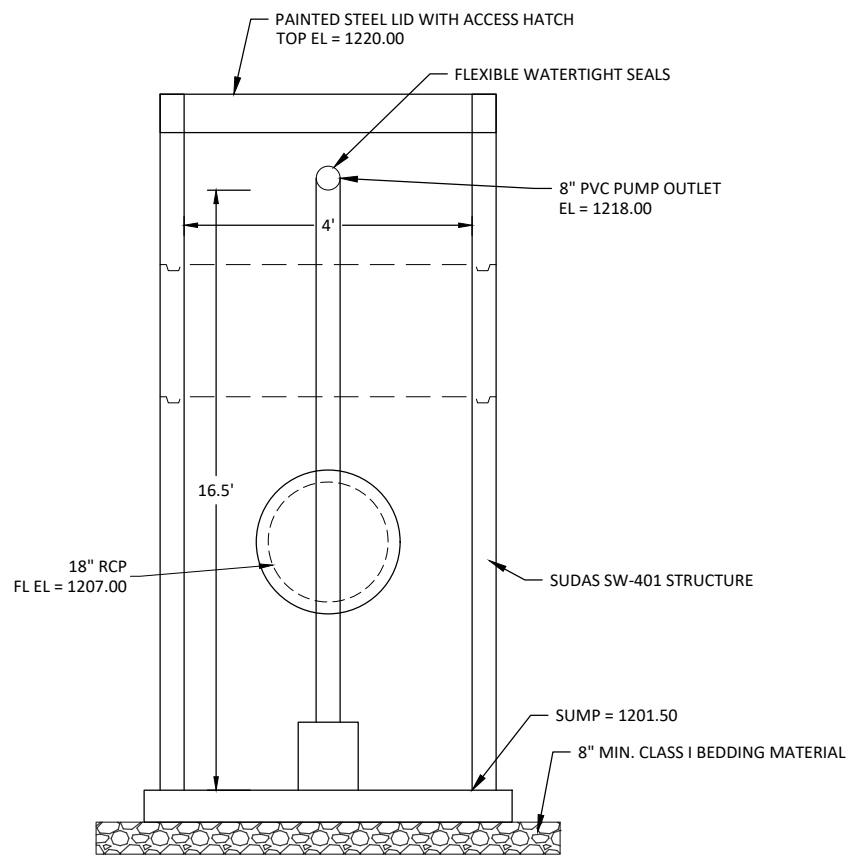
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CAR833409A - THRILLS HILLS WETLAND
TRASH GUARD DETAIL

SHEET

B.02

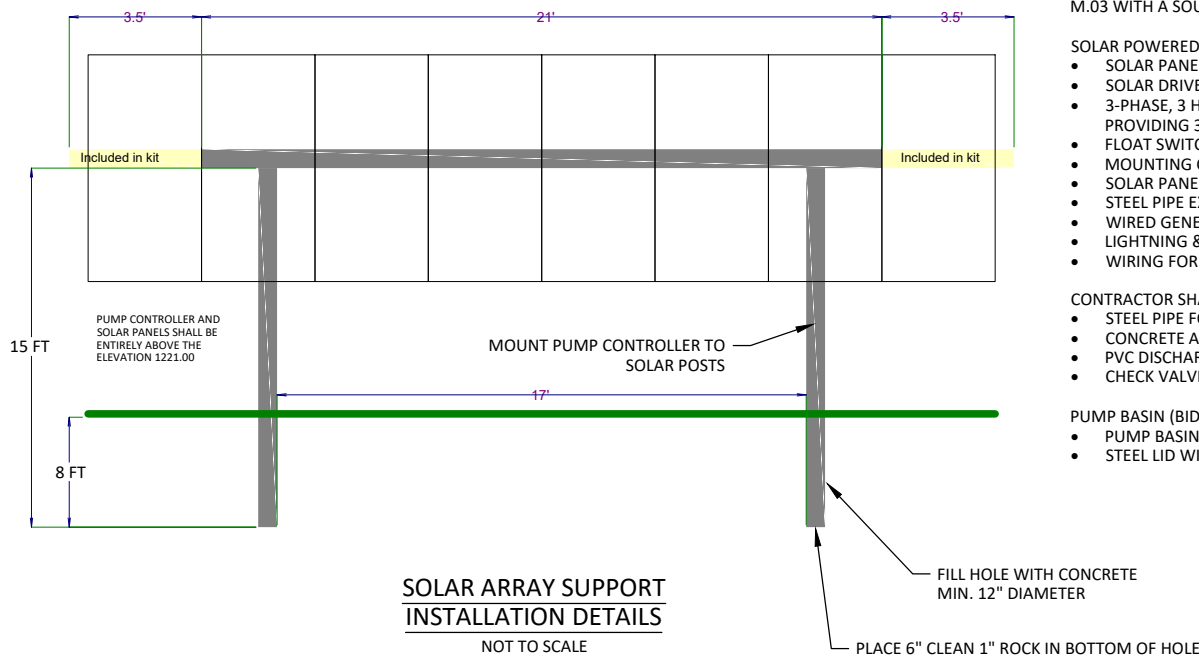


SW-401 PUMP BASIN ELEVATION
NOT TO SCALE



SW-401 PUMP BASIN SECTION
NOT TO SCALE

SOLAR ARRAY SUPPORT INSTALLATION DETAILS



**SOLAR ARRAY SUPPORT
INSTALLATION DETAILS**
NOT TO SCALE

NOTE: SOLAR PANELS SHALL BE INSTALLED IN THE LOCATION SHOWN ON A.03 AND M.03 WITH A SOUTHWARD ORIENTATION.

SOLAR POWERED PUMP SYSTEM (BID ITEM 15) SHALL INCLUDE THE FOLLOWING:

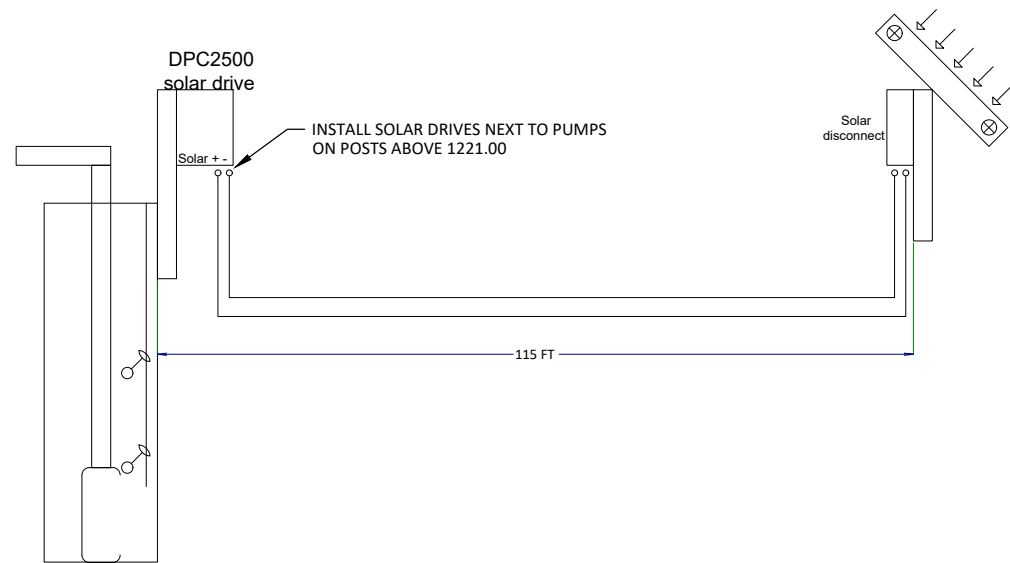
- SOLAR PANELS
- SOLAR DRIVE
- 3-PHASE, 3 HP AXIAL PUMP (CARRY CP-04 WITH 17° IMPELLER OR APPROVED EQUAL, PROVIDING 340 GPM AT 11.25 FT TDH)
- FLOAT SWITCH
- MOUNTING CLAMPS FOR CONTROLLER
- SOLAR PANEL MOUNTING KIT
- STEEL PIPE EXTENDERS
- WIRED GENERATOR PLUG
- LIGHTNING & SURGE PROTECTOR
- WIRING FOR PANELS, PUMP, AND CONTROLLER

CONTRACTOR SHALL PROVIDE THE FOLLOWING, SUBSIDIARY TO BID ITEM 15:

- STEEL PIPE FOR MOUNTING
- CONCRETE AND ROCK BEDDING FOR MOUNTING POLES
- PVC DISCHARGE PIPE
- CHECK VALVE

PUMP BASIN (BID ITEM 14) SHALL INCLUDE THE FOLLOWING:

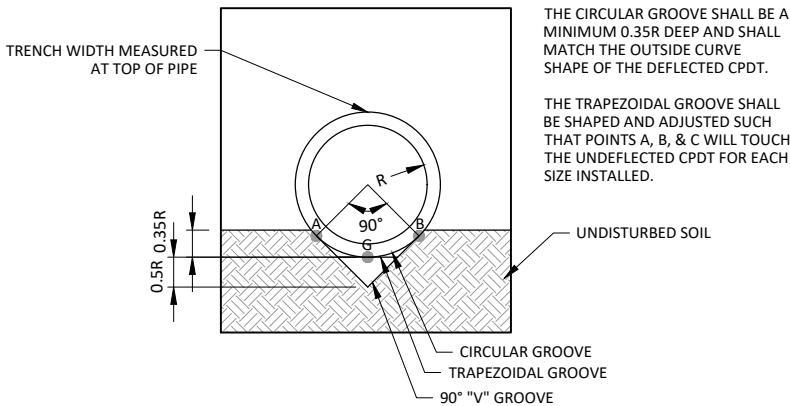
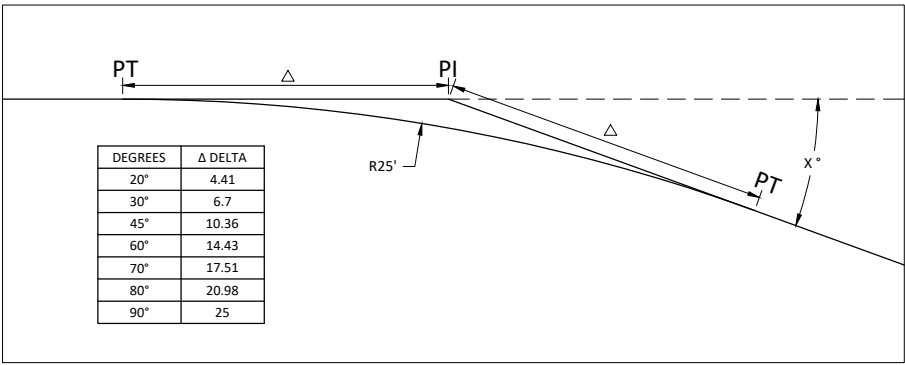
- PUMP BASIN (MODIFIED SW-401, SEE DETAILS)
- STEEL LID WITH STAND



