

Judicial Ditch No. 5 Improvement

Amended Final Engineer's Report
Brown and Redwood Counties, Minnesota

November 15, 2024

Project No. 19-23338

REPORT FOR:
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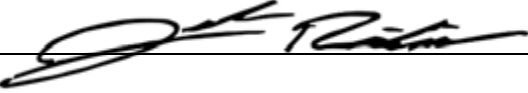
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Architecture
Engineering
Environmental
Planning
ISGInc.com

SIGNATURE SHEET

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed professional engineer under the laws of the State of Minnesota.



Jacob Rischmiller, PE
Project Engineer
Reg. No. 58670

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115 East Hickory Street + Suite 300
Mankato, MN 56001

Judicial Ditch No. 5 Improvement
Brown and Redwood Counties, Minnesota

Engineer's Project Number: 19-23338

Dated this 15th day of November 2024

TABLE OF CONTENTS

Signature Sheet	i
Table of Contents	ii
Appendices	ii
Executive Summary	1
Storage Pond	1
Preliminary Cost Estimate	1
Statute Required + Suggested Efforts	1
Summary of Findings, Conclusions + Recommendations	3

APPENDICES

Appendix A: Preliminary Plans	A
Appendix B: Hydraulic Modeling Report	B
Appendix C: Preliminary Cost Estimates	C

EXECUTIVE SUMMARY

The Brown Redwood Judicial Ditch No. 5 (JD5) Final Engineer’s Report was submitted June 20, 2024. The Department of Natural Resources’ Advisory Report was received July 19, 2024 and a meeting was held with JD5 petitioners on September 18, 2024 to discuss the project and ways that the proposed water quality practices could be enhanced. Through these discussions, petitioners decided to deepen the pond an additional three feet while maintaining the originally designed pond footprint to enhance its temporary storage capacity by 8.3 acre-feet. The rest of the proposed improvement is not changing from the originally issued FER.

STORAGE POND

The proposed storage pond is 5.85 acres including the grass buffer and is located near the outlet of the drainage system. The water levels within the pond will be controlled by a pipe overflow structure and a berm with an emergency overflow for overland flow. The preliminary design was reviewed with the effected landowners, in which all parties agreed to the design. The landowner comments were incorporated into the final design of the project. Additional coordination with the cell phone tower company was also had to notify them of the disturbance to the access road during project construction. In this amendment to the Final Engineer’s Report, the proposed pond will be deepened by an additional three feet from the previously proposed design to enhance the pond’s storage capacity. In order to accommodate future maintenance an access drive has been incorporated into the design to allow machinery to drive to the bottom of the pond to clean the sediment trap.

PRELIMINARY COST ESTIMATE

The following table summarizes the estimated cost for the proposed improvement with the enhanced storage pond.

TABLE 1. ESTIMATED PROJECT COST

Area	Separable Maintenance	Improvement Cost	Net Cost
Mainline Tile	\$ 875,144	\$ 1,193,400	\$ 318,255
Mainline West Tile	\$ 251,310	\$ 308,285	\$ 56,975
Branch 4 Tile	\$ 43,369	\$ 57,594	\$ 14,225
Branch 6 Tile	\$ 32,953	\$ 55,520	\$ 22,567
Branch 16 Tile	\$ 23,983	\$ 41,927	\$ 17,944
Branch 18 Tile	\$ 29,507	\$ 29,722	\$ 215
Storage Pond (5 AC)	\$ -	\$ 740,221	\$ 740,221
Road Authority Costs	\$ -	\$ -	\$ -
Total Project Costs	\$ 1,256,266	\$ 2,426,667	\$ 1,170,401
Subtotal Separable Maintenance Costs			\$ 1,256,266
Net Costs			\$ 1,170,401
Total Project Costs for Landowners			\$ 2,426,667
Benefits (Per Ditch Viewer Report)			\$ 1,619,179
Net Benefit			\$ 448,778

STATUTE REQUIRED + SUGGESTED EFFORTS

- (4) *current and potential flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50-year flood events, including adequacy of the outlet for the drainage project;*

The ACSIC and proposed conditions were modeled with Infoworks ICM, a dynamic modeling software that combines 1-dimensional flow calculations (open channel, pipe flow, etc.) with 2-dimensional flow calculations (floodplain, overland flow, etc.) to better analyze hydrologic and hydraulic conditions. The 1D aspect incorporates land use, soil type, topography, and the associated 2D components to simulate overland and floodplain flow from a watershed runoff event. A model was developed for the 5, 10, 25, and 50-year rainfall events for a 24-hour storm duration.

Table 4 below shows the peak flow rates at the terminus of the system. The proposed improvement reduces peak flows leaving the system for the modeled storm events. Tables 5 and 6 compare the tile and overland flow peak velocities at the terminus of JD 5. Comparisons of peak water elevations at the terminus are shown in Tables 7 and 8.

TABLE 4. JD 5 TERMINUS PEAK FLOW (COMBINED TILE + OVERLAND) COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	78.0	55.9	-28%
10-yr	115.7	65.9	-43%
25-yr	193.2	139.6	-28%
50-yr	268.0	230.2	-14%

TABLE 5. JD 5 TERMINUS PEAK VELOCITY (TILE) COMPARISON

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	7.9	8.9	13%
10-yr	8.7	9.1	5%
25-yr	9.9	9.3	-6%
50-yr	10.7	9.5	-11%

TABLE 6. JD 5 TERMINUS PEAK VELOCITY (OVERLAND) COMPARISON

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	2.6	0.0	-100%
10-yr	3.2	0.0	-100%
25-yr	4.2	1.5	-64%
50-yr	5.0	3.1	-38%

TABLE 7. JD 5 TERMINUS PEAK ELEVATION (TILE) COMPARISON

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	992.43	992.85	0.42
10-yr	992.48	992.94	0.46
25-yr	992.66	993.03	0.37
50-yr	992.80	993.16	0.36

*Channel Bottom Elevation is 991.94

TABLE 8. JD 5 TERMINUS PEAK ELEVATION (OVERLAND) COMPARISON

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	1002.81	1002.30	-0.51
10-yr	1002.92	1002.30	-0.62
25-yr	1003.10	1002.75	-0.35
50-yr	1003.24	1003.11	-0.13

*Ground Elevation is 1002.30

The results above include the proposed storage pond, which helps prevent impacts from the drainage system improvement. The proposed improvement greatly reduces peak flows leaving the system by reducing overland flow at the outlet and providing temporary storage. A detailed modeling report and additional analysis can be found in Appendix E.

The Engineer also reviewed the potential impacts of this project on the outlet. This system drains into JD 36, which becomes Sleepy Eye Creek approximately 1.5 miles downstream from the JD 5 outlet. The channel has minimal erosion concerns at the JD5 outlet, but the proposed reduction in overland flow will reduce bank erosion issues and riprap will be placed around the tile outlet to prevent erosion and scour around the pipe. US Highway 14 Bridge 08004 is the nearest downstream crossing, about 1/3 mile downstream. The improvement project will decrease peak flowrates leaving the JD 5 system, meaning that the peak hydraulic impact at the bridge would also decrease as compared to the ACSIC condition. This is shown for the 50-year rainfall event at US HWY 14 in Table 8.

TABLE 8. US HWY 14 BRIDGE FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)
50-yr	3300	3262

Public Waters and Potential Permits

The Engineer believes that if the project moves forward, the drainage authority will not need to apply for a Public Waters Work Permit because the proposed improvement has an adequate outlet and does not substantially impact a public water.

Prior to project construction, permits will be acquired from road authorities, applicable utilities, and the MN Pollution Control Agency as necessary.

SUMMARY OF FINDINGS, CONCLUSIONS + RECOMMENDATIONS

After a review of the Brown and Redwood Counties Judicial Ditch No. 5 system, portions of the system were determined to have lower capacities than the recommended 0.50 in/day which is necessary to meet the needs of today’s standard farming practices. The system is approximately 102 years old, which is above the life expectancy of tile systems like JD 5. This improvement would be a public benefit and contribute to the public welfare of the area as the decrease in flooding will benefit the roads as well as the farm fields.

JD 5 tiles will be enlarged to increase the drainage capacity of the system, reducing flooding extents and duration of standing water within system. A hydraulic/hydrologic model was created to compare the As Constructed system with the proposed tile improvement and storage pond to compare flood extents, durations, and outlet flows. The proposed system mitigates downstream flooding impacts, is considered a cost effective and feasible improvement, and is recommended by the engineer.

In accordance with Section 103E.285. 1: Whereas the engineer has determined the proposed drainage project is necessary and feasible with reference to the environmental, land use, and multipurpose water management criteria in section 103E.015, Subd. 1, and whereas the engineer has determined the project to be of Public Utility, Benefit or Welfare, and whereas the engineer has determined that the proposed drainage project mitigates any potential effects on Public Waters, and whereas the engineer has created construction plans and provided tile specifications, and whereas the engineer has provided construction cost estimates, and whereas the engineer has found the project to be cost effective related to system benefits, and whereas the engineer has determined a soil survey is not needed, and whereas the engineer has responded to the DNR’s Preliminary Engineers Report Advisory Review and questions and comments not responded to at the Preliminary Hearing, therefore the engineer recommends the proposed project to the Joint Brown and Redwood County Drainage Authority for final approval.

Appendix A: Preliminary Plans

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5



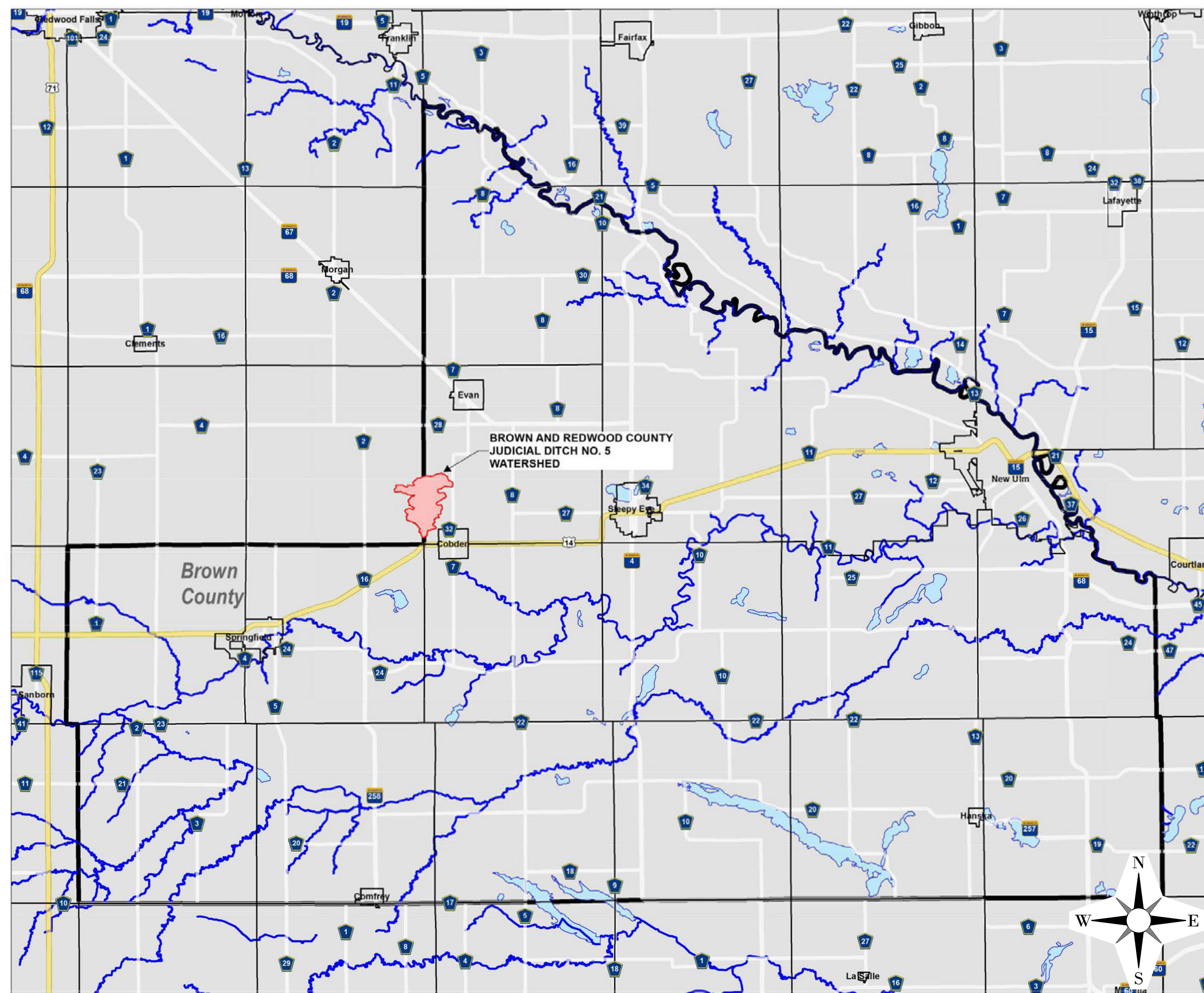
BROWN COUNTY, MINNESOTA

FINAL ENGINEERING REPORT

ISG PROJECT # 22-23338

LEGEND

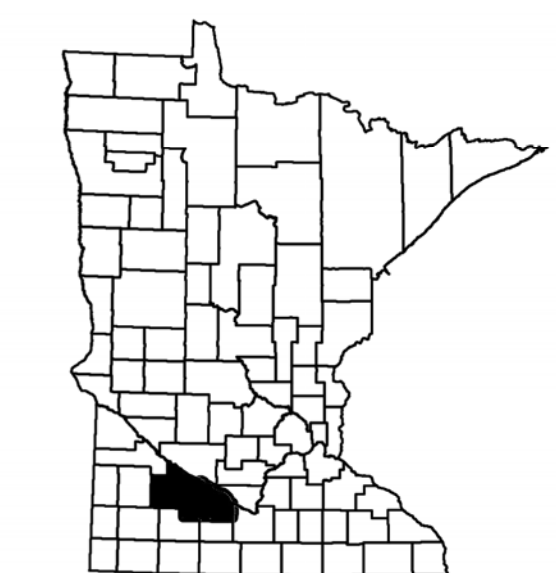
EXISTING	
	WATERSHED BOUNDARY
	CITY LIMITS
	SECTION LINE
	QUARTER SECTION LINE
	RIGHT OF WAY LINE
	PROPERTY / LOTLINE
	EASEMENT LINE
	ACCESS CONTROL
	WATER EDGE
	WETLAND BOUNDARY
	FENCE LINE
	EXISTING OPEN DITCH
	CULVERT
	TILE
	PRIVATE TILE
	WATER
	GAS
	OVERHEAD ELECTRIC
	UNDERGROUND ELECTRIC
	UNDERGROUND TELEPHONE
	UNDERGROUND TV
	OVERHEAD UTILITY
	UNDERGROUND UTILITY
	UNDERGROUND FIBER OPTIC
	CONTOUR (MAJOR)
	CONTOUR (MINOR)
	DECIDUOUS TREE
	CONIFEROUS TREE
	TREE LINE
	DROP INTAKE
	HYDRANT
	POWER POLE
PROPOSED	
	EASEMENT
	PROPOSED OPEN DITCH
	OPEN DITCH REPAIR
	CULVERT (RCP)
	CULVERT (CMP)
	CULVERT (HDPE)
	TILE
	TILE (PIPE WIDTH)
	PRIVATE TILE
	WATER
	GAS
	OVERHEAD ELECTRIC
	UNDERGROUND ELECTRIC
	UNDERGROUND TV
	CONTOUR (MAJOR)
	CONTOUR (MINOR)
	DROP INTAKE
	SLOUGH REPAIR
	SPOIL PLACEMENT
	TREE CLEARING
	REMOVE TREE
	BUFFER



LOCATION MAP

SHEET INDEX

- 1 TITLE
- 2 ESTIMATED QUANTITIES AND SCHEDULES
- 3 CONSTRUCTION NOTES
- 4 EXISTING WATERSHED
- 5 PROPOSED WATERSHED
- 6 DETAILS
- 7 DETAILS
- 8 DETAILS
- 9 DETAILS
- 10 STRUCTURE S-1 DETAIL
- 11 PLAN - PROFILE MAINLINE
- 12 PLAN - PROFILE MAINLINE
- 13 PLAN - PROFILE MAINLINE
- 14 PLAN - PROFILE MAINLINE
- 15 PLAN - PROFILE MAINLINE
- 16 PLAN - PROFILE MAINLINE WEST
- 17 PLAN - PROFILE MAINLINE WEST
- 18 PLAN - PROFILE BRANCH 4
- 19 PLAN - PROFILE BRANCH 6
- 20 PLAN - PROFILE BRANCH 16
- 21 PLAN - PROFILE BRANCH 18
- 22 POND GRADING
- 23 POND SECTIONS
- 24 SPOILS GRADING



I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRELIMINARY NOT FOR CONSTRUCTION

DATE: _____ LIC. NO. _____

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GIS DISCLAIMER:
INFORMATION FOR THE BOUNDARY / LOT LINES, AND UNDERGROUND UTILITIES SHOWN WAS DERIVED FROM DIGITAL DATABASES AND IS FOR INFORMATIONAL PURPOSES ONLY. DATA MAY NOT HAVE BEEN PREPARED FOR, OR BE SUITABLE FOR, LEGAL, ENGINEERING, OR SURVEYING PURPOSES.

PROJECT GENERAL NOTES

1. ALL WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS, WHICH INCLUDE, BUT ARE NOT LIMITED TO, THE OWNER - CONTRACTOR AGREEMENT, THE PROJECT MANUAL, (WHICH INCLUDES GENERAL SUPPLEMENTARY CONDITIONS AND SPECIFICATIONS), DRAWINGS OF ALL DISCIPLINES AND ALL ADDENDA, MODIFICATIONS, AND CLARIFICATIONS ISSUED BY ARCHITECT/ENGINEER.
2. CONTRACT DOCUMENTS SHALL BE ISSUED TO ALL SUBCONTRACTORS BY THE GENERAL CONTRACTOR IN COMPLETE SETS IN ORDER TO ACHIEVE THE FULL EXTENT AND COMPLETE COORDINATION OF ALL WORK.
3. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
4. FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
5. DETAILS SHOWN ARE INTENDED TO BE INDICATIVE OF THE PROFILES AND TYPE OF DETAILING REQUIRED THROUGHOUT THE WORK. DETAILS NOT SHOWN ARE SIMILAR IN CHARACTER TO DETAILS SHOWN, WHERE SPECIFIC DIMENSIONS, DETAILS, OR DESIGN INTENT CANNOT BE DETERMINED, NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK.
6. ALL MANUFACTURED ARTICLES, MATERIALS, AND EQUIPMENT SHALL BE APPLIED, INSTALLED, CONNECTED, ERECTED, CLEANED, AND CONDITIONED ACCORDING TO MANUFACTURERS' INSTRUCTIONS. IN CASE OF DISCREPANCIES BETWEEN MANUFACTURERS' INSTRUCTIONS AND THE CONTRACT DOCUMENTS, NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK.
7. ALL DISSIMILAR METALS SHALL BE EFFECTIVELY ISOLATED FROM EACH OTHER TO AVOID GALVANIC CORROSION.
8. THE LOCATION AND TYPE OF ALL EXISTING UTILITIES SHOWN ON THE PLANS ARE FOR GENERAL INFORMATION ONLY AND ARE ACCURATE AND COMPLETE TO THE BEST OF THE KNOWLEDGE OF I & S GROUP, INC. (ISG). NO WARRANTY OR GUARANTEE IS IMPLIED. THE CONTRACTOR SHALL VERIFY THE SIZES, LOCATIONS, AND ELEVATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES OR VARIATIONS FROM PLAN.
9. THE CONTRACTOR IS TO CONTACT "GOPHER STATE ONE CALL" FOR UTILITY LOCATIONS A MINIMUM OF 2 BUSINESS DAYS PRIOR TO ANY EXCAVATION / CONSTRUCTION (1-800-252-1166).

PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 TITLE
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

PROJECT INDEX:

OWNER:
BROWN COUNTY
AUDITOR-TREASURER OFFICE
14 S STATE STREET
NEW ULM, MN 56073
PH: 507.233.6613

PROJECT ADDRESS / LOCATION:
SECTIONS 19, 30-31,
PRAIRIEVILLE TWP.
BROWN COUNTY, MINNESOTA

SECTIONS 24-24, 36,
BROOKVILLE TWP.
REDWOOD COUNTY, MINNESOTA

MANAGING OFFICE:

MANKATO OFFICE
115 EAST HICKORY STREET
SUITE 300
MANKATO, MN 56001
PHONE: 507.387.6651

PROJECT MANAGER: JACOB RISCHMILLER
EMAIL: JACOB.RISCHMILLER@ISGINC.COM

SPECIFICATIONS REFERENCE
ALL CONSTRUCTION SHALL COMPLY WITH THE COUNTIES OF BROWN AND REDWOOD REQUIREMENTS AND MNDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2020 EDITION, AND THE STANDARD SPECIFICATIONS FOR SANITARY SEWER, STORM DRAIN AND WATERMAIN AS PROPOSED BY THE CITY ENGINEERS ASSOCIATION OF MINNESOTA 2023, UNLESS DIRECTED OTHERWISE.

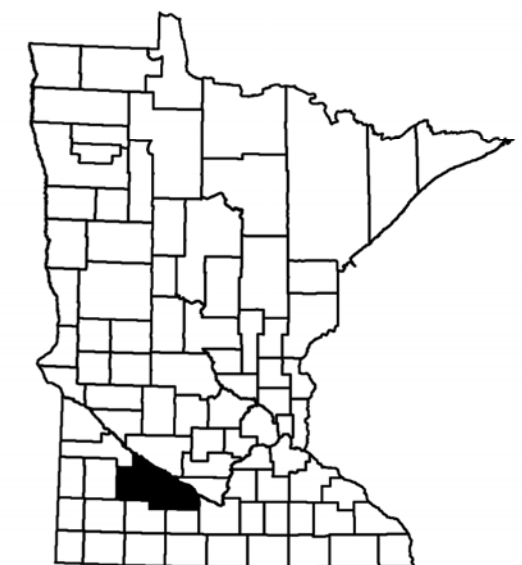
PROJECT DATUM
HORIZONTAL COORDINATES HAVE BEEN REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83), 1986 ADJUSTMENT (NAD83(1996)) ON THE BROWN COUNTY COORDINATE SYSTEM, IN U.S. SURVEY FEET.
ELEVATIONS HAVE BEEN REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
RTK GPS METHODS WERE USED TO ESTABLISH HORIZONTAL AND VERTICAL COORDINATES FOR THIS PROJECT.

B.M. ELEVATION=1038.82
SAINTS - MNDOT POINT
NW CORNER OF THE INTERSECTION OF
TRUNK HIGHWAY 14 AND COUNTY
ROAD 7 IN THE TOWN OF COBDEN.

TOPOGRAPHIC SURVEY
THIS PROJECT'S TOPOGRAPHIC SURVEY CONSISTS OF DATA COLLECTED IN OCTOBER 2022 BY ISG.

