CONSTRUCTION PLANS FOR

IDALS PROJECT NO. WOR982203CN

SITE GRADING, BERM CONSTRUCTION, WATER CONTROL STRUCTURES,

DRAINAGE TILE, RIPRAP, EROSION AND SEDIMENT CONTROL

WORTH COUNTY, IOWA

SEPTEMBER 2023

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",
SERIES 2021 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.

IOWA ONE CALL
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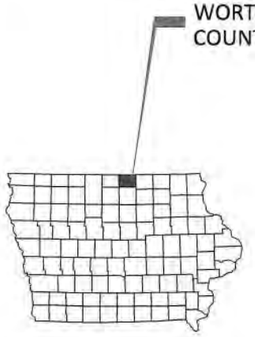
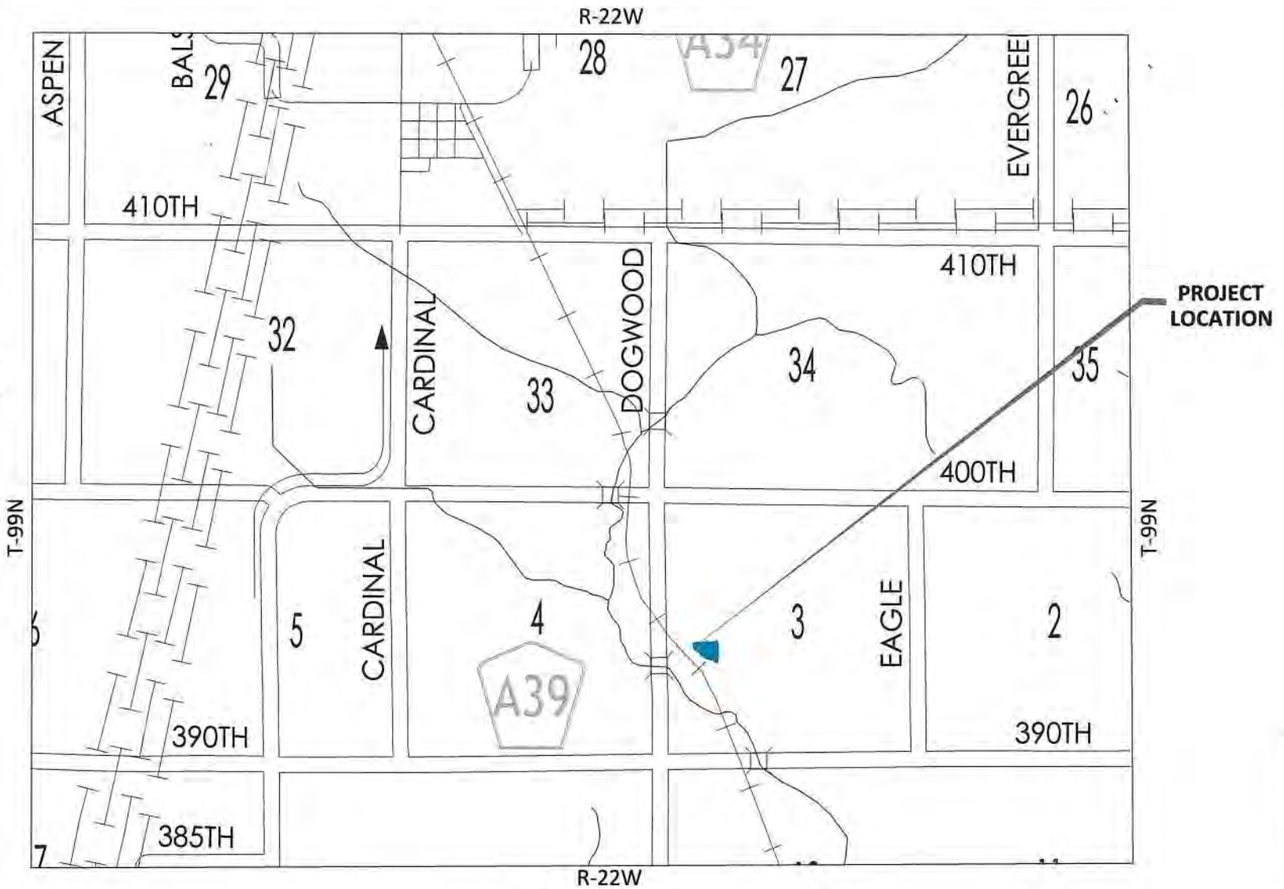
www.iowaonecall.com

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."





MAP OF PORTIONS OF
WORTH COUNTY, IOWA

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THIS PLAN SET CONTAINS 29 SHEETS.

THESE PLANS WERE PREPARED IN ACCORDANCE WITH NRCS ENGINEERING JOB CLASS v, SPECIFICATIONS 656, 410, AND 378

DATUM EQUATION	PROJECT DATUM: STATE PLANE
1916 DATUM + 1130.5' = NAVD 88	HORIZONTAL: IOWA NORTH
	VERTICAL: NAVD 1988

LICENSED PROFESSIONAL ENGINEER
JONATHAN P. ROSENGREN
21661
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.

JONATHAN P. ROSENGREN, P.E.

REG. NO. 21661 DATE: April 18, 2024

MY LICENSE RENEWAL DATE IS 12/31/2024

PAGES OR SHEETS COVERED BY THIS SEAL:

ALL PLAN SHEETS

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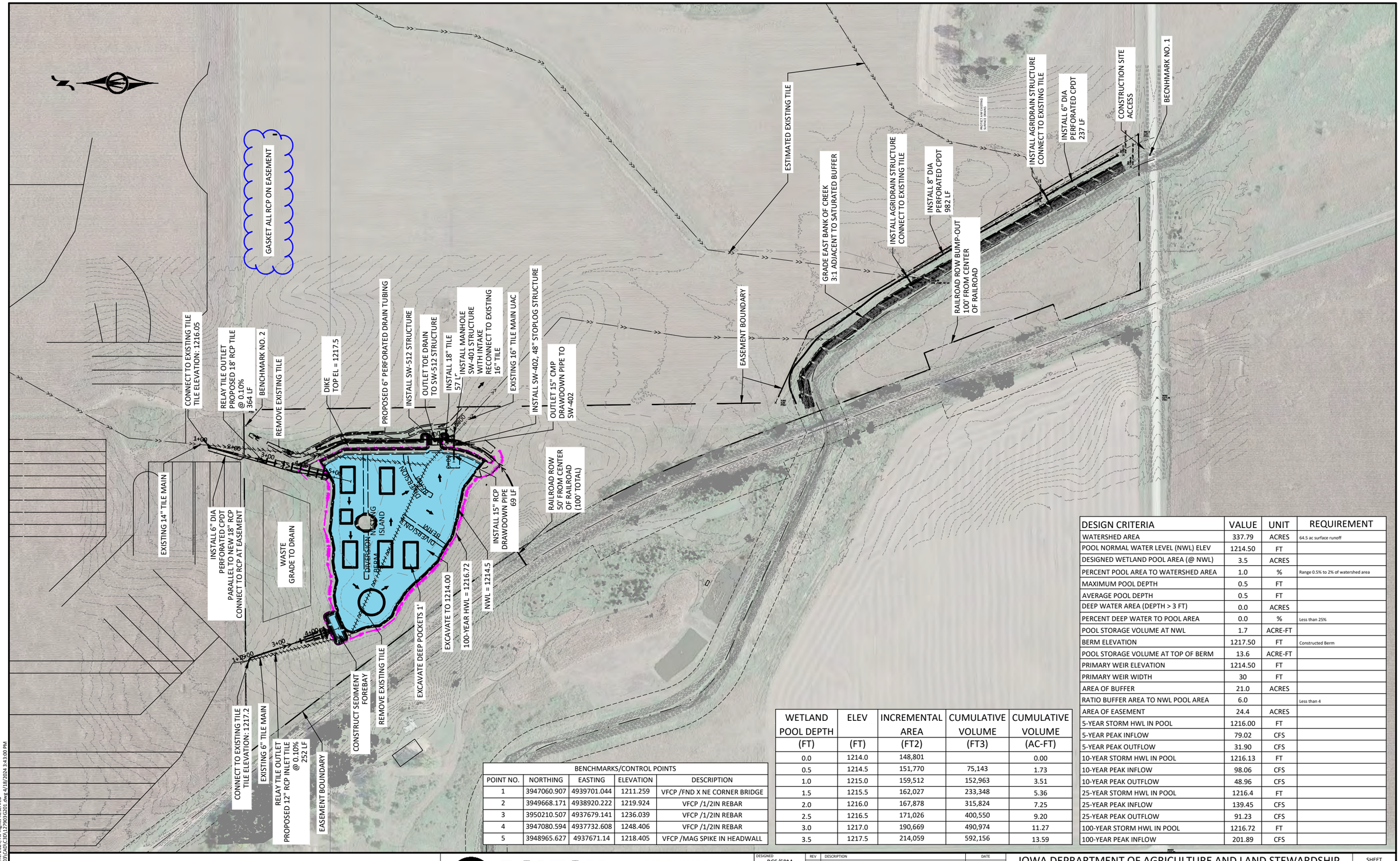
CHECKED: JPR			
CLIENT PROJ. NO.: 0A1.127903			

IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
TITLE SHEET

SHEET A.01



BENCHMARKS/CONTROL POINTS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	3947060.907	4939701.044	1211.259	VFCP /FND X NE CORNER BRIDGE
2	3949668.171	4938920.222	1219.924	VFCP /1/2IN REBAR
3	3950210.507	4937679.141	1236.039	VFCP /1/2IN REBAR
4	3947080.594	4937732.608	1248.406	VFCP /1/2IN REBAR
5	3948965.627	4937671.14	1218.405	VFCP /MAG SPIKE IN HEADWALL

WETLAND POOL DEPTH	ELEV	INCREMENTAL AREA	CUMULATIVE VOLUME	CUMULATIVE VOLUME
(FT)	(FT)	(FT2)	(FT3)	(AC-FT)
0.0	1214.0	148,801		0.00
0.5	1214.5	151,770	75,143	1.73
1.0	1215.0	159,512	152,963	3.51
1.5	1215.5	162,027	233,348	5.36
2.0	1216.0	167,878	315,824	7.25
2.5	1216.5	171,026	400,550	9.20
3.0	1217.0	190,669	490,974	11.27
3.5	1217.5	214,059	592,156	13.59

DESIGN CRITERIA	VALUE	UNIT	REQUIREMENT
WATERSHED AREA	337.79	ACRES	64.5 ac surface runoff
POOL NORMAL WATER LEVEL (NWL) ELEV	1214.50	FT	
DESIGNED WETLAND POOL AREA (@ NWL)	3.5	ACRES	
PERCENT POOL AREA TO WATERSHED AREA	1.0	%	Range 0.5% to 2% of watershed area
MAXIMUM POOL DEPTH	0.5	FT	
AVERAGE POOL DEPTH	0.5	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	1.7	ACRE-FT	
BERM ELEVATION	1217.50	FT	Constructed Berm
POOL STORAGE VOLUME AT TOP OF BERM	13.6	ACRE-FT	
PRIMARY WEIR ELEVATION	1214.50	FT	
PRIMARY WEIR WIDTH	30	FT	
AREA OF BUFFER	21.0	ACRES	
RATIO BUFFER AREA TO NWL POOL AREA	6.0		Less than 4
AREA OF EASEMENT	24.4	ACRES	
5-YEAR STORM HWL IN POOL	1216.00	FT	
5-YEAR PEAK INFLOW	79.02	CFS	
5-YEAR PEAK OUTFLOW	31.90	CFS	
10-YEAR STORM HWL IN POOL	1216.13	FT	
10-YEAR PEAK INFLOW	98.06	CFS	
10-YEAR PEAK OUTFLOW	48.96	CFS	
25-YEAR STORM HWL IN POOL	1216.4	FT	
25-YEAR PEAK INFLOW	139.45	CFS	
25-YEAR PEAK OUTFLOW	91.23	CFS	
100-YEAR STORM HWL IN POOL	1216.72	FT	
100-YEAR PEAK INFLOW	201.89	CFS	

HORZ. SCALE 0 150 300 FEET

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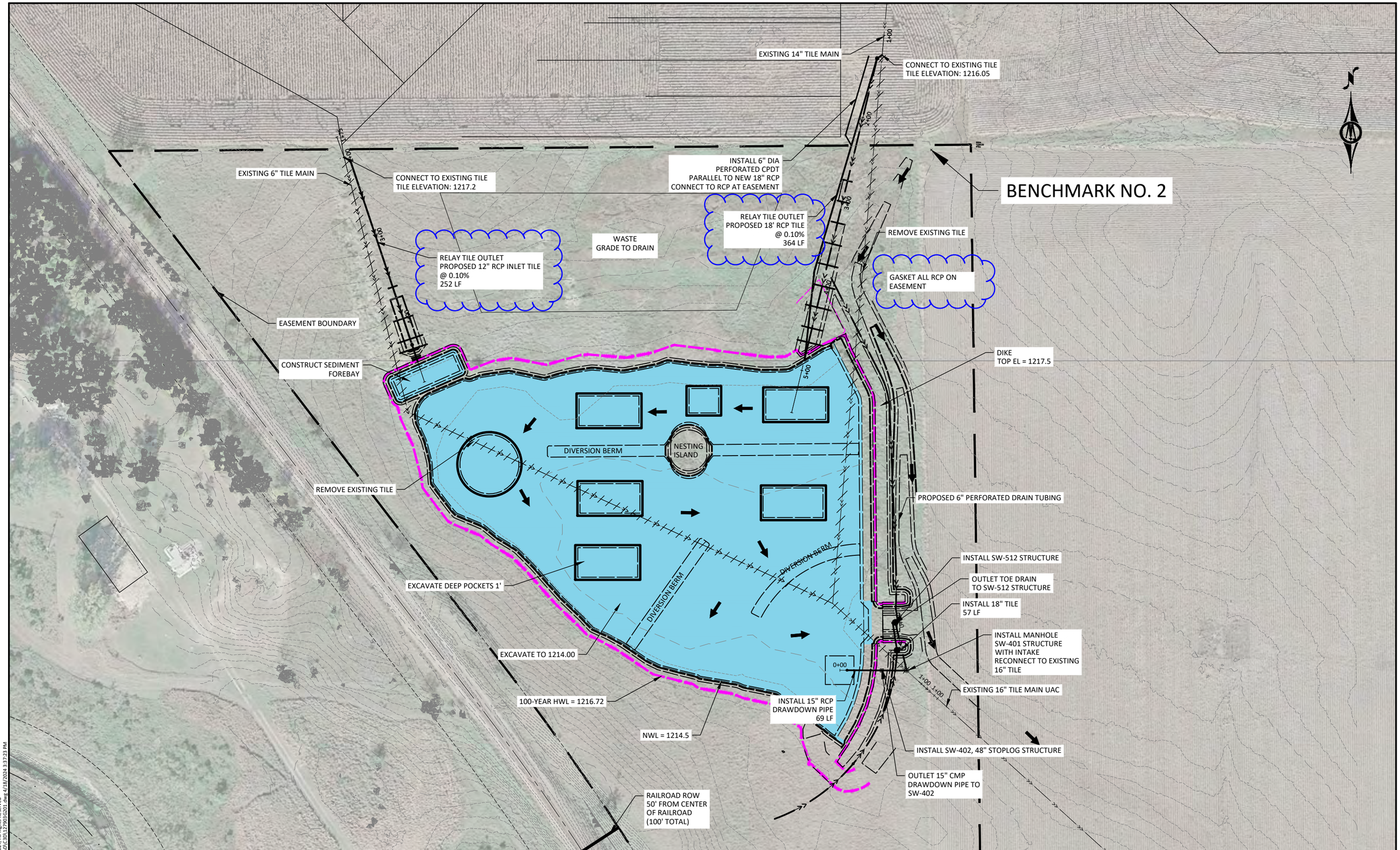
REV	DESCRIPTION	DATE

IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
OVERVIEW PLAN DESIGN

SHEET A.02



HORZ. 0 50 100
SCALE FEET

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IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
OVERVIEW PLAN DESIGN - WETLAND

SHEET
A.03

HORZ. SCALE 0 50 100 FEET

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IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

OVERVIEW PLAN DESIGN - SATURATED BUFFER

SHEET A.04

PIPE HAUNCH FILL AND COMPACTION METHOD
PLAN REQUIREMENTS COMPLIANCE VERIFICATION

THE CONTRACTOR IS SOLEY RESPONSIBLE FOR THE INSTALLATION OF ALL PIPE ACCORDING TO PLAN REQUIREMENTS. THE CONTRACTOR'S PARTICIPATION IN AND COMPLIANCE WITH THE FOLLOWING PROCEDURE IS REQUIRED AND WILL ALLOW FOR FEWER SOIL DENSITY TESTS TO ENSURE PROPER PIPE INSTALLATION.

STEP 1
BEFORE COMMENCING PIPE INSTALLATION, STANDARD SOIL PROCTOR DENSITY TEST RESULTS OF REPRESENTATIVE SAMPLE(S) OF PIPE HAUNCH FILL SHALL BE PROVIDED BY AN INDEPENDENT QUALIFIED SOILS TESTING LAB. THE SELECTION OF THE SAMPLE(S) WILL BE MADE BY THE ENGINEER AND CONTRACTOR (WHEN SPECIFIED).

STEP 2
CONTRACTOR MAY BEGIN EXCAVATING THE MODIFIED TYPE 4 TRENCH
WITH THE REQUIRED SHAPED BOTTOM GROOVE AND PLACE SEVERAL PIPE SECTIONS ONLY WHEN BOTH ENGINEER AND TESTING LAB TECHNICIAN ARE PRESENT

CONTRACTOR SHALL DEMONSTRATE THE INTENDED METHODS FOR COMPACTING THE FILL FOR THE PIPE HAUNCH AREAS. SOIL DENSITY TESTS SHALL BE TAKEN AT LOCATIONS DESIGNATED BY THE ENGINEER TO CONFIRM THAT THE INTEDNED METHODS FOR FILL AND COMPACTION OF THE PIPE HAUNCH AREAS SATIFIES THE PLAN REQUIREMENTS. CONTRACTOR SHALL MODIFIY THE INSTALLATION METHODS AND REPEAT STEP 2 UNTIL ACCEPTABLE TESTS RESULTS ARE ACHIEVED.

STEP 3
CONTRACTOR MAY INSTALL THE NEXT SEVERAL HUNDRED FEET OF PIPE. ENGINEER SHALL DESIGNATE SEVERAL LOCATIONS (APPROXIMATELY 10% OF THE INSTALLED LENGTH) WHERE CONTRACTOR SHALL LEAVE THE PIPE UNBLINDED FOR FURTHER DENSITY TESTS OF THE HAUNCH FILL AREA. ALL DENSITY TESTS MUST MEET PLAN REQUIREMENTS BEFORE WORK MAY PROCEED FURTHER.

IF DENSITY TESTING DATA CONFIRMS TO THE SATISFACTION OF THE ENGINEER THAT THE CONTRACTOR'S INSTALLATION METHOD WILL PRODUCE CONSISTENT COMPLIANCE WITH PLAN REQUIREMENTS, CONTRACTOR MAY CONTINUE INSTALLATION OF THE PIPE WITH NO ADDITIONAL TESTING REQUIRED. IF NOT, STEPS 2 AND 3 SHALL BE REPEATED UNTIL A RELIABLE, SUCCESSFUL METHOD OF PIPE INSTALLATION THAT PRODUCES SATISFACTORY RESULTS IS ESTABLISHED.

CONTRACTOR IS REQUIRED TO PROPERLY AND ADEQUATELY INSTRUCT SUBCONTRACTORS AND/OR SUBSEQUENT PIPE INSTALLATION WORKERS ON THE PROPER INSTALLATION METHOD.

STEP 4A
SOIL OR TRENCH CONDITION CHANGES

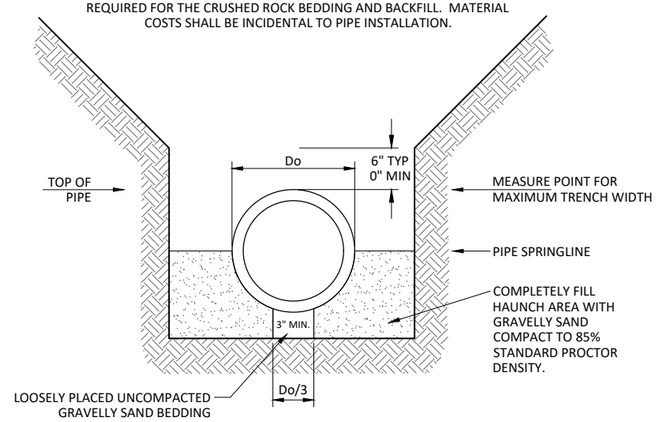
TO VERIFY CONTRACTOR'S COMPLIANCE WITH PLAN REQUIREMENTS UNDER THE CHANGED CONDITIONS, ENGINEER MAY STOP WORK AND REQUIRE ADDITIONAL SOIL PROCTOR TESTS AND/OR SOIL DENSITY TESTS SIMILAR TO STEPS 1 THROUGH 3. THE WORK AND COSTS OF THE FIRST TWO REVERIFICATIONS IS SUBSIDIARY TO THE PIPE INSTALLATION. SUBSEQUENT VERIFICATIONS WILL BE CONSIDERED EXTRA WORK.

STEP 4B
CONTRACTOR FAILS TO CONSISTENTLY PERFORM INSTALLATION METHOD OR INSTRUCT OTHER INSTALLERS

IF CONTRACTOR FAILS TO CONSISTENTLY PERFORM OR ADEQUATELY INSTRUCT SUBCONTRACTORS AND/OR SUBSEQUENT PIPE INSTALLATION WORKERS ON THE APPROVED INSTALLATION METHOD, ENGINEER MAY STOP WORK AND REQUIRE ADDITIONAL SOIL PROCTOR TESTS AND/OR SOIL DENSITY TESTS SIMILAR TO STEPS 1 THROUGH 3 TO VERIFY CONTRACTOR'S COMPLIANCE WITH PLAN REQUIREMENTS. THE WORK AND COSTS OF ALL VERIFICATIONS UNDER SUCH CONDITIONS IS SUBSIDIARY TO THE PIPE INSTALLATION.