PUMP WIRING DIAGRAM
NOT TO SCALE

CORRUGATED POLYETHYLENE DRAINAGE TUBING
MATERIAL & INSTALLATION NOTES

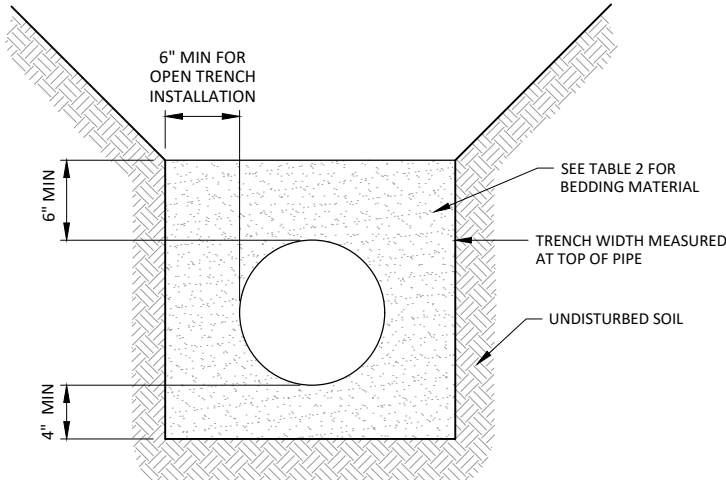
- ALL CPDT AND CONNECTORS FURNISHED SHALL BE IN COMPLIANCE WITH MATERIAL STANDARDS ASTM F405 AND F667, AS APPLICABLE, AND SHALL BE CLASSIFIED AS HEAVY-DUTY UNDER THOSE STANDARDS.
- EXCEPT MODIFIED HEREIN OR OTHERWISE APPROVED BY ENGINEER, ALL CPDT SHALL BE INSTALLED IN COMPLIANCE WITH THE ASTM 449 STANDARD PRACTICE.
- FOR PIPES 6" DIAMETER AND SMALLER A 90° V GROOVE BOTTOM MAY BE USED, FOR ALL LARGER PIPE A TRAPEZOIDAL BOTTOM OR A CIRCULAR BOTTOM CONFORMING TO THE OUTSIDE DIAMETER OF THE PIPE SHALL BE USED. PRIOR TO THE INSTALLATION OF CPDT, CONTRACTOR MUST PROVE TO ENGINEER THAT THE INSTALLATION REQUIREMENTS, INCLUDING THE SHAPE OF THE TRENCH BOTTOM, WILL BE ACCOMPLISHED.
- WHERE TRENCH BOTTOM IS IN FIRM UNDISTURBED SOIL, SHAPE TRENCH BASE GROOVE. WHERE EXCESS CUT OCCURS, OVEREXCAVATE AND PLACE MINIMUM THREE (3) INCH THICK, GRAVELLY SAND BEDDING TO RESTORE GRADE. THIS BEDDING SHALL MEET THAT REQUIRED FOR TRENCH INSTALLATION TYPE 3 ON PLAN SHEET C.02. IF DUE TO CONTRACTOR ERROR THIS MATERIAL AND WORK IS SUBSIDIARY TO THE INSTALLATION OF THE PIPE. CONTRACTOR MAY SUBSTITUTE PIPE BEDDING ROCK AS THE BEDDING MATERIAL.
- NATIVE SOILS MAY BE USED AS BACKFILL MATERIAL UNLESS UNSTABLE TRENCH CONDITIONS PREVENT THE TRENCH BOTTOM HOLDING THE SHAPED GROOVE. IF TRENCH BOTTOM WILL NOT HOLD GROOVE SHAPE CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY. A FLAT BOTTOM TRENCH INSTALLATION WILL THEN BE ASSUMED. THE REQUIRED BEDDING MATERIAL WILL BE PAID UNDER THE TILE TRENCH STABILIZATION AND CRADLING ROCK BID ITEM.
- MINIMUM TRENCH WIDTH IS PIPE OUTSIDE DIAMETER PLUS FOUR (4) INCHES FOR PLOWED INSTALLATION AND PIPE OUTSIDE DIAMETER PLUS TWELVE (12) INCHES FOR OPEN TRENCH INSTALLATION.
- ALL LATERAL CONNECTIONS, ELBOWS, TEES, ALIGNMENT CURVES, START HOLES AND ALL PORTIONS OF THE TRENCH NOT MEETING THE GROOVED TRENCH INSTALLATION REQUIREMENTS SHALL BE FILLED TO A MINIMUM OF SIX (6) INCH COVER OVER THE PIPE WITH GRADED CRUSHED STONE OR GRAVEL AS SHOWN ON TABLE 2 OF THIS SHEET. UNLESS DUE TO CONTRACTOR ERROR THIS BEDDING MATERIAL WILL BE PAID UNDER THE TILE TRENCH STABILIZATION AND CRADLING ROCK BID ITEM.
- MANUFACTURER'S ENDCAPS SHALL BE INSTALLED AT THE TERMINATION OF EACH LINE UNLESS A CONNECTION TO AN EXISTING DRAIN IS MADE.
- WITH THE INSTALLATION OF THE FIRST REACH OF CPDT ON THE PROJECT, CONTRACTOR IS REQUIRED TO WORK WITH THE ENGINEER TO CHECK AND CONFIRM THAT THE PIPE STRETCH, IF ANY, DOES NOT EXCEED 5%.
- ALIGNMENT TURNS MAYBE MADE USING EITHER A MANUFACTURED FITTING OR CURVING THE LINE WITH A 25' MINIMUM RADIUS.



PREFFERED TRENCH INSTALLATION BOTTOM
TRAPEZOIDAL GROOVE, "V" GROOVE, & CIRCULAR GROOVE
NOT TO SCALE
SOURCE: ASTM F449

Table 1 Maximum Allowable Buried Depth to Flowline of CPDT					
Nominal Pipe Diameter (IN)	Pipe Quality (ASTM)	Trench Width at Top of the Pipe (FT)			
		12"	18"	24"	30" or Greater
4	Standard	13	7	5.5	5
	Heavy-duty	Any	10	7	6
6	Standard	10	7	5.5	5
	Heavy-duty	Any	9.5	6.5	6
8	Standard	10	7	5.5	5
	Heavy-duty	Any	10	7	6
10	Heavy-duty	...	9	7	6
12	Heavy-duty	...	9	7	6
15	Heavy-duty	...	...	7	6
Table 2 Acceptable Bedding Material and Compaction Requirements					
Description	Percentage Passing Sieve Sizes			Minimum Standard Density (%)	Maximum Compaction Layer Height (IN.)
	1"	3/4"	No. 4		
Crushed Stone Crushed Gravel*	100%	> 95%	< 5%	Dumped	18

* Class 1 Bedding Material Per SUDAS 3010.202A is an Allowable Substitute

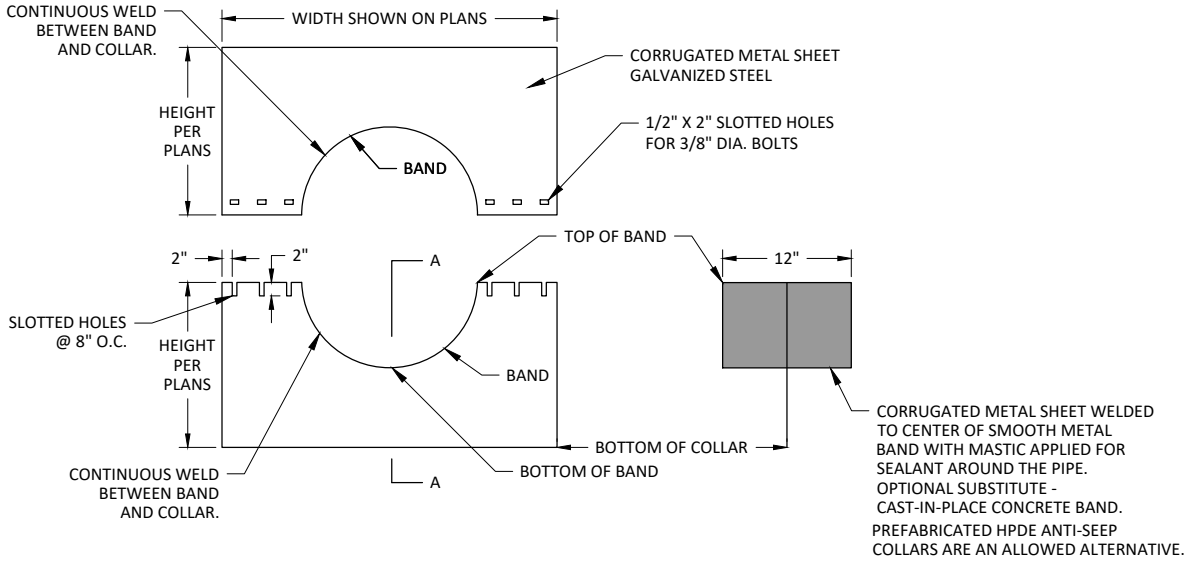


FILL TRENCH TO 6" ABOVE TOP OF PIPE WITH CRUSHED STONE OR GRAVEL MEETING THE REQUIREMENTS IN TABLE 2. BEDDING MATERIAL SHALL BE INCIDENTAL TO THE PIPE INSTALLATION.

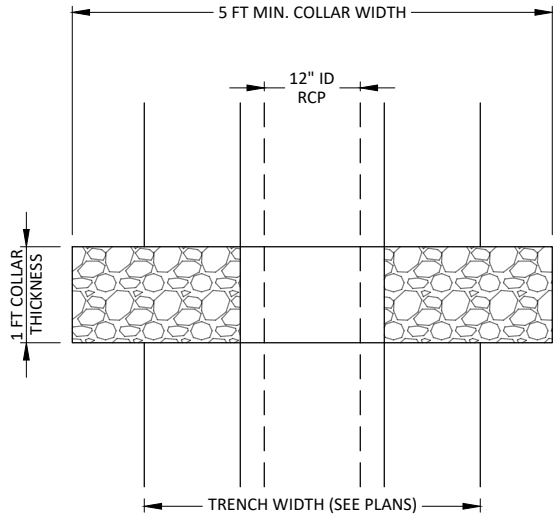
FLAT BOTTOM TRENCH INSTALLATION
NOT TO SCALE
SOURCE: ASTM F449

NOTE: THIS IS AN ALLOWED ALTERNATIVE INSTALLATION FOR CPDT

ANTI-SEEP COLLAR DETAILS



ALTERNATIVE 1: RCP ANTI-SEEP COLLAR
NOT TO SCALE



- NOTES:
- COMPOSITE BENTONITE AGGREGATE (CBA) SHALL BE AQUABLOK OR APPROVED EQUAL.
 - COLLAR SHALL EXTEND 1.75 FT BELOW BOTTOM OF PIPE AND 1.75 FT ABOVE TOP OF PIPE. MINIMUM DIMENSIONS ARE SHOWN ON THE PROFILE SHEET.
 - COLLAR SHALL BE A MINIMUM OF 5 FT WIDE AND EXTEND A MINIMUM OF 6" BEYOND EDGE OF TRENCH. MINIMUM DIMENSIONS ARE SHOWN ON THE PROFILE SHEET.
 - NO COMPACTION OF CBA IS REQUIRED.
 - EXCAVATE AND BACKFILL THE REMAINDER OF THE TRENCH AS NOTED IN THE PLANS.

ALTERNATIVE 2: COMPOSITE BENTONITE AGGREGATE COLLAR
NOT TO SCALE



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IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

CAR833409A - THRILLS HILLS WETLAND

CPDT INSTALLATION & ANTI-SEEP COLLAR DETAILS

SHEET

B.04

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Bid Item	Sub-Item	Description	Specifications		Plan No.	Estimated Quantities	
			No.	Page		Quantity	Unit
1	-	Site Stripping & Preparation	IA CS-001	3	N/A	1	LS
2	-	Crop Damage	IA CS-001	3	N/A	0	AC
3	-	Structure & Channel Seeding	IA CS-006	7	K.01	1.5	AC
4	-	Buffer Seeding	IA CS-006	7	K.01	0.9	AC
5	-	Mobilization & Demobilization	IA CS-008	11	N/A	1	LS
6	-	Drain Tile Investigation and Removal	IA CS-009	14	A.03	4	HR
7	-	Excavation (General)	IA CS-021	20	D.01	13310	CY
8	-	Earthfill (General)	IA CS-023	23	D.01, D.04	126	CY
9	-	Earthfill (General Dam)	IA CS-023	23	D.02-D.03	2767	CY
10	-	Earthfill (Dam Core)	IA CS-023	23	D.02-D.03	2023	CY
11	-	Topsoil Strip, Salvage, and Respread	IA CS-026	27	D.01	1635	CY
12	-	Reinforced Concrete Pipe					
	C.	18" Diameter	IA CS-031	29	M.01	120	LF
	D.	36" Diameter	IA CS-031	29	M.01	130	LF
13	-	SW-401 Pump Basin	IA CS-031	29	B.02, M.01	1	EA
14	-	Solar Pump System	IA CS-031	29	B.03, M.01	1	EA
15	-	Modified SW-513 Outlet Structure (78" x 78")	IA CS-031	29	B.01, M.01	1	EA
16	-	Concrete Apron, Footing, Bar Guard					
	A.	18" Diameter	IA CS-031	29	M.01	1	EA
	B.	36" Diameter	IA CS-031	29	M.01	1	EA
17	-	8" Dia. Corrugated HDPE Pipe (Dual-Wall, Non-Perforated)	IA CS-046	36	B.04, M.02	954	LF
18	-	CMP Tile Outlets (20 LF Each)					
	A.	10" Diameter	IA CS-051	39	M.02	2	EA
19	-	Anti-Seep Collars	IA CS-051	39	M.01	6	EA
20	-	Riprap (Class E)	IA CS-061	43	M.01	29.3	TN