TITLE
TITLE

SHEET
1 OF 24



TOTAL ESTIMATED QUANTITIES			
Item Code	Item	Unit	Estimated Quantity
01.7113.1000.01	MOBILIZATION	LS	1
31.2316.1000.05	TOP SOIL STRIP & PLACE SPOILS	AC	26.69
31.2316.1000.07	COMMON EXCAVATION - POND (P) (EV)	CY	78953
31.2500.1000.03	INSTALL INLET PROTECTION	EA	21
31.3700.1000.07	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	300
32.9219.1000.04	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	3205
33.0513.1000.02	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	16
33.0513.1000.02	FURNISH & INSTALL WATER QUALITY INLET	EA	9
33.0513.1000.02	INSTALL DROP INTAKE (18-INCH)	EA	24
33.0513.1000.02	CAP DROP INTAKE (18-INCH)	EA	8
33.0513.1000.02	INSTALL STRUCTURE S-1 WITH GALVANIZED GRATE	EA	1
33.4510.1000.02	CONNECT EXISTING 24-INCH TILE	EA	4
33.4510.1000.02	CONNECT EXISTING 18-INCH TILE	EA	2
33.4510.1000.02	CONNECT EXISTING 15-INCH TILE	EA	3
33.4510.1000.02	CONNECT EXISTING 12-INCH TILE	EA	2
33.4510.1000.02	CONNECT EXISTING 10-INCH TILE	EA	4
33.4510.1000.02	CONNECT EXISTING 8-INCH TILE	EA	11
33.4510.1000.02	CONNECT EXISTING 6-INCH TILE	EA	30
33.4510.1000.02	CONNECT EXISTING 4-INCH TILE	EA	40
33.4510.1000.02	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1
33.4510.1000.02	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1
33.4510.1000.02	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	4
33.4510.1000.02	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	4
33.4510.1000.02	10-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2
33.4510.1000.02	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2
33.4510.1000.02	BULKHEAD EXISTING TILE	EA	1
33.4510.1000.02	REMOVE EXISTING DROP INTAKE	EA	2
33.4510.1000.03	42-INCH AGRICULTURAL TILE	LF	589
33.4510.1000.03	36-INCH AGRICULTURAL TILE	LF	2987
33.4510.1000.03	30-INCH AGRICULTURAL TILE	LF	2983
33.4510.1000.03	24-INCH AGRICULTURAL TILE	LF	2341
33.4510.1000.03	18-INCH AGRICULTURAL TILE	LF	6800
33.4510.1000.03	15-INCH AGRICULTURAL TILE	LF	1127
33.4510.1000.03	12-INCH AGRICULTURAL TILE	LF	536
33.4510.1000.03	10-INCH AGRICULTURAL TILE	LF	49
33.4510.1000.03	8-INCH AGRICULTURAL TILE	LF	667
33.4510.1000.03	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	269
33.4510.1000.03	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	675
33.4510.1000.07	GRANULAR PIPE FOUNDATION	CY	583
33.4510.1000.10	TILE INVESTIGATION	HR	39
33.4520.1000.03	30-INCH CLASS III RCP PIPE	LF	43
34.0100.1000.02	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	7

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

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PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
 BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338
 FILE NAME 23338 DETAILS
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--/--
 CLIENT PROJECT NO. -

TITLE
ESTIMATED QUANTITIES AND SCHEDULES

SHEET
2 OF 24

GENERAL PROJECT NOTES:

- DURING CONSTRUCTION, CONTRACTOR SHALL MAINTAIN A DRAINAGE OUTLET FOR THE ENTIRE JD 5 PROJECT AREA.
- ALL PIPE DIMENSIONS REFERENCED IN THE PLANS REFER TO THE INSIDE DIAMETER.
- RODENT GUARDS SHALL BE INSTALLED ON ALL OUTLETS 18" AND SMALLER. (INCIDENTAL TO RESPECTIVE BID ITEMS).
- ALL ROAD SIGNAGE, COORDINATION, AND TRAFFIC CONTROL SIGNAGE SHALL BE INCIDENTAL TO ROAD RESTORATIONS AND SHALL CONFORM TO LOCAL ROAD AUTHORITY PERMITS AND REGULATIONS.
- THE CONTRACTOR SHALL SUBMIT A WINTER CONSTRUCTION PLAN FOR SITE STABILIZATION, EROSION PREVENTION, AND SEDIMENT CONTROL IF THE PROJECT IS NOT COMPLETED BY OCTOBER 15 OF THE GIVEN CONSTRUCTION SEASON, UNLESS APPROVED BY THE ENGINEER. THE PLAN SHALL BE DEVELOPED TO SPECIFICALLY ADDRESS SHUTDOWN PROCEDURES OR ACTIVE CONSTRUCTION PLANS.
- ALL DEWATERING FOR THE PROJECT IS INCIDENTAL.
- PRODUCT MATERIAL SHALL BE AS SPECIFIED IN THE PLANS. IF NO SPECIFIC MATERIAL IS CALLED OUT, MATERIAL SHALL CONFORM TO THE APPROVED PRODUCT LIST IN THE APPROPRIATE SPECIFICATION.
- ALL EFFORTS SHALL BE MADE DURING CONSTRUCTION TO SEPARATE SOIL TYPES. BACKFILL SHALL BE COMPACTED PRIOR TO PLACEMENT OF TOPSOIL, EXCEPT THE TOP TWO (2) FEET, FOR WHICH COMPACTION SHALL BE MINIMIZED TO THE EXTENT POSSIBLE. TOPSOIL SHALL BE PLACED TO A MINIMUM DEPTH OF 18", OR UNIFORM TO THE TOPSOIL DEPTH OF THE SURROUNDING AREA UNLESS SPECIFIED ELSEWHERE IN THE PLANS. EXCAVATED SPOILS SHALL BE SPREAD EVENLY IN CONSTRUCTION AREA AS TO NOT IMPEDE DRAINAGE. ALL EFFORTS SHALL BE MADE TO KEEP TOPSOIL ON TOP AND SEPARATED. NO TOPSOIL SHALL BE PLACED IN THE TRENCH BELOW 2' FROM EXISTING GROUND UNLESS APPROVED BY THE ENGINEER.
- ALL SPOIL LEVELING, GRADING, AND RESTORATION OF DISTURBED AREAS SHALL BE IN ACCORDANCE TO THE CONTRACT DOCUMENTS AND SHALL BE INCIDENTAL TO THE WORK UNLESS OTHERWISE SPECIFIED.
- HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL SHALL ONLY BE COMPLETED AS NECESSARY FOR SAFE CONSTRUCTION PRACTICES AND WITHIN THE ALLOWED CONSTRUCTION EASEMENT, UNLESS APPROVED BY THE ENGINEER. TREE REMOVAL AND GRUBBING SHALL BE INCIDENTAL TO HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL BID ITEM.
- TREES CALLED OUT AS "REMOVE TREE" SHALL BE PAID FOR BY EACH OCCURRENCE. IF TREES ARE NOT CALLED OUT IN THE CONSTRUCTION DOCUMENTS AS REMOVE TREE, THEN THE REMOVAL SHALL BE PAID FOR BY THE ACRE AS HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL.
- AGGREGATE SURFACE SHALL BE INCIDENTAL TO CROSSING OR ROAD RESTORATION.
- RIPRAP QUANTITIES ARE ESTIMATED. ADDITIONAL QUANTITY MAY BE REQUIRED BY THE ENGINEER. ALL RIPRAP QUANTITIES SHALL BE PAID BY THE CUBIC YARD INSTALLED, UNLESS RIPRAP IS INCIDENTAL TO A SEPARATE PAY ITEM. ALL EXCAVATION AND GEOTEXTILE FABRIC SHALL BE INCIDENTAL TO RESPECTIVE BID ITEM.
- ALL WORK SHALL BE DONE IN 2,500 LF SECTIONS, UNLESS APPROVED OF BY THE ENGINEER. PRIOR TO COMMENCING ON A NEW SECTION, ALL WORK IN THE PREVIOUS SECTION MUST BE COMPLETED IN ADHERENCE WITH THE CONTRACT DOCUMENTS. THE ENGINEER RESERVES THE RIGHT TO CEASE OPERATIONS AND/OR WITHHOLD PAYMENT UNTIL COMPLIANCE HAS BEEN ACHIEVED.
- EXISTING TILES THAT ARE DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED AT NO COST TO THE PROJECT, UNLESS OTHERWISE SPECIFIED.
- ALL SIGNS AND MARKERS SHALL BE PROTECTED OR REMOVED AND REINSTALLED AT NO ADDITIONAL COST TO THE PROJECT, UNLESS OTHERWISE SPECIFIED. THE ENGINEER SHALL BE NOTIFIED OF ANY SIGNS OR MARKERS IN POOR CONDITION PRIOR TO REMOVAL.
- THE DRAINAGE AUTHORITY TAKES NO AUTHORITY OVER OR RESPONSIBILITY FOR ANY AND ALL PRIVATE TILE SHOWN ON THESE PLANS. PRIVATE TILE LOCATIONS HAVE BEEN SUPPLIED BY LANDOWNERS FOR USE BY THE CONTRACTOR.
- THE CONTRACTOR SHALL PAY ALL DAMAGES OUTSIDE OF THE AGREED UPON EASEMENT IN AN AMOUNT OF \$1,200 PER ACRE OF DISTURBANCE, AS MEASURED BY THE ENGINEER.

GENERAL TILE INSTALLATION NOTES:

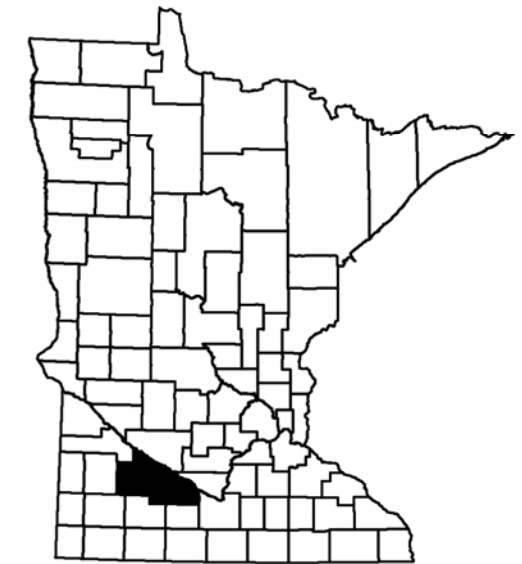
- UNLESS OTHERWISE NOTED, CONTRACTOR SHALL LIMIT CONSTRUCTION ACTIVITY TO WITHIN A 100-FOOT WIDE SWATH ALONG PROPOSED TILE ALIGNMENTS FOR 24" TILE OR LESS, AND A 150-FOOT SWATH ALONG PROPOSED TILE ALIGNMENTS FOR TILES LARGER THAN 24". THE SWATH NEED NOT BE CENTERED ON THE PROPOSED TILE ALIGNMENT. ALL ACCESS ROADS SHOULD FOLLOW THE PROPOSED ALIGNMENTS. THE SWATH SHALL NOT DISTURB ANY NON-AGRICULTURAL PRIVATE PROPERTY. DISTURBANCE THROUGH ROAD CROSSINGS, ROAD DITCHES, AND GRASS BUFFERS SHALL BE LIMITED TO THE WIDTH OF A TRENCH NECESSARY FOR SAFE CONSTRUCTION PRACTICES AND MUST BE RE-SEEDED WHERE NEEDED.
- MISCELLANEOUS TREE CLEARING SHALL BE INCIDENTAL TO TILE INSTALLATION UNLESS SPECIFIED IN THE PLANS.
- ALL PIPE BEDDING AND ENCASMENT IS INCIDENTAL TO STANDARD TILE INSTALLATION. REFER TO SPECIFICATIONS FOR DEFINITIONS. GRANULAR FOUNDATION MATERIAL SHALL BE USED IF UNSUITABLE OR UNSTABLE SOILS ARE PRESENT. THE USE OF FOUNDATION MATERIAL SHALL BE APPROVED BY THE ENGINEER BEFORE PLACEMENT AND WILL BE PAID FOR BY THE CUBIC YARD.
- ALL BENDS, FITTINGS, AND TEES SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL, BANDED, AND WRAPPED IN GEOTEXTILE FABRIC. INCIDENTAL TO RESPECTIVE BID ITEM.
- ALL TILE ENDS MUST BE CAPPED TO NOT TAKE SEDIMENT UNLESS ANOTHER TILE (PRIVATE OR PUBLIC) IS CONNECTED INTO THE PROPOSED TILE. CAPPING SHALL BE INCIDENTAL TO TILE INSTALLATION.
- THE CONNECTION OF DISSIMILAR PROPOSED PIPE TYPES SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL AND BE MADE WITH A WATERTIGHT COUPLER APPROVED OF BY THE ENGINEER. THE CONNECTION SHALL BE INCIDENTAL TO TILE INSTALLATION.
- ALL BENDS SHALL BE CONSTRUCTED AS PRE-FABRICATED BENDS, UNLESS APPROVED BY THE ENGINEER. ANY BENDS LARGER THAN 45° MUST BE CONSTRUCTED WITH MULTIPLE BENDS WITH AT LEAST 40 FEET IN BETWEEN EACH BEND. 45° BENDS SHALL NOT BE USED ON TILE 18 INCHES AND SMALLER.
- UNLESS SPECIFICALLY NOTED, HDPE AND RCP WILL BE THE ONLY ACCEPTABLE MATERIALS FOR ALL AGRICULTURAL DRAIN TILE. REFER TO SPECIFICATIONS FOR PROPER INSTALLATION REQUIREMENTS AND MATERIALS.
- VERIFY EXISTING TILE LOCATIONS AND ELEVATIONS PRIOR TO CONSTRUCTION, PAID FOR AS TILE INVESTIGATION BY THE HOUR.
- ANY ALIGNMENT CHANGES MADE DUE TO TILE INVESTIGATION SHALL BE APPROVED BY THE ENGINEER DURING CONSTRUCTION. ALL EFFORTS WILL BE MADE TO UTILIZE THE SAME FITTINGS AS ORIGINALLY DESIGNED. THE CONTRACTOR WILL ONLY BE COMPENSATED FOR ADDITIONAL LINEAR FOOTAGE OF INSTALLED TILE DUE TO THE ALIGNMENT CHANGE PER THE UNIT BID PRICE.
- DROP INTAKES WILL BE PAID FOR BY EACH AND NO ADDITIONAL COMPENSATION WILL BE MADE FOR IN-FIELD ELEVATIONS THAT VARY FROM THE PLANS. MINOR SHAPING AROUND DROP INTAKES AND CULVERT INLETS SHALL BE INCIDENTAL TO THEIR RESPECTIVE PAY ITEMS.
- DROP INTAKES THAT ARE NOT INTENDED TO TAKE SURFACE FLOW MAY BE CAPPED, AS DETERMINED BY THE ENGINEER. INTAKES MAY BE CUT DOWN AND BURIED AFTER FINAL TELEVISION, PER LANDOWNER REQUEST PRIOR TO CLOSEOUT, AND WILL BE PAID FOR AS "CAP DROP INTAKE."
- DROP INTAKES THAT ARE DESIGNED TO BE ON PROPERTY LINES SHALL BE ADJUSTED IN THE FIELD TO MATCH ACTUAL LOCATION OF PROPERTY LINE.
- AT CROSSINGS OF EXISTING TILE, ONLY THE UPSTREAM SIDE NEED BE CONNECTED, UNLESS OTHERWISE DEEMED NECESSARY. ALL BENDS, TEES, CONNECTING TILE, AND OTHER FITTINGS NECESSARY FOR CONNECTION SHALL BE INCIDENTAL TO RESPECTIVE BID ITEM.
- ALL TILE CONNECTIONS MUST BE CONNECTED TO THE PROPOSED TILE ON THE UPSTREAM SIDE OF THE EXISTING TILE.
- TILE CONNECTIONS SHALL BE CONSTRUCTED WITH TILE THE SAME SIZE OR THE NEXT SIZE LARGER THAN THE EXISTING TILE, UNLESS OTHERWISE SPECIFIED OR APPROVED BY THE ENGINEER. HDPE SHALL BE USED FOR THE CONNECTION OF ALL EXISTING PUBLIC TILES AS WELL AS ALL PRIVATE TILES WHERE THE FILL HEIGHT OVER THE PROPOSED TILE IS GREATER THAN 10 FEET. PE SHALL ONLY BE ALLOWED FOR PRIVATE TILE WITH A PROPOSED FILL HEIGHT LESS THAN OR EQUAL TO 10 FEET. (SEE CONNECT TO EXISTING TILE DETAIL)

GENERAL POND EXCAVATION NOTES:

- A 16.5-FOOT GRASS STRIP SHALL BE ESTABLISHED AROUND THE TOP OF THE POND EXCAVATION AREA. SEEDING SHALL OCCUR IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- CONSTRUCTION ACTIVITY OUTSIDE OF THE PROPOSED POND TOP AND FILL AREA SHALL BE LIMITED TO SAFE CONSTRUCTION PRACTICES OR A MAXIMUM OF 50 FEET WITHOUT APPROVAL FROM THE ENGINEER. APPROVAL FROM THE ENGINEER SHALL BE OBTAINED FOR ANY DISTURBANCE OUTSIDE OF THE APPROVED AREA BEFORE THE WORK BEGINS. ALL DISTURBED AREA SHALL BE RESTORED AS SPECIFIED IN THE CONTRACT DOCUMENTS.
- A MINIMUM OF 6" OF TOPSOIL SHALL BE PLACED ON POND BOTTOM AND SIDE SLOPES, UNLESS APPROVED BY THE ENGINEER (INCIDENTAL TO POND EXCAVATION).
- TOPSOIL STRIPPING IN THE AREA OF THE POND SHALL BE PAID FOR AS COMMON EXCAVATION TO THE POND. SEE GRADING CALCULATIONS AND SPECIFICATIONS FOR FURTHER CLARIFICATION.
- PLACE ALL SPOILS FROM POND EXCAVATION IN DESIGNATED SPOIL AREAS IDENTIFIED ON PLANS, UNLESS OTHERWISE DETERMINED BY THE ENGINEER. SPOIL LEVELING/GRADING IS INCIDENTAL TO POND EXCAVATION UNLESS OTHERWISE SPECIFIED. CONTRACTOR MAY REMOVE CLAY MATERIAL FROM SITE FOR OTHER USE AT NO ADDITIONAL COST TO THE PROJECT IF APPROVED BY THE ENGINEER. ALL TOPSOIL SHALL REMAIN ON SITE.
- TOPSOIL IN TOPSOIL STRIP AREAS DESIGNATED ON THE PLANS SHALL BE STRIPPED PRIOR TO PLACEMENT OF FILL MATERIAL FROM POND EXCAVATION. RECLAIMING, LEVELING, AND RIPPING OF THE TOPSOIL ON TOP OF THE SPOILS SHALL BE INCIDENTAL TO TOPSOIL STRIPPING.
- EXISTING TOPSOIL DEPTH IN FILL AREA MAY DIFFER FROM THE DEPTH AT THE POND LOCATION. THE FILL AREA SHALL HAVE A MINIMUM OF 12" IN DEPTH AFTER WORK IS COMPLETED, UNLESS APPROVED OF BY THE ENGINEER.
- TOPSOIL SHALL BE PLACED IN AN UNIFORM MANNER AS SPECIFIED BY THE CONTRACT DOCUMENTS UNLESS APPROVED BY THE ENGINEER.
- ALL CONCRETE PIPE SECTIONS FOR THE POND OUTLET SHALL CONSIST OF CLASS III RCP CONFORMING TO MNDOT 3006G. ALL SECTIONS SHALL BE TIED TOGETHER.
- CONTRACTOR SHALL SUBMIT A GRADING PLAN TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCING ON POND CONSTRUCTION.

ABBREVIATIONS

AC	ACRE	GA	GAUGE	PP	POLYPROPYLENE
ADD	ADDENDUM	GAL	GALLON	PSI	POUNDS PER SQUARE INCH
AGG	AGGREGATE	GPM	GALLONS PER MINUTE	PVC	POLYVINYL CHLORIDE
APPROX	APPROXIMATE	HDPE	HIGH DENSITY POLYETHYLENE	PVMT	PAVEMENT
BIT	BITUMINOUS	HORIZ	HORIZONTAL	QTY	QUANTITY
CAD	COMPUTER-AIDED DESIGN	HR	HOURLY	RCP	REINFORCED CONCRETE PIPE
CFS	CUBIC FEET PER SECOND	HWL	HIGH WATER LEVEL	REBAR	REINFORCING BAR
CF	CUBIC FOOT	HWY	HIGHWAY	REM	REMOVE
CL	CENTERLINE	HYD	HYDRANT	ROW	RIGHT OF WAY
CMP	CORRUGATED METAL PIPE	I	INVERT	R/W	RIGHT OF WAY
CONC	CONCRETE	ID	INSIDE DIAMETER	SCH	SCHEDULE
CONST	CONSTRUCTION	IN	INCH	SF	SQUARE FOOT
CONT	CONTINUOUS	INV	INVERT	SPEC	SPECIFICATION
CR	COUNTY ROAD	LF	LINEAR FEET	SQ	SQUARE
CSAH	COUNTY STATE AID	LIN	LINEAR	STA	STATION
	HIGHWAY	LS	LUMP SUM	SY	SQUARE YARD
CY	CUBIC YARD	MAX	MAXIMUM	TEMP	TEMPORARY
DI	DROP INTAKE	MH	MANHOLE	THRU	THROUGH
DIA	DIAMETER	MIN	MINIMUM	TRANS	TRANSFORMER
DIM	DIMENSION	MISC	MISCELLANEOUS	TV	TELEVISION
EA	EACH	NO	NUMBER	TYP	TYPICAL
ELEC	ELECTRICAL	NTS	NOT TO SCALE	UT	UTILITY, UNDERGROUND
ELEV	ELEVATION	NWL	NORMAL WATER LEVEL	UT	TELEPHONE
EOF	EMERGENCY OVERFLOW	OC	ON CENTER	VCP	VITRIFIED CLAY PIPE
EQ	EQUAL	OCEW	ON CENTER EACH WAY	W/O	WITHOUT
EX	EXISTING	OH	OVERHEAD	W/	WITH
FDN	FOUNDATION	OHWL	ORDINARY HIGH WATER	YD	YARD
FPM	FEET PER MINUTE	OZ	OUNCE	YR	YEAR
FPS	FEET PER SECOND	PERF	PERFORATED		
FT	FOOT, FEET	PL	PROPERTY LINE		



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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

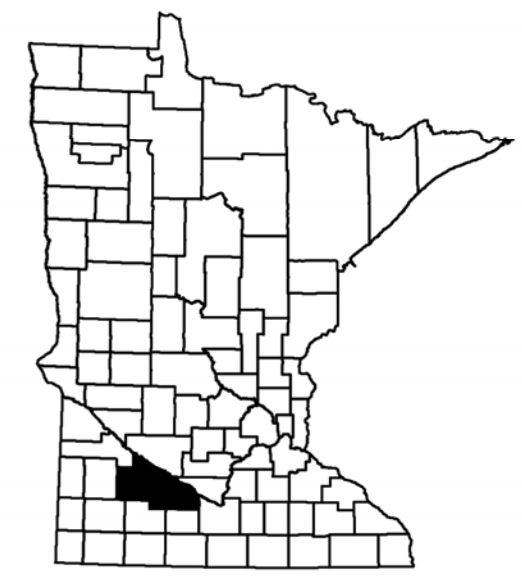
BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 DETAILS
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