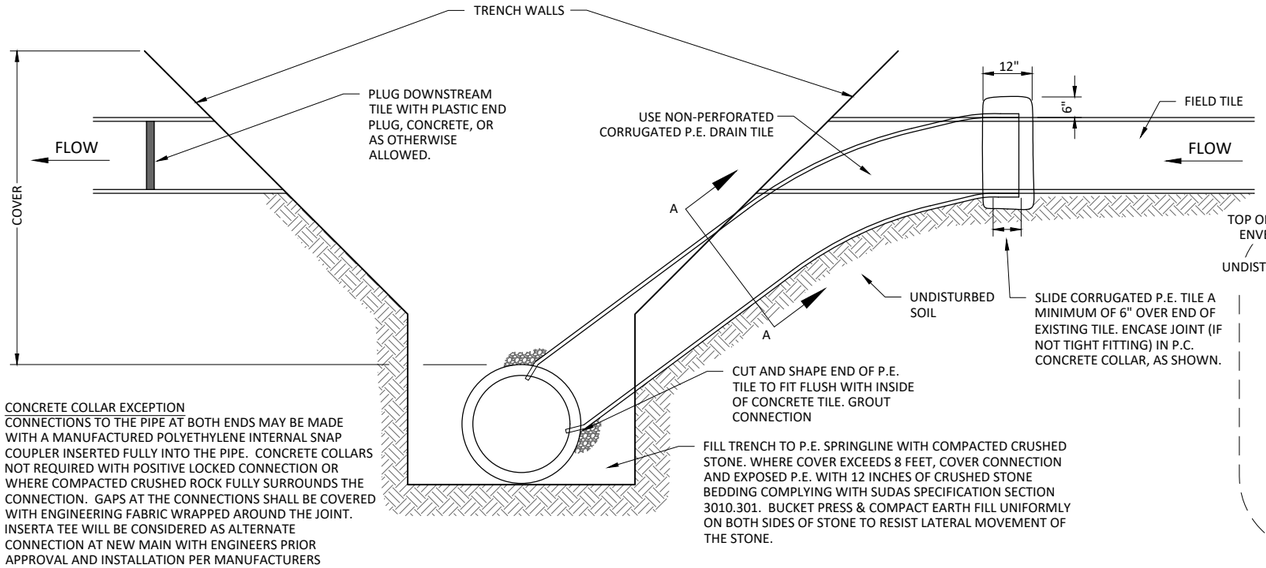
EXCEPTION
IF CONTRACTOR ELECTS TO SHAPE THE TRENCH BOTTOM SUCH THAT A MINIMUM OF 45% OF THE OUTER CIRCUMFERENCE OF THE PIPE IS FIRMLY BEDDED IN AND CONSISTENTLY SUPPORTED BY UNDISTURBED SOIL, PIPE HAUNCH FILL COMPACTION TESTING WILL NOT BE REQUIRED. THE CONTRACTOR IS REQUIRED TO COMPLY WITH A PROPER INSTALLATION METHOD AND TO FULLY COMPLY WITH THE REQUIREMENTS OF THE VERIFICATION OUTLINED ABOVE FOR ALL SITUATIONS WHERE THIS EXCEPTION IS NOT MET.

CRUSHED ROCK MEETING THE GRADATION OF SUDAS CLASS I BEDDING MATERAL, SPECIFICATION SECTION 3010.2.02.A, MAY BE SUBSTITUTED FOR THE SAND OR CLAY HAUNCH BACKFILL MATERIAL. NO COMPACTION WILL BE REQUIRED FOR THE CRUSHED ROCK BEDDING AND BACKFILL. MATERIAL COSTS SHALL BE INCIDENTAL TO PIPE INSTALLATION.



GRAVELLY SAND BEDDING SHALL BE CONSISTENT WITH THE GRADATION AND OTHER CHARACTERISTICS OF STANDARD AASHTO A1 OR A3 SOIL. A REPRESENTATIVE SAMPLE OF THE MATERIAL AND A GRADATION REPORT OR SUPPLIER'S CERTIFICATION OF COMPLIANCE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO DELIVERY TO SITE. SEE SOIL DATA IN APPENDIX OF SPECIFICATIONS BOOKLET.

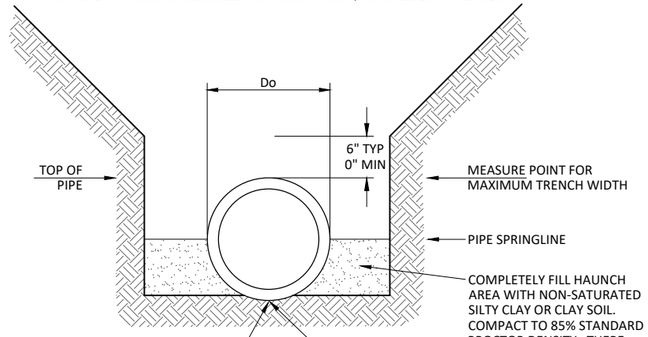
TRENCH INSTALLATION TYPE 3
NOT TO SCALE
SOURCE: AMERICAN CONCRETE PIPE ASSOCIATION
CONCRETE PIPE DESIGN MANUAL



CONCRETE COLLAR EXCEPTION
CONNECTIONS TO THE PIPE AT BOTH ENDS MAY BE MADE WITH A MANUFACTURED POLYETHYLENE INTERNAL SNAP COUPLER INSERTED FULLY INTO THE PIPE. CONCRETE COLLARS NOT REQUIRED WITH POSITIVE LOCKED CONNECTION OR WHERE COMPACTED CRUSHED ROCK FULLY SURROUNDS THE CONNECTION. GAPS AT THE CONNECTIONS SHALL BE COVERED WITH ENGINEERING FABRIC WRAPPED AROUND THE JOINT. INSERTA TEE WILL BE CONSIDERED AS ALTERNATE CONNECTION AT NEW MAIN WITH ENGINEERS PRIOR APPROVAL AND INSTALLATION PER MANUFACTURERS RECOMMENDATION.

TYPICAL FIELD TILE CONNECTION
FOR FIELD TILE UP TO 10" DIAMETER

MINIMUM TRENCH WIDTH SHALL BE OUTSIDE DIAMETER OF PIPE PLUS 12" OR THAT WIDTH WHICH IS REQUIRED FOR COMPACTION, WHICHEVER IS GREATER



WHERE TRENCH BOTTOM IN FIRM UNDISTURBED SOIL, SHAPE TRENCH BASE GROOVE TO MATCH MINIMUM 1/6 OF THE OUTER CIRCUMFERENCE OF THE PIPE. WHERE THE SHAPED GROOVE CANNOT BE CONSTRUCTED INTO UNDISTURBED GROUND OR WHERE EXCESS CUT OCCURS OVER EXCAVATE AND PLACE MINIMUM 3-INCH THICK COMPACTED GRAVELLY SAND BEDDING TO RESTORE GRADE SUCH THAT 1/6 OR MORE OF THE OUTER CIRCUMFERENCE OF THE PIPE IS BEDDED. THIS MATERIAL AND WORK IS SUBSIDIARY TO THE INSTALLATION OF THE PIPE. CONTRACTOR MAY SUBSTITUTE PIPE BEDDING ROCK AS THE BEDDING MATERIAL. IT ALSO IS SUBSIDIARY.

MODIFIED TRENCH INSTALLATION TYPE 4
NOT TO SCALE
SOURCE: AMERICAN CONCRETE PIPE ASSOCIATION
CONCRETE PIPE DESIGN MANUAL

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IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
RCP INSTALLATION DETAIL

SHEET B.01

CORRUGATED POLYETHYLENE DRAINAGE TUBING MATERIAL & INSTALLATION NOTES

1. 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.
2. EXCEPT MODIFIED HEREIN OR OTHERWISE APPROVED BY ENGINEER, ALL CPDT SHALL BE INSTALLED IN COMPLIANCE WITH THE ASTM 449 STANDARD PRACTICE.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. MANUFACTURER'S ENDCAPS SHALL BE INSTALLED AT THE TERMINATION OF EACH LINE UNLESS A CONNECTION TO AN EXISTING DRAIN IS MADE.
9. 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%.
10. ALIGNMENT TURNS MAYBE MADE USING EITHER A MANUFACTURED FITTING OR CURVING THE LINE WITH A 25' MINIMUM RADIUS.

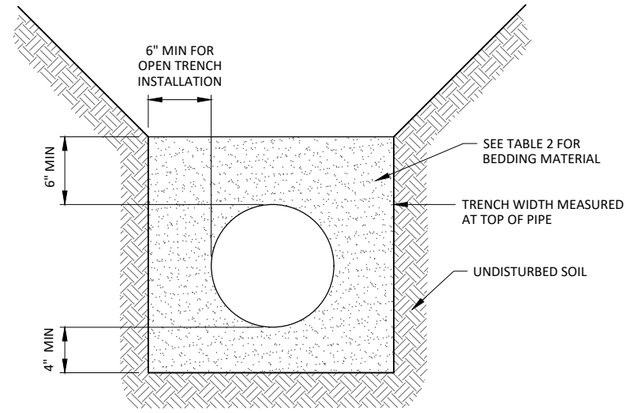
Table 1
Maximum Allowable Buried Depth to Flowline of CPDT

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

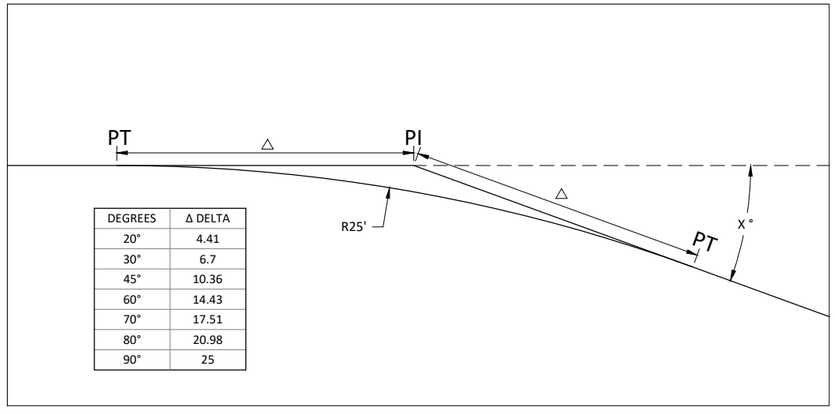


FILL TRENCH TO 6" ABOVE TOP OF PIPE WITH CRUSHED STONE OR GRAVEL MEETING THE REQUIREMENTS IN TABLE 2. BEDDING MATERIAL SHALL BE INCIDENTAL TO THE PIPE INSTALLATION.

FLAT BOTTOM TRENCH INSTALLATION

NOT TO SCALE
SOURCE: ASTM F449

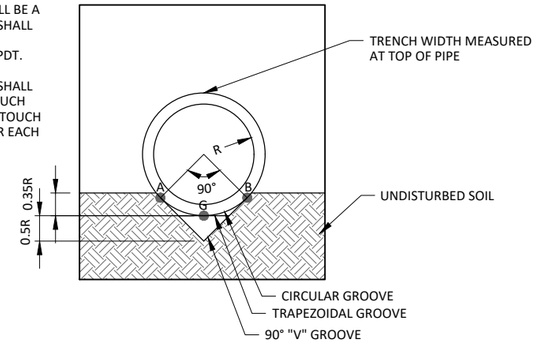
NOTE: THIS IS AN ALLOWED ALTERNATIVE INSTALLATION FOR CPDT



DEGREES	Δ DELTA
20°	4.41
30°	6.7
45°	10.36
60°	14.43
70°	17.51
80°	20.98
90°	25

THE CIRCULAR GROOVE SHALL BE A MINIMUM 0.35R DEEP AND SHALL MATCH THE OUTSIDE CURVE SHAPE OF THE DEFLECTED CPDT.

THE TRAPEZOIDAL GROOVE SHALL BE SHAPED AND ADJUSTED SUCH THAT POINTS A, B, & C WILL TOUCH THE UNDEFLECTED CPDT FOR EACH SIZE INSTALLED.



PREFFERED TRENCH INSTALLATION BOTTOM

TRAPEZOIDAL GROOVE, "V" GROOVE, & CIRCULAR GROOVE
NOT TO SCALE
SOURCE: ASTM F449

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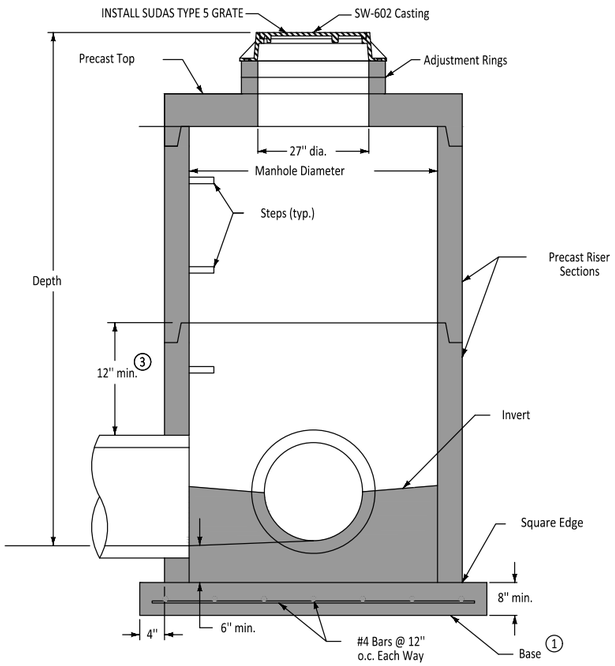
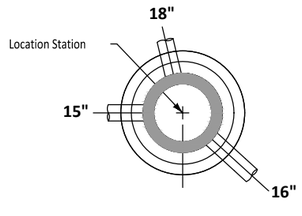
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
CPDT INSTALLATION DETAIL

SHEET B.02

1. Cast-in-place base shown. If base is precast integral with bottom riser, the footprint of the base is not required to extend beyond the outer edge of the riser.
2. For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.
3. 12 inch minimum riser height above all pipe openings.



TYPICAL SECTION
(not to scale)



PLAN

Manhole Diameter (inches)	Maximum Pipe Diameter (inches) for 2 Pipes ②	
	At 180 ° Separation	At 90 ° Separation
48	24	18
60	36	24
72	42	30
84	48	36
96	60	42

SW-401

DETAIL - TILE INTERCEPT MANHOLE

SUDAS	Iowa Department of Transportation	REVISION
FIGURE 6010.401	STANDARD ROAD PLAN	NEW 04-21-09
		SW-401
		SHEET 1 of 1

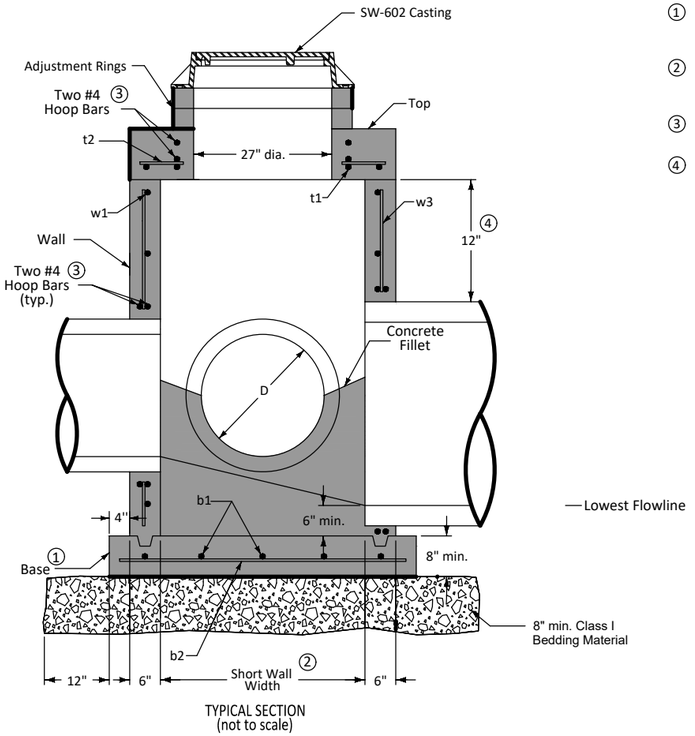
REVISIONS: New. Replaces SUDAS Type "M-A" Manhole. Will replace RA-50.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

CIRCULAR STORM SEWER MANHOLE

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
2. Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.
3. Provide two #4 hoop bars at top opening and at all pipe openings.
4. 12 inch minimum wall height above all pipes.



TYPICAL SECTION
(not to scale)

SW-402

FOR INFORMATIONAL PURPOSES ONLY

SUDAS	Iowa Department of Transportation	REVISION
FIGURE 6010.402	STANDARD ROAD PLAN	NEW 04-21-09
		SW-402
		SHEET 1 of 1

REVISIONS:

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

RECTANGULAR STORM SEWER

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DRAWN BCS/SPM/JKF			
CHECKED JPR			
CLIENT PROJ. NO. 0A1.127903			

IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
IOWA DOT STRUCTURE DETAILS

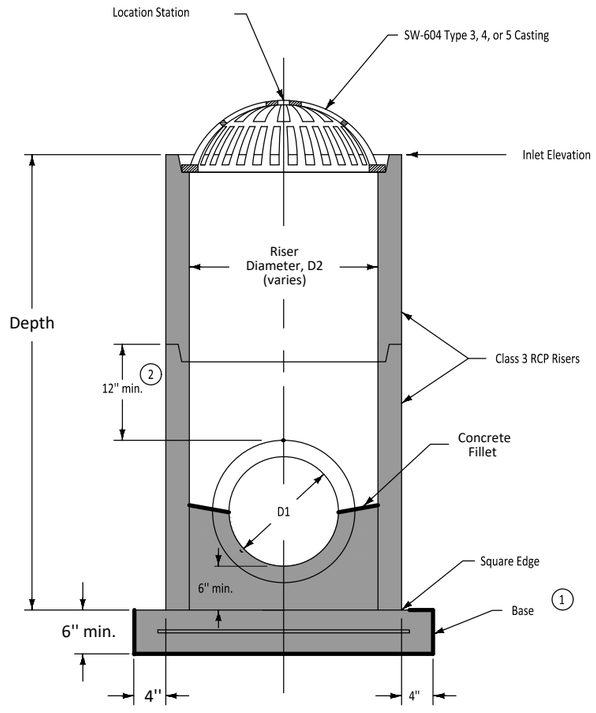
SHEET B.03

(1) Precast (shown) or cast-in-place base:

Precast: 6 inch thick concrete with #6 welded wire mesh on 4 inch centers (WWF 4'' x 4''). Center mesh vertically within base.

Cast-in-place: 8 inch thick non-reinforced concrete.

(2) 12 inch minimum riser height above all pipes.



TYPICAL SECTION
(not to scale)

INTAKE SIZE - CASE 1	
Outlet Pipe Diameter, D1	Minimum Riser Diameter, D2
12''	18''
15''	24''
18''	24''
21''	30''
24''	30''
27''	36''

SW-512

SUDAS	Iowa Department of Transportation	REVISION 4 04-21-20
FIGURE 6010.512	STANDARD ROAD PLAN	SW-512
		SHEET 1 of 2

REVISIONS: Changed 1 to I on Bedding Material.
MODIFICATIONS:

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

CIRCULAR AREA INTAKE

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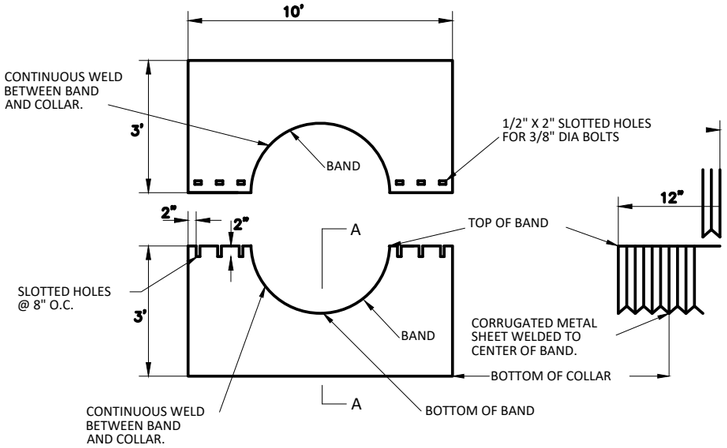
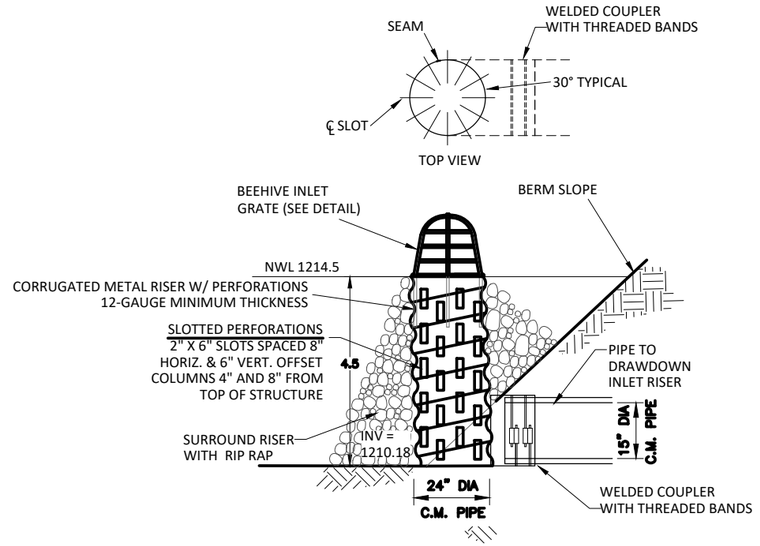
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
IOWA DOT STRUCTURE DETAILS

SHEET B.04



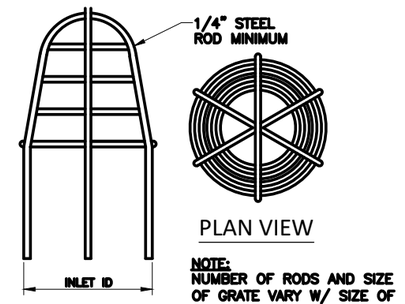
CMP ANTI-SEEP COLLAR

NOT TO SCALE



CMP SLOTTED INTAKE RISER

NOT TO SCALE



PLAN VIEW

SECTION VIEW

NOTE:
NUMBER OF RODS AND SIZE OF GRATE VARY W/ SIZE OF TILE INTAKES PAINT WITH (2) COATS RUST INHIBITING PAINT FOLLOWING FABRICATION

BEEHIVE INLET GRATE (STEEL BARS)