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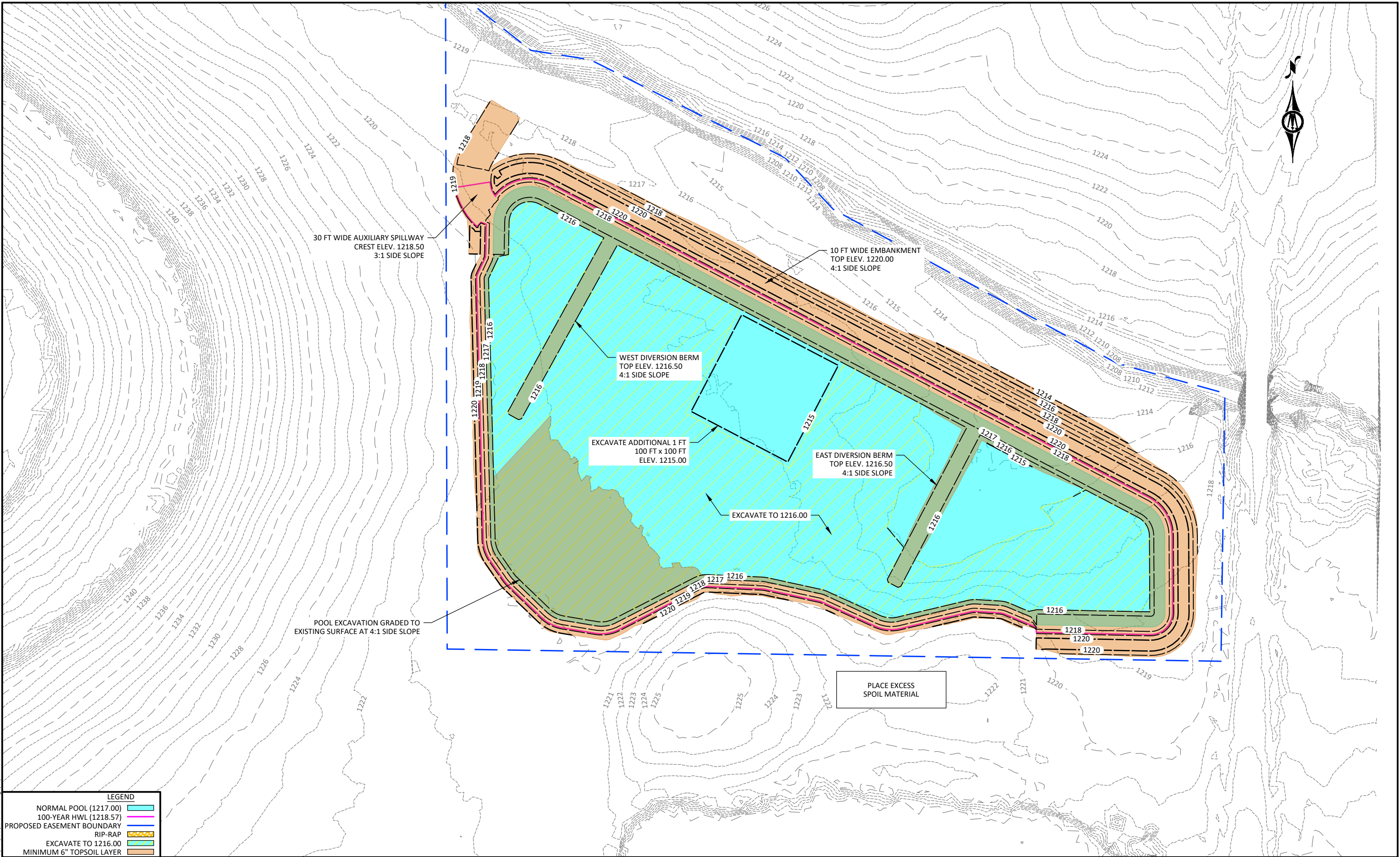
CAR833409A - THRILLS HILLS WETLAND

ESTIMATED QUANTITIES

SHEET

C.01

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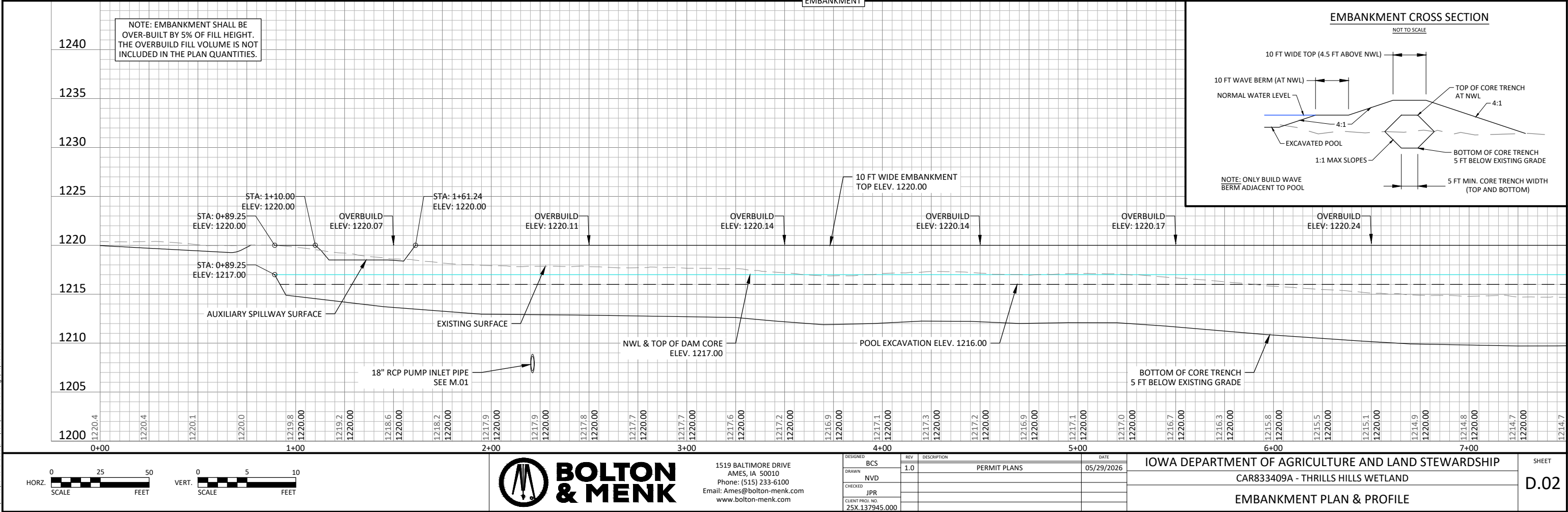
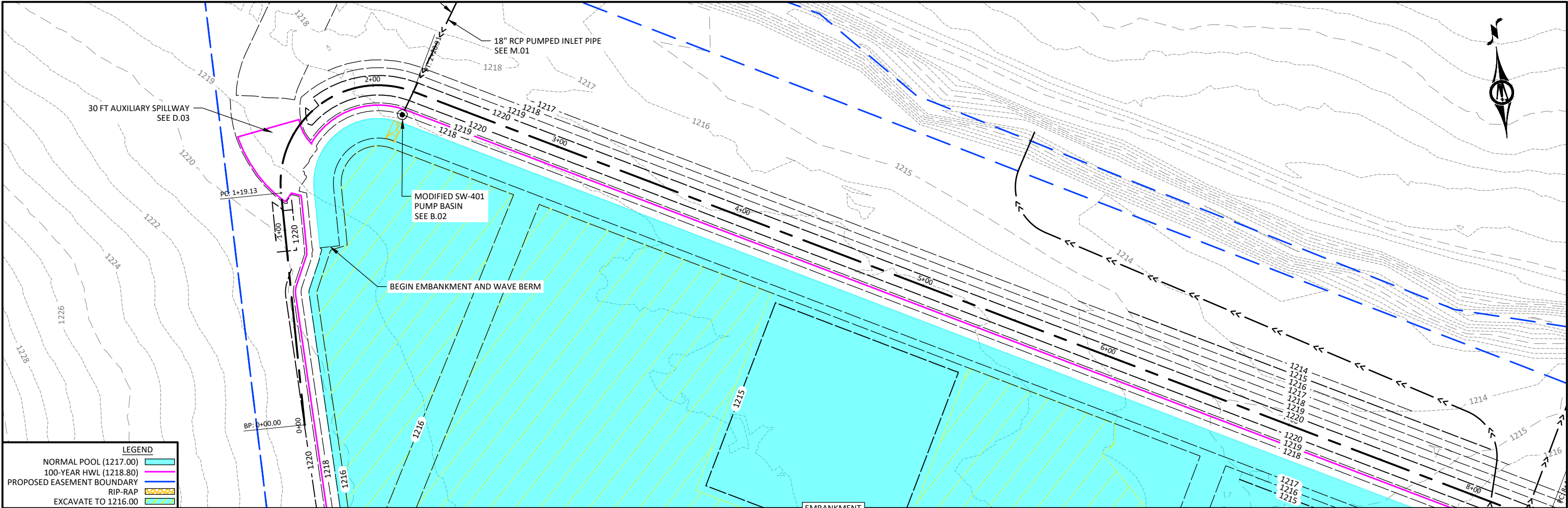


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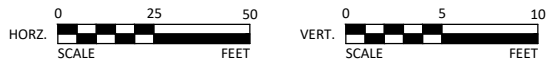
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CLIENT PROJ. NO.	25X.137945.000		