CONSTRUCTION NOTES

SHEET



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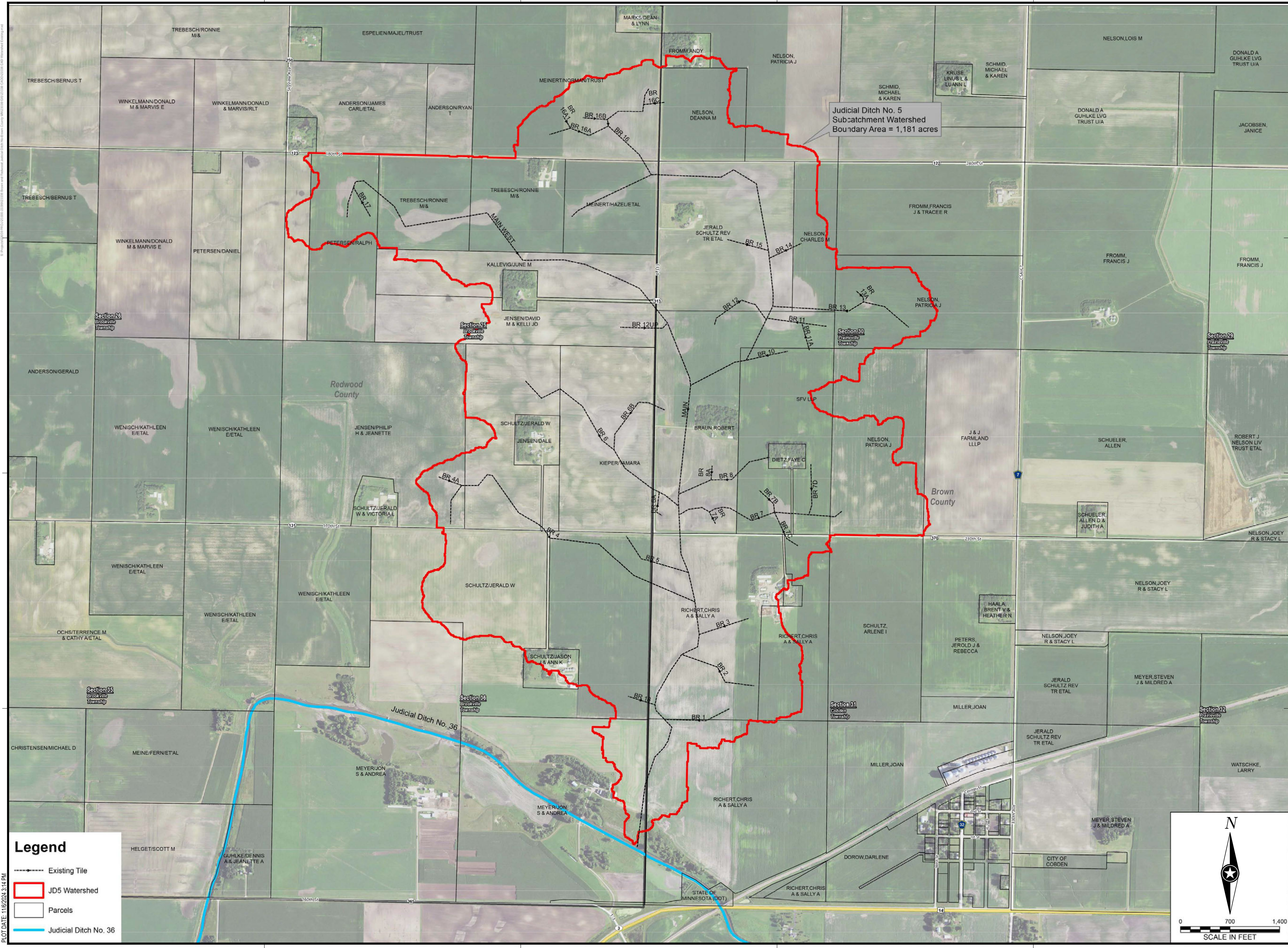
PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338
 FILE NAME 23338 WATERSHED MAPS
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--/--
 CLIENT PROJECT NO. -

TITLE
EXISTING WATERSHED

SHEET
4 OF 24



Legend

- Existing Tile
- ▭ JD5 Watershed
- ▭ Parcels
- Judicial Ditch No. 36

N

 0 700 1,400
 SCALE IN FEET

PLT DATE: 11/6/2024 3:14 PM



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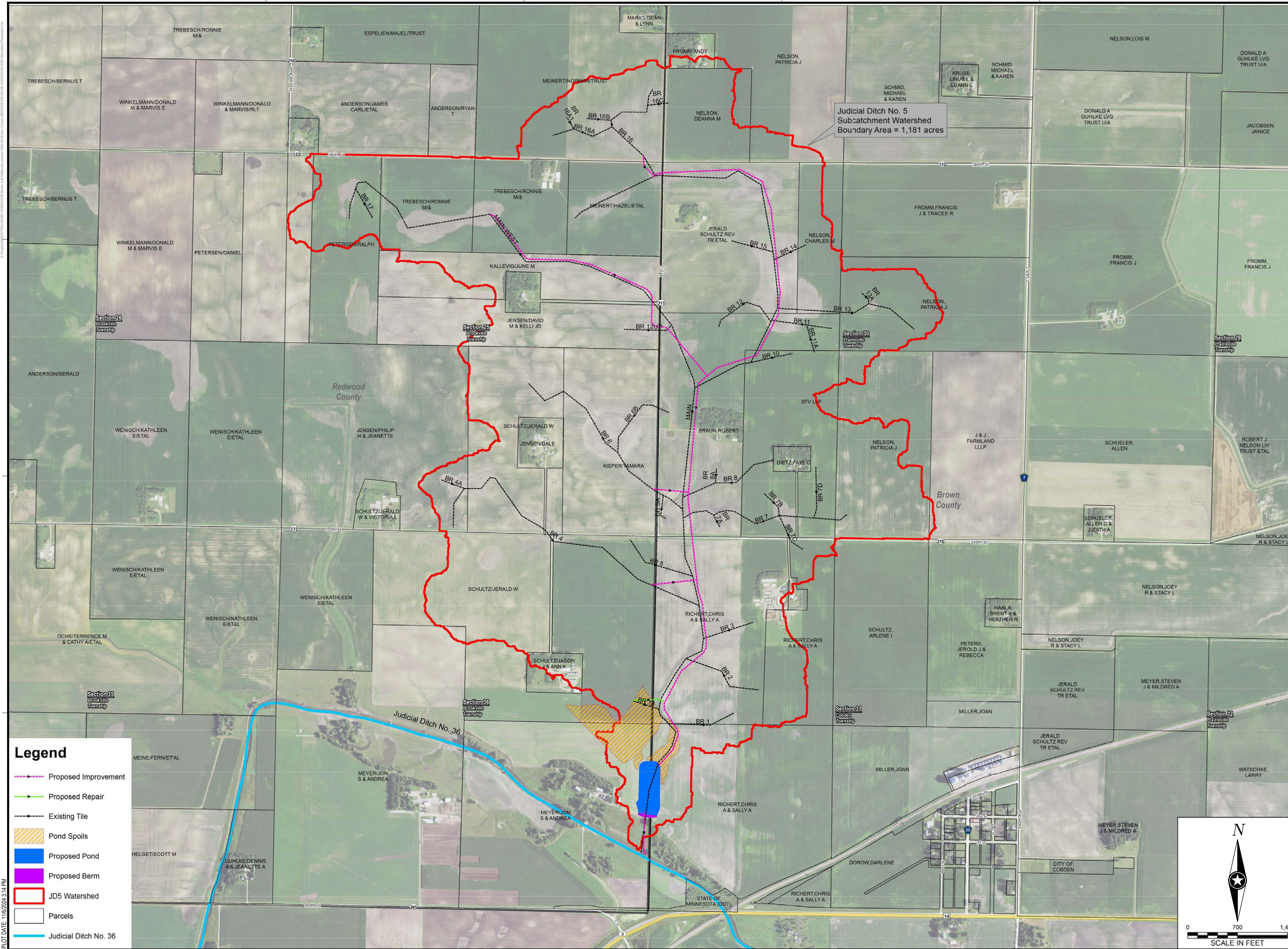
PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338
 FILE NAME 23338 WATERSHED MAPS
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--/--
 CLIENT PROJECT NO. -

TITLE
PROPOSED WATERSHED

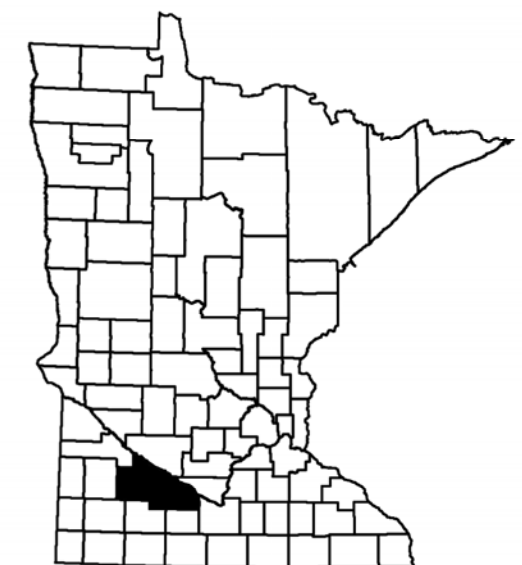
SHEET
5 OF 24



Legend

- Proposed Improvement
- Proposed Repair
- Existing Tile
- Pond Spoils
- Proposed Pond
- Proposed Berm
- JD5 Watershed
- Parcels
- Judicial Ditch No. 36

PLT DATE: 11/6/2024 3:14 PM



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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

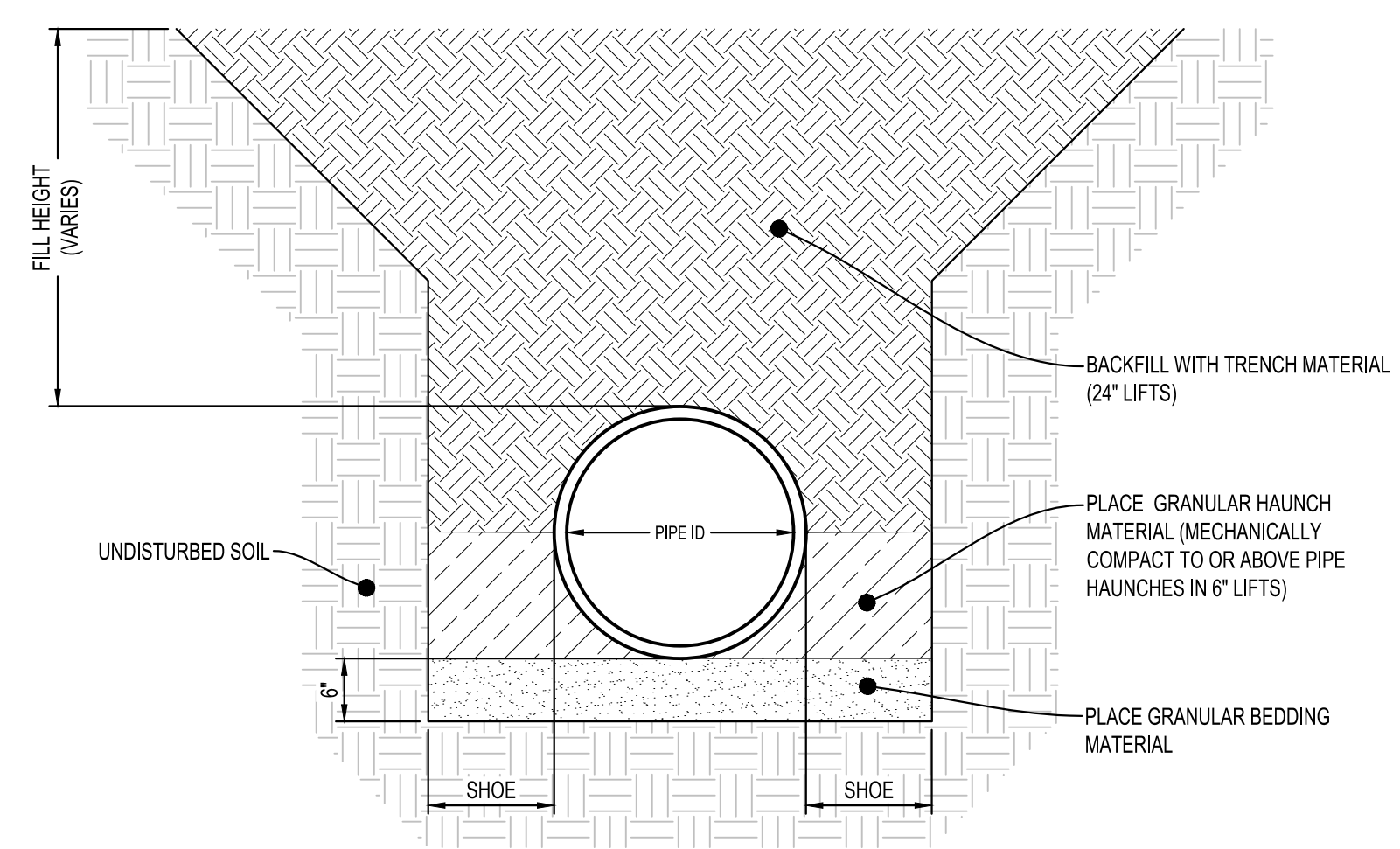
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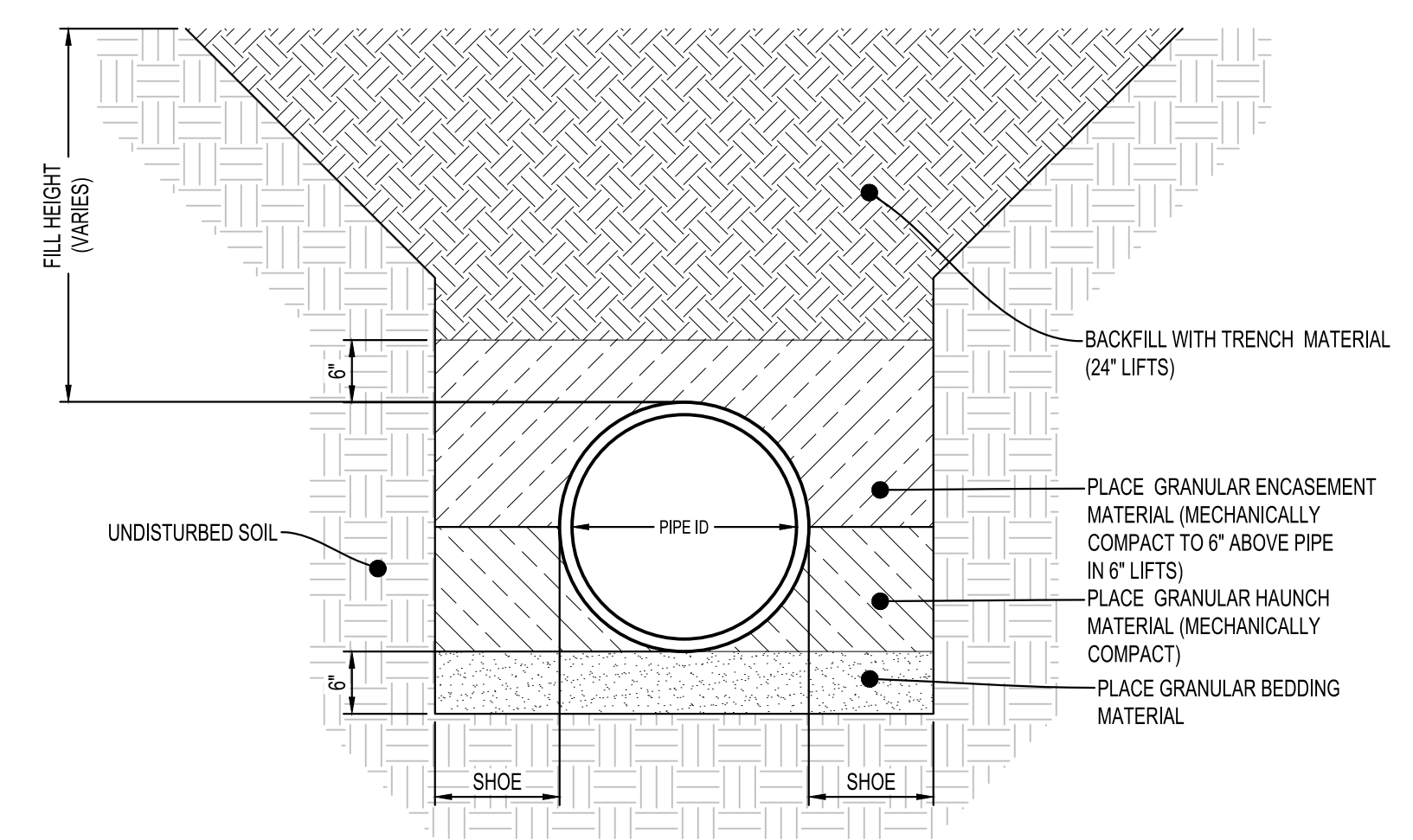
DETAILS

SHEET



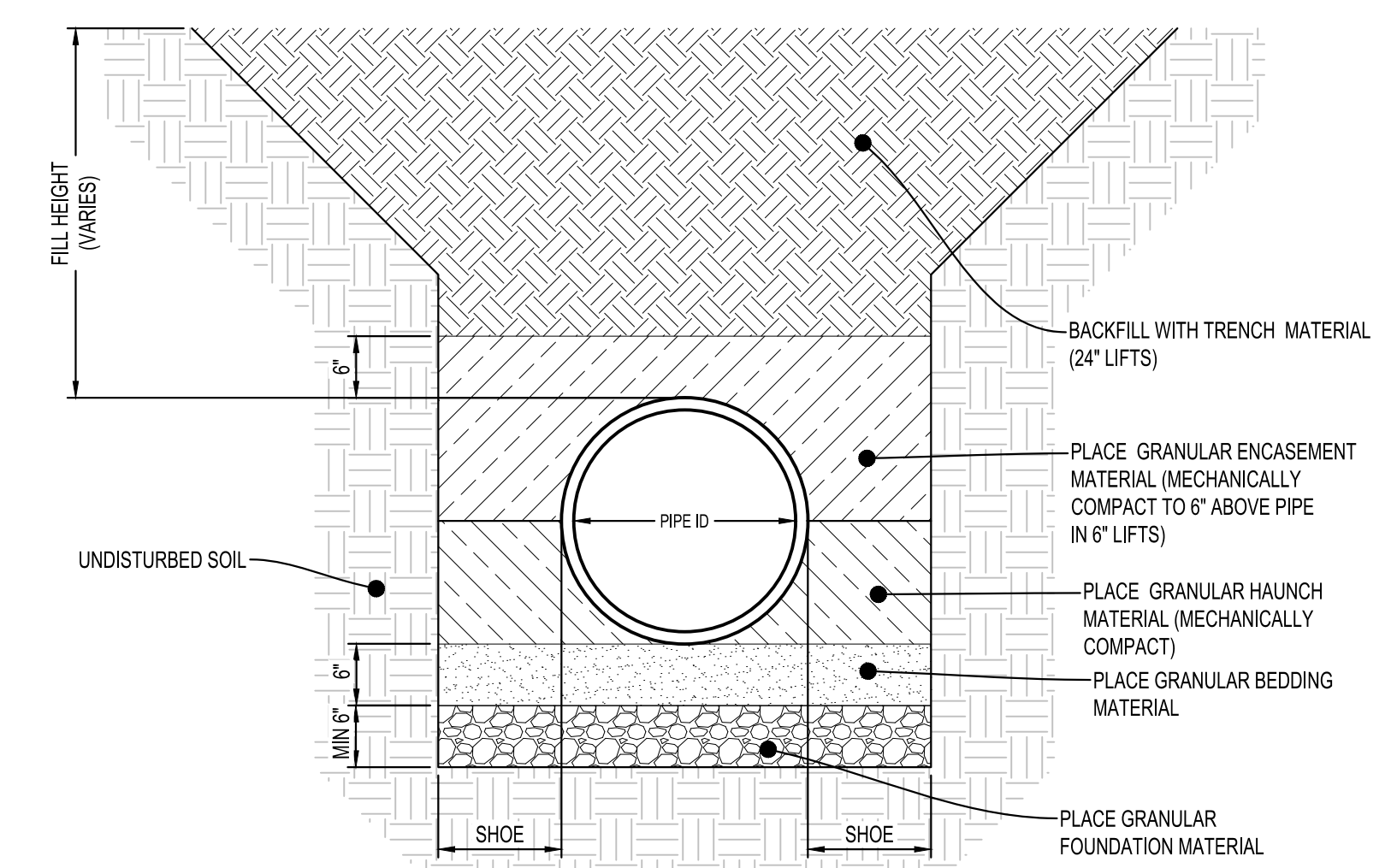
NOTES:
 GRANULAR BEDDING, GRANULAR ENCASEMENT, AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
 ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.
 THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.
 THE CLASS OF RCP REQUIRED SHALL BE BASED ON THE PIPE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE SPECIFIED.

RCP FLAT BOTTOM TRENCH
NTS



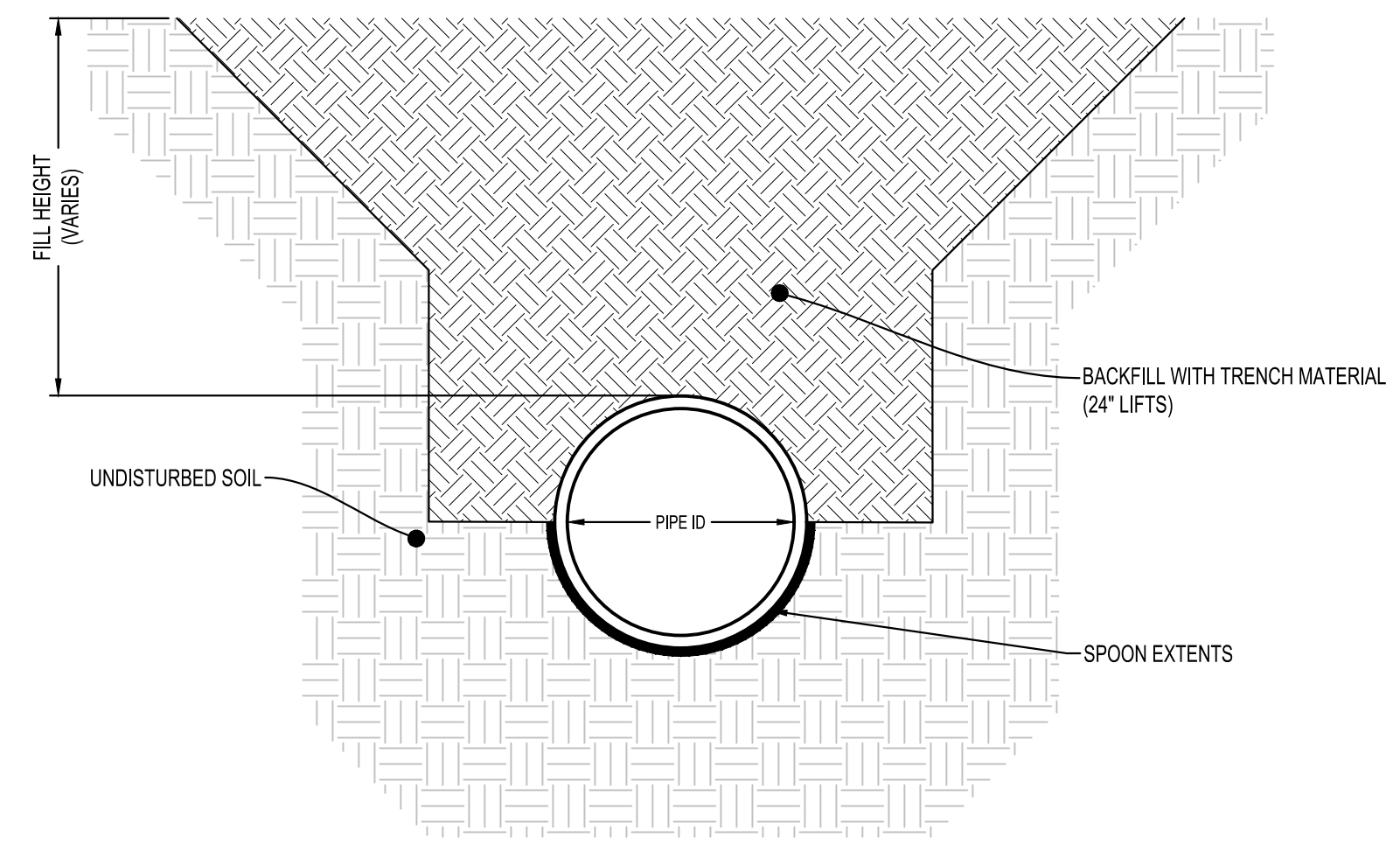
NOTE:
 GRANULAR BEDDING, GRANULAR ENCASEMENT, AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
 ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.
 THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.