NOT TO SCALE

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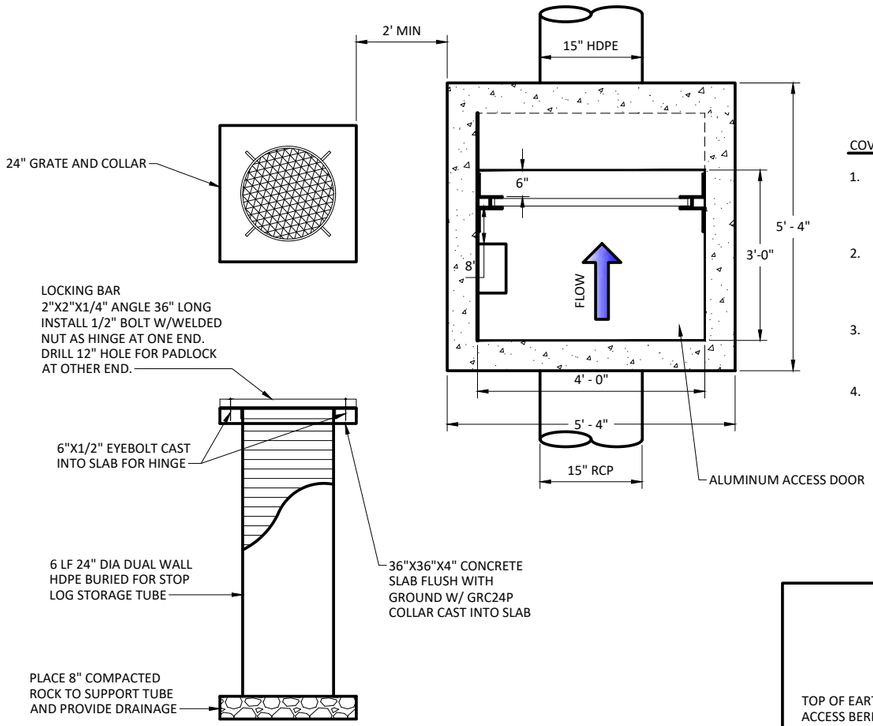
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
MODIFIED STRUCTURES

SHEET B.05

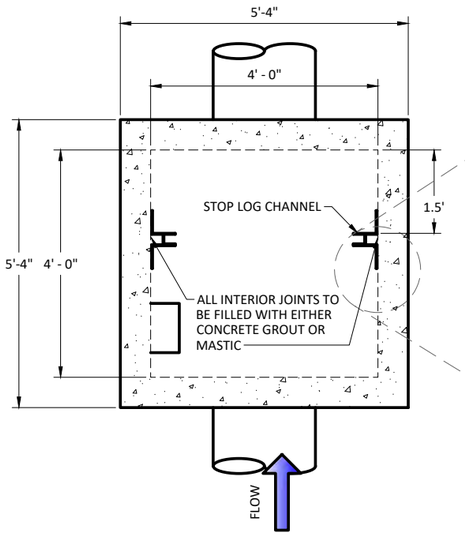


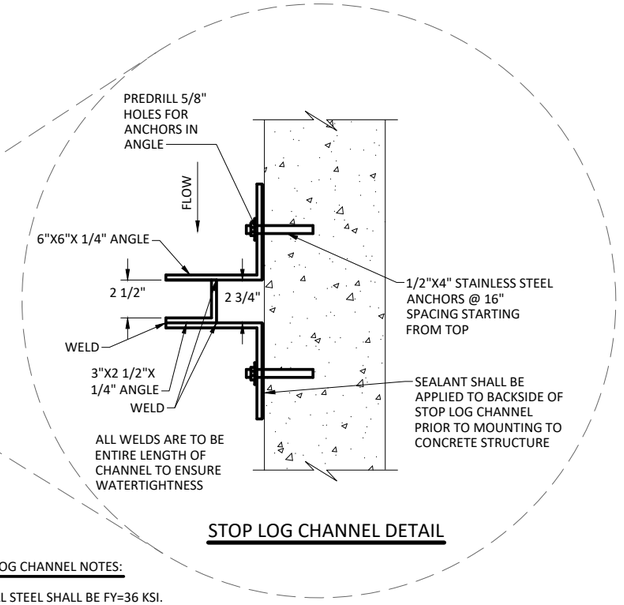
COVER AND STOP LOG STORAGE DETAIL

NOT TO SCALE

COVER/STOP LOG STORAGE NOTES:

1. PROVIDE (HALLIDAY PRODUCTS MODEL S1R3660 OR APPROVED EQUAL) 36"X60" ALUMINUM ACCESS DOOR WITH LOCKING MECHANISM AND LIFTING HANDLE.
2. BOTH PADLOCKS FOR ACCESS DOOR AND STOP LOG STORAGE TUBE SHALL BE KEYED ALIKE. FOUR KEYS ARE TO BE SUPPLIED UPON PROJECT COMPLETION.
3. TOP OF STRUCTURE SHALL BE AN 8" THICK REINFORCED PRECAST TOP WITH ALUMINUM ACCESS DOOR CAST INTO TOP.
4. PROVIDE 24" GRATE AND COLLAR (AGRI DRAIN GR24 GRATE AND GRC24 COLLAR OR APPROVED EQUAL) FOR STOP LOG STORAGE.

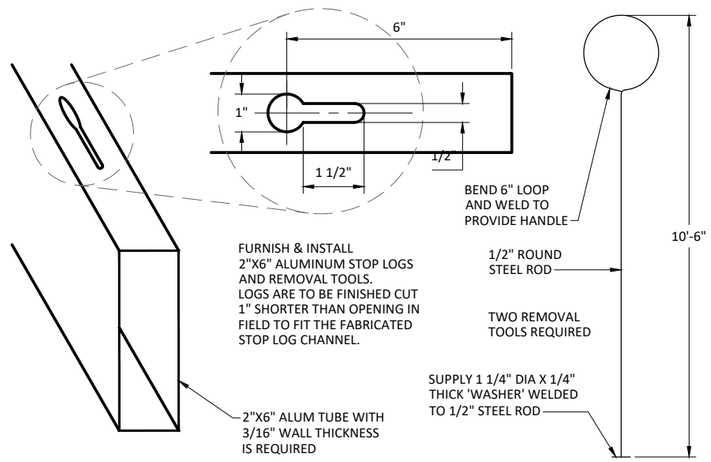




STOP LOG CHANNEL DETAIL

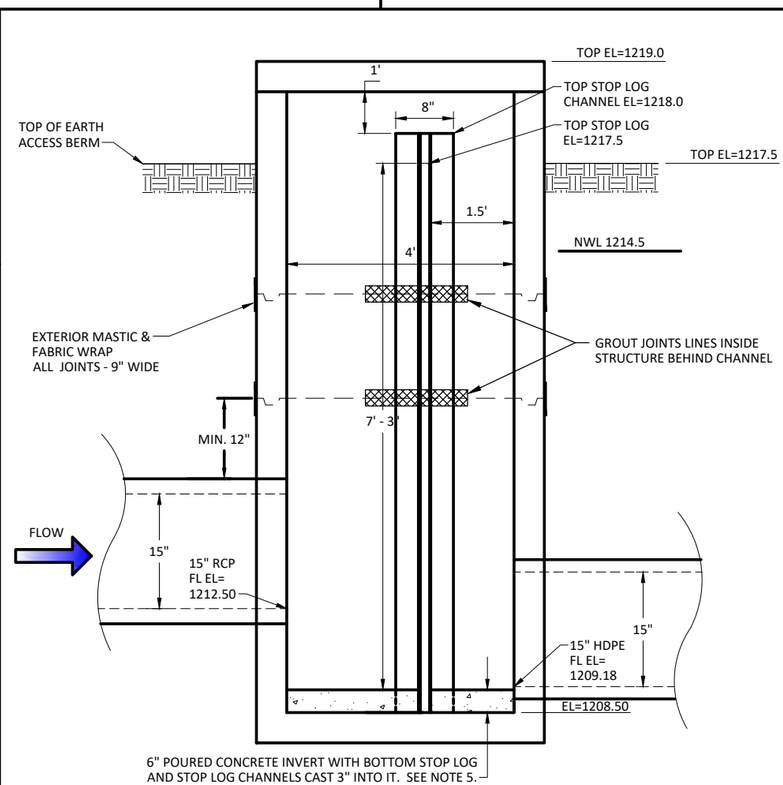
STOP LOG CHANNEL NOTES:

1. ALL STEEL SHALL BE FY=36 KSI.
2. ANCHORS SHALL BE STAINLESS STEEL FURNISHED W/NUTS, WASHERS AND LOCK WASHERS.
3. STOP LOG CHANNEL SHALL BE FURNISHED AS ONE CONTINUOUS PIECE W/CONTINUOUS WELDS.
4. ALL STEEL STOP LOG CHANNEL COMPONENTS ARE TO BE GALVANIZED AFTER WELDING AND DRILLING IS COMPLETE.
5. CONTRACTOR SHALL GROUT JOINT LINES INSIDE STRUCTURE ON WALLS BEHIND STOPLOGS CHANNEL
6. CONTRACTOR IS TO APPLY SEALANT VERY GENEROUSLY TO BACKSIDE OF STOP LOG CHANNEL TO ENSURE WATERTIGHT SEAL. SEALANT SHALL BE SIKA 30 YEAR INDUSTRIAL CAULK IN LIMESTONE GREY OR APPROVED EQUIVALENT.



STOP LOG & REMOVAL TOOL DETAIL

NOT TO SCALE



SW-402 WATER CONTROL OUTLET STRUCTURE ELEVATION

NOT TO SCALE

WATER CONTROL STRUCTURE NOTES:

1. STRUCTURE FABRICATION AND INSTALLATION SHALL CONFORM TO SUDAS 6010.302 SW-402 SANITARY MANHOLE
2. STRUCTURE SHOP DRAWINGS ARE REQUIRED FOR ENGINEER'S REVIEW AND APPROVAL BEFORE FABRICATION OF WATER CONTROL STRUCTURE.
3. PRECAST WATER CONTROL STRUCTURE SHALL BE SUPPLED IN 2 OR 3 SECTIONS, PLUS AN 8" THICK COVER SECTION. SECTION SIZE IS LEFT TO CONTRACTOR'S DISCRETION EXCEPT BOTTOM SECTION SHALL INCLUDE BASE AND WALLS TO 12" ABOVE INLET HOLE.
4. STOP LOG CHANNEL IS TO BE ANCHORED TO THE WALLS AND FLOOR PRIOR TO PLACING CONCRETE INVERT.
5. A CONCRETE INVERT IS TO BE INSTALLED AFTER STOP LOG CHANNEL IS INSTALLED. THE BOTTOM STOP LOG IS TO BE CAST INTO THE INVERT WITH THREE HALF INCH DIA. "J BOLTS" FASTENED TO THE BOTTOM STOP LOG. NO LIFTING HOLES ARE REQUIRED FOR THIS BOTTOM LOG.
6. ALL SECTIONS OF THE STRUCTURE ARE TO HAVE "TONGUE AND GROOVE" JOINTS SEALED WITH O RING GASKETS IN THE JOINT AND MASTIC AND FABRIC WRAP ON THE STRUCTURE EXTERIOR.
7. INTERIOR JOINTS SHALL BE FILLED AND SEALED TO PREVENT WATER FLOW IN JOINT BEHIND STOP LOG CHANNEL USING EITHER CONCRETE GROUT OR MASTIC.
8. ALL REINFORCEMENT FOR WATER CONTROL STRUCTURE SHALL BE ONE LAYER OF #4 REBAR @ 12" SPACING, CENTERED IN WALL, TWO #4 HOOP BARS ARE TO BE USED AT EACH OPENING.
9. PLACE BASE OF STRUCTURE ON FIRM UNDISTURBED EARTH FOUNDATION APPROVED BY ENGINEER.
10. A-LOK (OR EQUIVALENT) WATERTIGHT SEALS ARE REQUIRED FOR PIPE CONNECTIONS TO THE DRAWDOWN CONTROL STRUCTURE.
11. MANHOLE STEPS ARE TO BE INSTALLED FOR MAINTENANCE ACCESS TO THE STOP LOGS. STEPS ARE TO BE PER SUDAS SECTION 6010-2-2.13.
12. A-LOK'S (OR EQUIVATENT) WATERTIGHT SEALS ARE REQUIRED FOR PIPE CONNECTIONS TO THE WATER CONTROL STRUCTURE.
13. INSURE THAT ALL JOINTS ARE WATER-TIGHT AND PROPERLY SEALED

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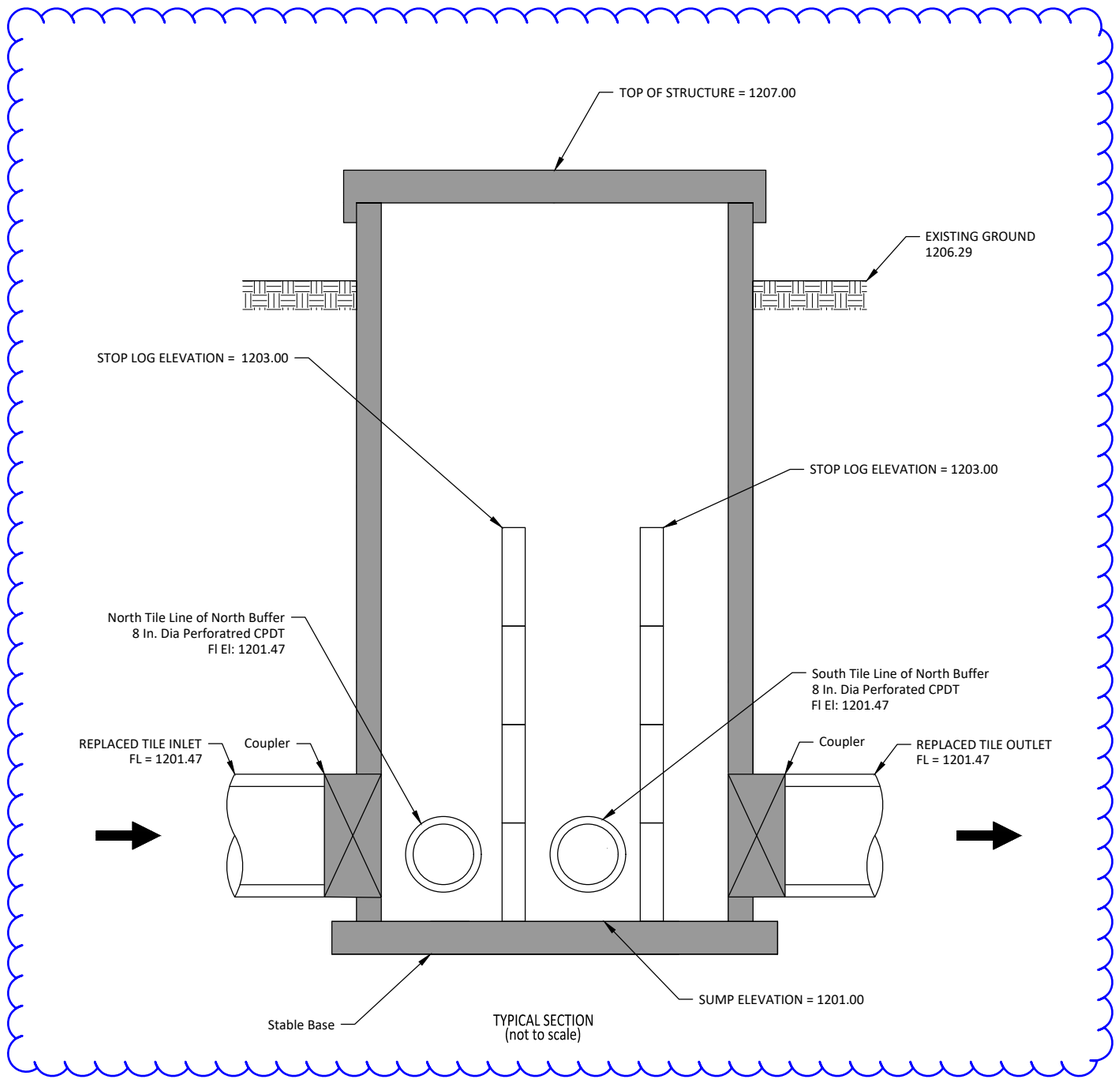
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

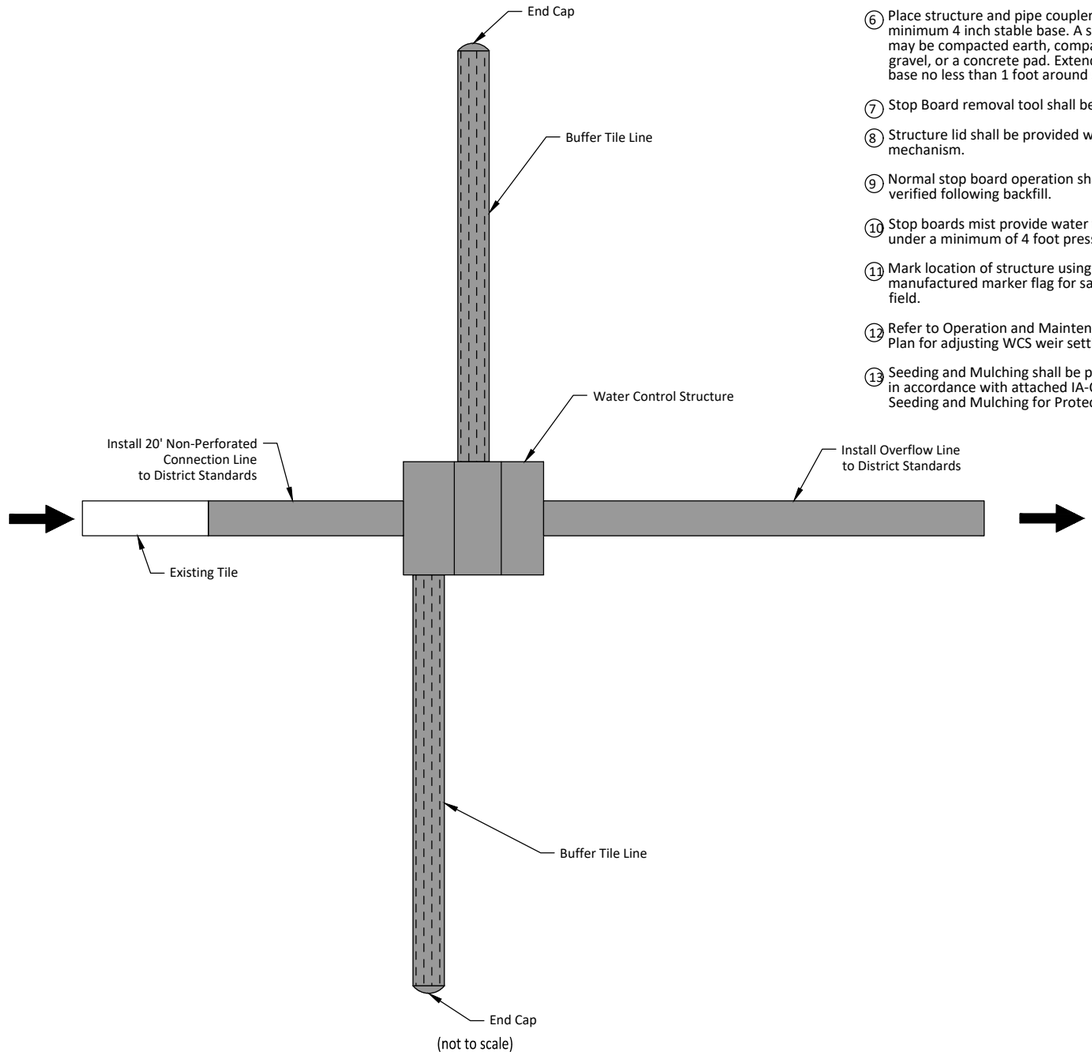
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

MODIFIED STRUCTURES

SHEET B.06



NORTH SATURATED BUFFER STRUCTURE AGRIDRAIN INLINE WATER LEVEL CONTROL STRUCUTRE



1. Install perforated buffer tile lines parallel to the ditch and connect them to the side couplers on the water control structure (see Plan).
2. Connect non-perforated plastic pipe to the upstream and downstream couplers on the water control structure, upstream 20' minimum, see typical section for downstream length. Diameter, d, is inside diameter in inches.
3. Pipe must be PVC of PE. Pipe, pipe sizes , fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop Board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards mist provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker flag for safety in the field.
12. Refer to Operation and Maintenace (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding and Mulching for Protective Cover.