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GRADING OVERVIEW

SHEET
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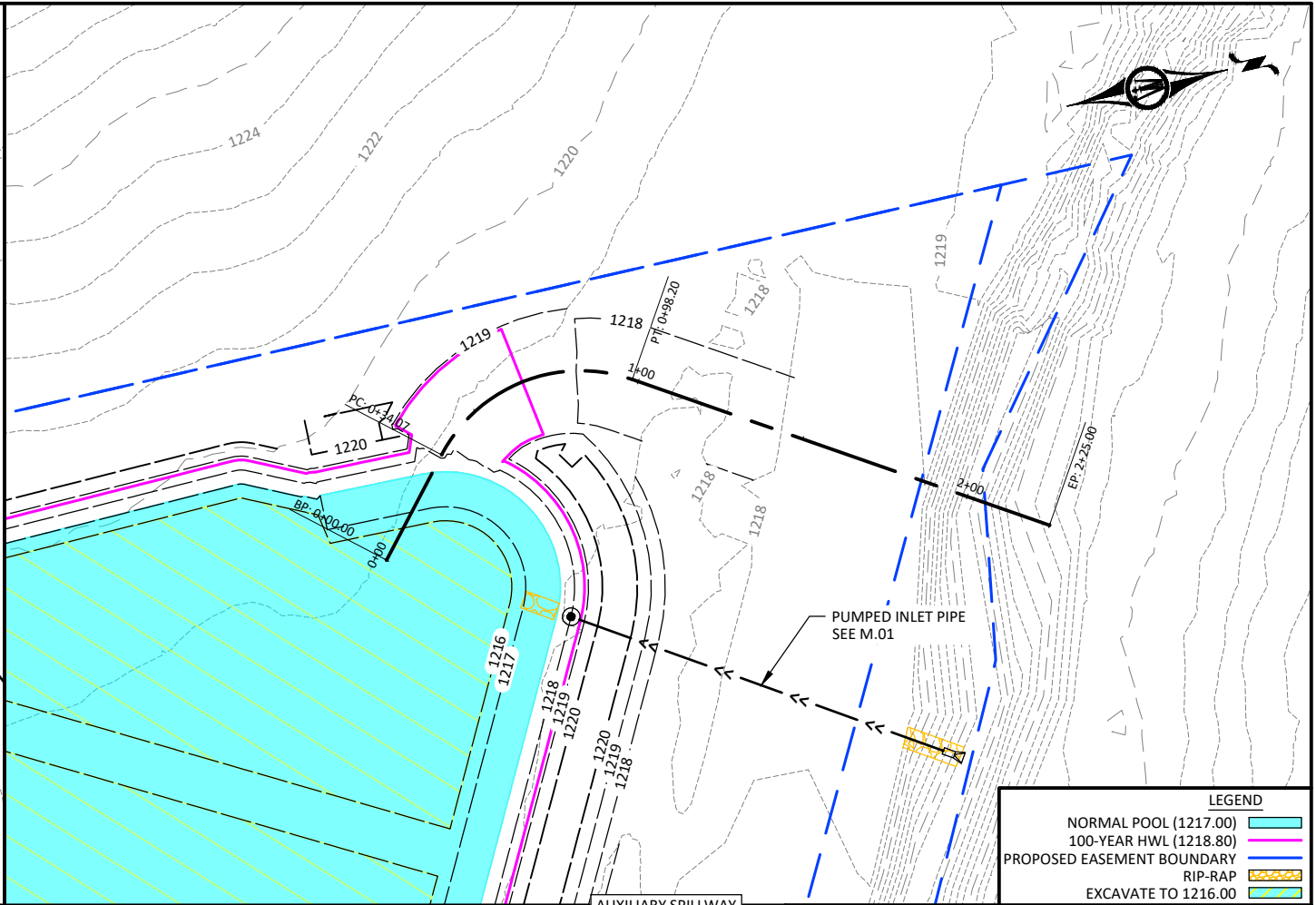
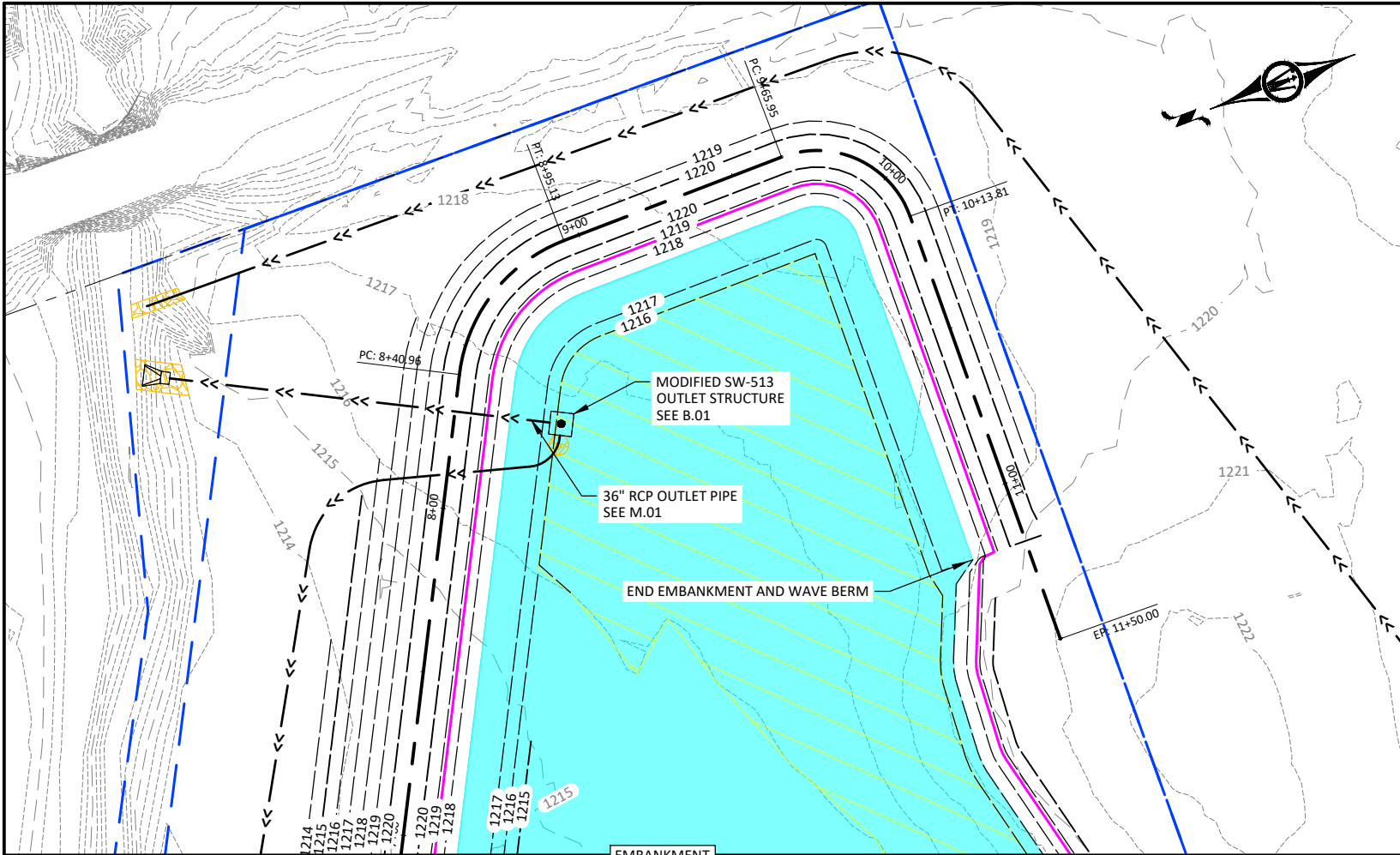
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CAR833409A - THRILLS HILLS WETLAND
EMBANKMENT PLAN & PROFILE

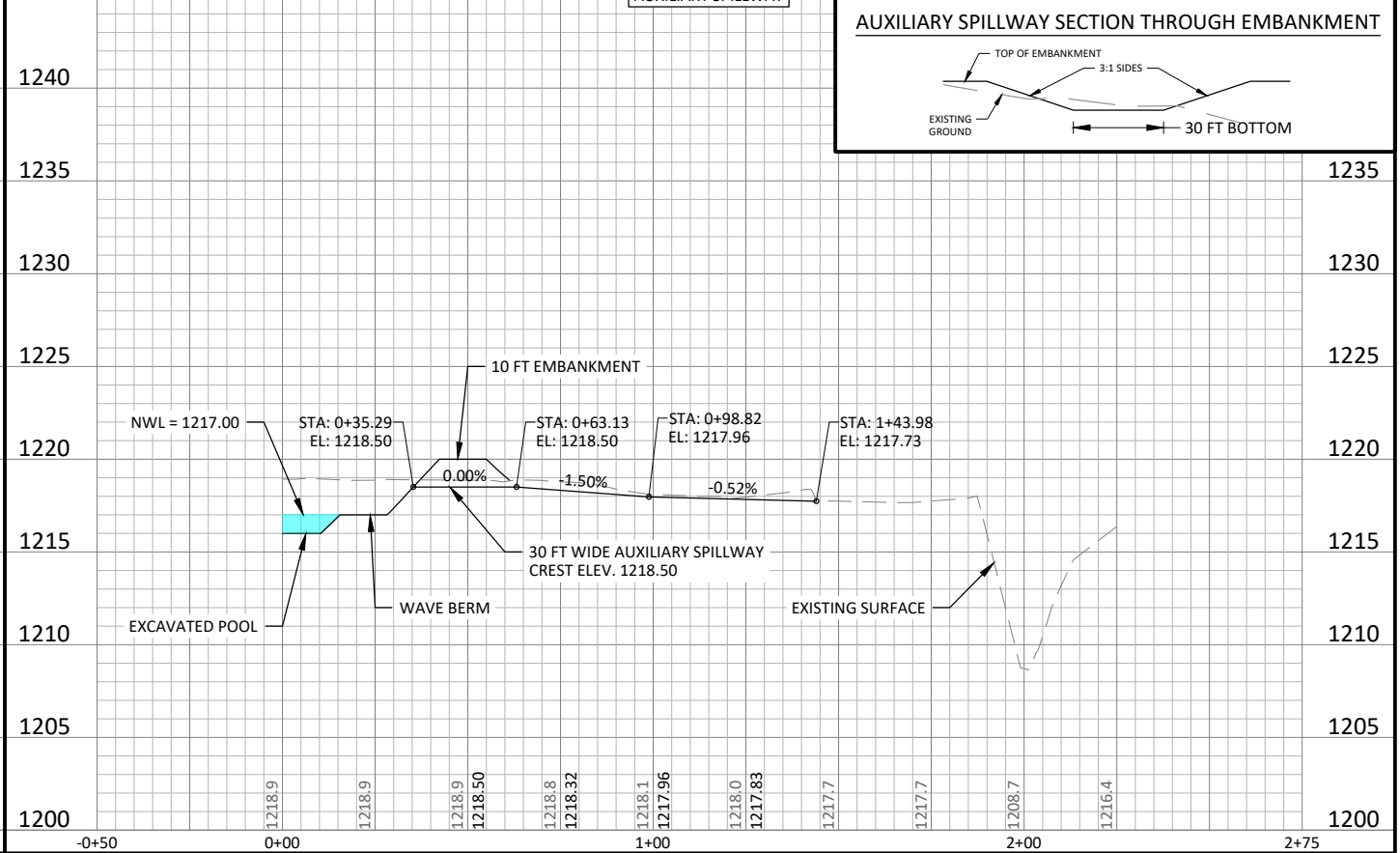
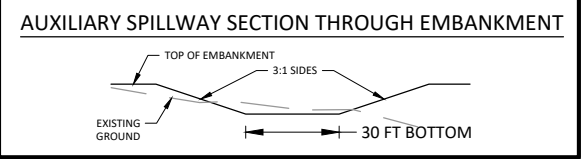
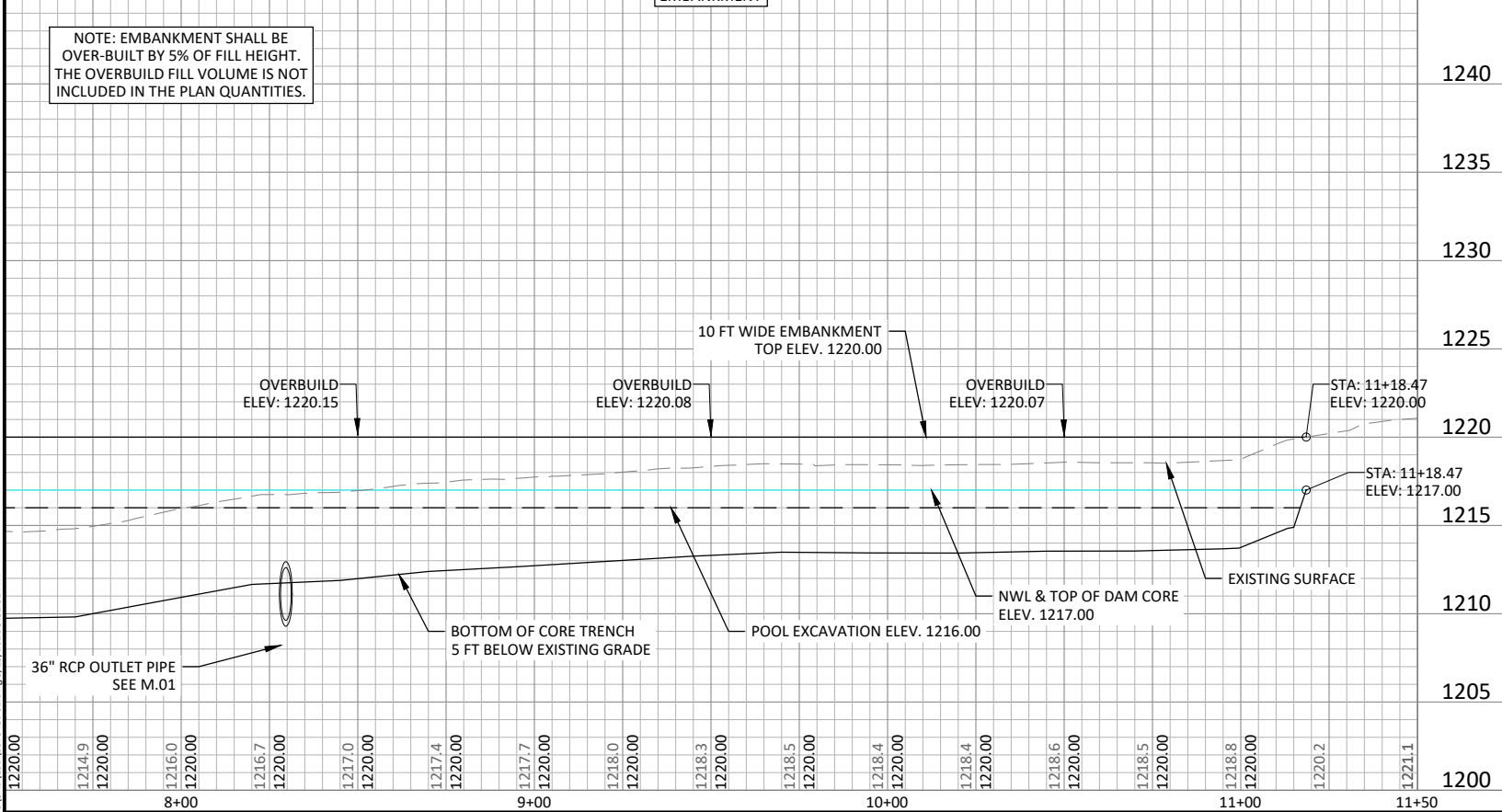
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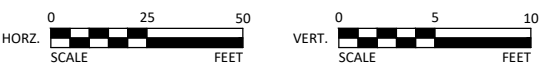