HDPE FLAT BOTTOM TRENCH
NTS



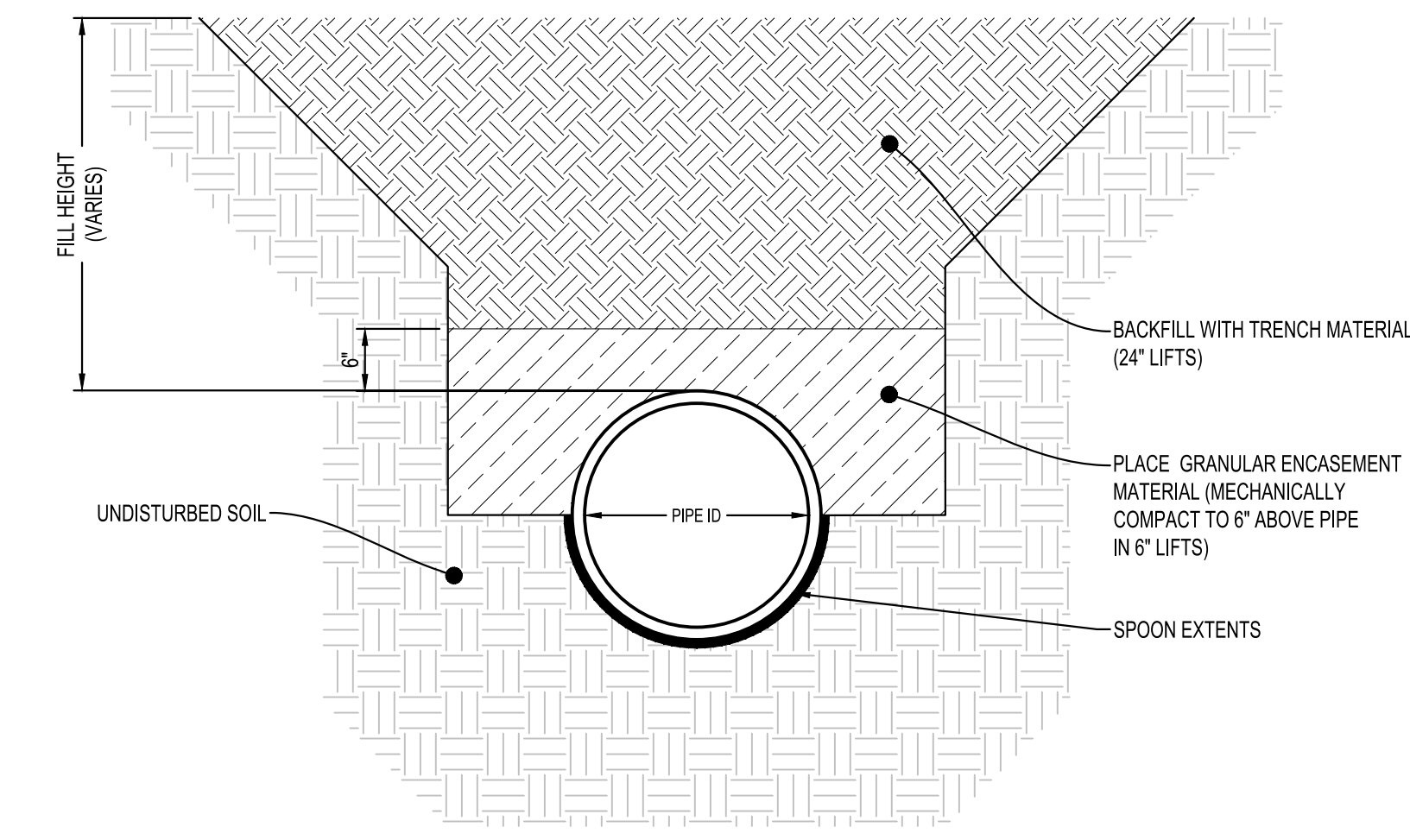
NOTES:
 GRANULAR BEDDING, GRANULAR ENCASEMENT, AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
 GRANULAR FOUNDATION BELOW THE PIPE SHALL BE PAID FOR BY THE CUBIC YARD, ONLY WHERE APPROVED BY THE FIELD ENGINEER.
 ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.
 THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.

HDPE FLAT BOTTOM TRENCH WITH GRANULAR FOUNDATION
NTS



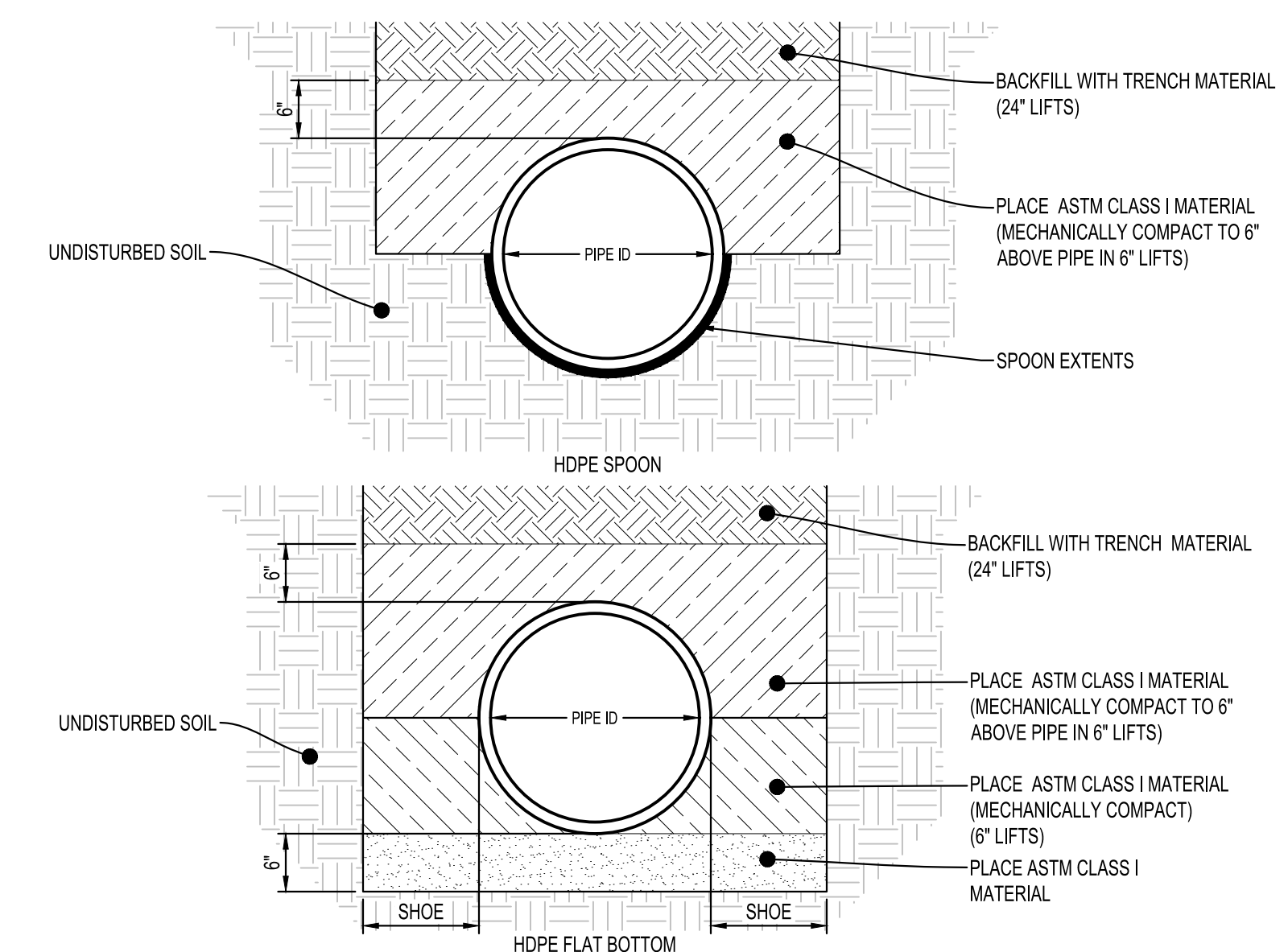
NOTES:
 BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
 SPOON DIMENSIONS SHALL COMPLY WITH PIPE MANUFACTURER'S SPECIFICATIONS.
 ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.
 THE CLASS OF RCP REQUIRED SHALL BE BASED ON THE PIPE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE SPECIFIED.

RCP SPOON TRENCH
NTS



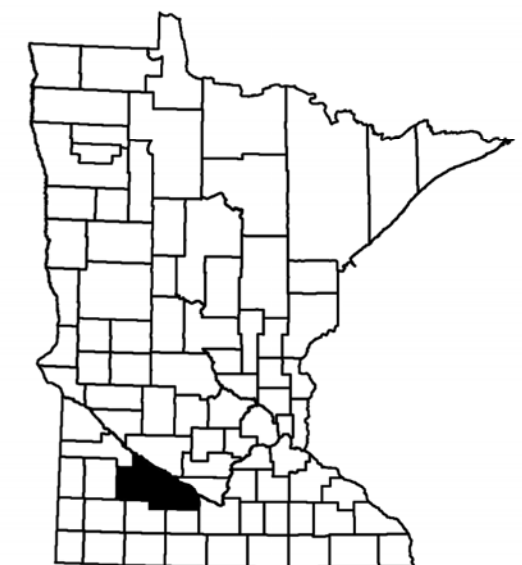
NOTES:
 GRANULAR ENCASEMENT AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
 SPOON DIMENSIONS SHALL COMPLY WITH PIPE MANUFACTURER'S SPECIFICATIONS.
 ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

HDPE SPOON TRENCH
NTS



NOTES:
 GRANULAR BEDDING AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
 SPOON DIMENSIONS SHALL COMPLY WITH PIPE MANUFACTURER'S SPECIFICATIONS.
 THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.
 ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

HDPE WITH ASTM CLASS I COVER HEIGHT OVER 15'
NTS



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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

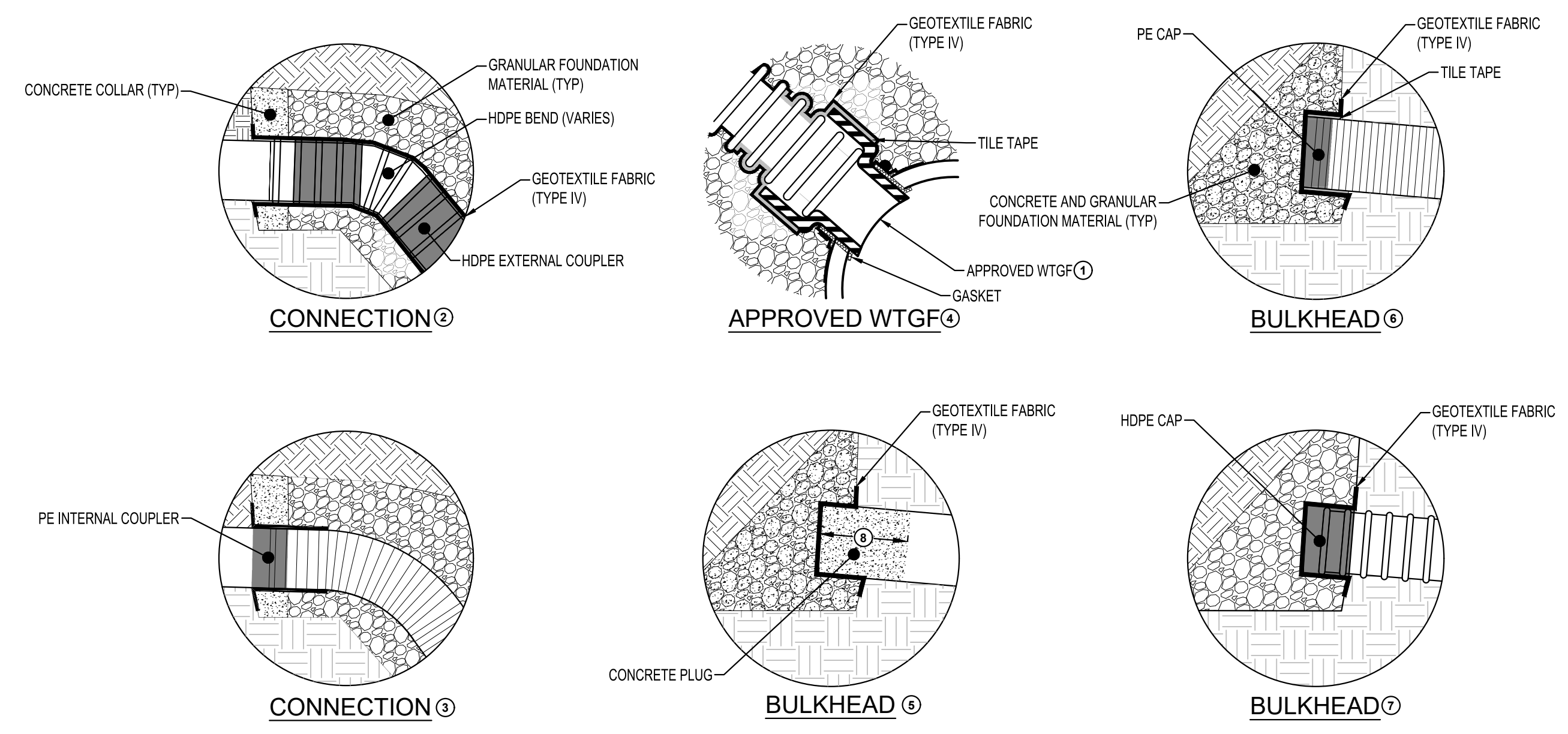
PROJECT NO.	22-23338
FILE NAME	23338 DETAILS
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	-

TITLE

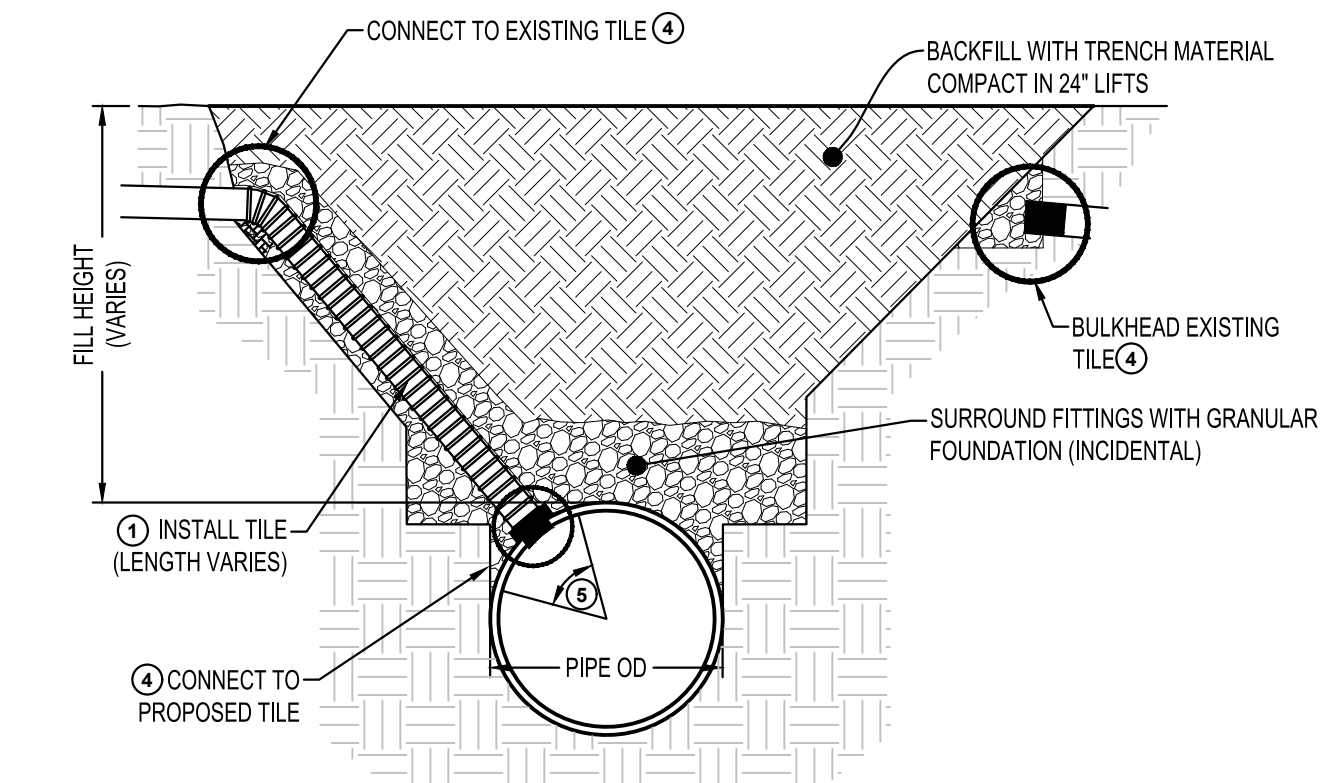
DETAILS

SHEET

7 OF 24



TYPICAL CONNECTION DETAILS
NTS



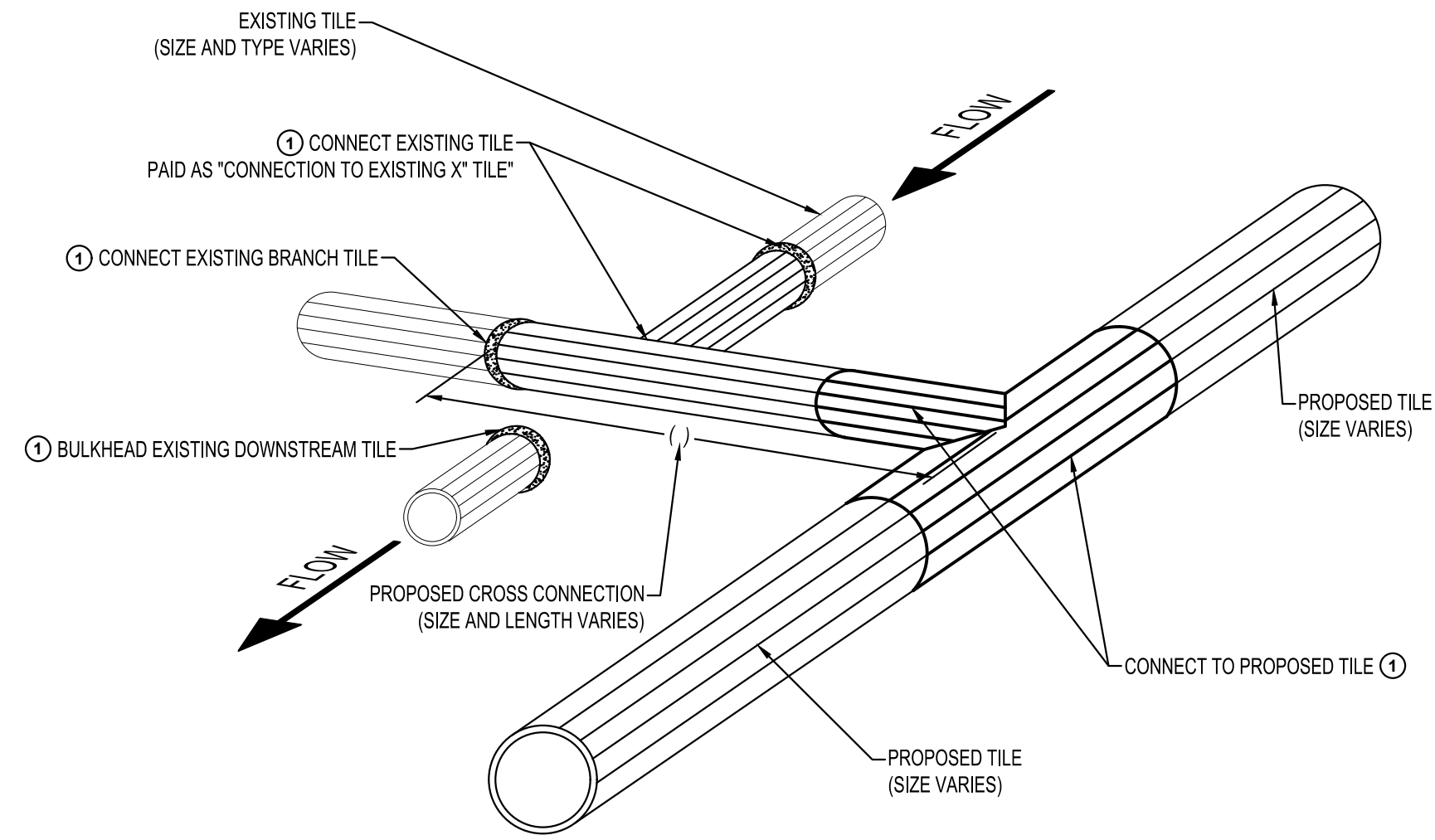
EXISTING TILE TYPE	FILL HEIGHT	CONNECTION MATERIAL 2
EXISTING PUBLIC TILES	ALL	HDPE
EXISTING PRIVATE TILES	>15 FEET	HDPE
EXISTING PRIVATE TILES	≤15 FEET	3

NOTES:

- REFER TO THE TABLE FOR MATERIAL. SIZE VARIES. THE TILE SHALL BE THE SAME AS OR THE NEXT AVAILABLE SIZE, UNLESS OTHERWISE SPECIFIED OR APPROVED BY THE ENGINEER.
- HDPE SHALL BE USED IF THE EXISTING TILE IS HDPE, REGARDLESS OF THE FILL HEIGHT.
- HDPE SHALL BE USED FOR FIRST 5 FEET AWAY FROM THE PROPOSED PIPE AND THEN PE MAY BE USED.
- REFER TO TYPICAL CONNECTION DETAILS.
- CONNECTION TO PROPOSED TILE SHALL BE LIMITED TO 15 TO 75 DEGREES FROM SPRING LINE.

ALL TILE, FITTINGS, GEOTEXTILE FABRIC, FOUNDATION ROCK, TILE TAPE, CONCRETE, AND EXCAVATION SHALL BE INCIDENTAL.

CONNECT TO EXISTING TILE
NTS



NOTES:

- REFER TO TYPICAL CONNECTION DETAILS.