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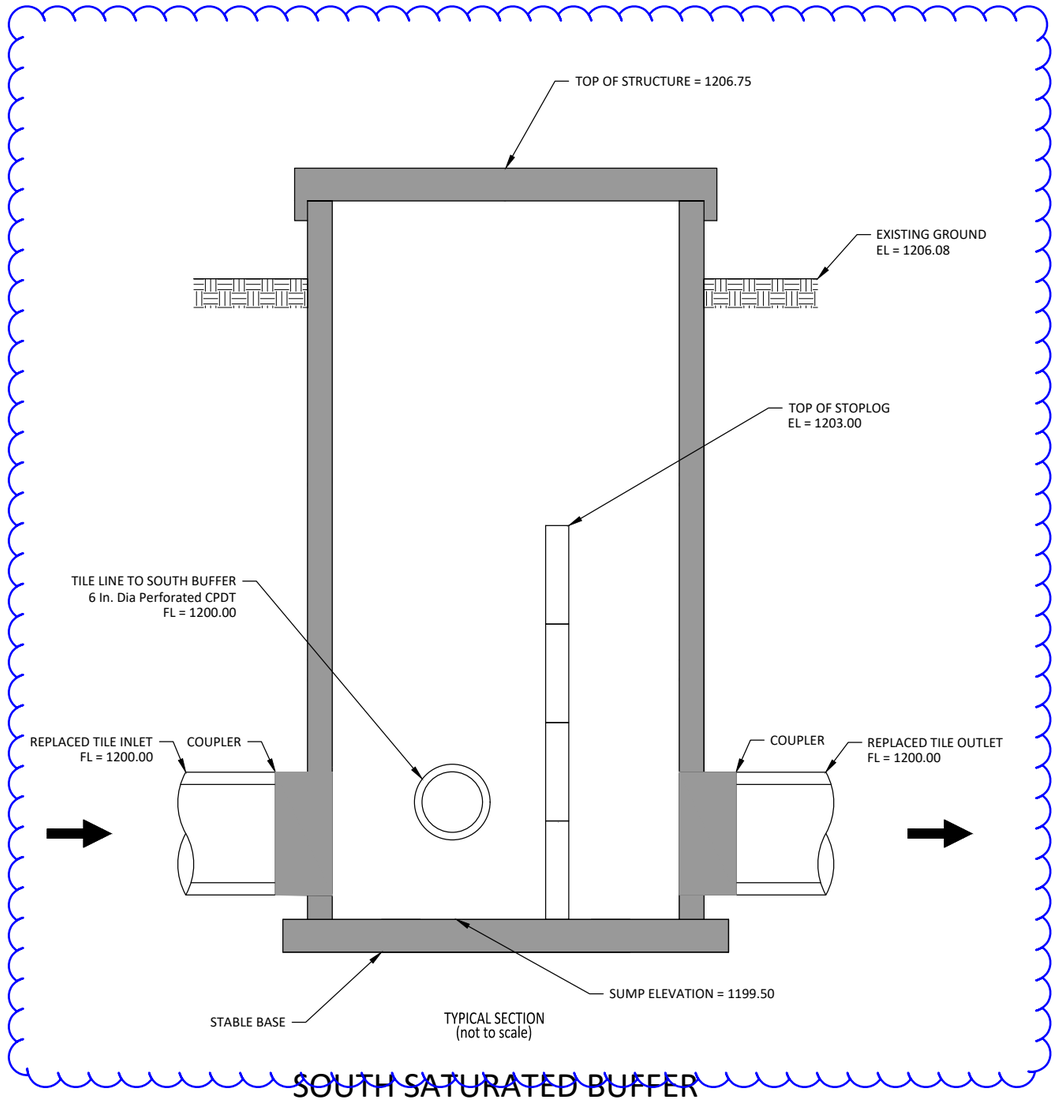
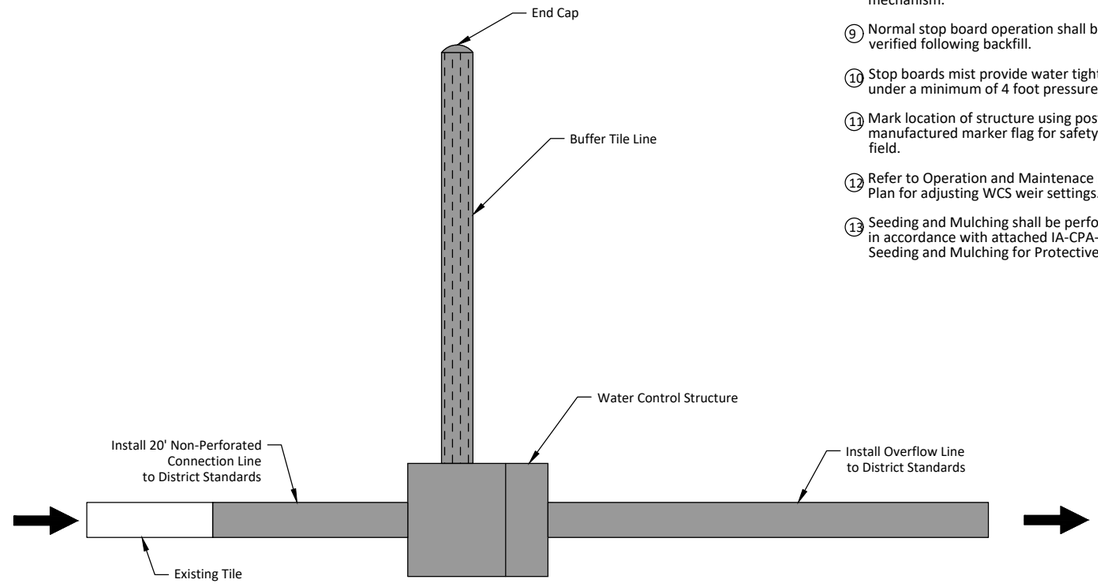
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
NORTH SATURATED BUFFER STRUCTURES

SHEET
B.07



SOUTH SATURATED BUFFER STRUCTURE
AGRIDRAIN INLINE WATER LEVEL CONTROL STRUCTURE



(not to scale)

1. Install perforated buffer tile lines parallel to the ditch and connect them to the side couplers on the water control structure (see Plan).
2. Connect non-perforated plastic pipe to the upstream and downstream couplers on the water control structure, upstream 20' minimum, see typical section for downstream length. Diameter, d, is inside diameter in inches.
3. Pipe must be PVC of PE. Pipe, pipe sizes , fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop Board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards mist provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker flag for safety in the field.
12. Refer to Operation and Maintenace (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding and Mulching for Protective Cover.

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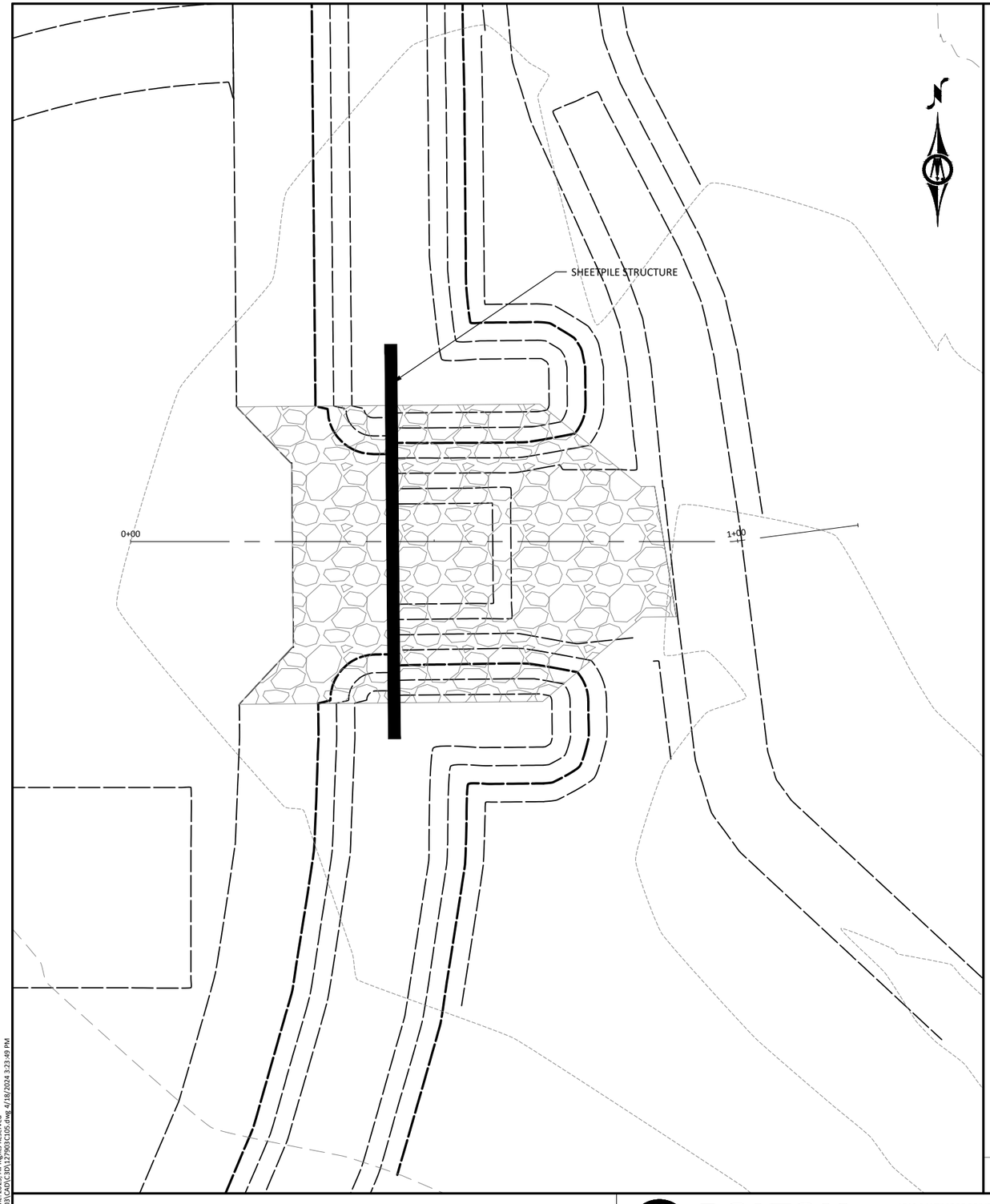
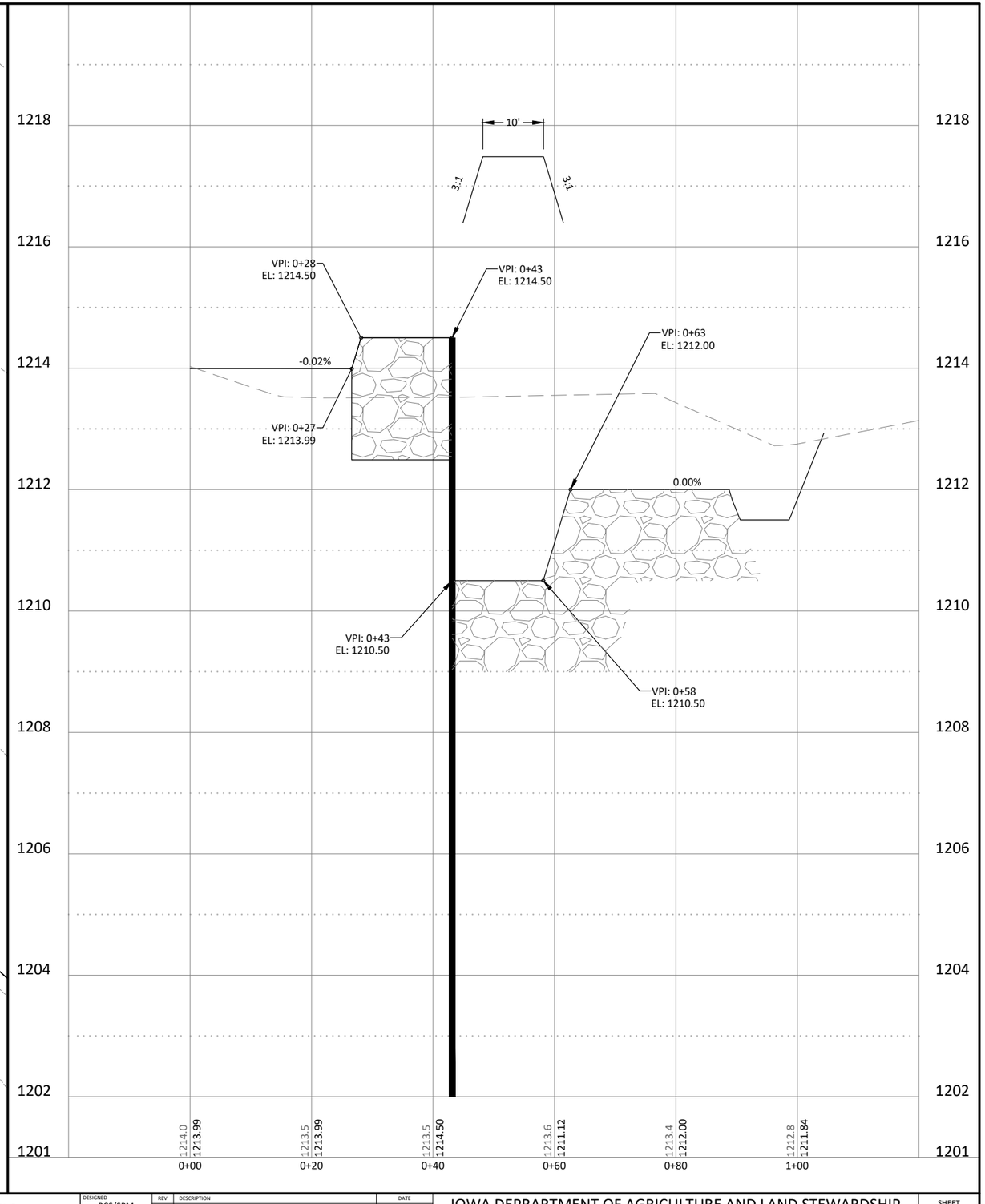
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
SOUTH SATURATED BUFFER STRUCTURES

SHEET B.08





HORZ. SCALE 0 20 40 FEET

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IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
STILLING BASIN DETAIL

SHEET B.09

DESIGN SHEET PILING AREA IS 464 SF - AFTER TRIMMING

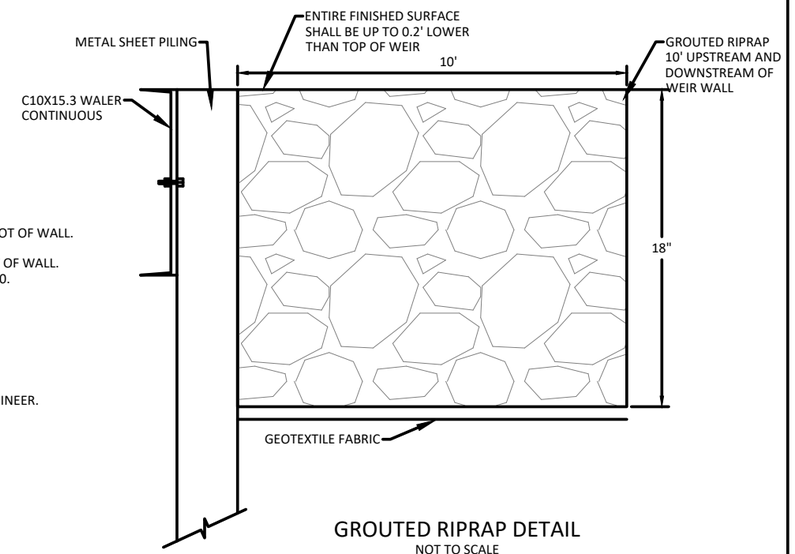
SHEET PILING REQUIREMENTS

MINIMUM WEB THICKNESS 0.250" IN
MINIMUM SECTION MODULUS OF 1.17 CUBIC INCHES PER FOOT OF WALL.
MINIMUM GRADE OF STEEL IS 25 KSI.
MINIMUM MOMENT OF INERTIA OF .67 INCHES ^ 4 PER FOOT OF WALL.
ALL SHEETING SHALL MEET ASTM A-328, A-572 GR50 OR A-690.

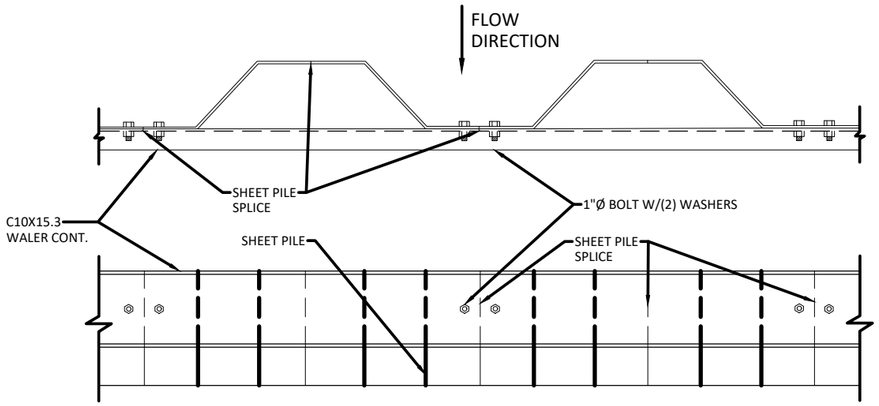
APPROVED PRODUCTS

CONTCH ENGINEERED SOLUTIONS LZ-250, SZ-15, SZ-14.5
SHORELINE STEEL LZ-250
SKYLINE STEEL SKS 14, SCZ 14

OTHER SHEETING MAYBE ALLOWED WITH PRIOR APPROVAL OF ENGINEER.



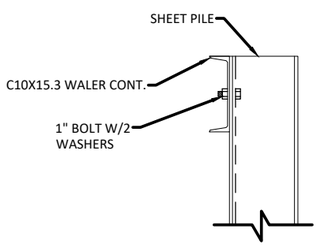
GROUTED RIPRAP DETAIL
NOT TO SCALE



WALER BOLT PLACEMENT
NOT TO SCALE

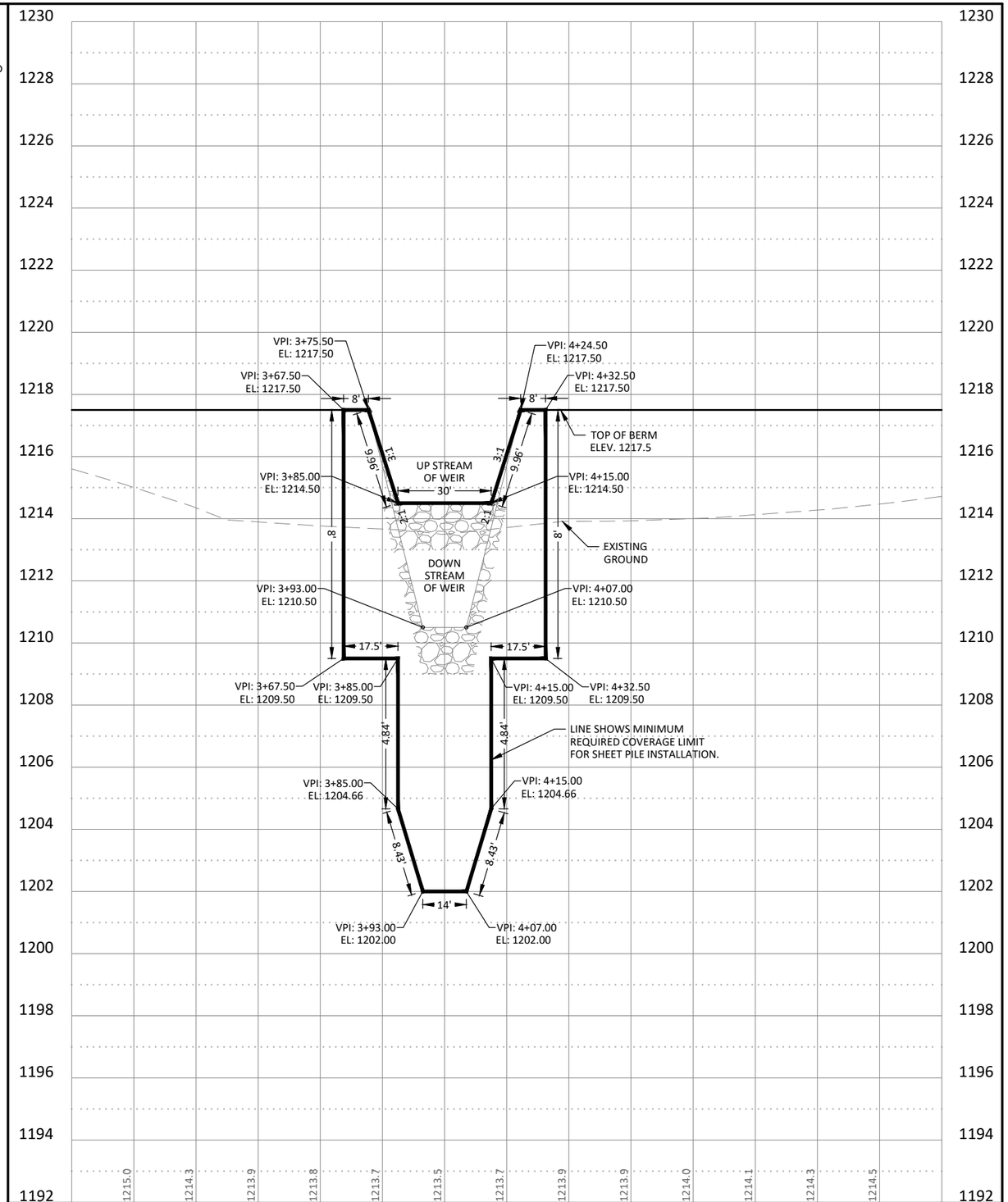
NOTES:

1. ALL BOLTS WILL BE 1" DIA. WITH 2 WASHERS. BOLT SHALL BE EXTENDED AT A MINIMUM OF $\frac{3}{8}$" BEYOND THE NUT.
2. ALL HOLES SHALL BE DRILLED $\frac{1}{16}$" DIA. LARGER THAN THE BOLT.
3. THE WALER SHALL BE PLACED ON THE DOWNSTREAM SIDE OF THE WEIR.
4. ANY HOLES LEFT IN SHEET PILE (LIFTING HOLES ETC.) SHALL BE WELDED CLOSED.
5. AFTER SHEETING AND WALER INSTALLATION ALL SHEETING ON THE WEIR IS TO BE CUT TO CONFORM WITH 3:1 SLOPE AND THE DESIGN ELEVATIONS.
6. STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED IN ACCORDING WITH THE LATEST SPECIFICATION OF AISC. FABRICATOR SHALL SUBMIT SHOP DRAWINGS SHOWING THAT PLANNED STEEL WILL COMPLETELY COVER INTENDED WALL AREA. FABRICATE AFTER ENGINEERS REVIEW.
7. DEFLECTIONS SHALL BE MADE IN FABRICATED PIECES AND STILL CONFORM TO THE DIMENSIONS GIVEN.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ALLOWABLE CONSTRUCTION LIVE LOADS.
9. PROVIDE ALL NECESSARY TEMPORARY BRACING, SHORING, GUYING OR OTHER MEANS TO AVOID EXCESSIVE STRESSES AND TO HOLD STRUCTURAL ELEMENTS IN PLACE DURING CONSTRUCTION.