LEGEND	
NORMAL POOL (1217.00)	
100-YEAR HWL (1218.80)	
PROPOSED EASEMENT BOUNDARY	
RIP-RAP	
EXCAVATE TO 1216.00	

NOTE: EMBANKMENT SHALL BE OVER-BUILT BY 5% OF FILL HEIGHT. THE OVERBUILD FILL VOLUME IS NOT INCLUDED IN THE PLAN QUANTITIES.



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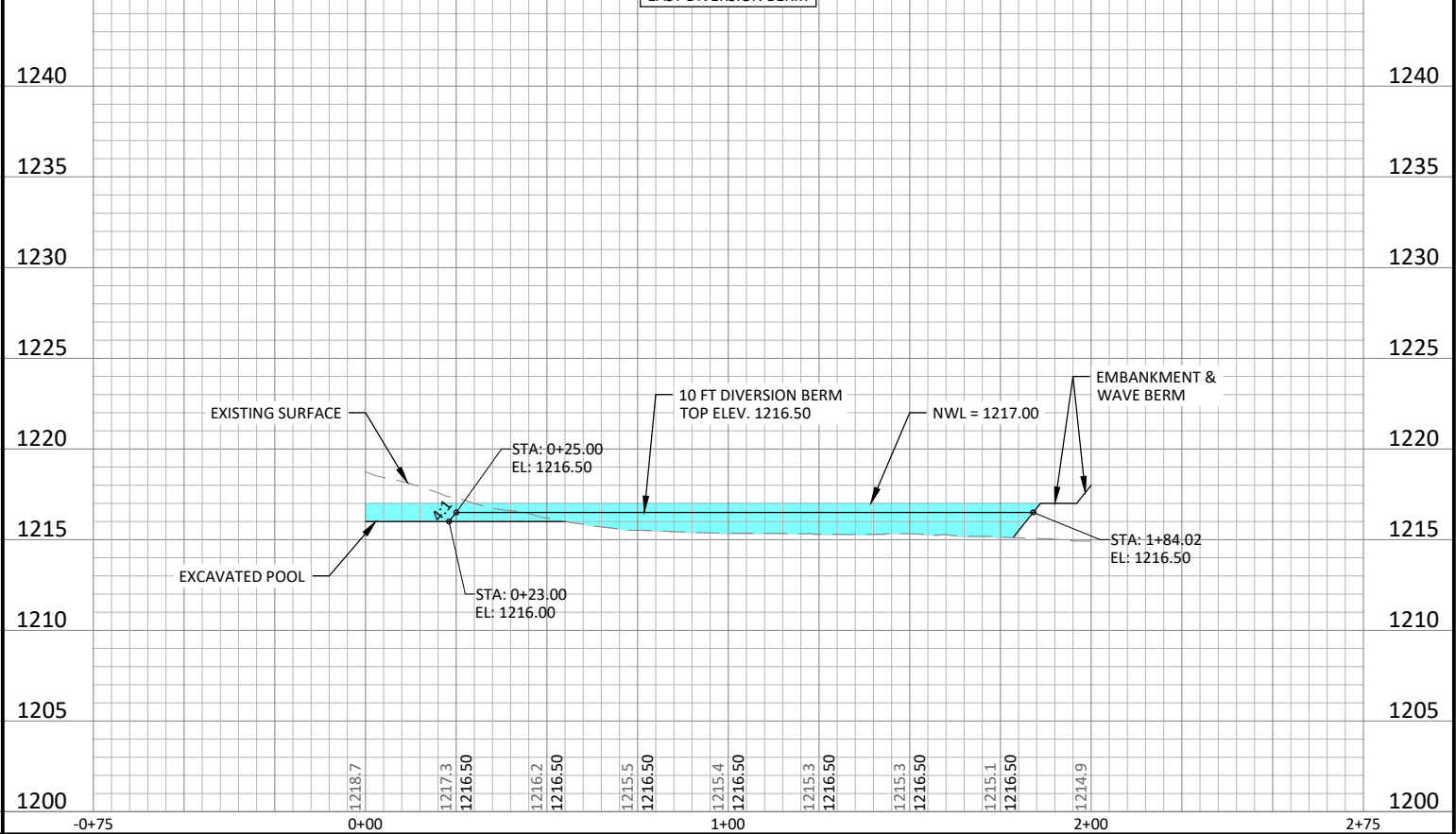
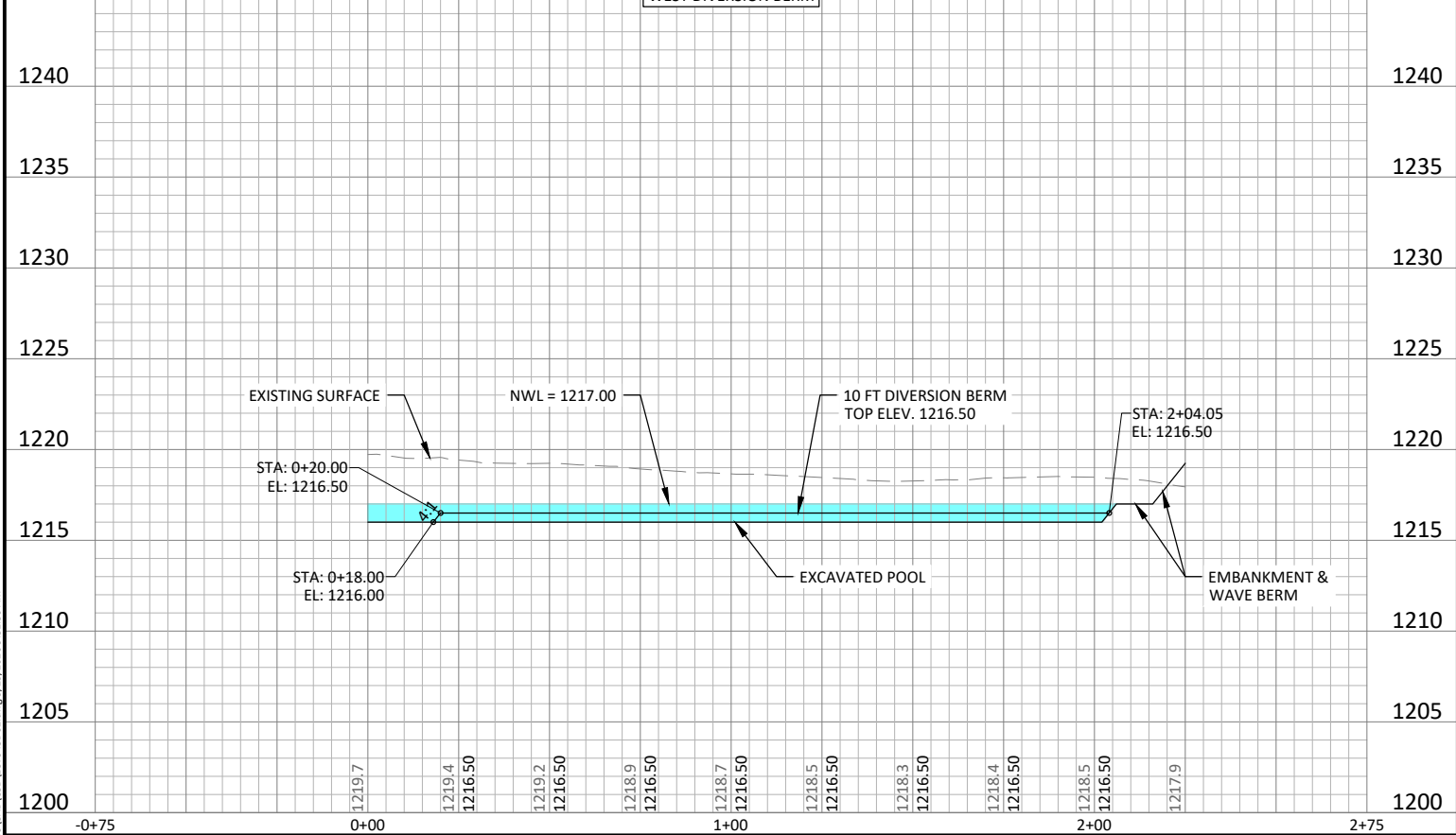
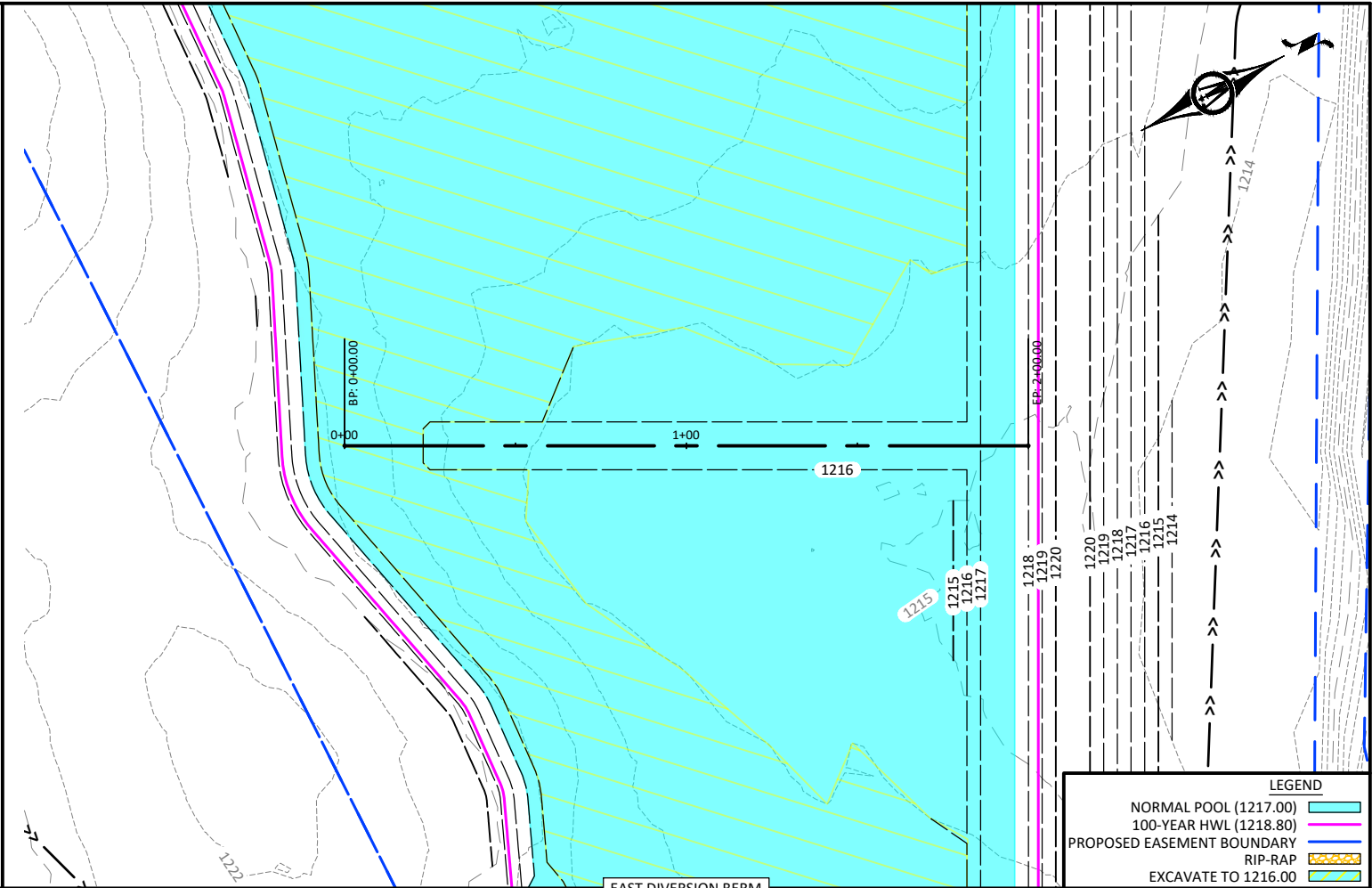
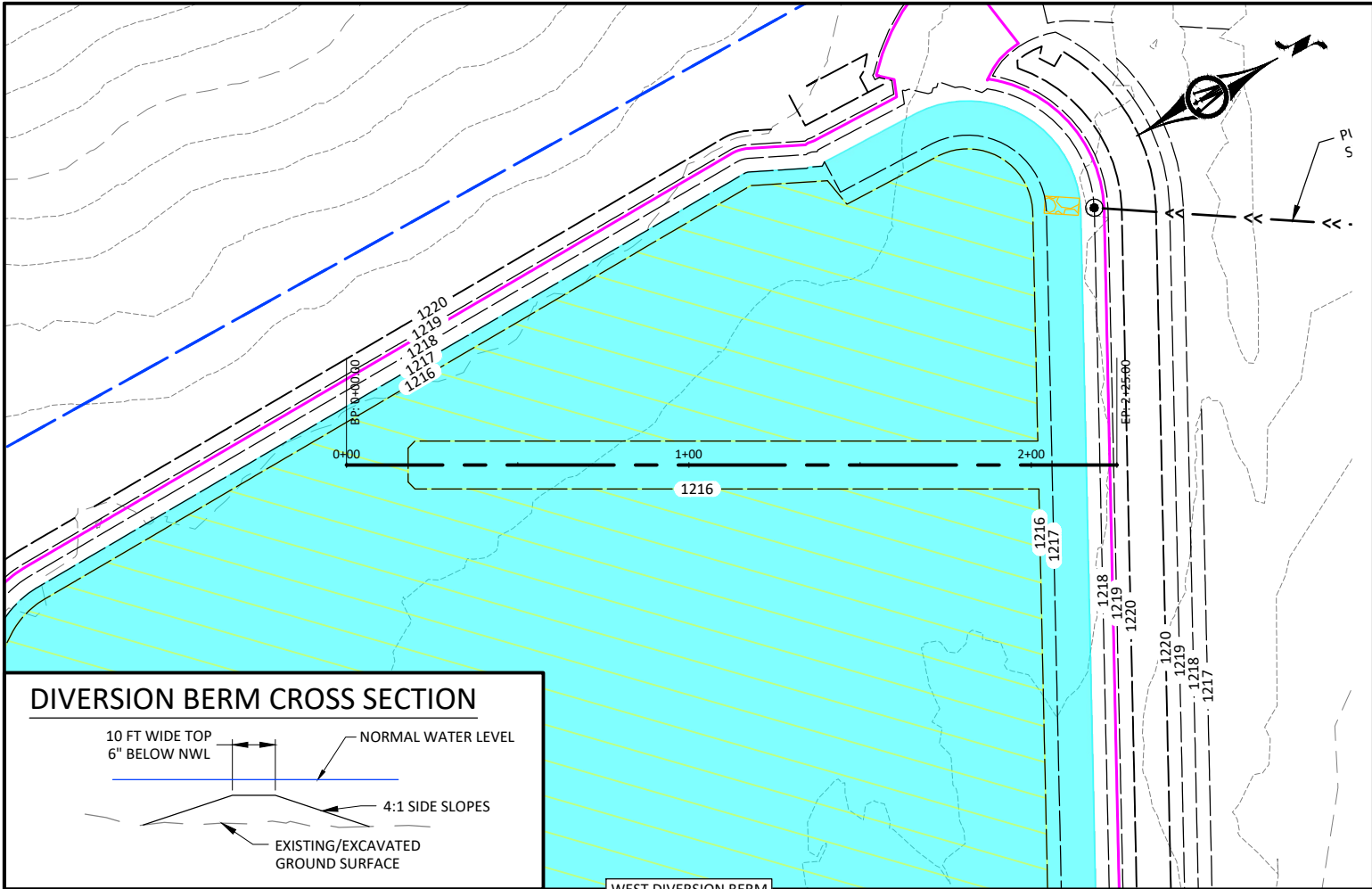