CROSS CONNECT SHALL BE PAID AS THREE (3) SEPARATE PAY ITEMS:

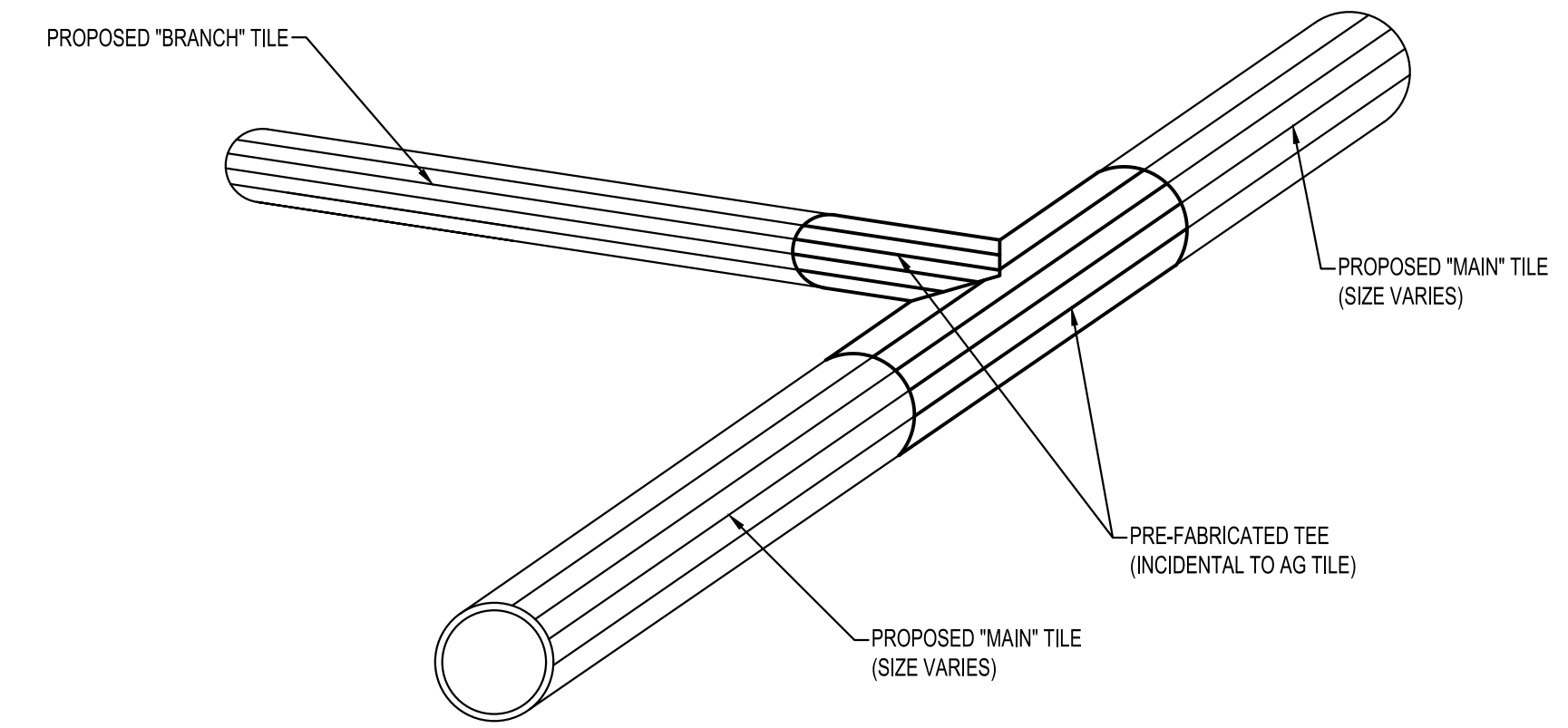
- X-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED PIPE
- X-INCH AGRICULTURAL TILE FOR LENGTHS GREATER THAN 40'
- CONNECTION TO EXISTING X\"/>

CROSS CONNECTION SHALL BE CONSTRUCTED WITH HDPE TILE.

CONNECTION TO PROPOSED TILE AND EXISTING BRANCH TILE ARE INCIDENTAL TO CROSS CONNECT. BULKHEAD IS INCIDENTAL TO CONNECTION TO EXISTING X\"/>

TILE CONNECTIONS SHALL NOT BE INSTALLED COMPLETELY VERTICAL FROM TOP OF PIPE.

CROSS CONNECT TO EXISTING BRANCH TILE
NTS

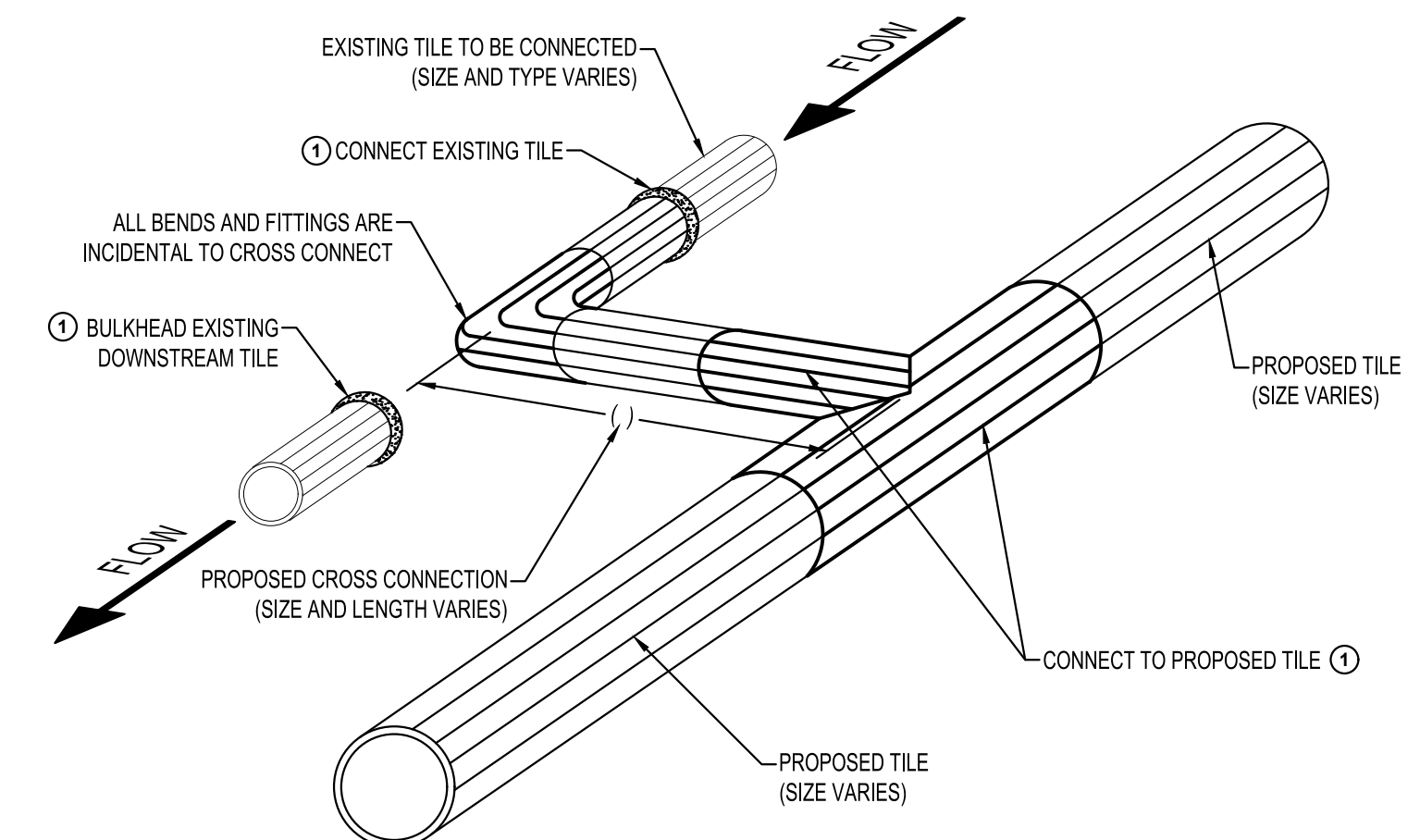


NOTES:

CONNECTION TO PROPOSED TILE SHALL BE INCIDENTAL TO TILE INSTALLATION.

PRE-FABRICATED TEE SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL.

CONNECT TO PROPOSED BRANCH TILE
NTS



NOTES:

- REFER TO TYPICAL CONNECTION DETAILS.

CROSS CONNECT SHALL BE PAID AS TWO (2) SEPARATE PAY ITEMS:

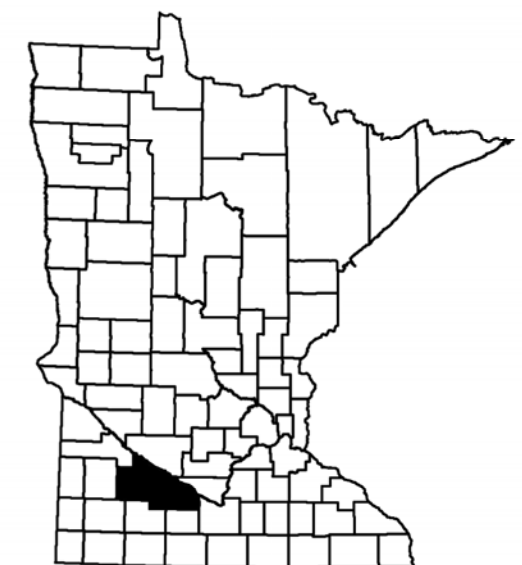
- X-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED PIPE
- X-INCH AGRICULTURAL TILE FOR LENGTHS GREATER THAN 40'

CROSS CONNECTION SHALL BE CONSTRUCTED WITH HDPE TILE.

CONNECTION TO PROPOSED TILE, EXISTING TILE, AND BULKHEAD ARE INCIDENTAL TO CROSS CONNECT.

TILE CONNECTIONS SHALL NOT BE INSTALLED COMPLETELY VERTICAL FROM TOP OF PIPE.

CROSS CONNECT TO EXISTING TILE
NTS



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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338

FILE NAME 23338 DETAILS

DRAWN BY KJH

DESIGNED BY JMW

REVIEWED BY JRR

ORIGINAL ISSUE DATE --/--

CLIENT PROJECT NO. -

TITLE

DETAILS

SHEET

8

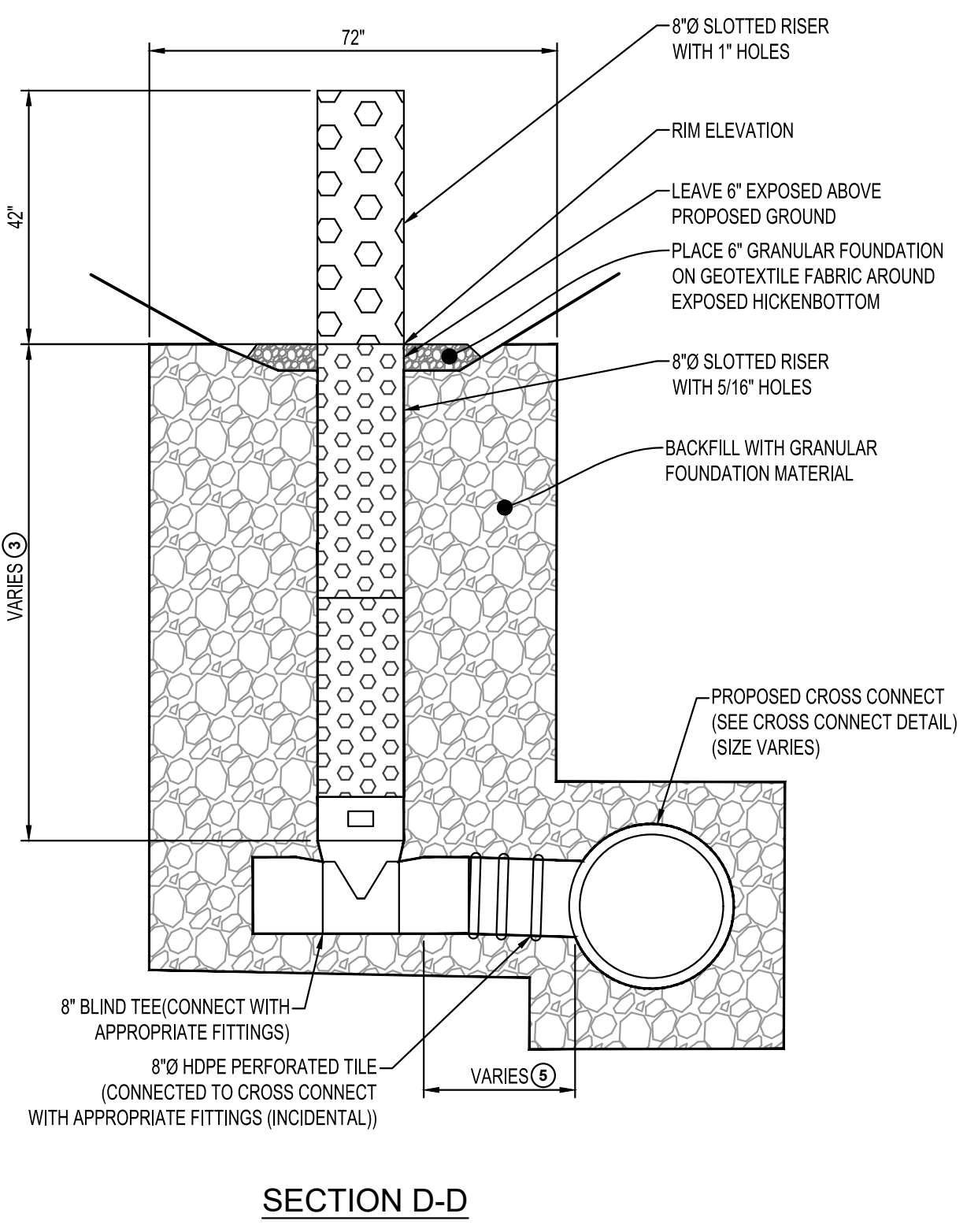
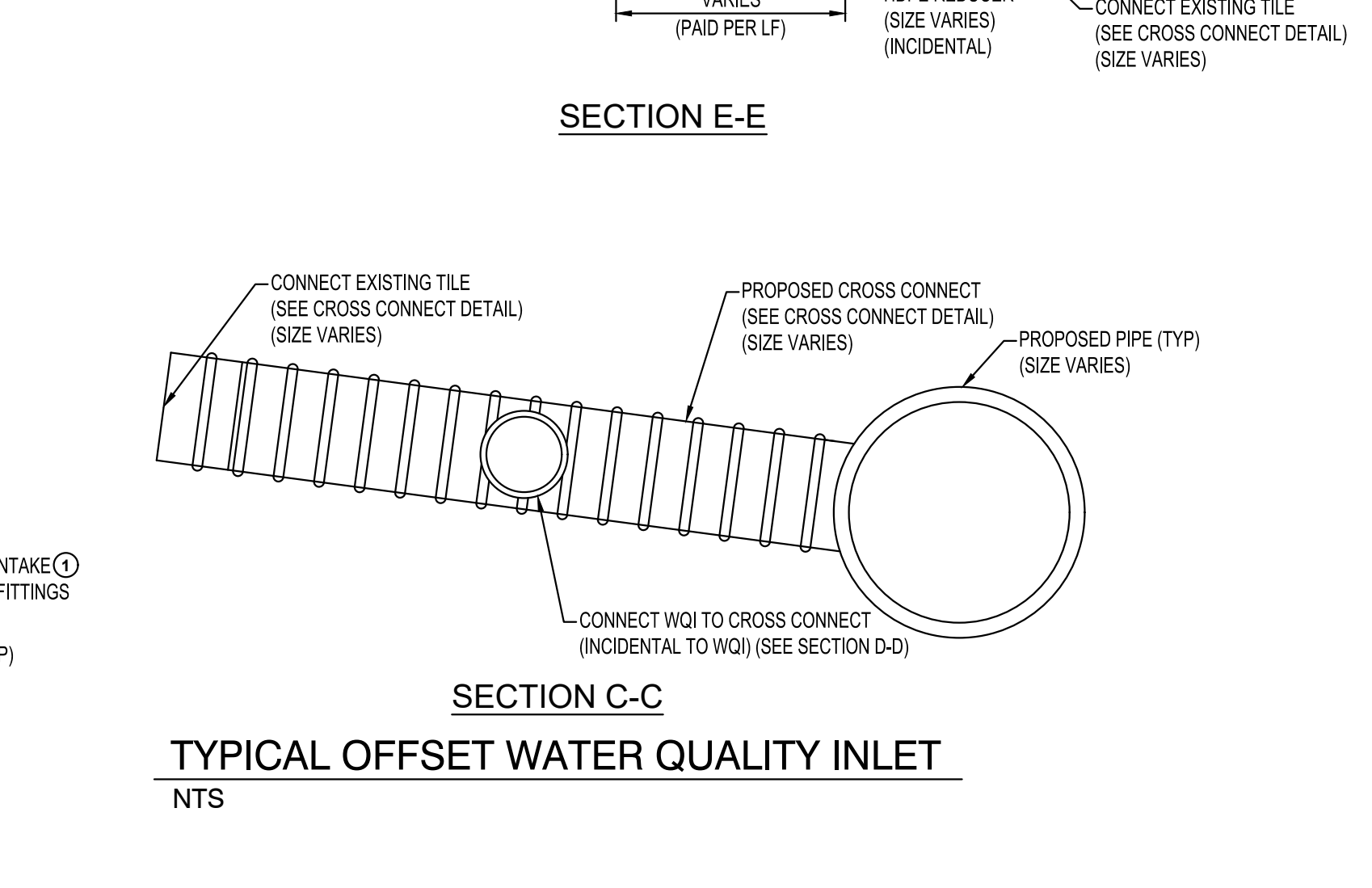
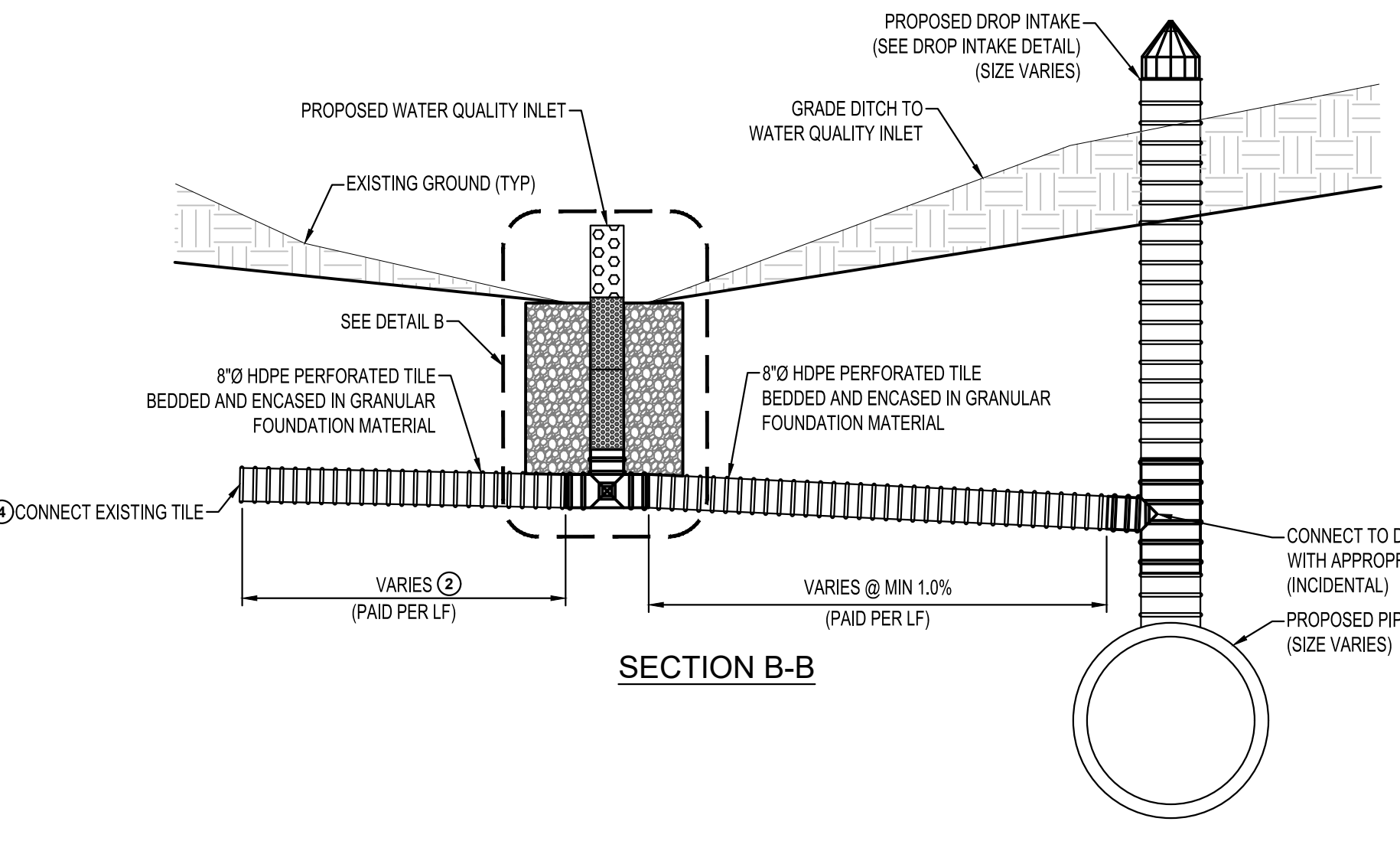
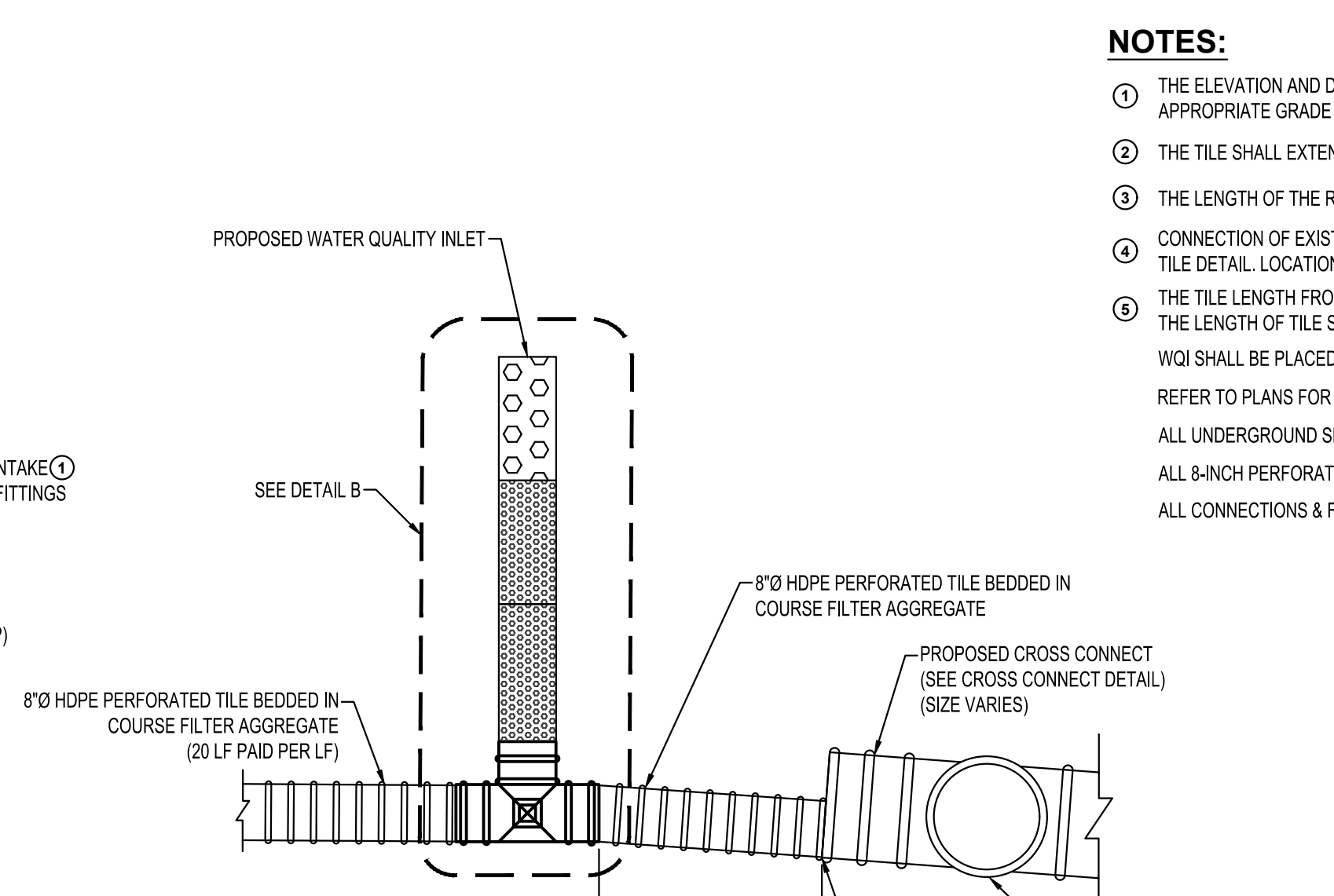
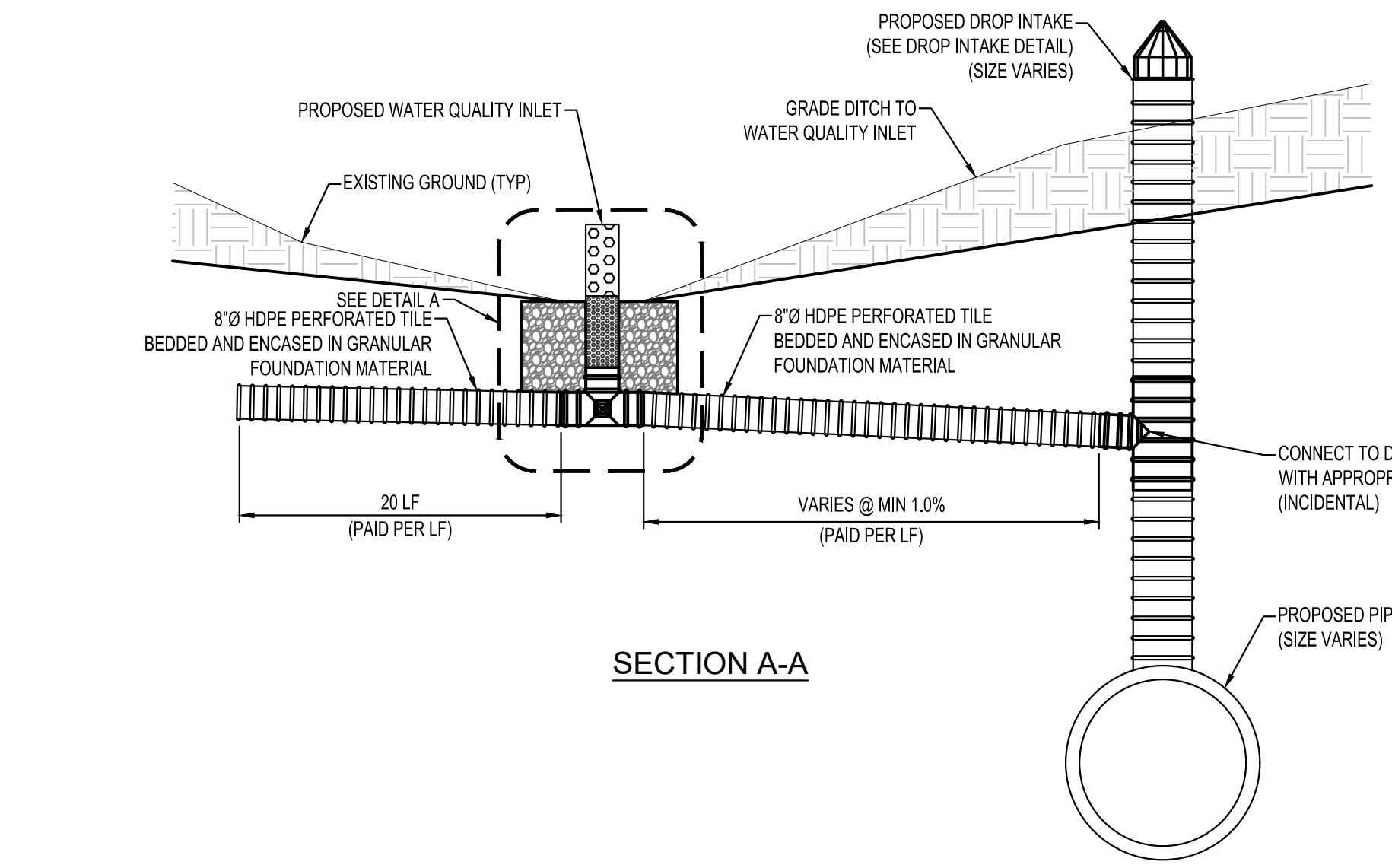
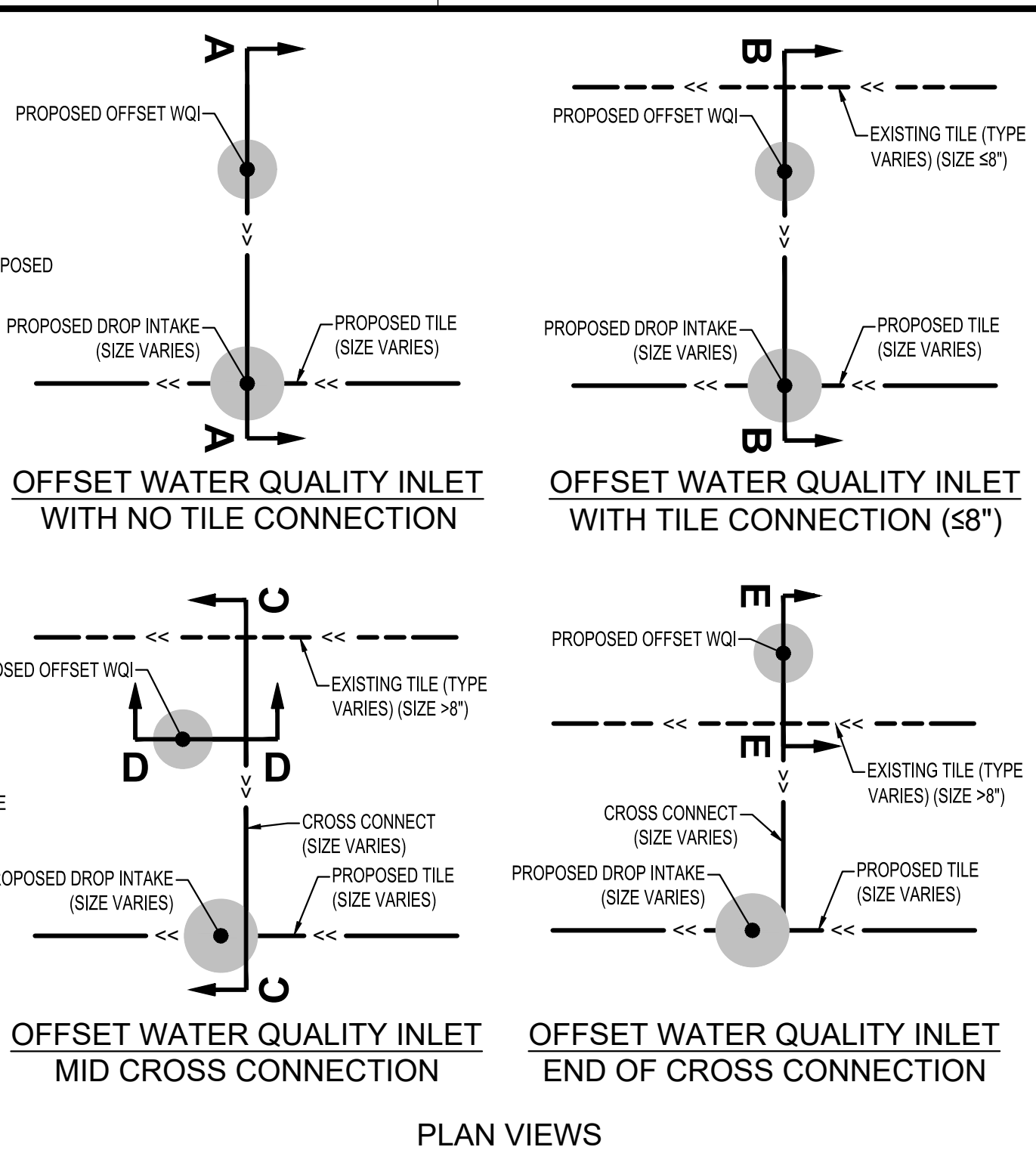
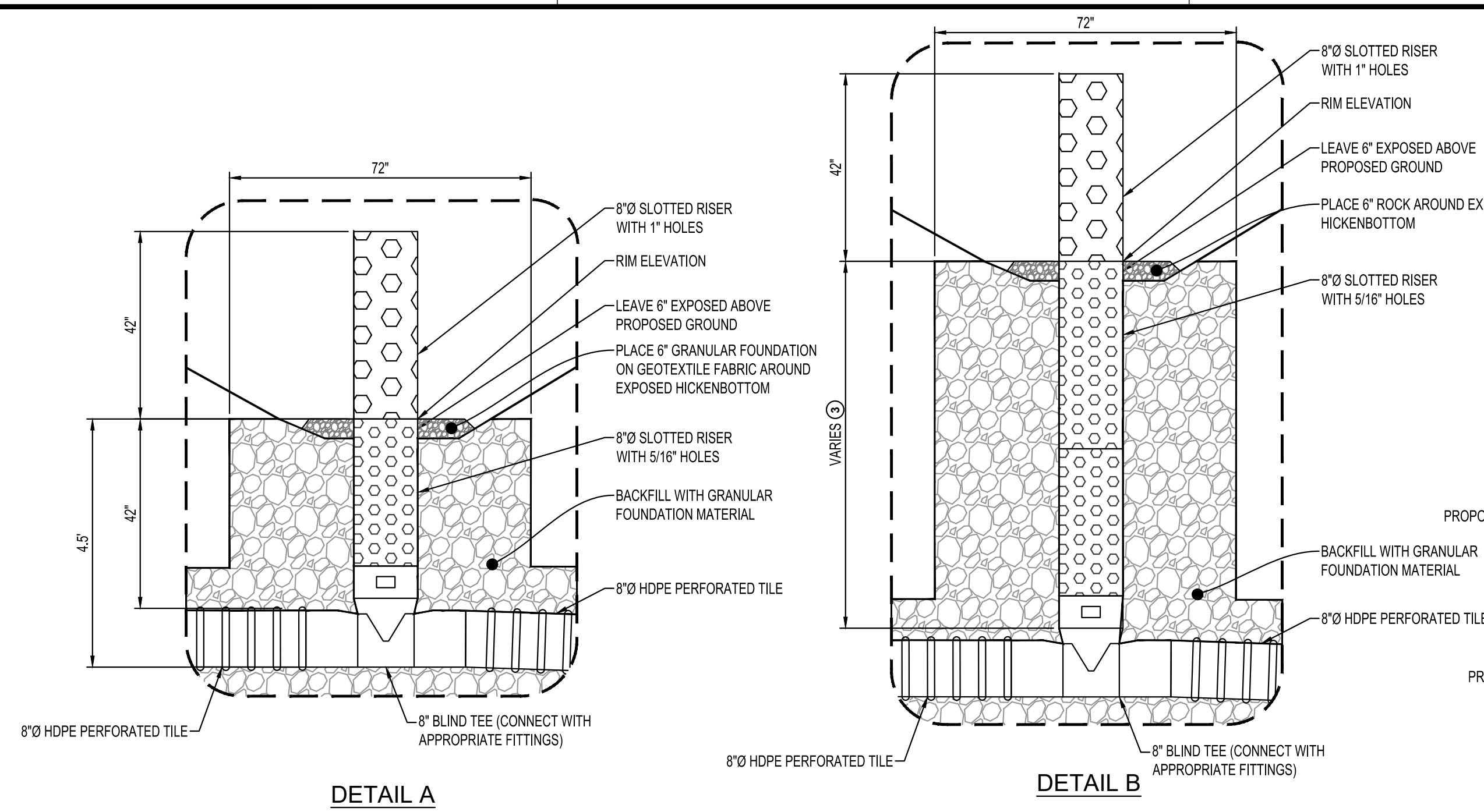
OF 24