NOTE: 1 BOLT TO BE PLACED ON EACH SIDE OF SPLICE

BOLT DETAIL
NOT TO SCALE



HORZ. 0 25 50
SCALE FEET

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IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
SHEET PILE DETAIL

SHEET B.10

1+00
2+00
3+00
4+00
5+00
1+79+00
3+00
4+00

LEGEND

PONDED AREA

BUFFER SEEDING

STRUCTURE SEEDING

HORZ. SCALE 0 100 200 FEET

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CLIENT PROJ. NO.: 0A1.127903			

IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

SEEDING MAP

SHEET B.11

Bid Item	Sub-Item	Description	Specifications		Plan No.	Estimated Quantities of Work	
			No.	Page		Quantity	Unit or Select
WETLAND QUANTITIES							
1	-	Site stripping & preparation	IA CS-001	1-2	A.02-04	1	LS
2	-	Crop damage	IA CS-001	1-2		0	AC
3	-	Structure & channel seeding	IA CS-006	6-9	B.10	1.4	AC
4	-	Buffer seeding	IA CS-006	6-9	B.10	9.4	AC
5	-	Mobilization and demobilization	CS-008	10-12		1	LS
6	-	Drain tile investigation and removal	IA CS-009	13-16	A.02-04	1	LS
7	-	Steel sheet piling	IA CS-013	19-20	B.06-09, D.01	610	SF
8	-	Excavation (General)	IA CS-021	21-23	D.01-05	4560	CY
9	-	Earthfill (General)	IA CS-023	24-28	D.01-05	830	CY
10	-	Earthfill (General Dam)	IA CS-023	24-28	D.01	1320	CY
11	-	Earthfill (Dam Core)	IA CS-023	24-28	D.01	1080	CY
12	-	Drainfill, fine	IA CS-024	29-31		60	CY
13	-	Topsoil Placement	IA CS-026	32-33	A.02-04	5800	CY
14	-	CMP tile outlets (20 LF each):					
	A.	18" x 20'	IA CS-051	50-53	M.02	0	EA
	B.	24" x 20'	IA CS-051	50-53	M.01	0	EA
15	-	Riprap (Class E)	IA CS-061	54-55	B.08-09, D.01	50	TN
16	-	Concrete grout	IA CS-062	56-58	B.08-09, D.01	40	CY
17	-	Geotextile Fabric	IA CS-095	56-58	B.08-09, D.01	220	SY
18	-	Concrete structures (Outlet):					
	A.	SW-401	IA CS-031, 6010-1.08-B	34-40	B.03, M.04	1	EA
	B.	SW-402 Water Control Outlet Structure	IA CS-031, 6010-1.08-B	34-40	B.03, M.04	1	EA
	C.	SW-512	IA CS-031, 6010-1.08-B	34-40	B.04, M.03-04	1	EA
19	-	Toe Drain					
	A.	Corrugated Polyethylene pipe (single wall) (perforated) - 6" Diameter	IA CS-045	41-45	M.03	700	LF
20	-	Reinforced concrete pipe (RCP)					
	A.	12" Diameter	IA-CS-046, SUDAS 4020	46-49	M.02	252	LF
	B.	15" Diameter	IA-CS-046, SUDAS 4020	46-49	M.04	29	LF
	C.	18" Diameter	IA-CS-046, SUDAS 4020	46-49	M.01, M.04	421	LF
21	-	RCP Drawdown Wetland Outlet Pipe					
	A.	15" Diameter	IA-CS-031, SUDAS 4020	34-40	B.05, M.04	40	LF
22	-	Silt Fence	IA-CS-005	3-4	D.04	250	LF
SATURATED BUFFER QUANTITIES							
23	-	Excavation (General)	IA-CS-021	21-23	M.08	3660	CY
24	-	Corrugated Polyethylene pipe (single wall) (perforated):					
	A.	6" Diameter	IA CS-045	41-45	M.07	537	LF
	B.	8" Diameter	IA CS-045	41-45	M.07	963	LF
25	-	Corrugated profile wall (Dual wall) Polyethylene pipe:					
	A.	10" Diameter	IA CS-045	41-45	M.07	37	LF
26	-	CMP tile outlets (20 LF each):					
	A.	12" x 20'	IA CS-051	50-53	M.07	1	EA
27	-	Reinforced concrete pipe (RCP)					
	A.	18" Diameter	IA-CS-046, SUDAS 4020	46-49	M.05	64	LF
28	-	North AgriDrain Water Control Structure	IA CS-045	41-45	M.05-07	1	EA
29	-	South AgriDrain Water Control Structure	IA CS-045	41-45	M.05-07	1	EA

ESTIMATE REFERENCE INFORMATION	
ITEM NO.	DESCRIPTION
1	SITE STRIPPING & PREPERATION
	THIS INCLUDES CLEARING, GRUBBING, STRIPPING, REFUSE REMOVAL, BANK SLOPING AND STRUCTURE REMOVAL ON THE SITE NECESSARY TO RID THE SITE OF ALL UNDESIRABLE MATERIALS ON OR NEAR THE SURFACE AND PREPARE THE SITE FOR THE STRUCTURE.
2	CROP DAMAGE
	THIS INCULDES CROP DAMAGE THAT RESULTS FROM CONSTRUCTION ACTIVITY.
3	STRUCTURE & CHANNEL SEEDING
	INCLUDES SEEDING OF HIGH WATER BERMS AND AREAS DISTURBED AROUND STRUCTURES. SEED MIX SHALL BE APPROVED BY IDALS AND THE NRCS.
4	BUFFER SEEDING
	INCLUDES SEEDING THE AREAS DESIGNATED ON THE PLANS AS BUFFER SEEDING AND INCLUDES BORROW AREAS, DISTURBED AREAS NOT SEEDED AS PART OF STRUCTURAL SEEDING, AND OTHER AREAS WITHIN THE EASEMENT
5	MOBILIZATION/DEMOBILIZATION
	INCLUDES MOBILIZATION AND DEMOBILIZATION OF THE CONTRACTOR'S FOURCES AND EQUIPMENT NECESSARY FOR PERFORMING THE WORK REQUIRED UNDER CONTRACT
6	DRAIN TILE INVESTIGATION AND REMOVAL
	THIS ITEM WILL CONSIST OF THE EXPLORATION REQUIRED TO LOCATE TILES SHOWN ON THE PLANS OR NOT SHOWN AND THE EXCAVATIONS REQUIRED TO ABANDON THE TILES SHOWN ON THE PLANS OR NOT SHOWN. THIS IS FULL COMPENSATION FOR THE EXCAVATION, BACKFILLING AND ABANDONMENT OF THE TILE TRENCHES WITHIN THE PERMANENT EASEMENT BOUNDARY.
7	STEEL SHEET PILE
	THIS ITEM SHAL CONSIST OF FURNISHING AND DRIVING THE SPECIFIC SHEET PILING AT THE LOCATION SHOWN ON THE DRAWINGS
8	EXCAVATION (GENERAL)
	THIS IS FULL COMPENSATION FOR THE EXCAVATION REQUIRED FOR THE CORE TRENCH, POOL AREA AND OUTLET CHANNEL. NO ADDITIONAL MEASURMENTS WILL BE TAKED AT THE END OF EXCAVATION. EXCAVATION WILL BE PAID BASED ON THE QUANTITY OUTLINED IN COST ESTIMATE AND PLAN SET.
9	EARTHFILL (GENERAL)
	THIS INCLUDES THE CONSTRUCTION OF THE COVER BERMS AND THE DIVERSION BERMS TO THE SLOPES AND ELEVATIONS DETAILED ON THE PLANS THE CONTRACTOR SHALL PROVIDE A MINIMUM ALLOWABLE SETTLEMENT OF 5% OF THE TOTAL FILL DEPTH WHEN CONSTRUCTING THE BERM. THIS ADDITIONAL QUANTITY OF MATERIAL IS NOT FIGURED INTO THE BID QUANTITY. EXCESS MATERIAL FROM EXCAVATIONS CAN BE USED OR WASTED HERE TO BUILD THE SLOPES. THIS QUANTITY ASSUMED A 35% SHRINKAGE FACTOR ON THE MATERIAL.
10	EARTHFILL (GENERAL DAM)
	THIS INCLUDES THE CONSTRUCTION OF THE EMBANKMENT BERM (DIKE) TO THE SLOPES AND ELEVATIONS DETAILED ON THE PLANS THE CONTRACTOR SHALL PROVIDE A MINIMUM ALLOWABLE SETTLEMENT OF 5% OF THE TOTAL FILL DEPTH WHEN CONSTRUCTING THE BERM. THIS ADDITIONAL QUANTITY OF MATERIAL IS NOT FIGURED INTO THE BID QUANTITY. EXCESS MATERIAL FROM EXCAVATIONS CAN BE USED OR WASTED HERE TO BUILD THE SLOPES. THIS QUANTITY ASSUMED A 35% SHRINKAGE FACTOR ON THE MATERIAL.
11	EARTHFILL (DAM CORE)
	THIS INCLUDES THE CONSTRUCTION OF THE CORE TRENCH OF THE EMBANKMENT BERM TO THE SLOPES AND ELEVATIONS DETAILED ON THE PLANS THE CONTRACTOR SHALL PROVIDE A MINIMUM ALLOWABLE SETTLEMENT OF 5% OF THE TOTAL FILL DEPTH WHEN CONSTRUCTING THE BERM. THIS ADDITIONAL QUANTITY OF MATERIAL IS NOT FIGURED INTO THE BID QUANTITY. EXCESS MATERIAL FROM EXCAVATIONS CAN BE USED OR WASTED HERE TO BUILD THE SLOPES. THIS QUANTITY ASSUMED A 35% SHRINKAGE FACTOR ON THE MATERIAL.
12	DRAINFILL, FINE
	THIS ITEM INCLUDES FURNISHING AND PLACING DRAINFILL REQUIRED IN THE CONSTRUCTION OF TOEWALL DRAINAGE SYSTEM
13	TOPSOIL PLACEMENT
	THIS ITEM INCLUDES REMOVAL OF VEGETATION FROM THE BORROW AREA PRIOR TO STRIPPING TOPSOIL, CLEARING AND GRUBBING, AND ANY FENCE REMOVAL/REPLACMENT NEEDED TO ACCESS AREAS ON PROJECT. ANY FENCE REMOVAL NEEDED SHALL BE COORIDINATE WITH PROPERTY OWNER TO MAINTAIN CATTLE CONFINEMENT.
14 A	CMP TILE OUTLETS, 18" X 20'
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE
14 B	CMP TILE OUTLETS, 24" X 20'
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE
15	RIPRAP (CLASS E)
	THIS ITEM INCLUDES THE CONSTRUCTION OF LOOSE ROCK RIPRAP REVETMENTS, STRUCTURES AND BLANKETS, INCLUDING FILTER LAYES OR BEDDING WHERE SPECIFIED ON SHEET B.08 AND B.09
16	CONCRETE GROUT
	THIS ITEM INCLUDES FURNISHING, TRANSPORTING, AND PLACING CONCRETE GROUT IN THE CONSTRUCTION OF GROUTED RIPRAP SECTIONS AS SHOWN ON IN SHEET B.08 AND B.09

ESTIMATE REFERENCE INFORMATION (CONTINUED)	
ITEM NO.	DESCRIPTION
17	GEOTEXTILE FABRIC
	THIS ITEM SHALL CONSIST OF FURNISHING AND PLACING GEOTEXTILE ON ALL SURFACES THAT CONTACT THE ROCK RIPRAP WITHIN THE STILLING BASIN AS SHOWN IN THE DRAWINGS
18 A	STRUCTURE, SW-401
	SEE SHEET B.03 FOR DETAILS.
18 B	STRUCTURE, SW-402
	SEE SHEET B.03 AND B.06 FOR DETAILS. INCLUDES FURNISHING AND INSTALLING STOP LOG CHANNELS, MANHOLE STEPS, AND ALUMINUM ACCESS DOOR. STOP LOGS, STOP LOG REMOVAL TOOL, STOPLOG STORAGE w/GRATE AND COLLAR, WATERTIGHT PIPE CONNECTIONS ARE ALL INCIDENTAL TO THIS BID ITEM.
18 C	STRUCTURE, SW-512
	SEE SHEET B.04 FOR DETAILS.
19 A	TOE DRAIN, CORRUGATED POLYETHYLENE PIPE (PERFORATED), 6"
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE TOE DRAIN TILE. THIS ITEM INCLUDES FULL COMPENSATION FOR ALL JUNCTIONS, FITTINGS, AND END CAPS NECESSARY FOR PROPER INSTALLATION ACCORDING TO PLANS AND SPECIFICATIONS. LENGTH IS MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE AND THROUGH BENDS. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON SHEET B.02.
20 A	REINFORCED CONCRETE PIPE (RCP), 12" DIAMETER
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON B.01. APRON, FOOTING, AND APRON GUARD ARE INCIDENTAL.
20 B	REINFORCED CONCRETE PIPE (RCP), 15" DIAMETER
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON B.01
20 C	REINFORCED CONCRETE PIPE (RCP), 18" DIAMETER
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON B.01. APRON, FOOTING, AND APRON GUARD ARE INCIDENTAL.
21	RCP DRAWDOWN WETLAND OUTLET PIPE, 15" DIAMETER
	THIS ITEM WILL CONSIST OF PROVIDING AND INSTALLING THE RCP DRAWDOWN OUTLET PIPE AS SHOWN IN THE DRAWINGS ALOND WITH THE INLET RISER STRUCTURE AND ANTI-SEEP COLLAR(S) AS DETAILED IN THE DRAWINGS. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON B.01
22	SILT FENCE
	SILT FENCE TO BE INSTALLED DURING CONSTRUCTION. ITEM INCLUDES ANCHORING POSTS, MAINTENANCE AND CLEANING, REMOVAL AND RESTORATION OF THE AREA TO FINISHED GRADE, AND DISPOSAL.
23	EXCAVATION (GENERAL)
	THIS IS FULL COMPENSATION FOR THE EXCAVATION REQUIRED FOR GRADING THE DITCH BANK. NO ADDITIONAL MEASURMENTS WILL BE TAKED AT THE END OF EXCAVATION. EXCAVATION WILL BE PAID BASED ON THE QUANTITY OUTLINED IN COST ESTIMATE AND PLAN SET.
24 A	CORRUGATED POLYETHYLENE PIPE (PERFORATED), 6" DIAMETER
	THIS ITEM INCLUDES MEASUREMENT AND PAYMENT FOR THE PVC OR PE PIPE INSTALLED ON A LINEAR FOOT BASIS, AND SHALL INCLUDE ALL NECESSARY FITTINGS AND ADAPTERS, WATERTIGHT JOINTS, EXCAVATION AND BACKFILL. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON SHEET B.02. 300 LF OF THIS QUANTITY WILL BE PLACED PARALLEL TO THE TILE INLET PIPE
24 B	CORRUGATED POLYETHYLENE PIPE (PERFORATED), 8" DIAMETER
	THIS ITEM INCLUDES MEASUREMENT AND PAYMENT FOR THE PVC OR PE PIPE INSTALLED ON A LINEAR FOOT BASIS, AND SHALL INCLUDE ALL NECESSARY FITTINGS AND ADAPTERS, WATERTIGHT JOINTS, EXCAVATION AND BACKFILL. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON SHEET B.02.
25 A	CORRUGATED PROFILE WALL (DUAL WALL) POLYETHYLENE PIPE 10" DIAMETER
	THIS ITEM INCLUDES MEASUREMENT AND PAYMENT FOR THE PVC OR PE PIPE INSTALLED ON A LINEAR FOOT BASIS, AND SHALL INCLUDE ALL NECESSARY FITTINGS AND ADAPTERS, WATERTIGHT JOINTS, EXCAVATION AND BACKFILL. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON SHEET B.02.
26 A	CMP TILE OUTLETS, 12" X 20'
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE
27 A	REINFORCED CONCRETE PIPE (RCP), 18" DIAMETER
	THIS IS FULL COMPENSATION FOR INSTALLATION, BEDDING AND BACKFILLING OF THE BYPASS TILE. LENGTH IS MEASURED FROM CENTER OF STRUCTURE. TRENCH INSTALLATION SHALL COMPLY WITH DETAILS ON B.01
28	NORTH AGRIDRAIN WATER CONTROL STRUCTURE
	THIS ITEM INCLUDES FURNISHING AND INSTALLING 31" WIDE BY 39" DEEP BY 8' TALL INLINE WATER LEVEL CONTROL STRUCTURE FROM AGRI DRAIN CORPORATION OR AN EQUAL APPROVED BY THE ENGINEER ALONG WITH CONDUITS AND APPURTENANCES NECESSARY FOR WATER CONTROL STRUCTURE. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.
29	SOUTH AGRIDRAIN WATER CONTROL STRUCTURE
	THIS ITEM INCLUDES FURNISHING AND INSTALLING 31" WIDE BY 39" DEEP BY 8' TALL INLINE WATER LEVEL CONTROL STRUCTURE FROM AGRI DRAIN CORPORATION OR AN EQUAL APPROVED BY THE ENGINEER ALONG WITH CONDUITS AND APPURTENANCES NECESSARY FOR WATER CONTROL STRUCTURE. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.

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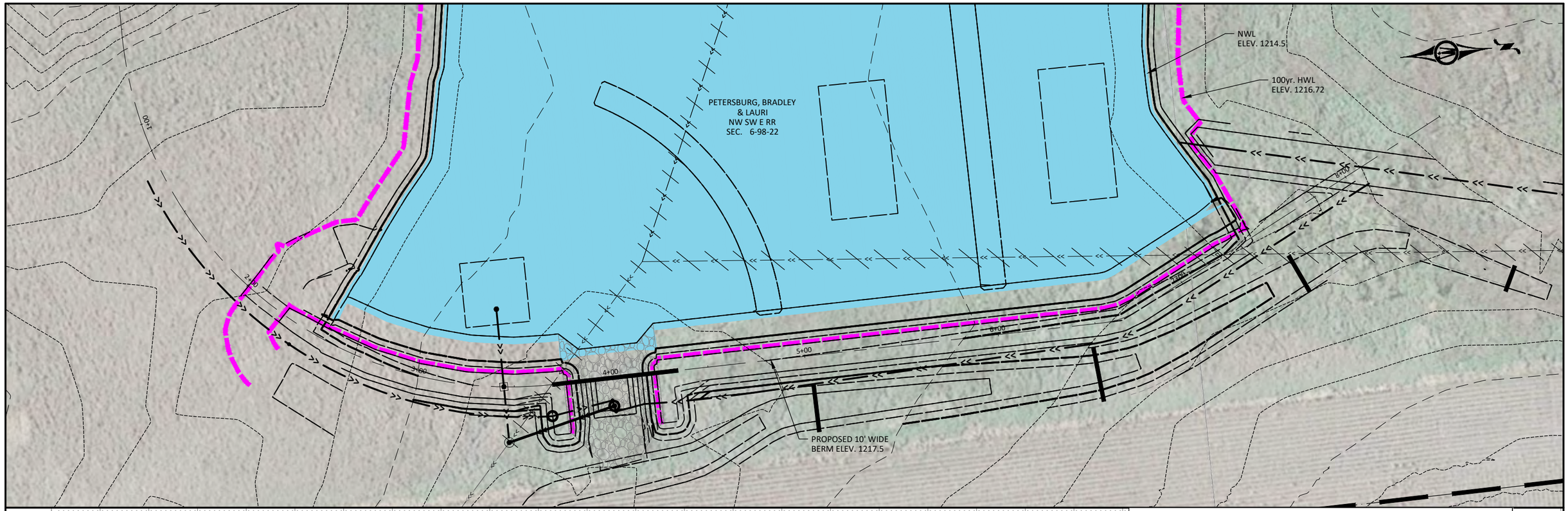
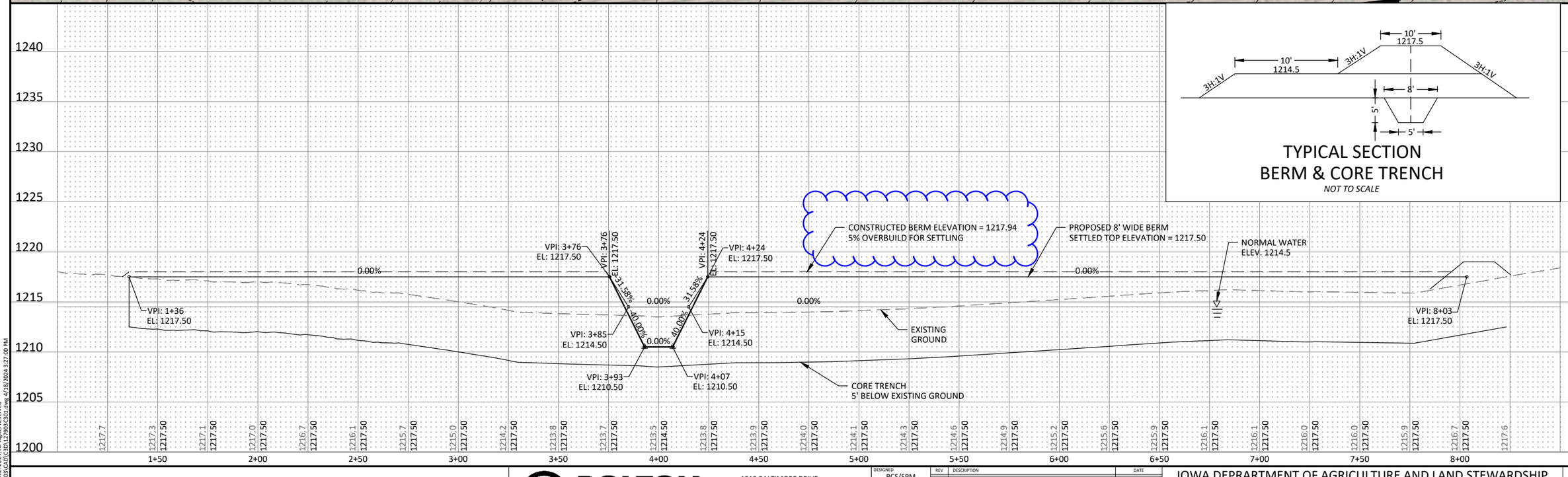
CLIENT PROJ. NO.: 0A1.127903			

IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
ESTIMATE QUANTITIES & REFERENCE NOTES