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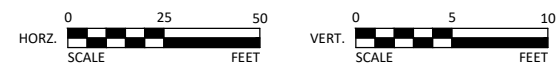
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CLIENT PROJ. NO.	25X.137945.000		

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CAR833409A - THRILLS HILLS WETLAND
EMBANKMENT (CONT.) & AUXILIARY SPILLWAY

SHEET
D.03



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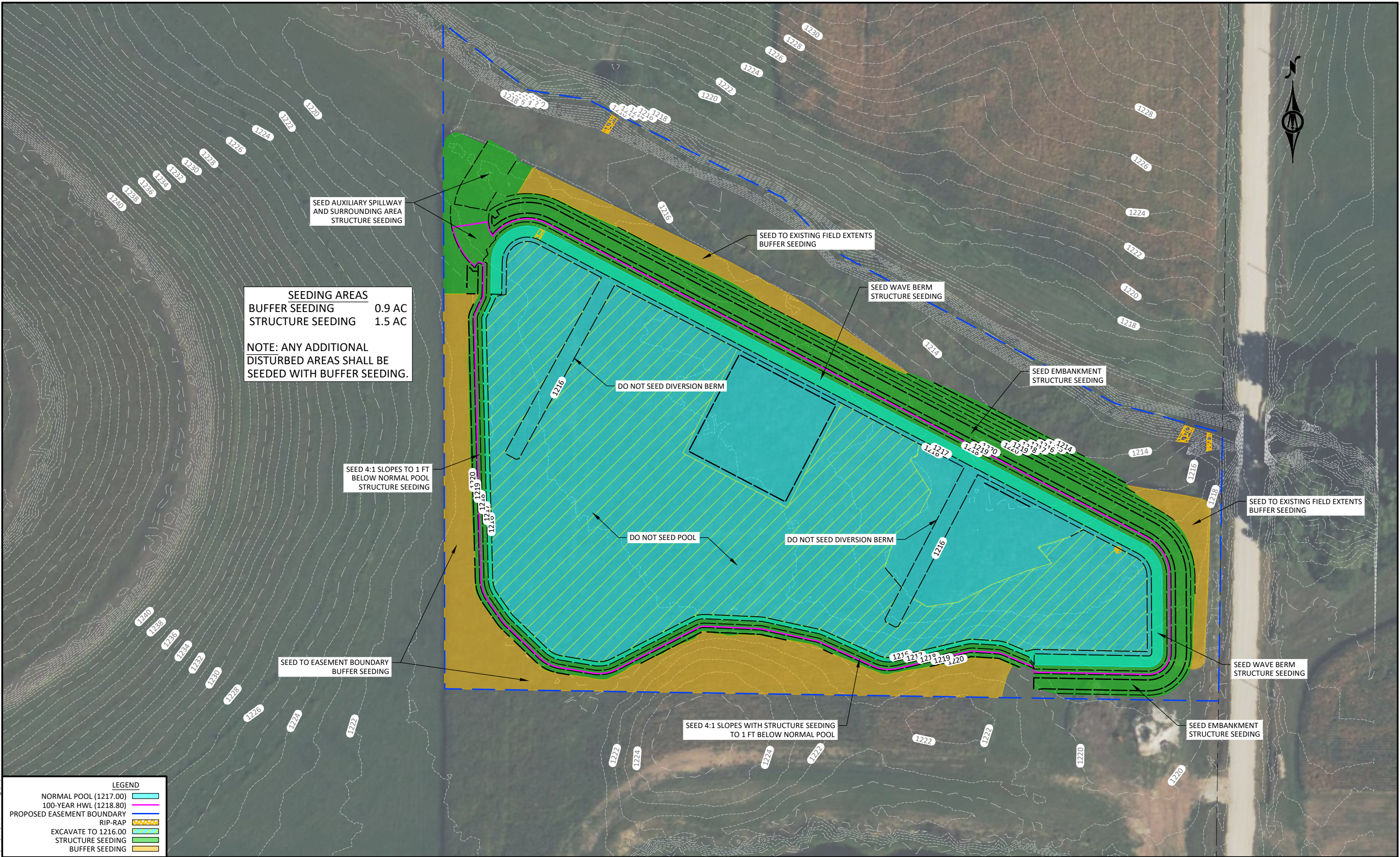
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CAR833409A - THRILLS HILLS WETLAND
DIVERSION BERMS