TYPICAL BID ITEM BREAKDOWN:

SITUATION	BID ITEMS
OFFSET WATER QUALITY INLET WITH NO TILE CONNECTION	1. FURNISH & INSTALL WATER QUALITY INLET (EA) 2. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF)
OFFSET WATER QUALITY INLET WITH TILE CONNECTION (S8")	1. FURNISH & INSTALL WATER QUALITY INLET (EA) 2. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF) 3. CONNECT EXISTING X-INCH TILE
OFFSET WATER QUALITY INLET MID CROSS CONNECTION	1. XX-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED TILE (EA) 2. FURNISH & INSTALL WATER QUALITY INLET (EA) 3. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF)
OFFSET WATER QUALITY INLET END OF CROSS CONNECTION	1. XX-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED TILE (EA) 2. FURNISH & INSTALL WATER QUALITY INLET (EA) 3. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF)

BID ITEM INCIDENTALS:

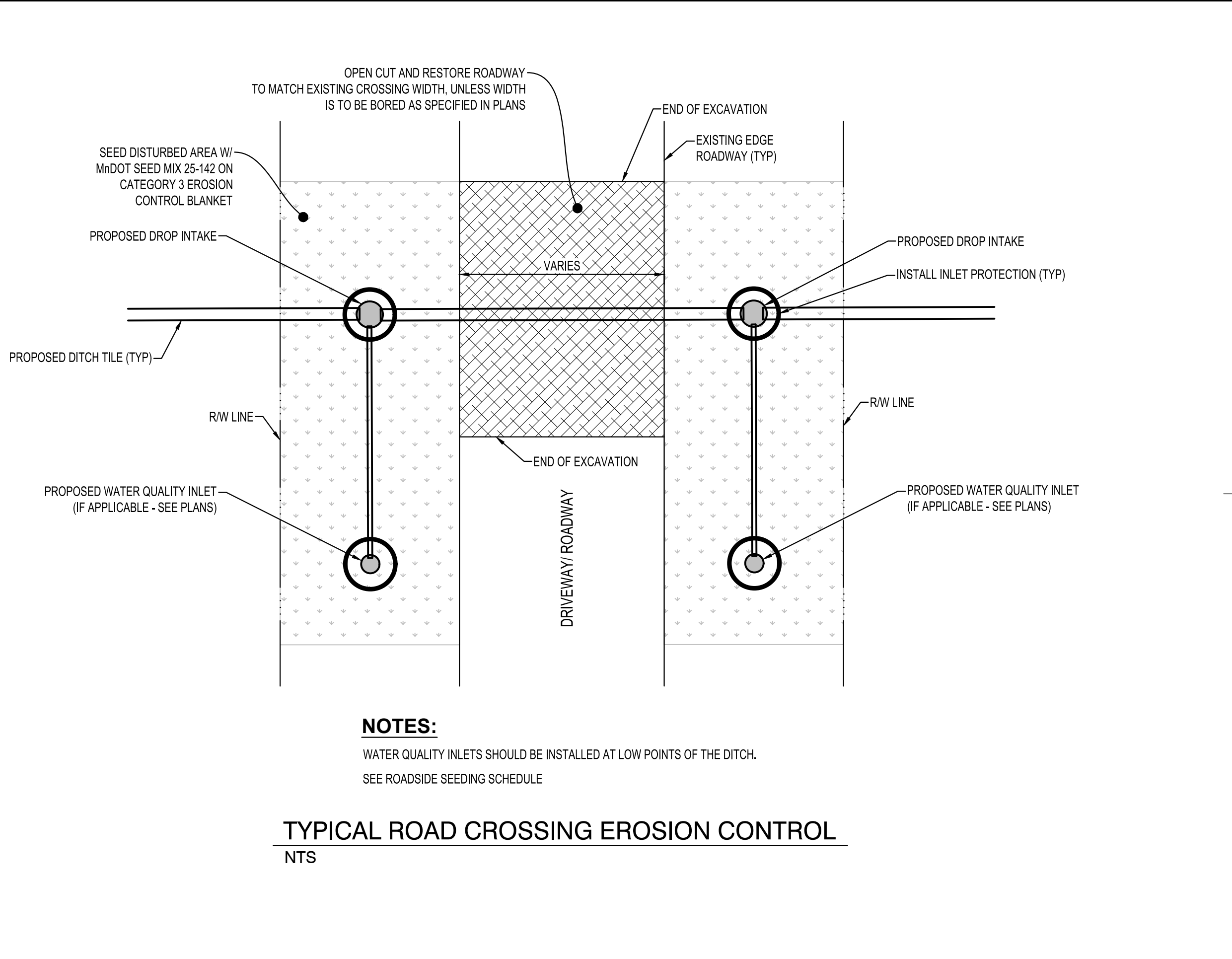
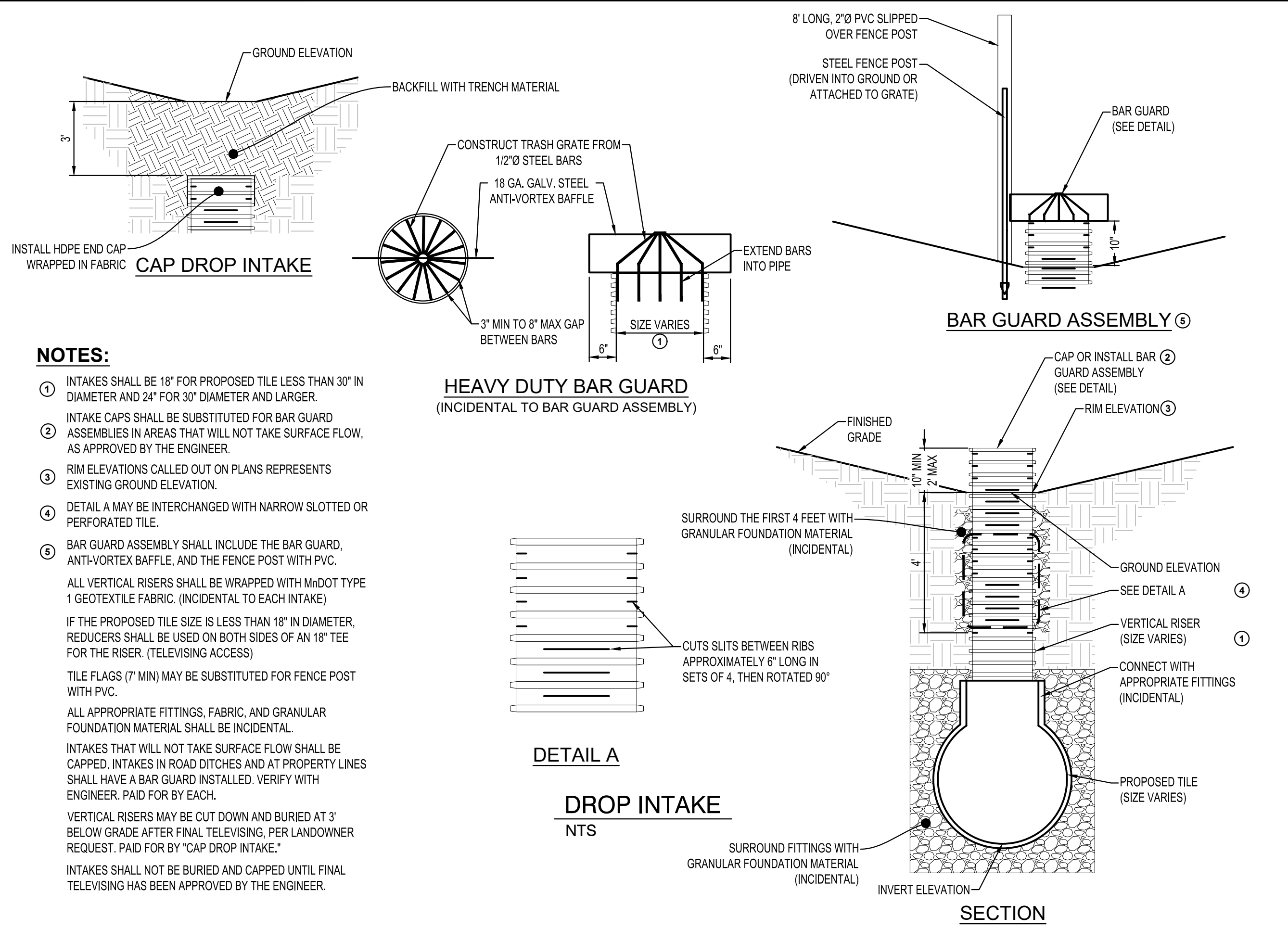
BID ITEM	UNIT	INCIDENTALS
FURNISH & INSTALL WATER QUALITY INLET	EA	ROCK, GEOTEXTILE FABRIC, RISER PIECES, BLIND TEE, FITTINGS, ALL CONNECTIONS
INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	PIPE, BEDDING AND ENCASMENT MATERIAL
CONNECT EXISTING X-INCH TILE	EA	REFER TO CONNECT TO EXISTING TILE DETAIL
XX-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED TILE	EA	REFER TO CROSS CONNECT TO EXISTING TILE DETAIL



NOTES:

- THE ELEVATION AND DEPTH OF THE CONNECTION VARIES. IF NECESSARY, THE CONNECTION SHALL BE MADE INTO THE PROPOSED TILE IN ORDER TO OBTAIN APPROPRIATE GRADE. IF APPROPRIATE GRADE CANNOT BE OBTAINED, THE ENGINEER SHALL BE NOTIFIED FOR GRADE ADJUSTMENTS. ANY ADDITIONAL MATERIAL AND FITTINGS SHALL BE INCIDENTAL.
- THE TILE SHALL EXTEND TO THE EXISTING TILE TO BE CONNECTED OR 20 LF PAST THE OFFSET WQI, WHICHEVER IS GREATER.
- THE LENGTH OF THE RISER VARIES BASED ON THE DEPTH REQUIRED TO CONNECT THE EXISTING TILE. THE EXTRA RISER LENGTH SHALL BE INCIDENTAL TO THE WQI.
- CONNECTION OF EXISTING TILES TO THE PERFORATED TILE OF THE OFFSET WATER QUALITY INLET SHALL BE PAID FOR AS A CONNECTION AND CONFORM TO THE CONNECT EXISTING TILE DETAIL. LOCATION OF CONNECTION VARIES.
- THE TILE LENGTH FROM THE CROSS CONNECT TO THE OFFSET WQI VARIES BASED ON THE LOCATION OF THE CROSS CONNECT COMPARED WITH THE BOTTOM OF THE ROAD DITCH. THE LENGTH OF TILE SHALL BE PAID FOR BY THE LINEAR FOOT. WQI SHALL BE PLACED IN THE LOW SPOT OF THE ROAD DITCH. REFER TO PLANS FOR SIZES. ALL UNDERGROUND SEGMENTS OF THE RISER SHALL BE WRAPPED IN M&DOT TYPE I GEOTEXTILE FABRIC. ALL 8-INCH PERFORATED TILE SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL. ALL CONNECTIONS & FITTINGS SHALL BE WRAPPED IN FABRIC, ENCASED IN SPECIFIED ROCK, AND BE APPROVED BY THE ENGINEER.