SHEET C.01





TYPICAL SECTION
BERM & CORE TRENCH
NOT TO SCALE

HORZ. SCALE 0 25 50 FEET
VERT. SCALE 0 5 10 FEET

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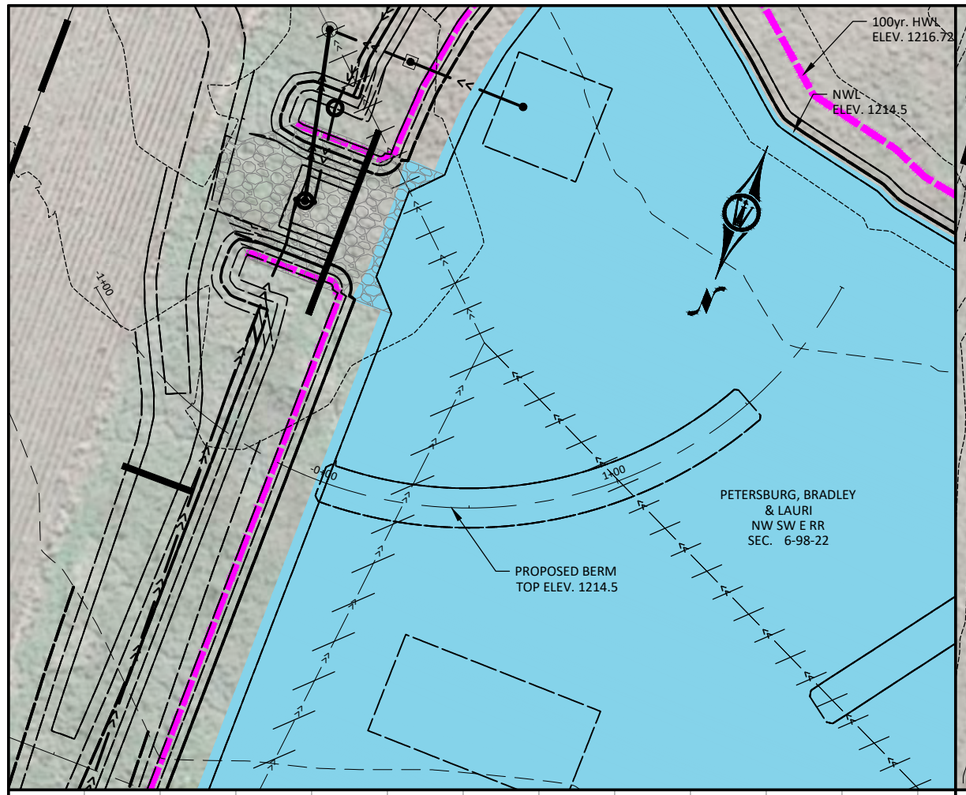
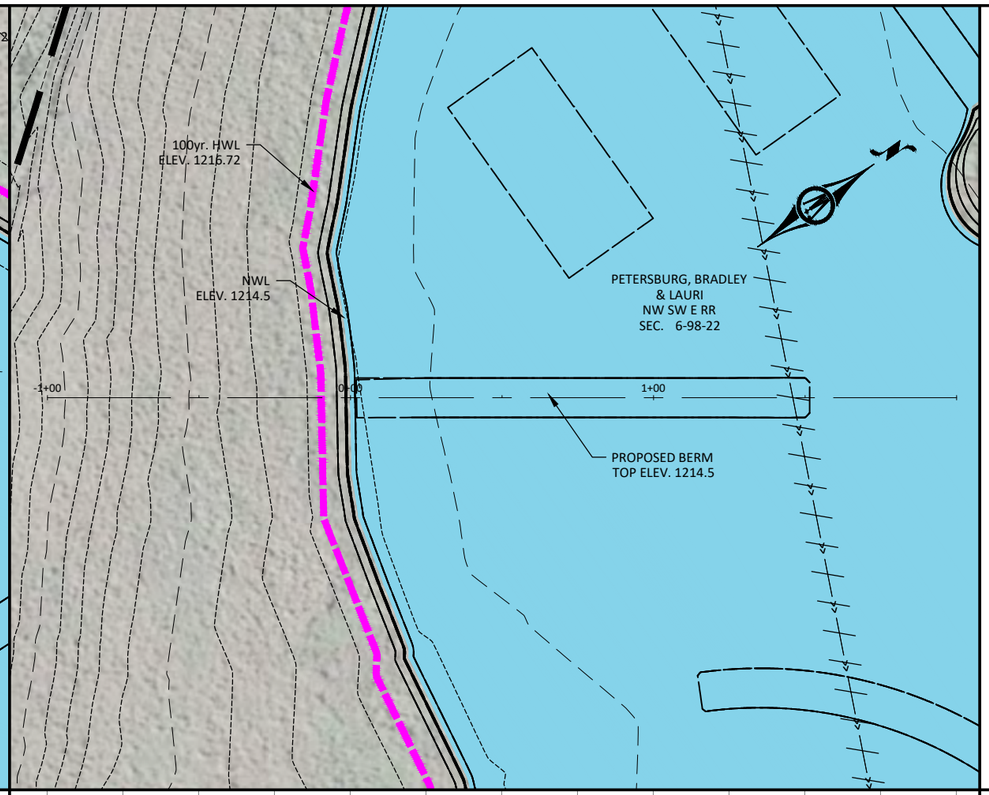
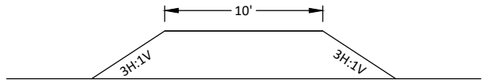
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
PLAN & PROFILE - 10' WIDE BERM

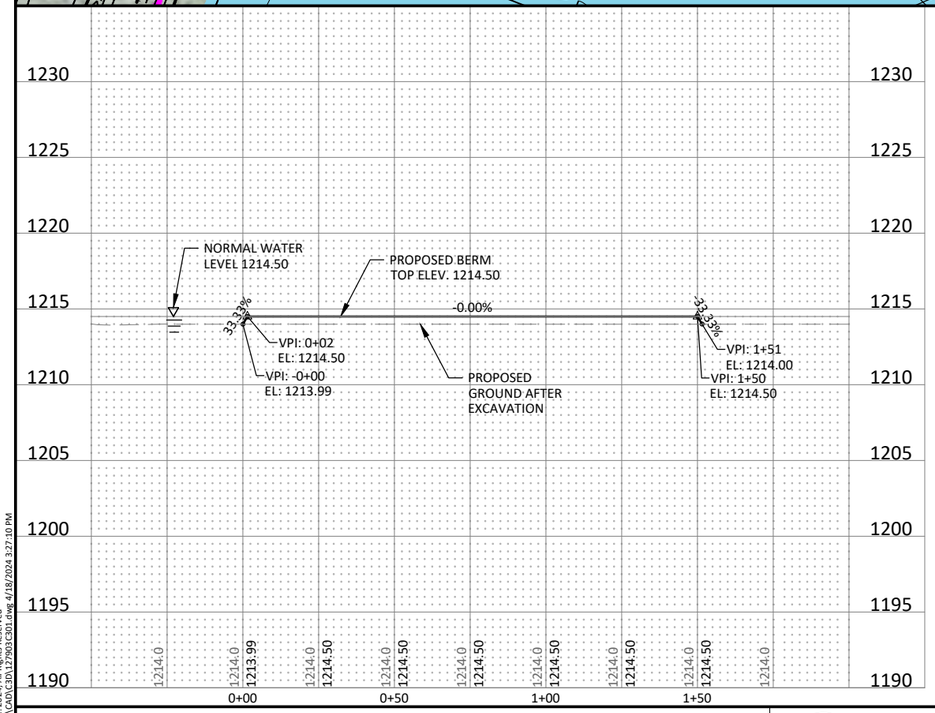
SHEET D.01

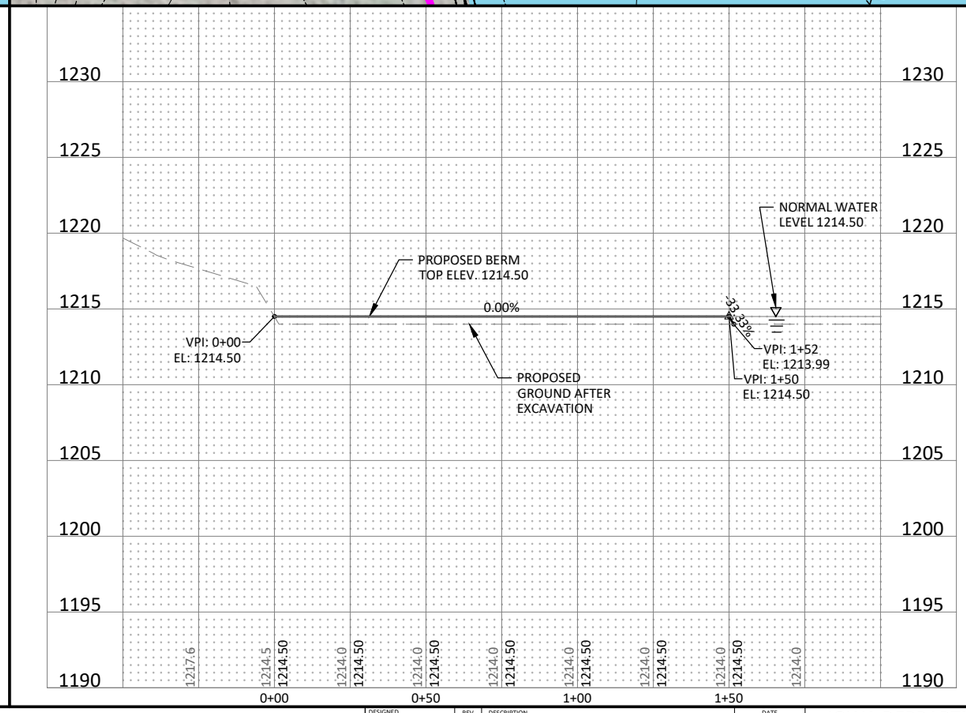






TYPICAL SECTION
DIVERSION BERM
NOT TO SCALE





HORZ. 0 25 50 SCALE FEET

VERT. 0 5 10 SCALE FEET

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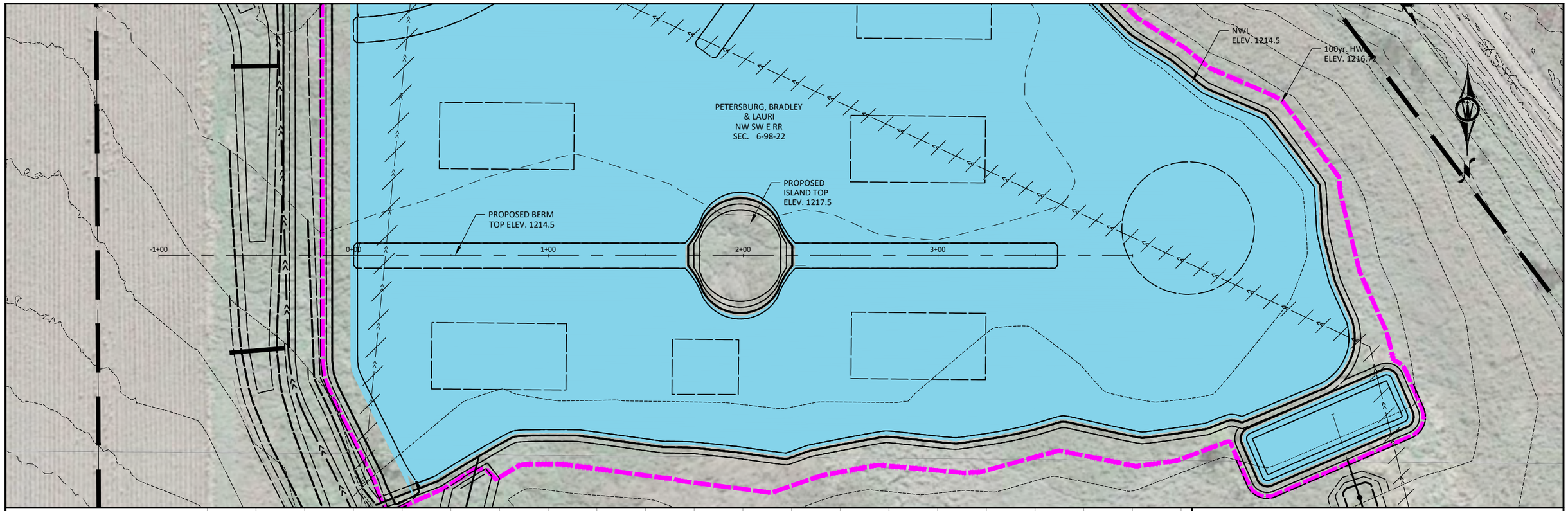
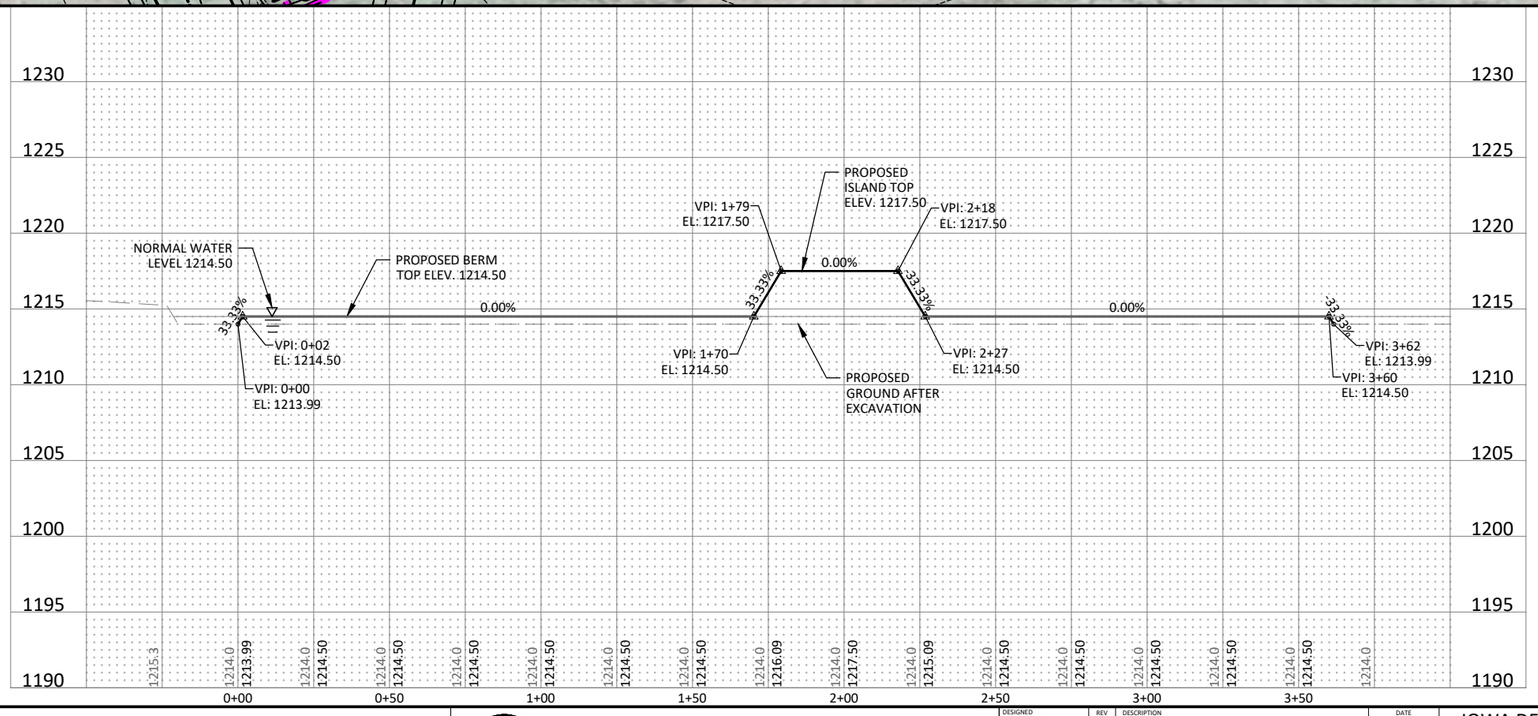
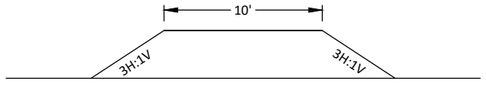
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

PLAN & PROFILE - DIVERSION BERMS

SHEET D.02







TYPICAL SECTION
DIVERSION BERM

NOT TO SCALE

HORZ. SCALE 0 25 50 FEET

VERT. SCALE 0 5 10 FEET

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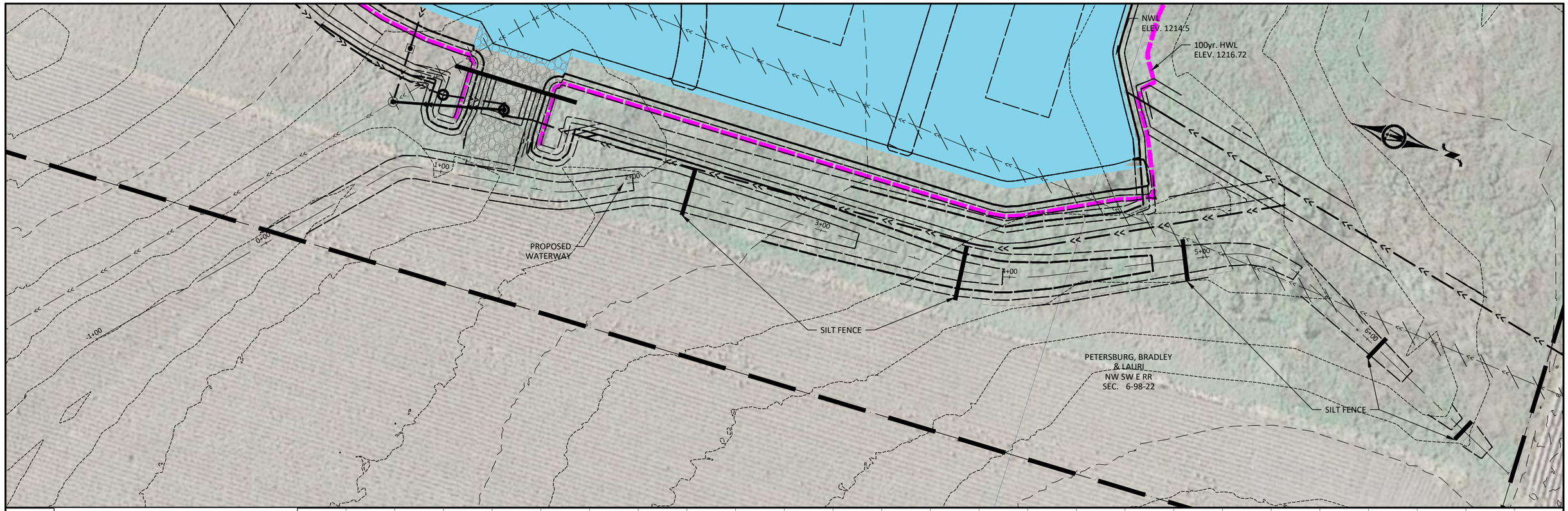
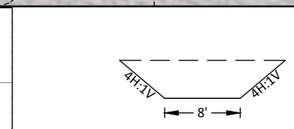
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

PLAN & PROFILE - DIVERSION BERMS

SHEET D.03





TYPICAL SECTION
WATERWAY
NOT TO SCALE

HORZ. SCALE 0 25 50 FEET
VERT. SCALE 0 5 10 FEET

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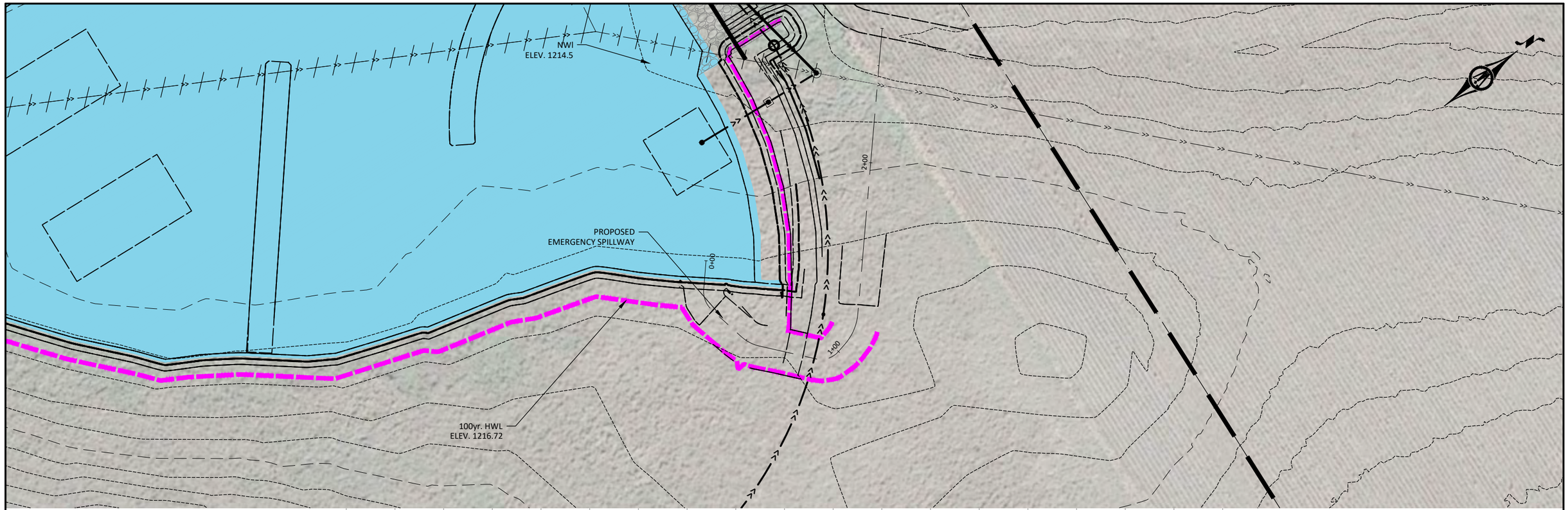
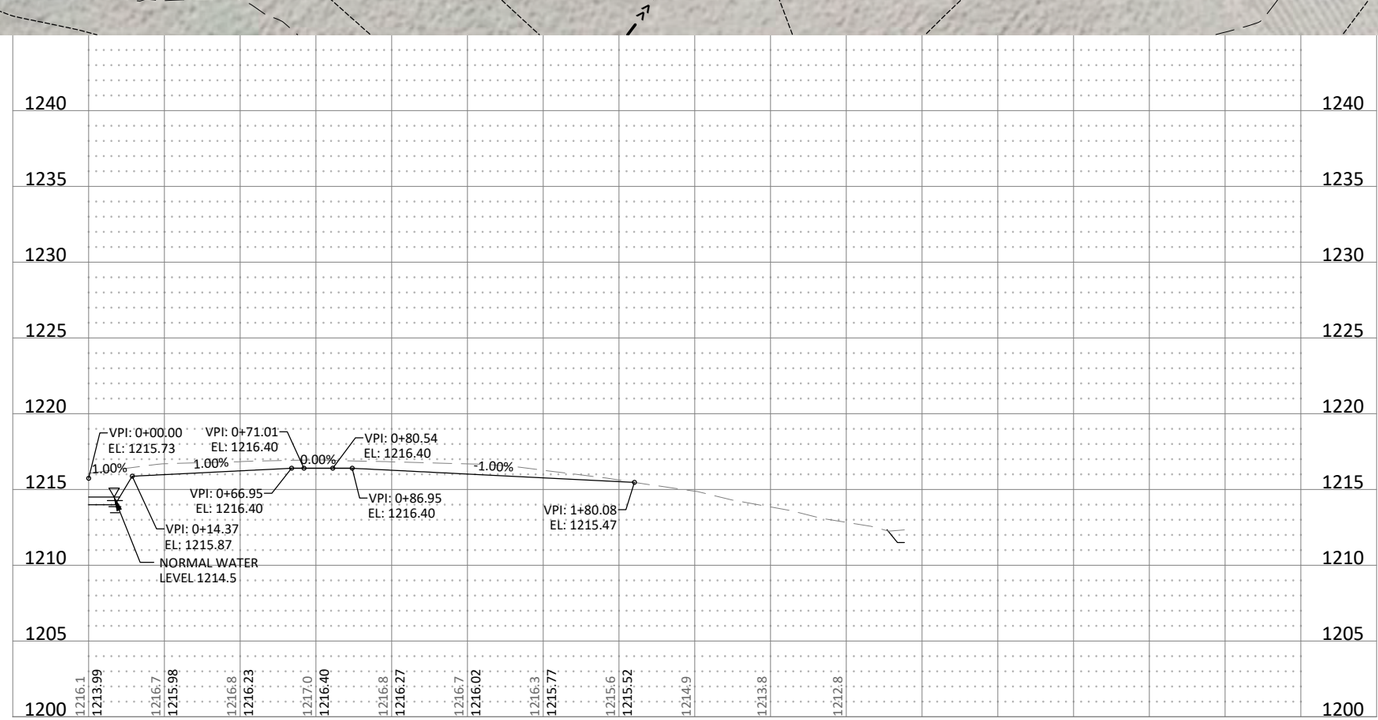
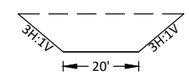
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
PLAN & PROFILE - WATERWAY