SHEET
D.04

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HORZ. SCALE
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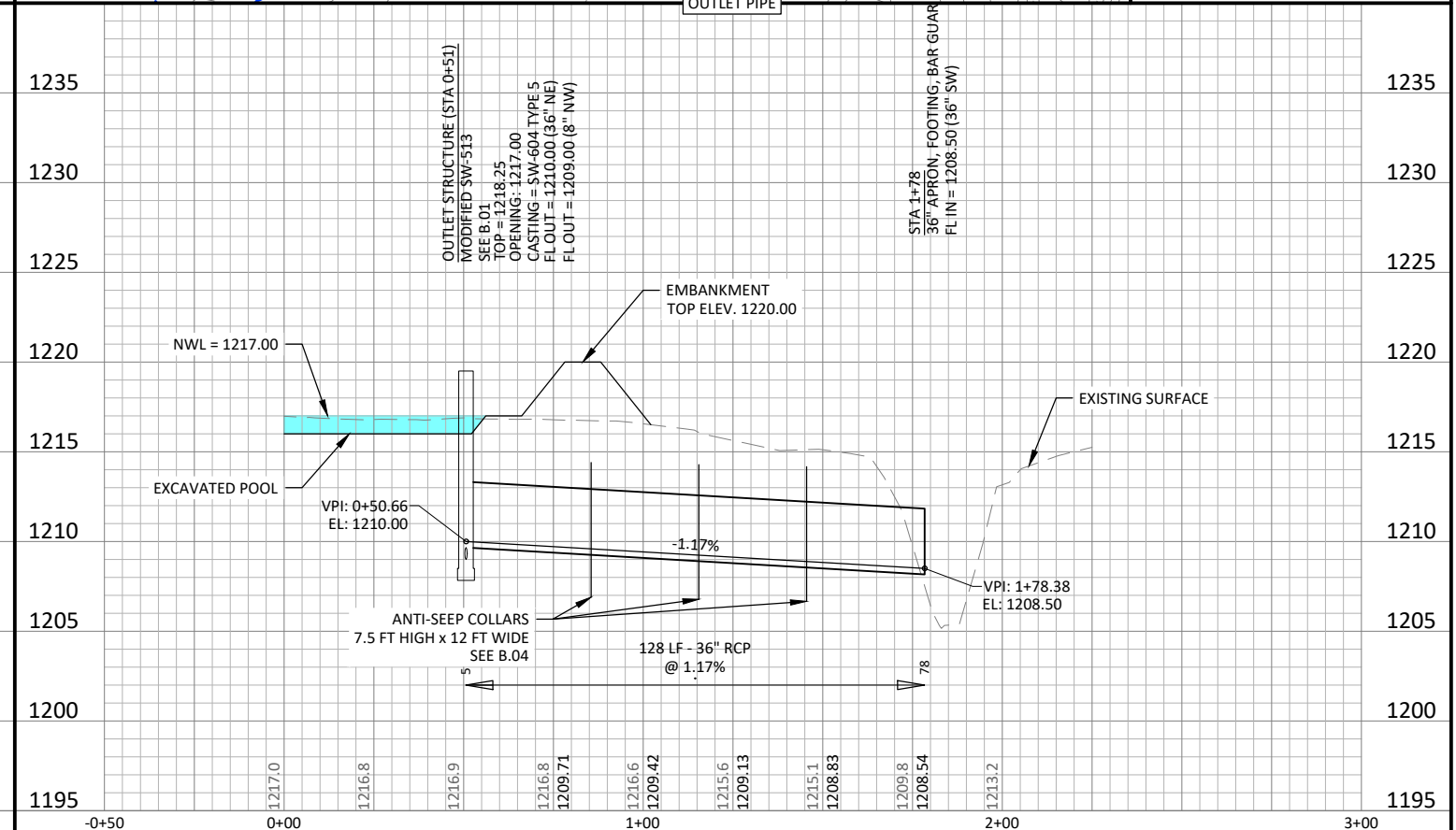
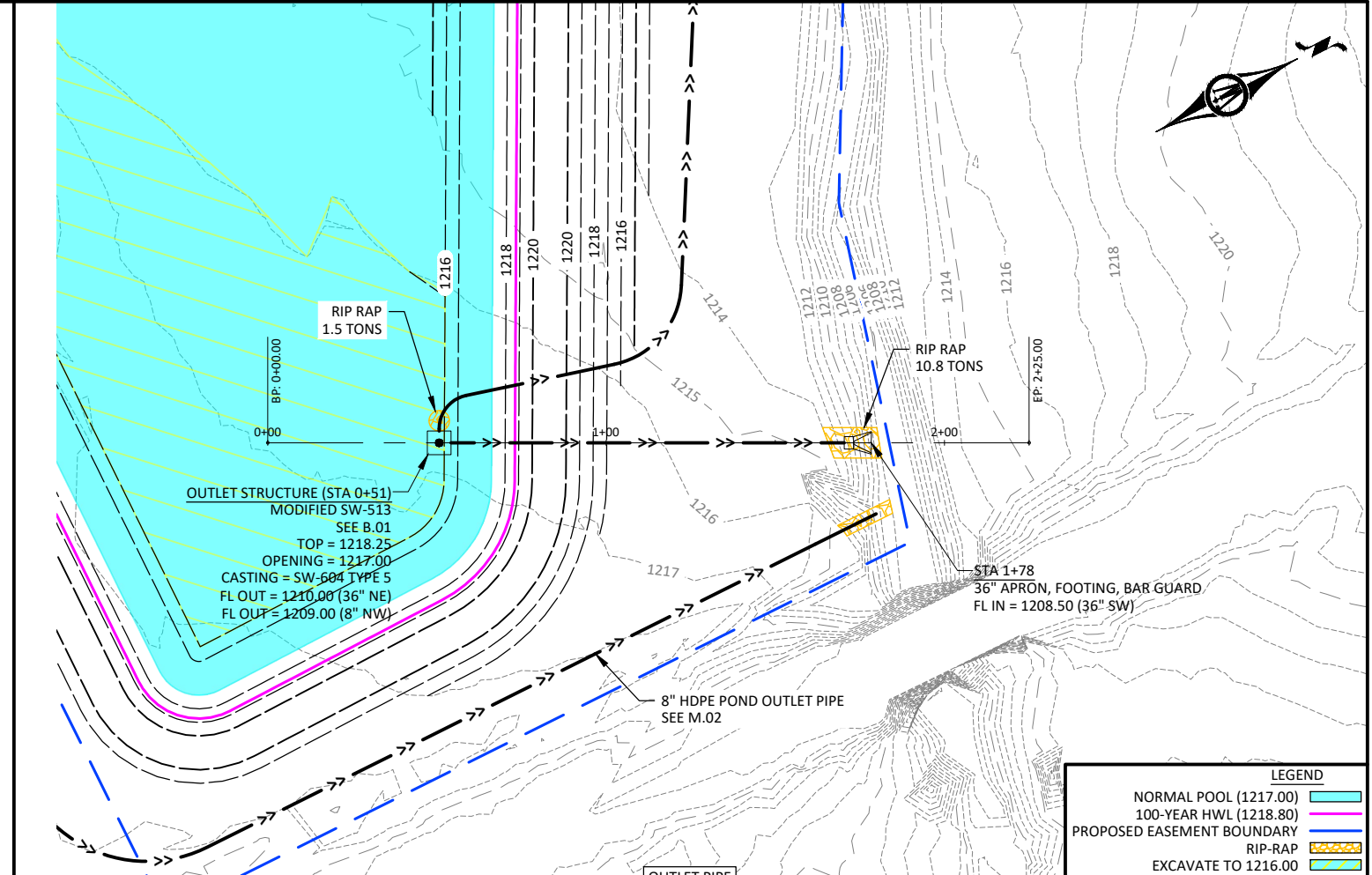
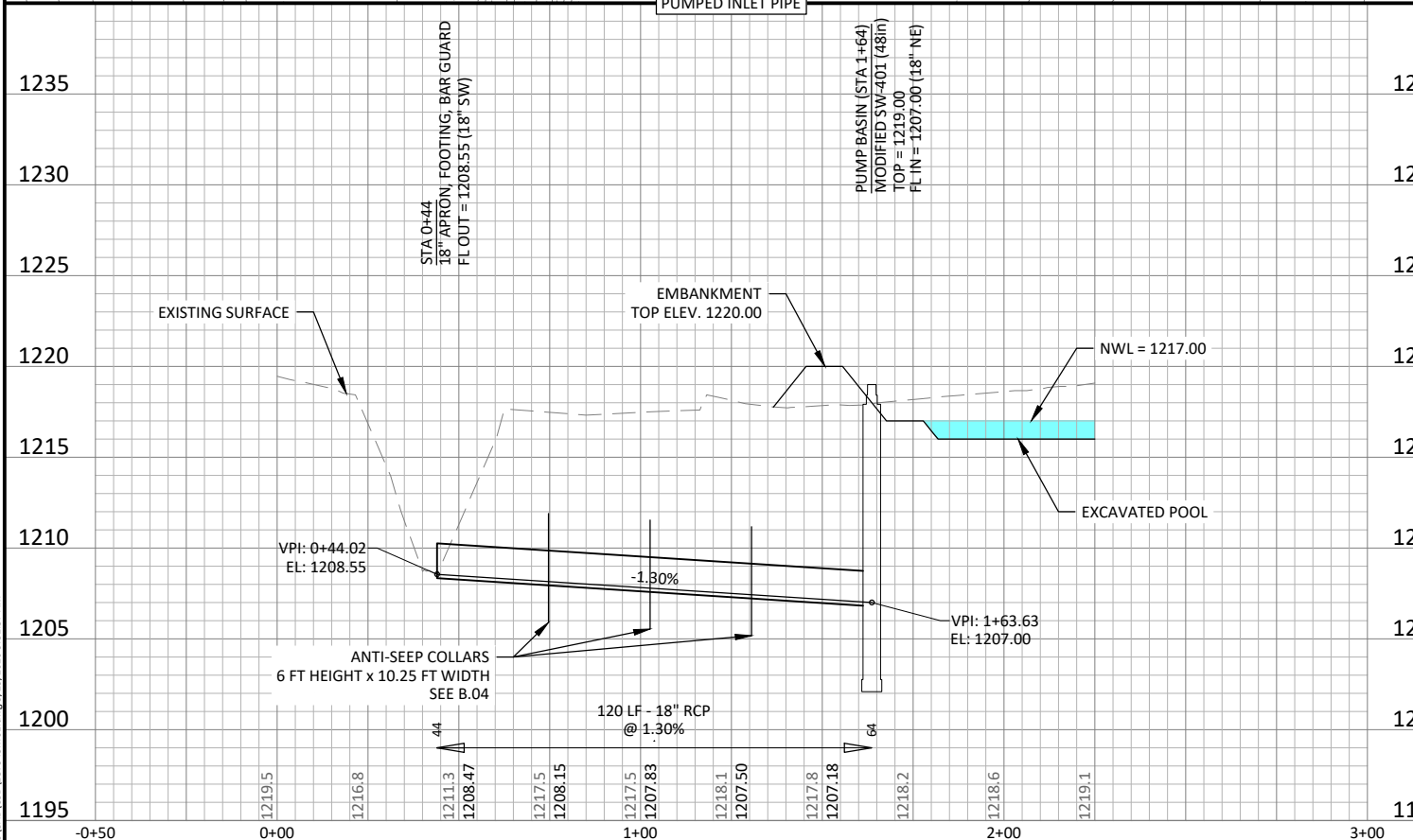
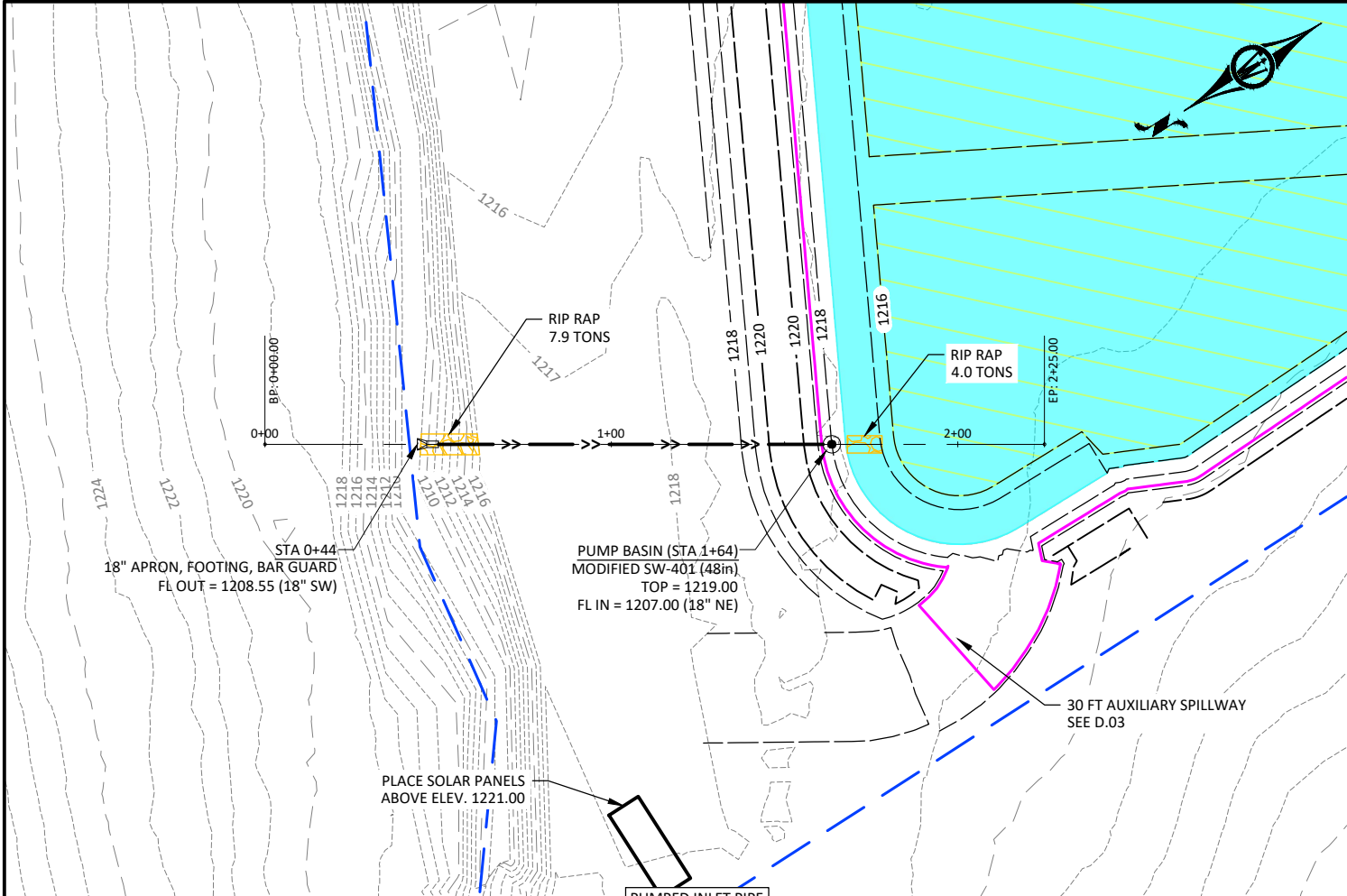
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CAR833409A - THRILLS HILLS WETLAND
SEEDING PLAN