PLOT DATE: 11/6/2024 3:15 PM



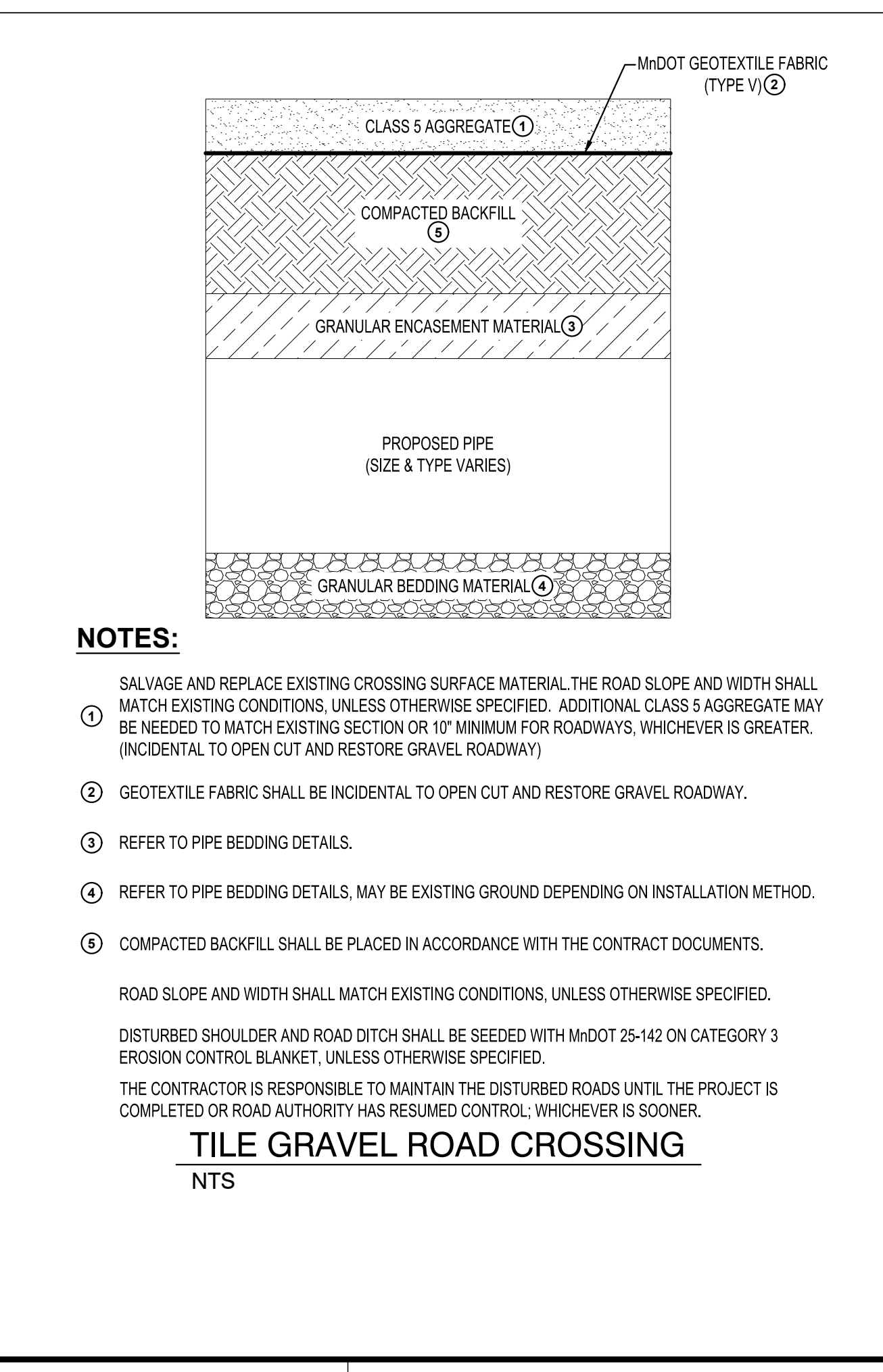
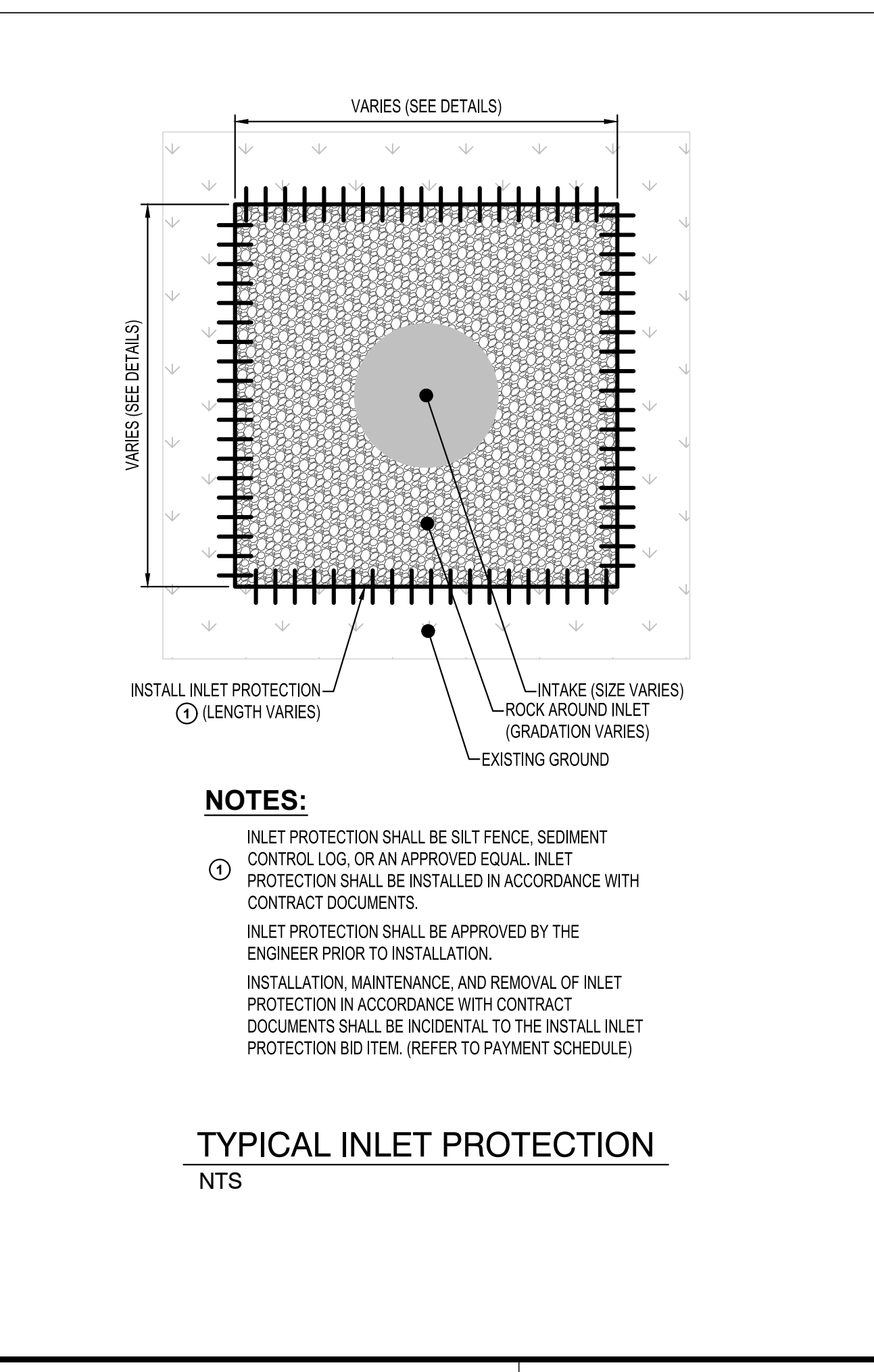
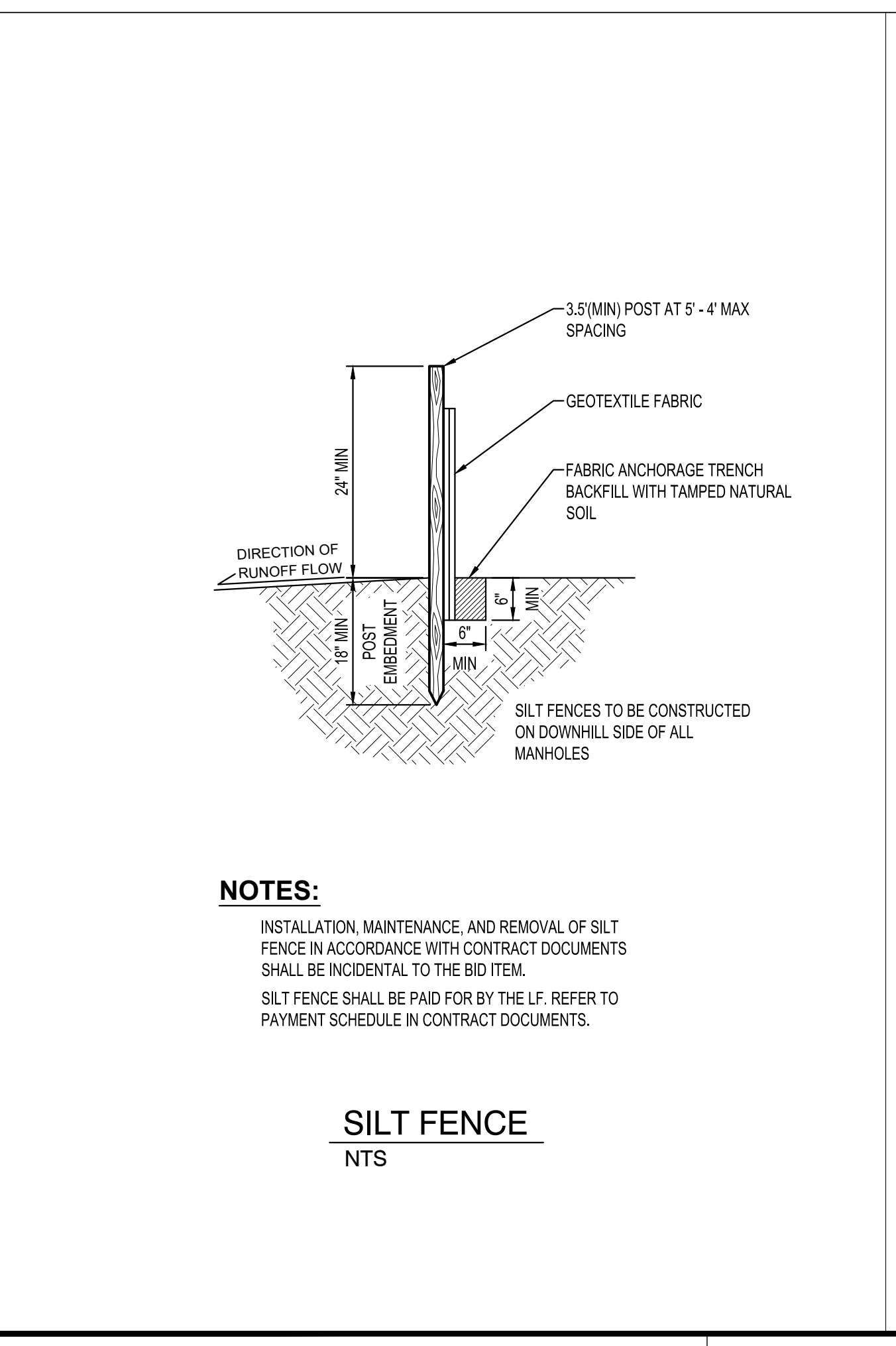
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PRELIMINARY NOT FOR CONSTRUCTION

DATE: _____ LIC. NO. _____

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338

FILE NAME 23338 DETAILS

DRAWN BY KJH

DESIGNED BY JMW

REVIEWED BY JRR

ORIGINAL ISSUE DATE --/--

CLIENT PROJECT NO. -

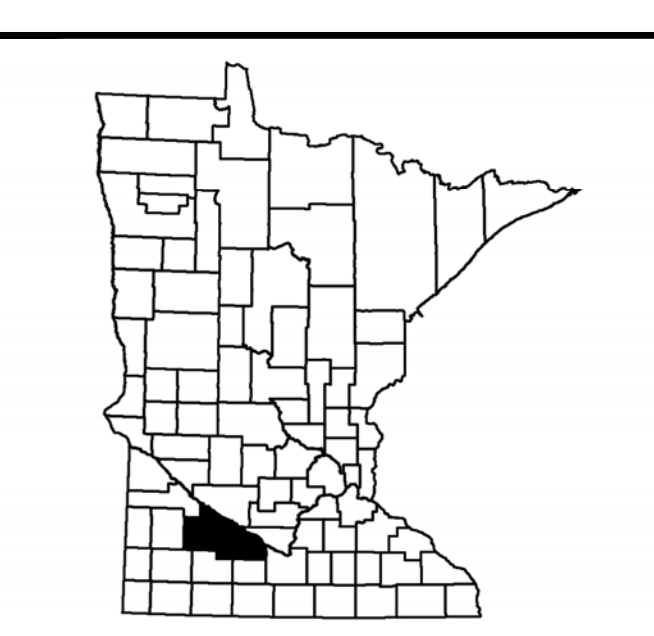
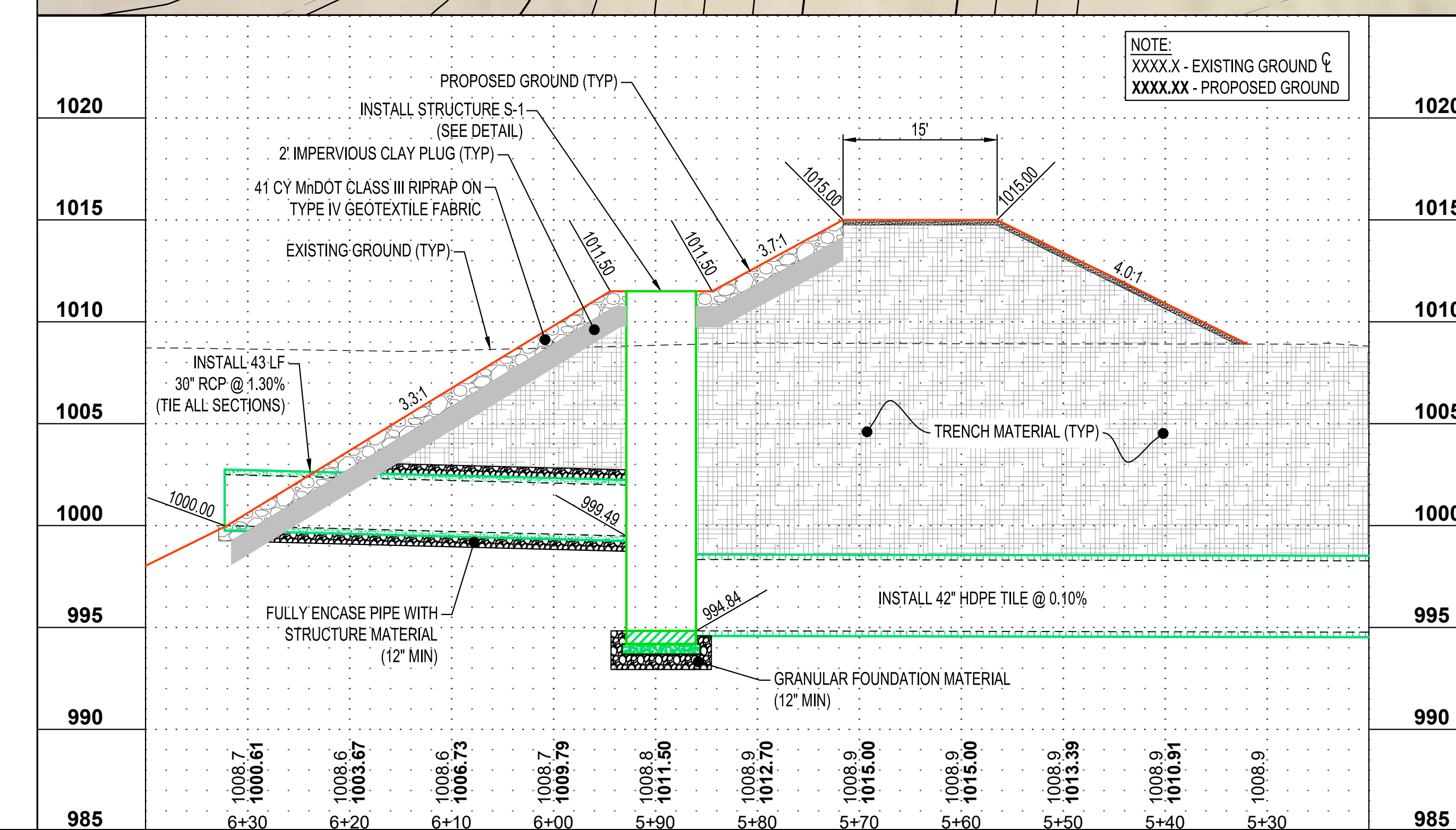
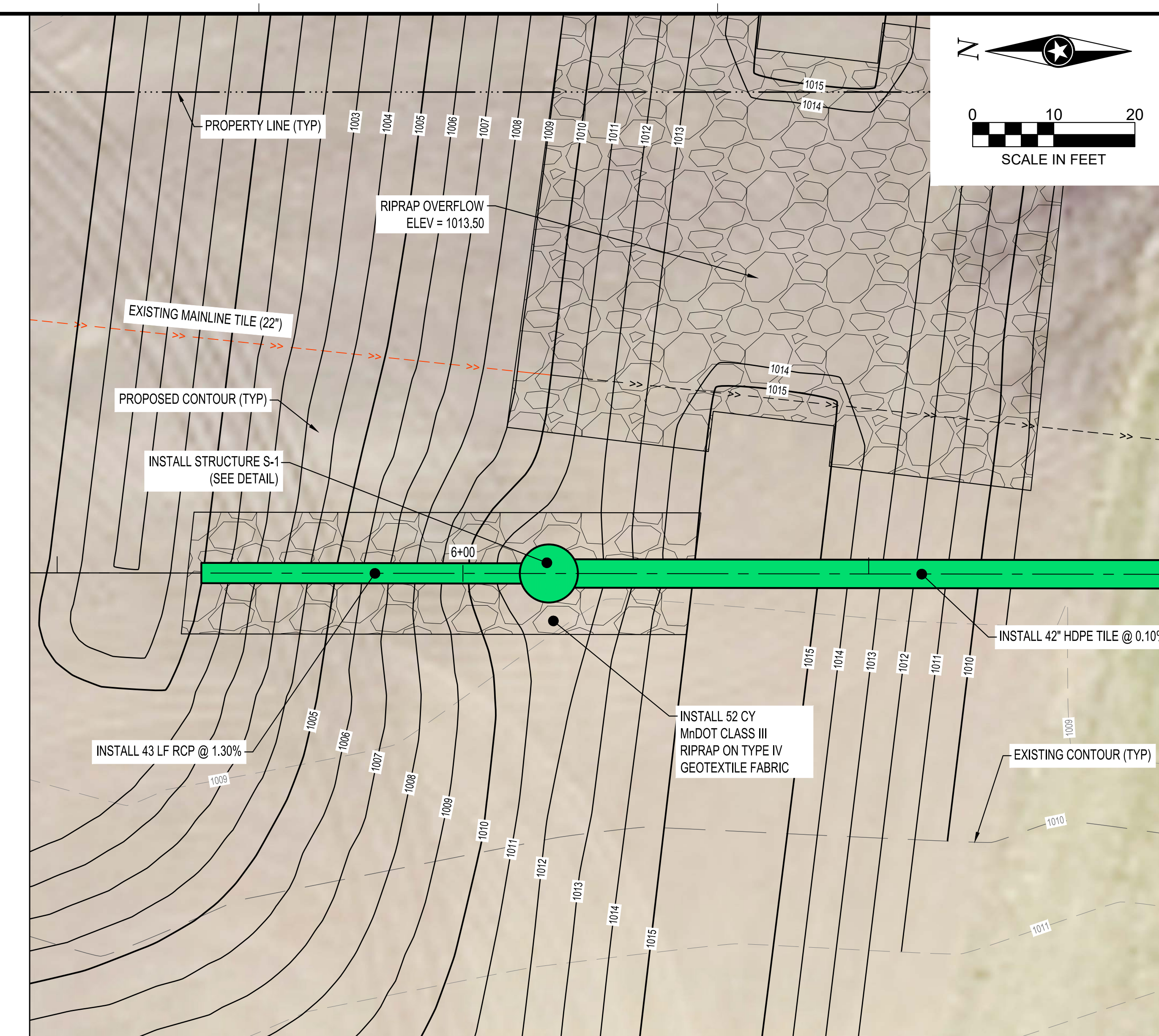
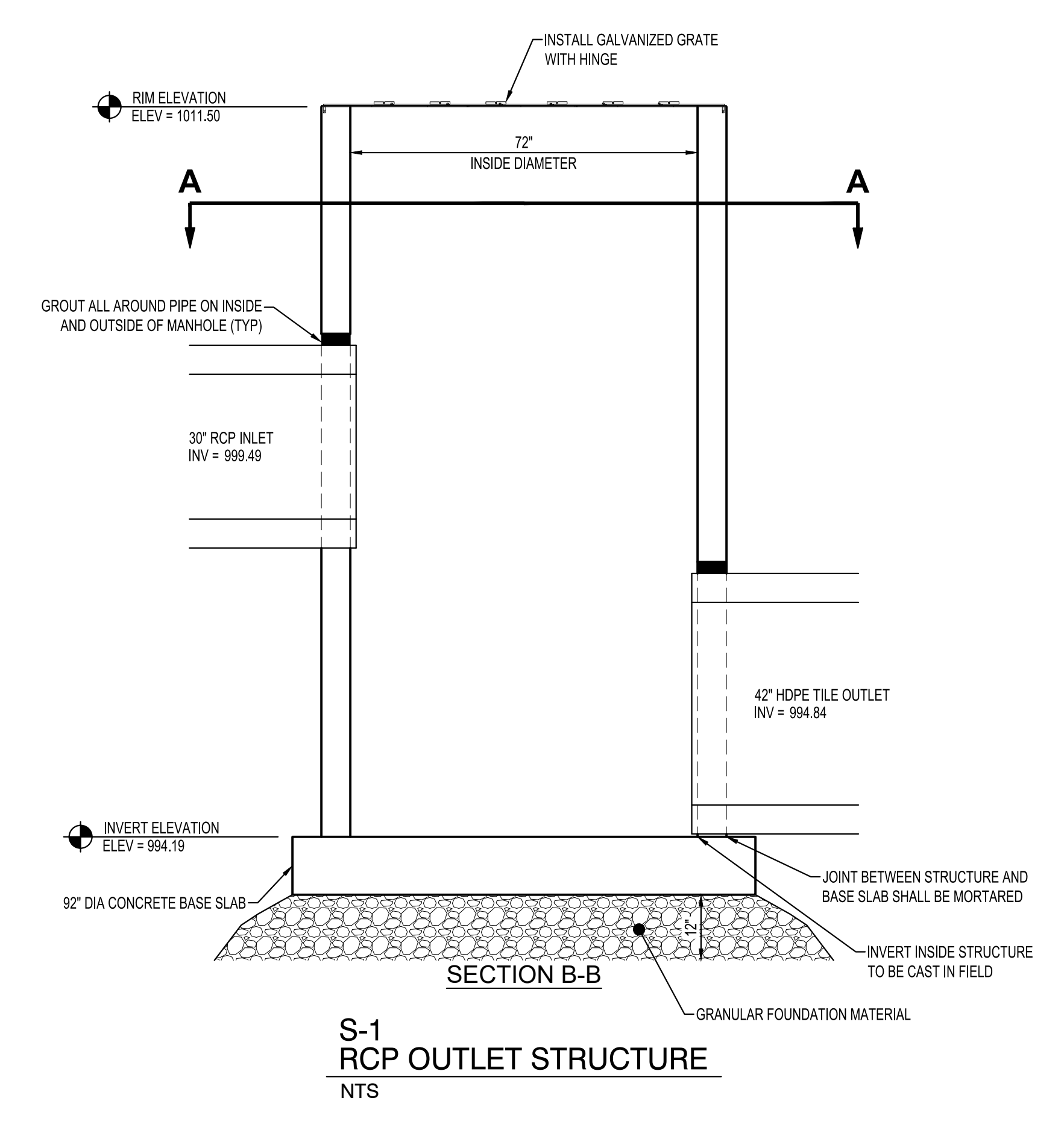
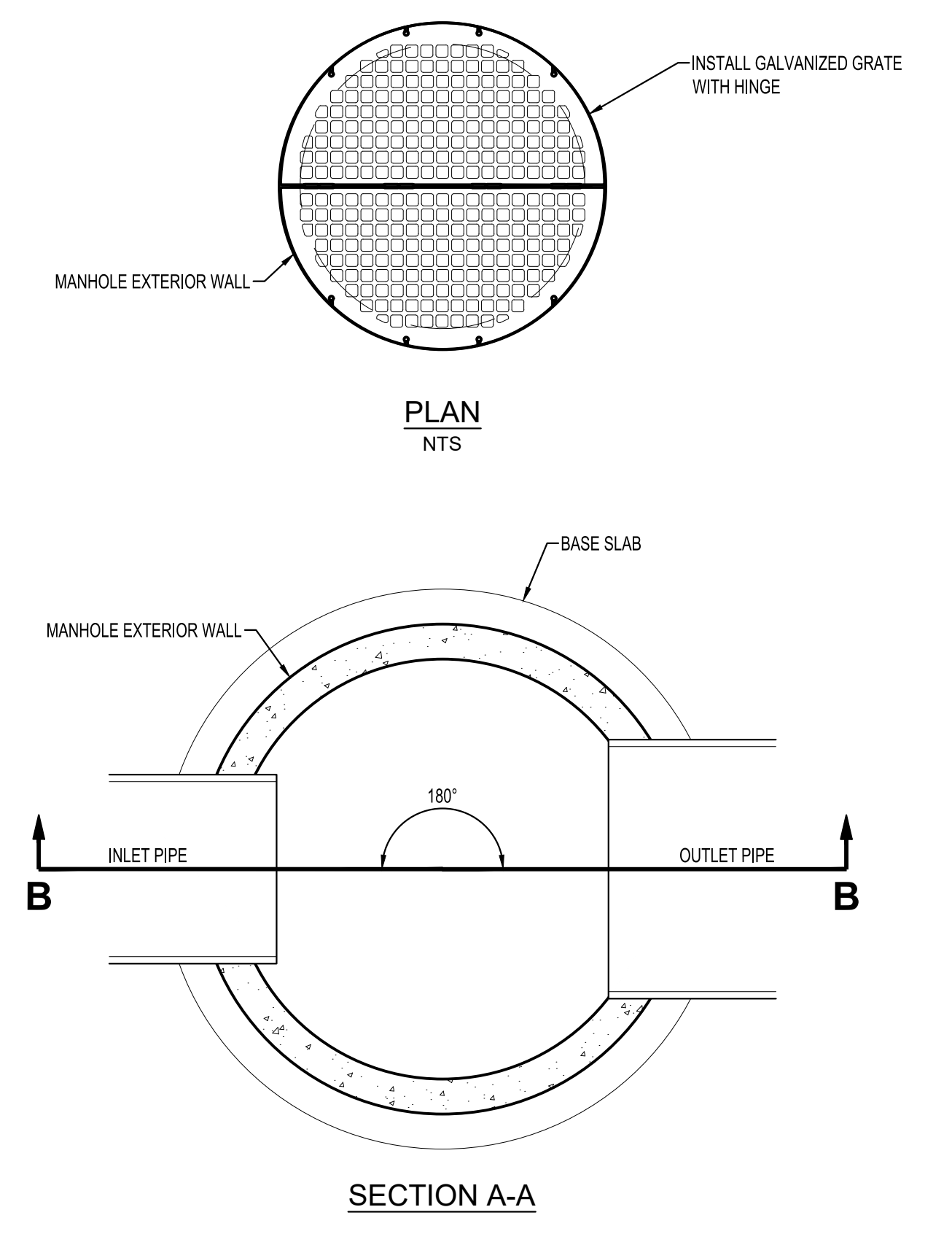
TITLE