SHEET
D.04







TYPICAL SECTION
EMERGENCY SPILLWAY
NOT TO SCALE

HORZ. SCALE 0 25 50 FEET
VERT. SCALE 0 5 10 FEET

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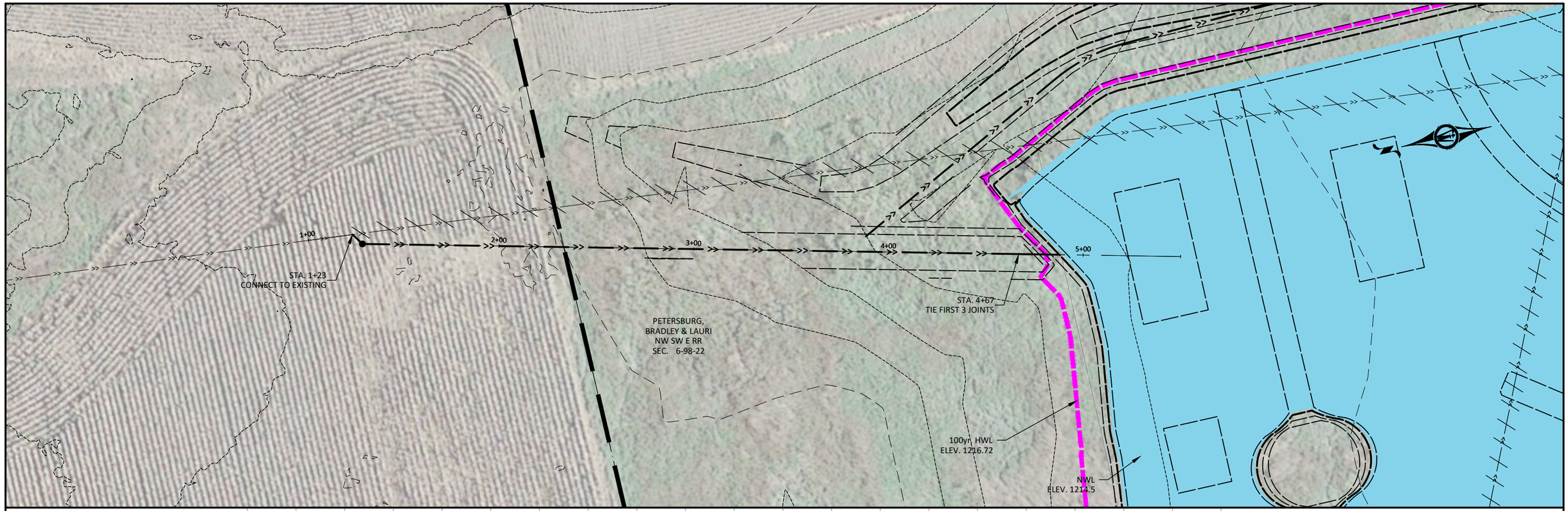
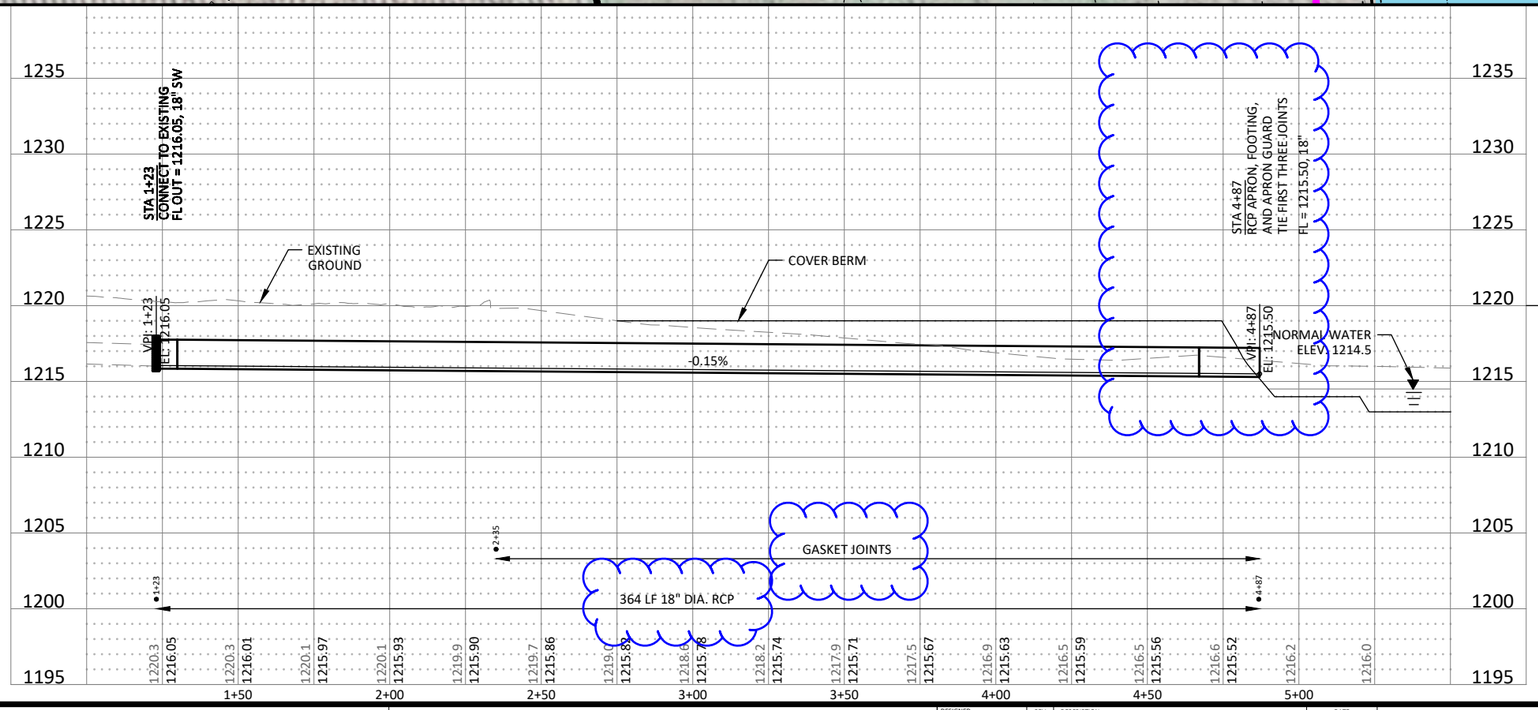
DRAWN	BCS/SPM/JKF
CHECKED	JPR
CLIENT PROJ. NO.	0A1.127903

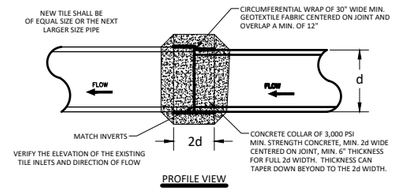
REV	DESCRIPTION	DATE

IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
PLAN & PROFILE - EMERGENCY SPILLWAY

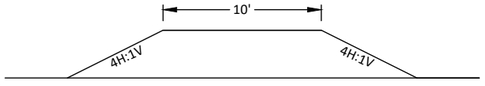
SHEET
D.05







FIELD TILE
REPAIR CONNECTION
NOT TO SCALE



TYPICAL SECTION
COVER BERM
NOT TO SCALE

HORZ. 0 25 50 SCALE FEET

VERT. 0 5 10 SCALE FEET

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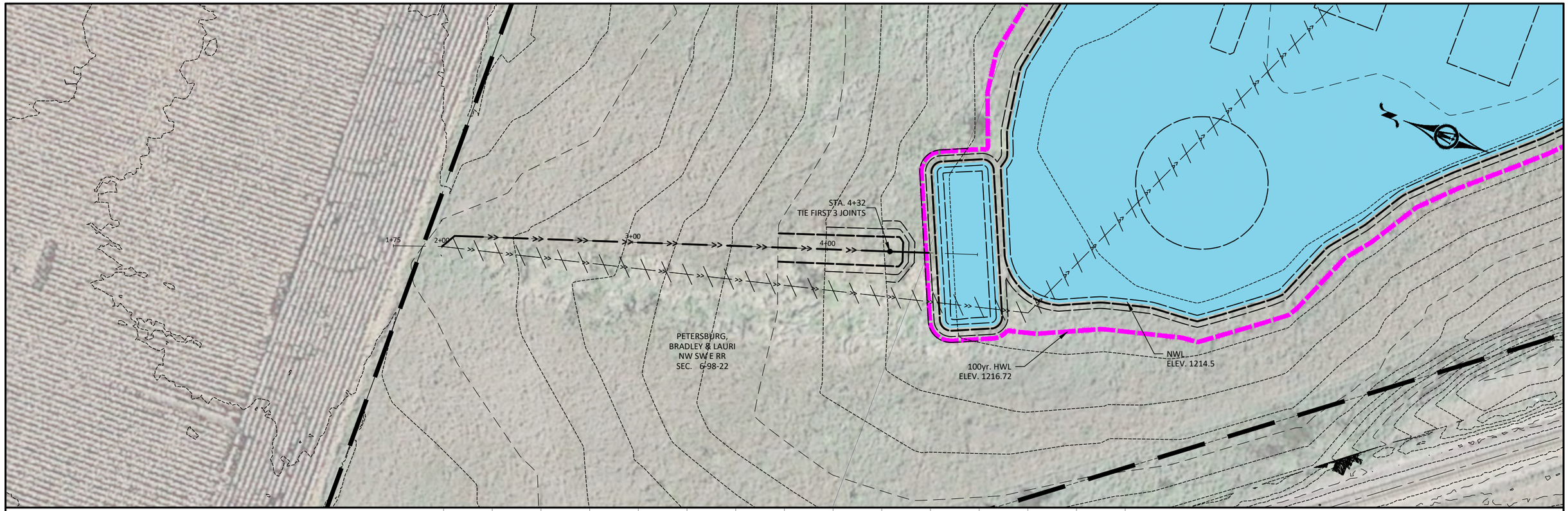
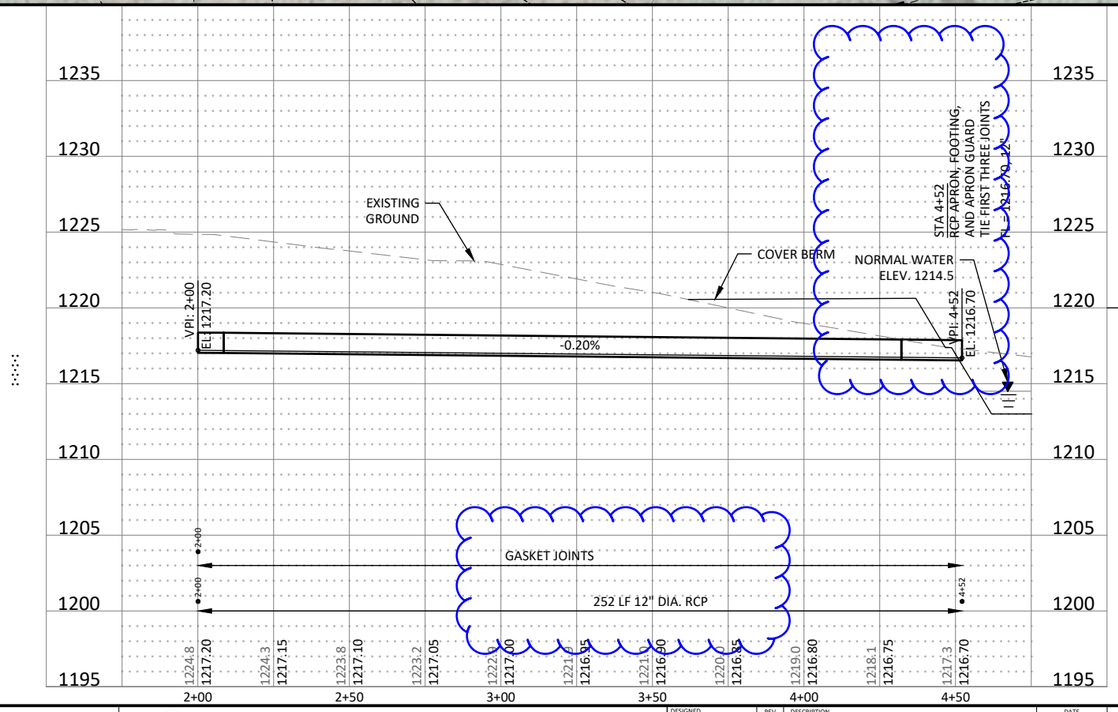
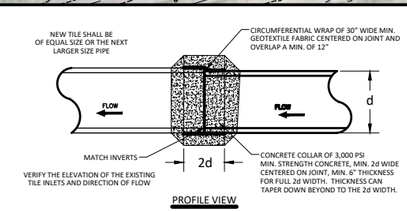
IOWA DEPRARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
PLAN & PROFILE - MAIN OUTLET PIPE

SHEET M.01

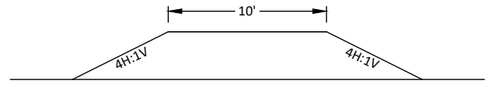






PROFILE VIEW

FIELD TILE
REPAIR CONNECTION
NOT TO SCALE



TYPICAL SECTION
COVER BERM
NOT TO SCALE

HORZ. 0 25 50 SCALE FEET

VERT. 0 5 10 SCALE FEET

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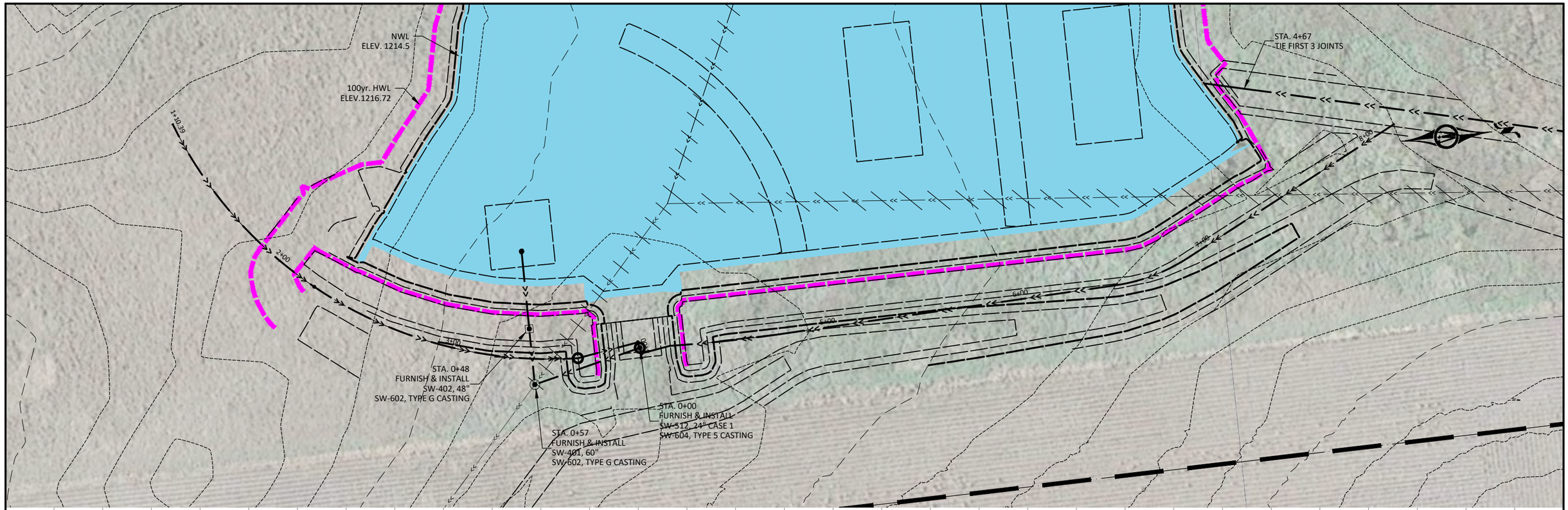
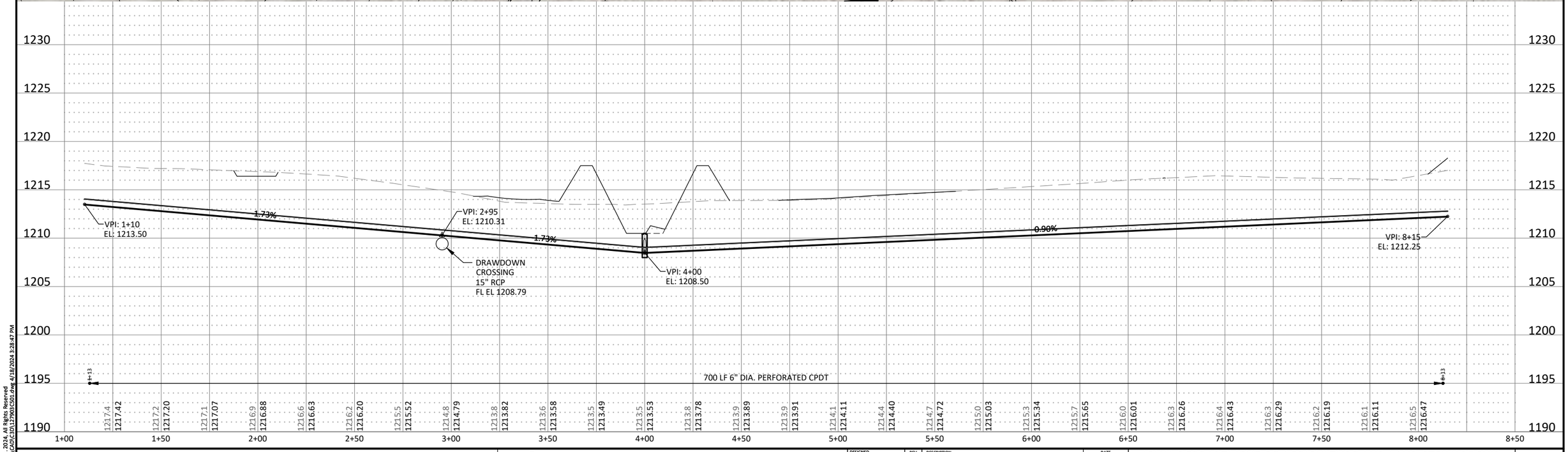
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

PLAN & PROFILE - LATERAL OUTLET PIPE

SHEET M.02





HORZ. 0 25 50 SCALE FEET
VERT. 0 5 10 SCALE FEET

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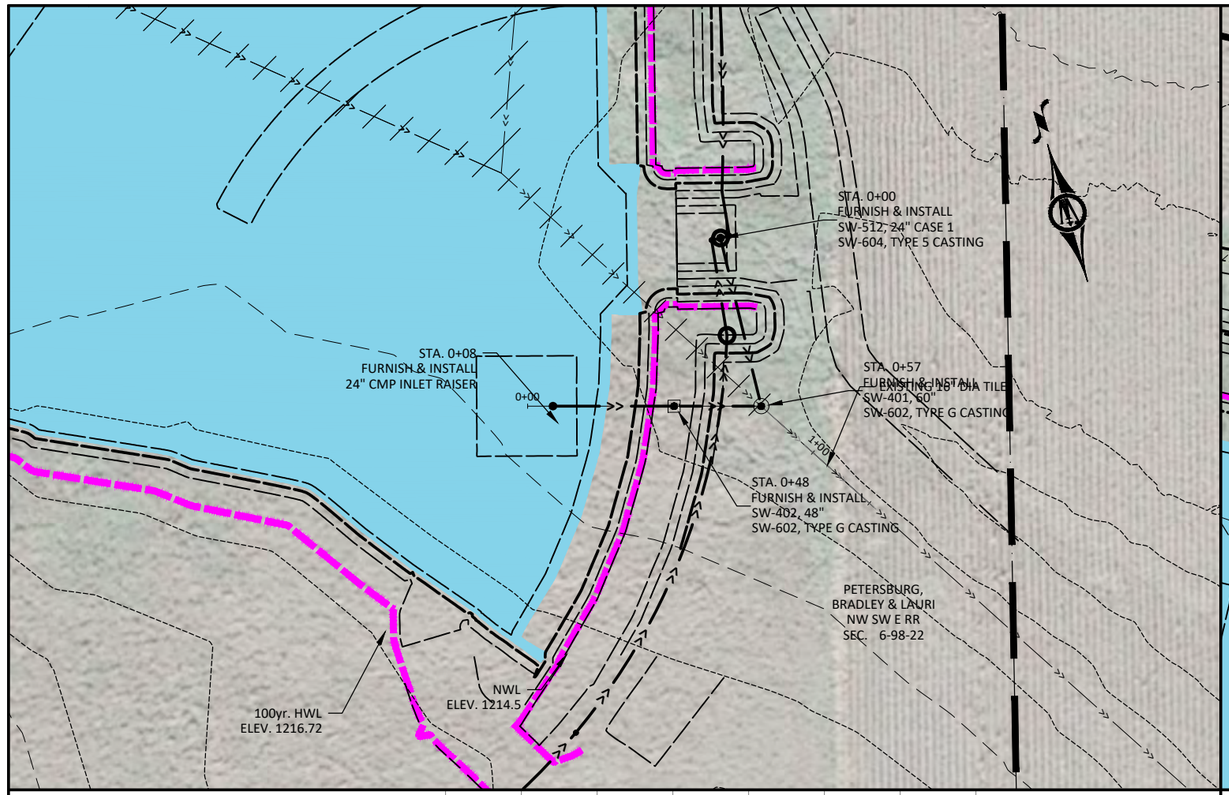
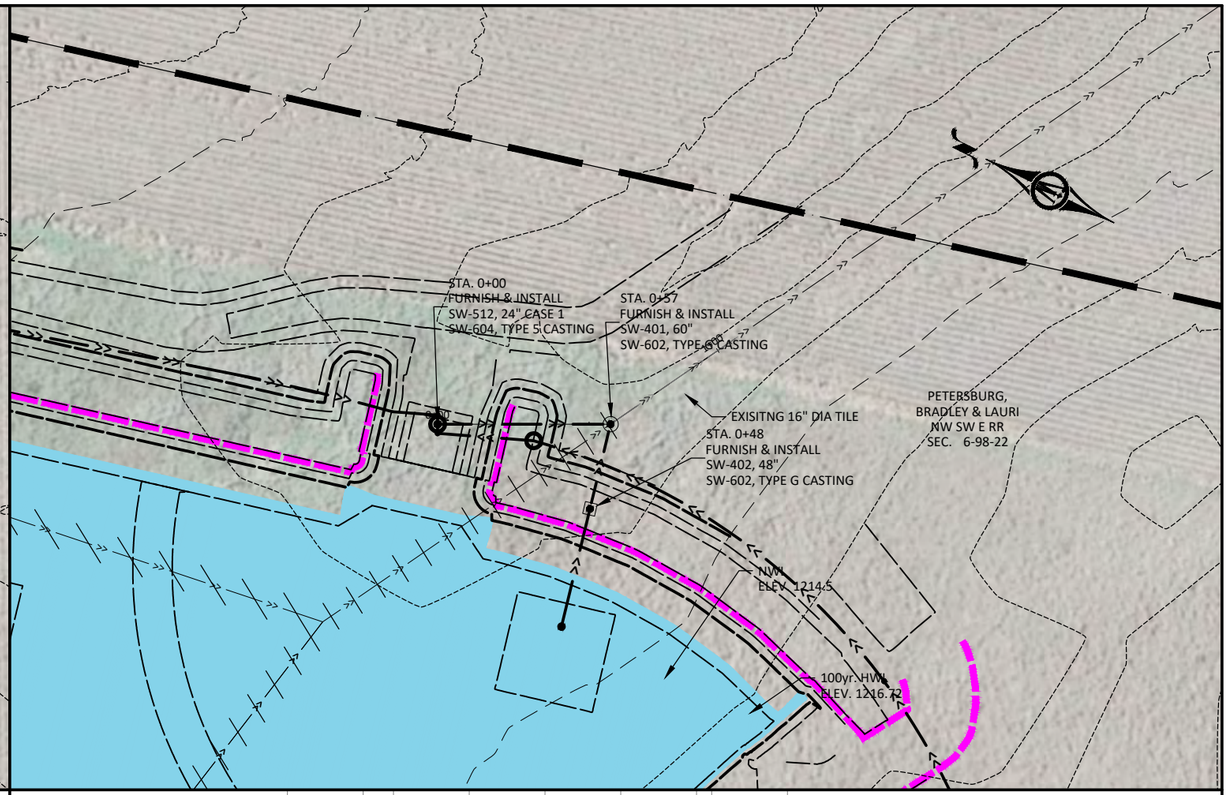
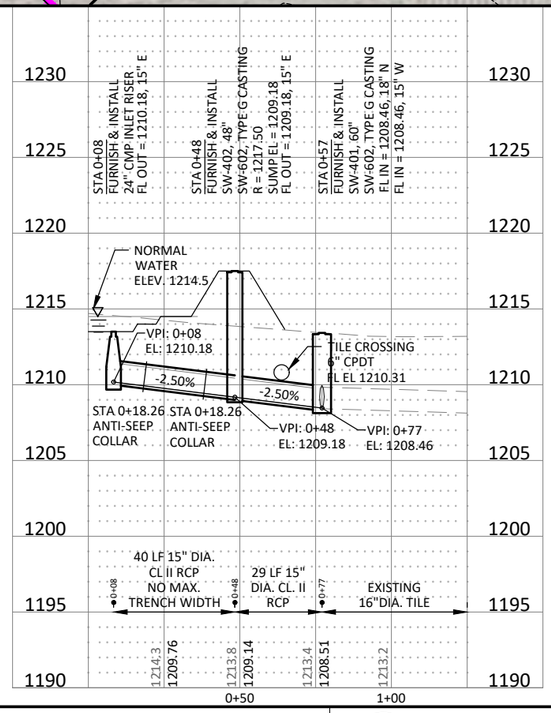
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