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K.01

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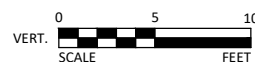
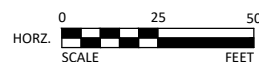
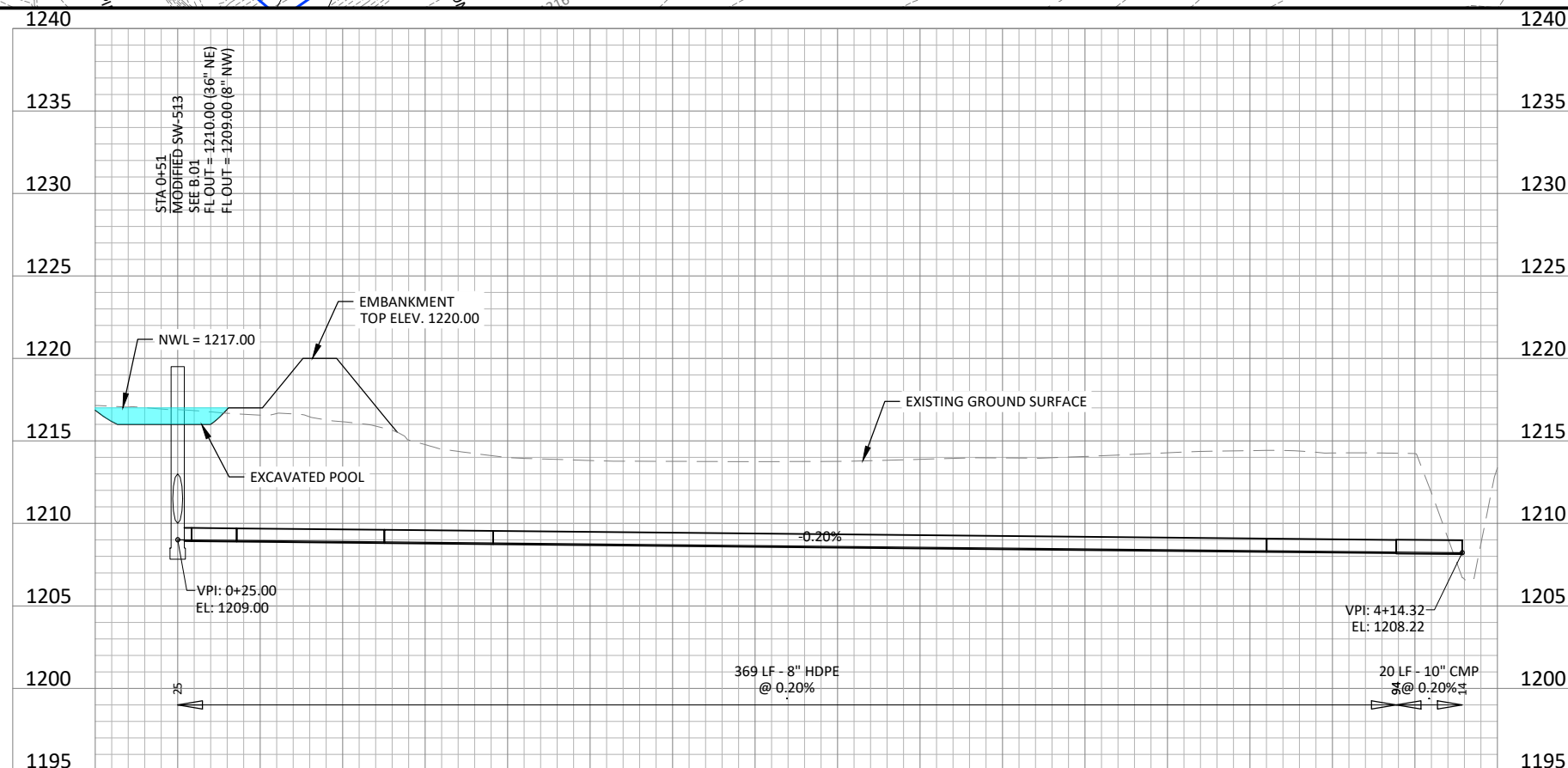
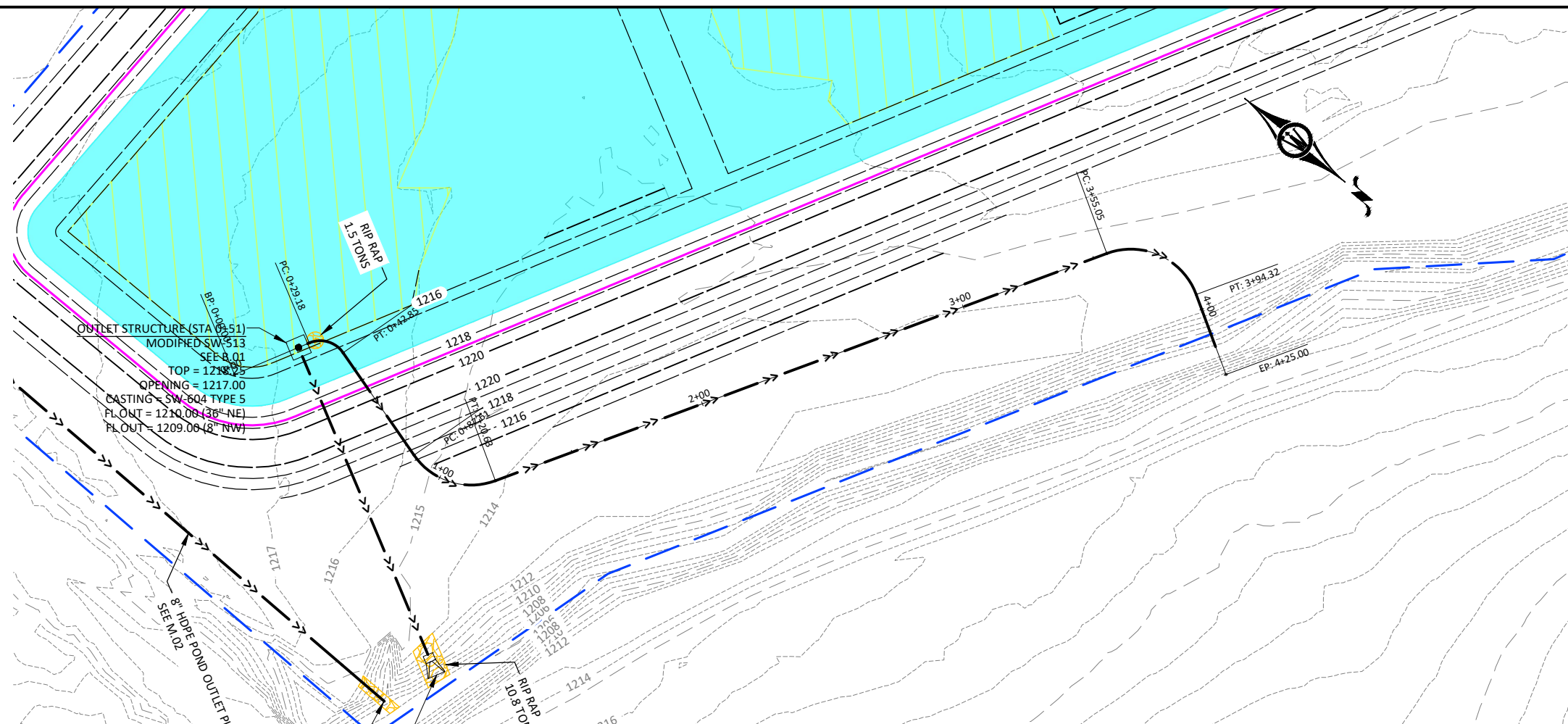


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PUMP INLET & OUTLET PIPES

SHEET
M.01



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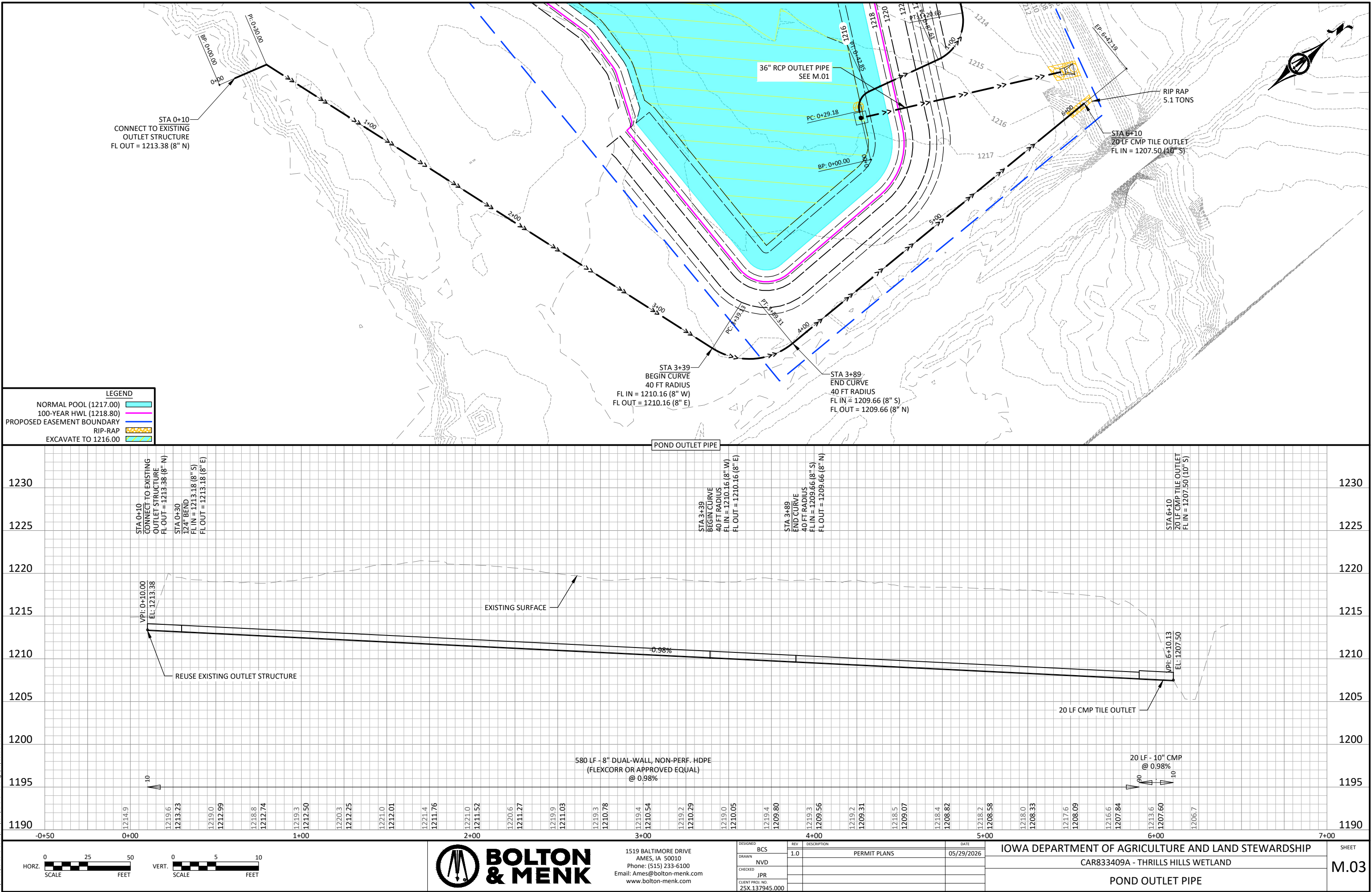
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SHEET

1.02

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POND OUTLET PIPE

SHEET
M.03