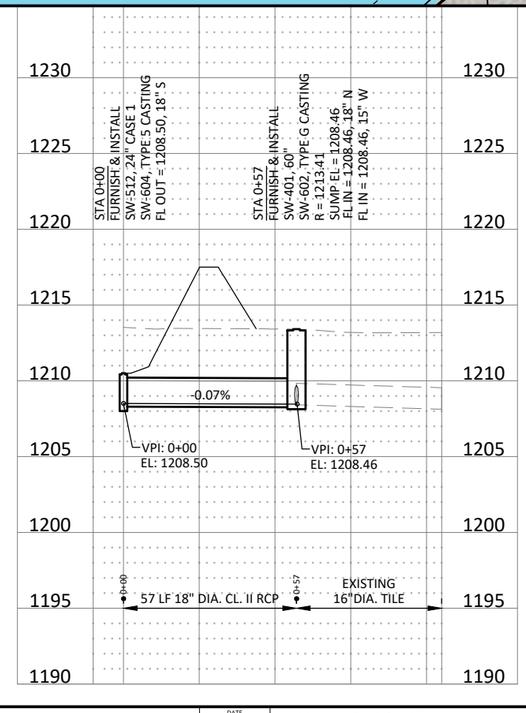
PLAN & PROFILE - TOE DRAIN

SHEET M.03









HORZ. SCALE 0 25 50 FEET

VERT. SCALE 0 5 10 FEET

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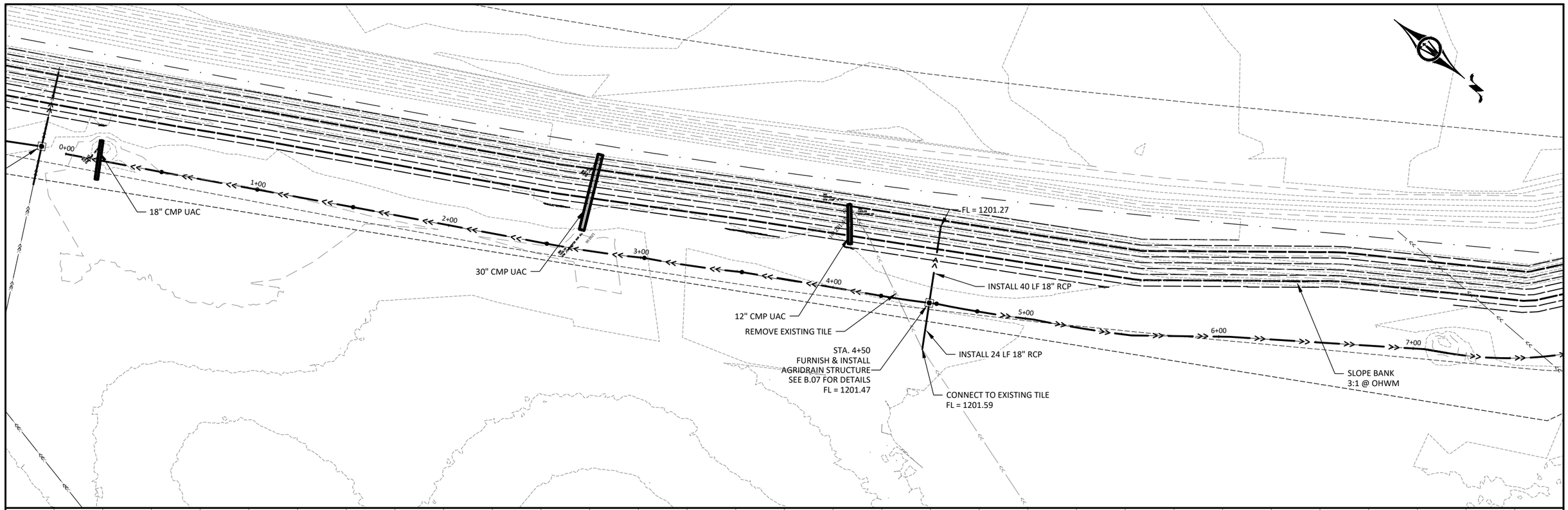
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

PLAN & PROFILE - DRAW DOWN PIPES

SHEET M.04



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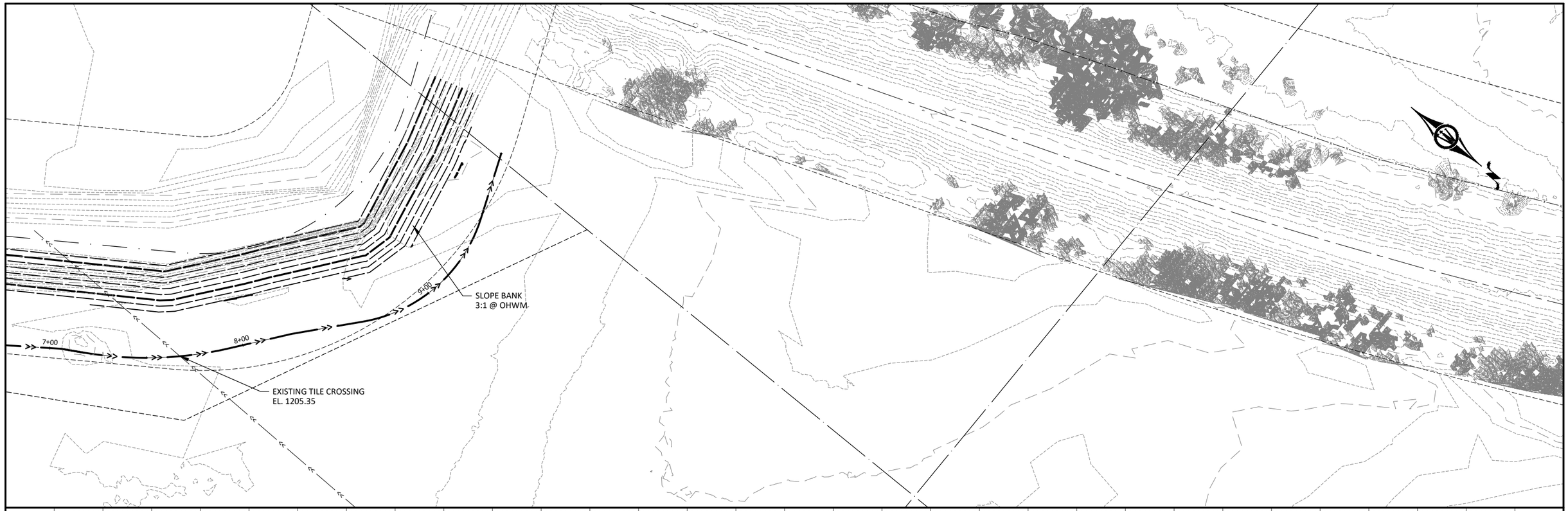
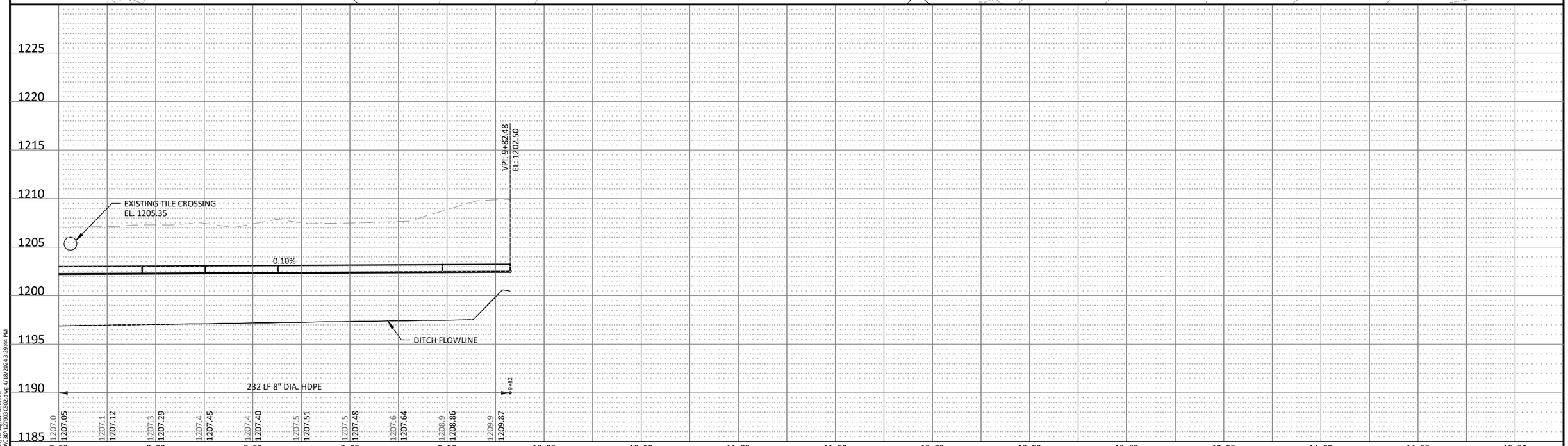
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

PLAN & PROFILE - NORTH SATURATED BUFFER

SHEET M.05





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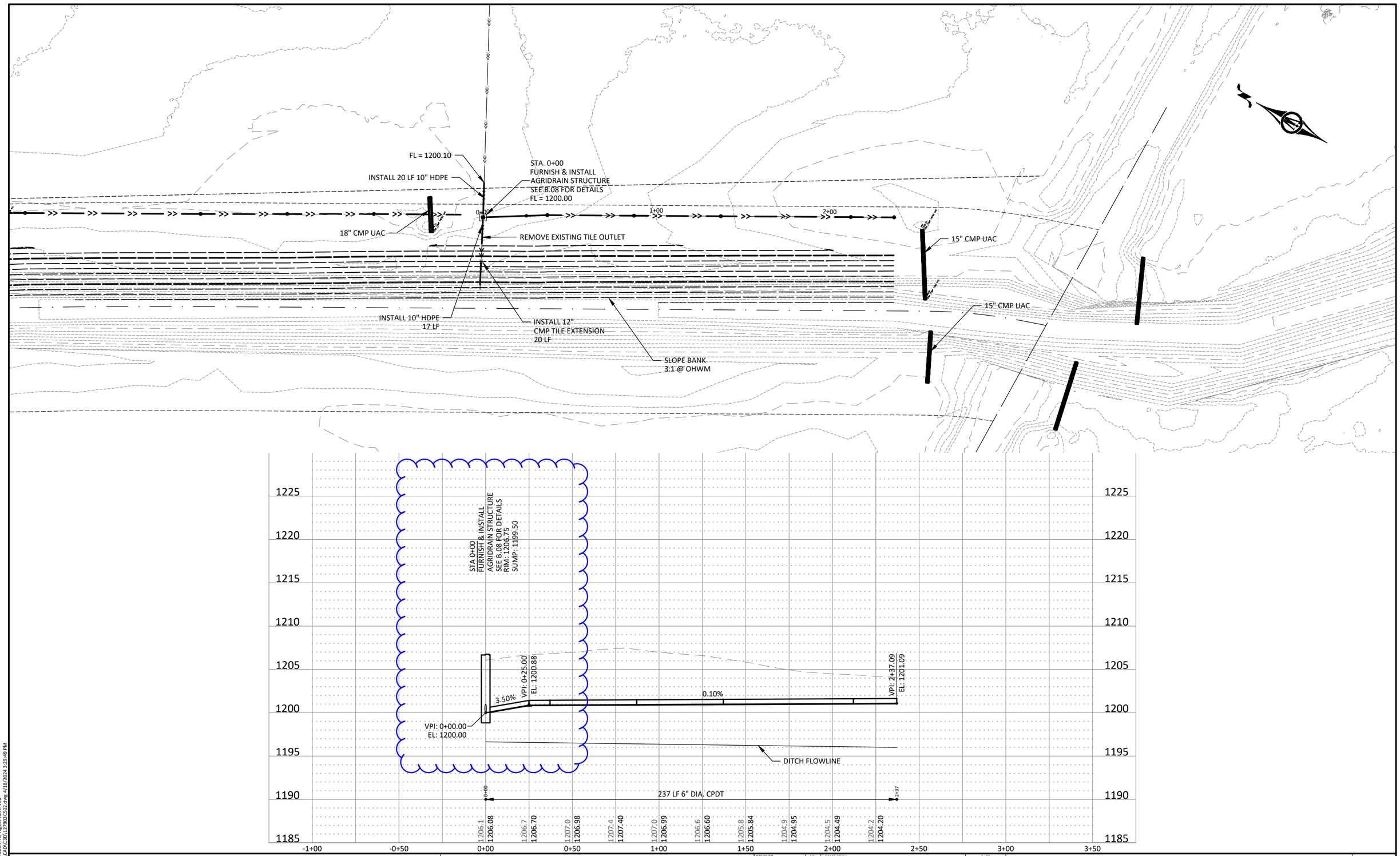
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

PLAN & PROFILE - NORTH SATURATED BUFFER

SHEET
M.06



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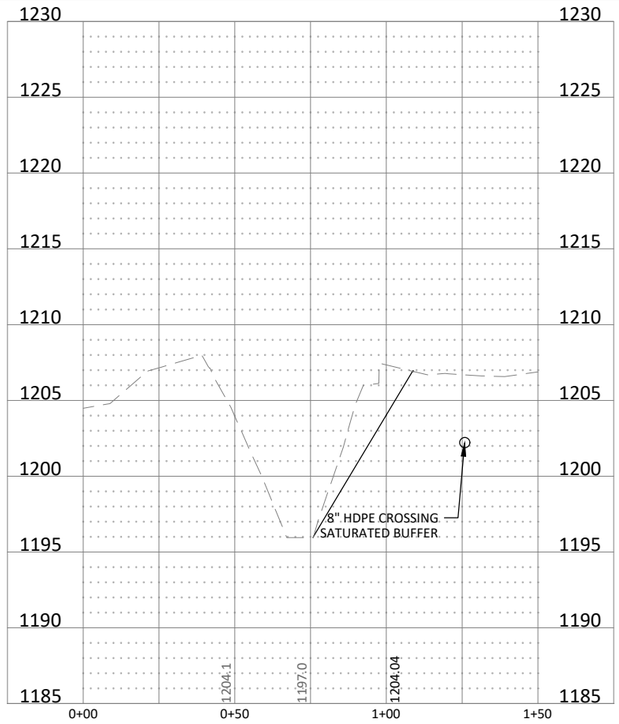
NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN

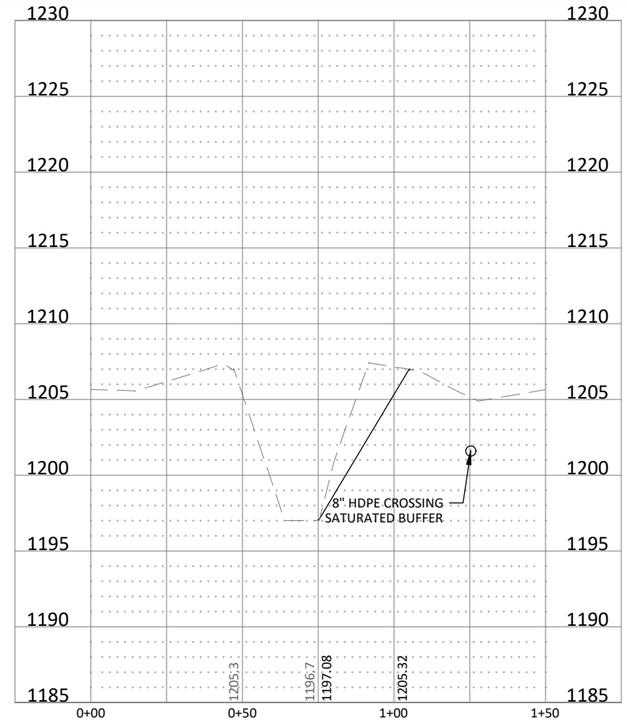
PLAN & PROFILE - SOUTH SATURATED BUFFER

SHEET M.07

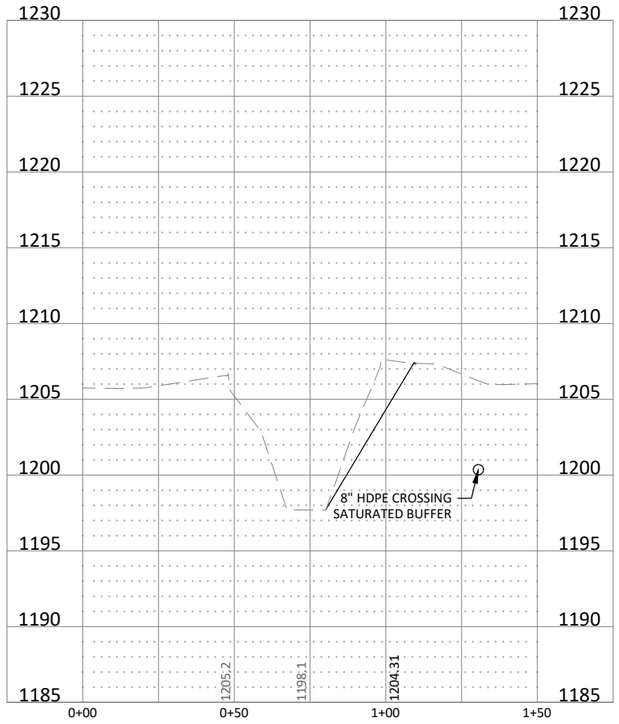
CROSS-SECTION:
SOUTH SATURATED BUFFER
STA. 1+18



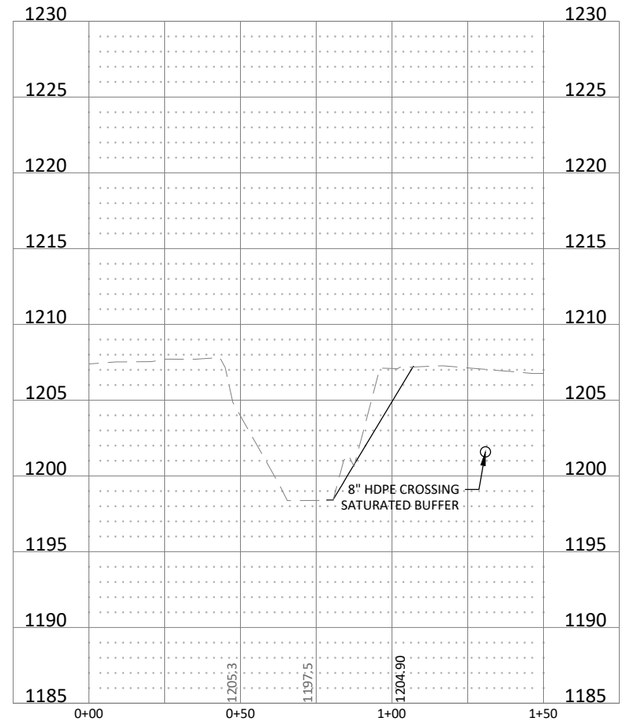
CROSS-SECTION:
NORTH SATURATED BUFFER
STA. 2+45



CROSS-SECTION:
NORTH SATURATED BUFFER
STA. 4+91



CROSS-SECTION:
NORTH SATURATED BUFFER
STA. 7+36



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NUTRIENT REDUCTION WETLAND & SATURATED BUFFER - WOR982203CN
DITCH RECONSTRUCTION CROSS-SECTIONS

SHEET
M.08