DETAILS

SHEET

9 OF 24

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

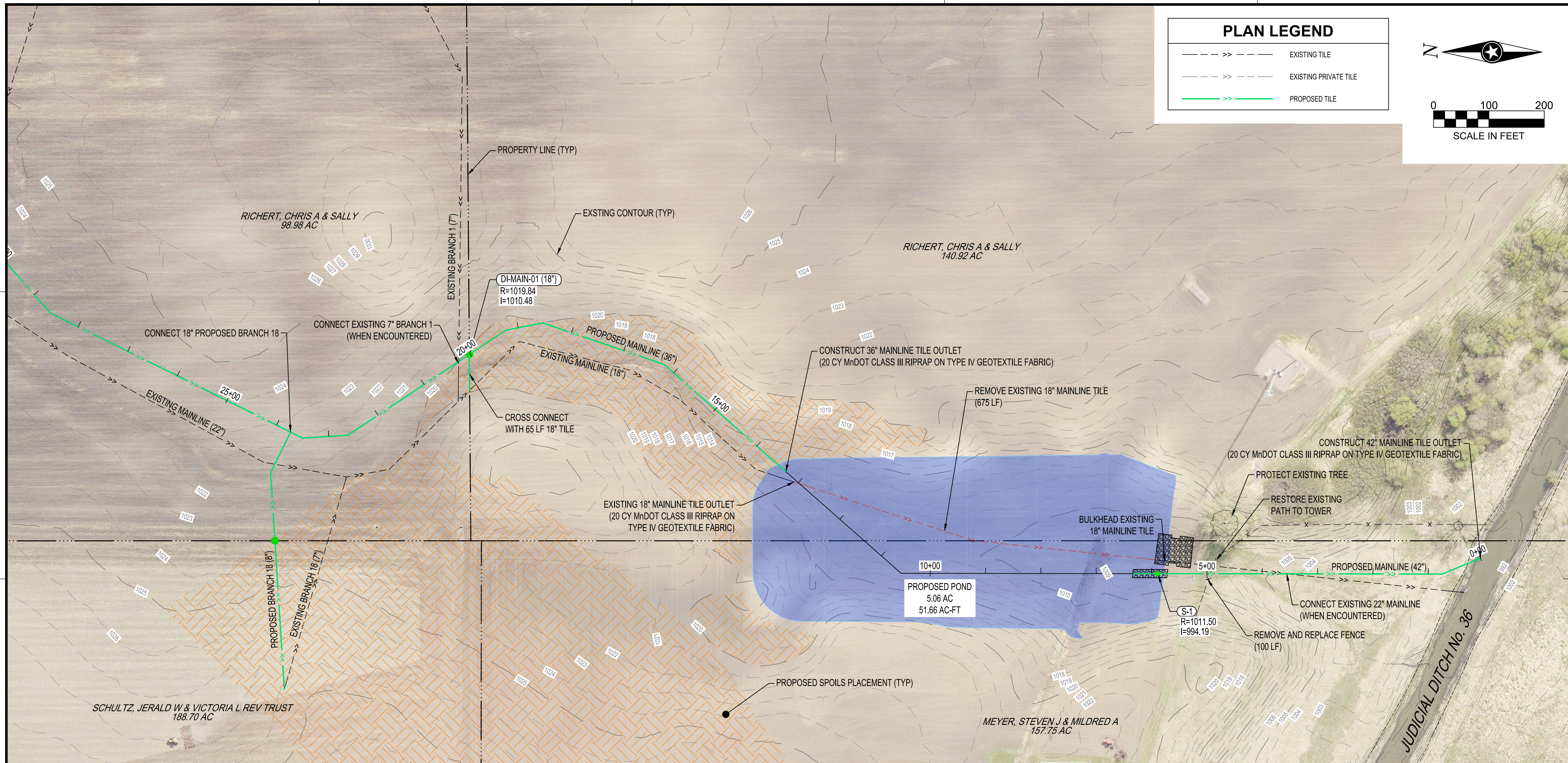
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 FILE NAME 23338 POND OUTLET
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--/--
 CLIENT PROJECT NO. --

TITLE

STRUCTURE S-1 DETAIL

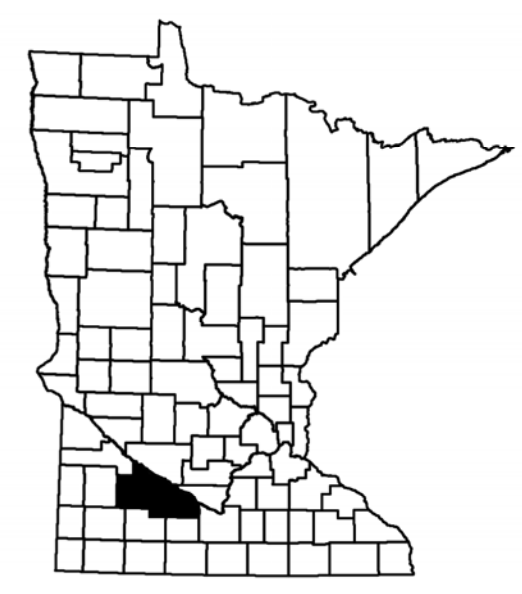
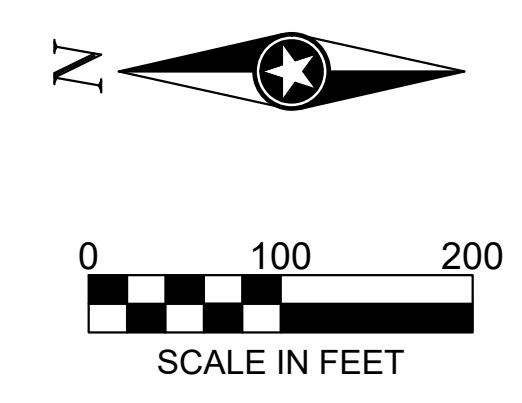
SHEET

10 OF 24



PLAN LEGEND

	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO. 22-23338

FILE NAME 23338 MAINLINE PROFILES

DRAWN BY KJH

DESIGNED BY JMW

REVIEWED BY JRR

ORIGINAL ISSUE DATE --/--

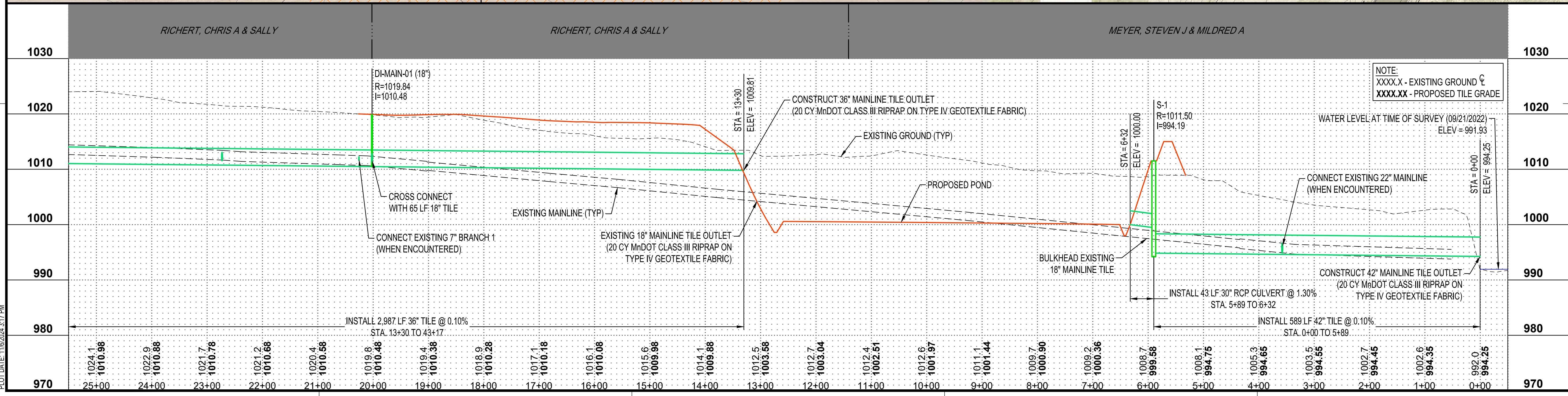
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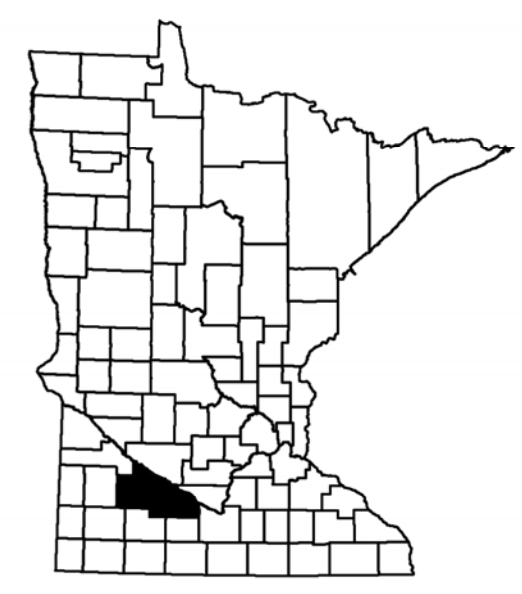
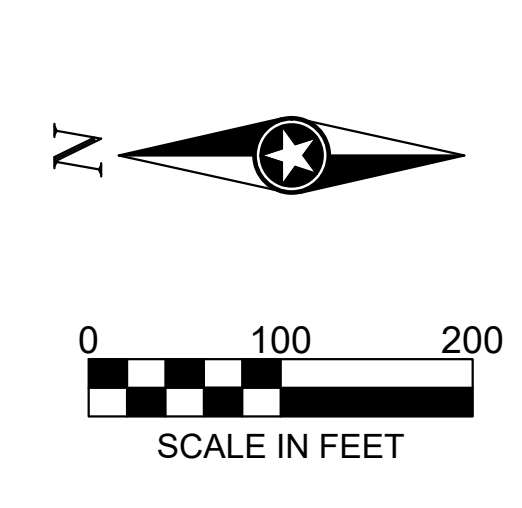
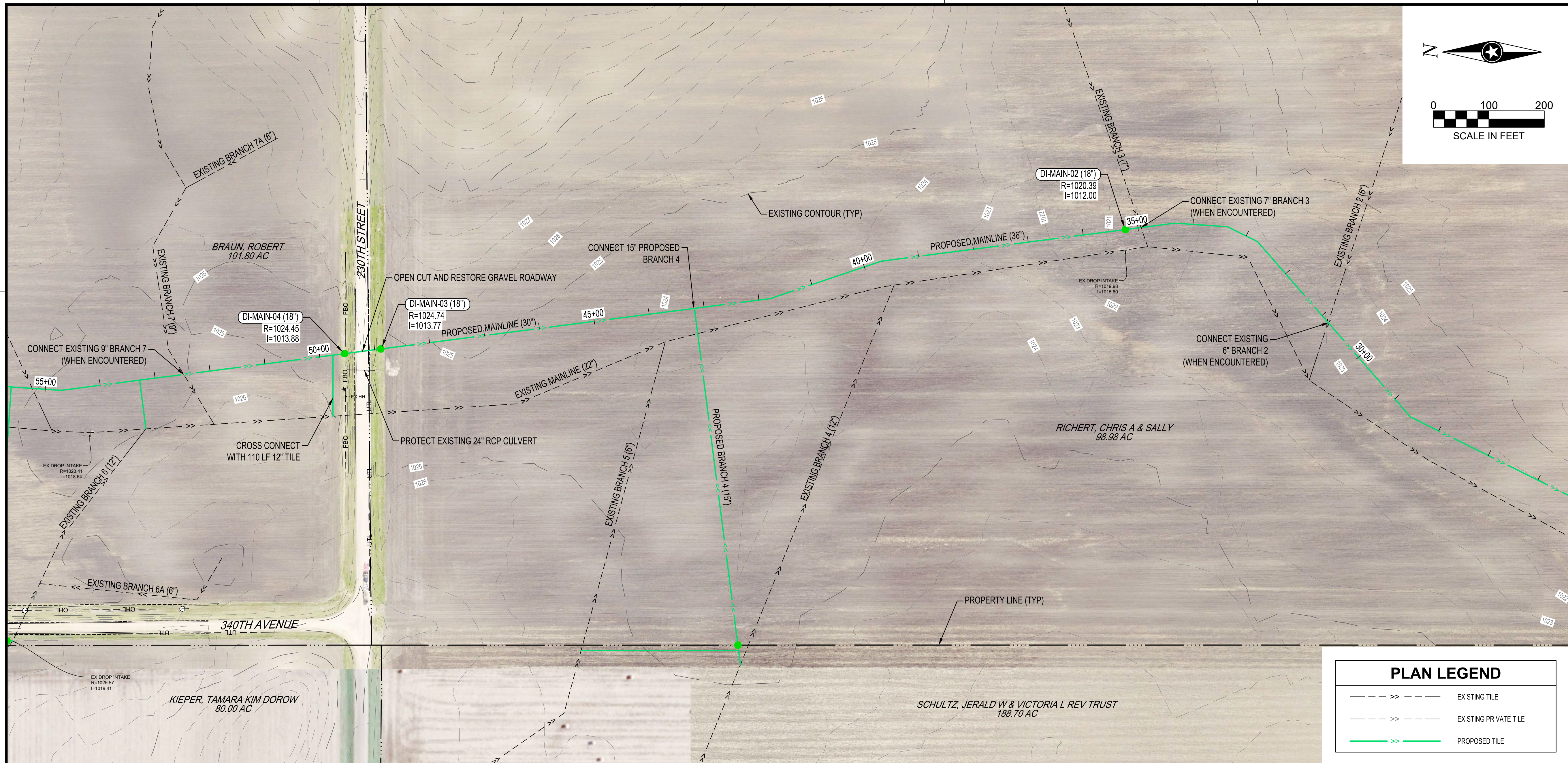
PLAN - PROFILE MAINLINE

SHEET

11 OF 24



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DATE: _____ LIC. NO. _____

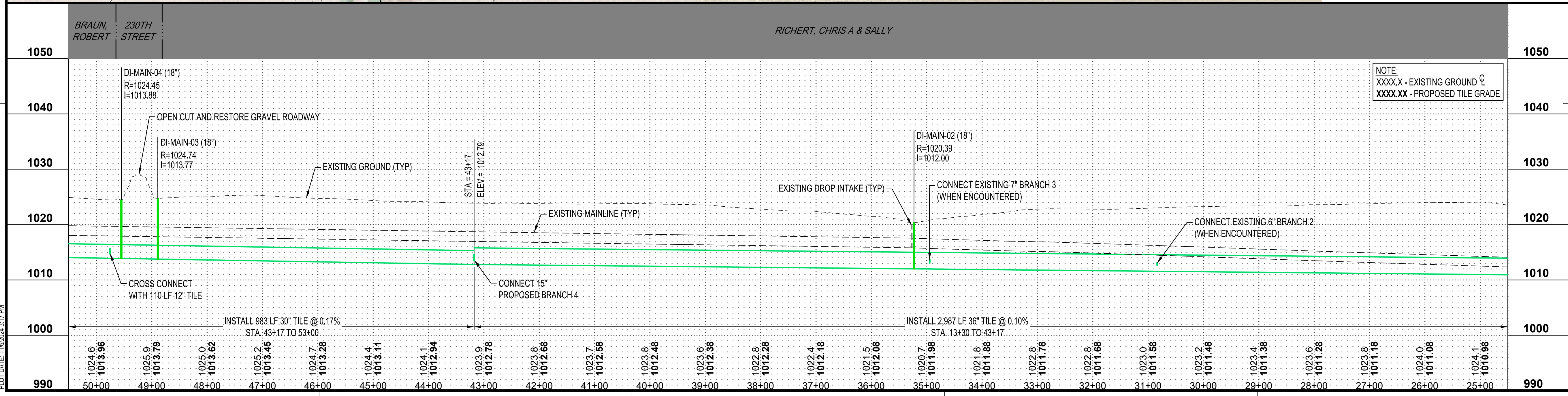
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PLAN LEGEND	
--- >> ---	EXISTING TILE
--- >> ---	EXISTING PRIVATE TILE
--- >> ---	PROPOSED TILE

PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA



NOTE:
 XXXX.X - EXISTING GROUND E
 XXXX.XX - PROPOSED TILE GRADE

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

TITLE

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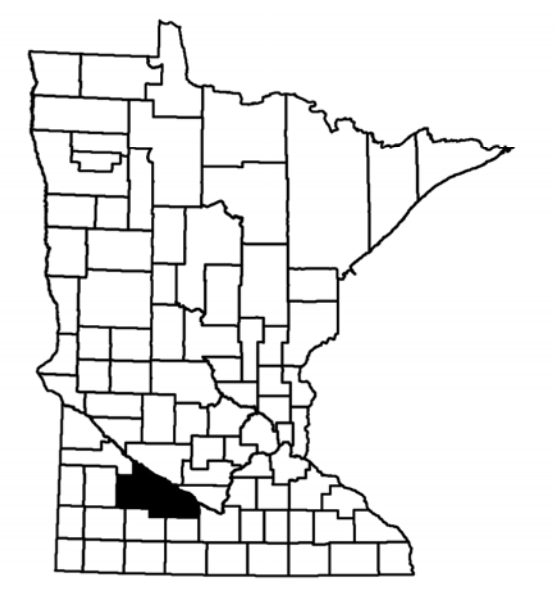
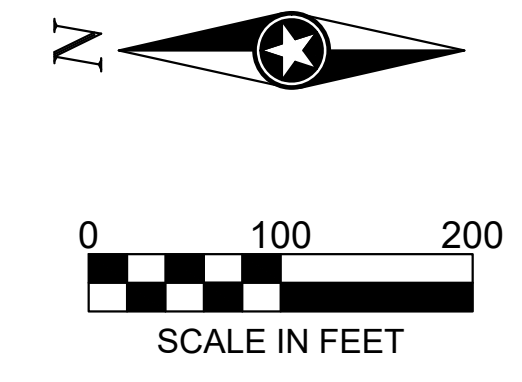
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12 OF 24

PLOT DATE: 11/6/2024 3:17 PM



PLAN LEGEND	
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

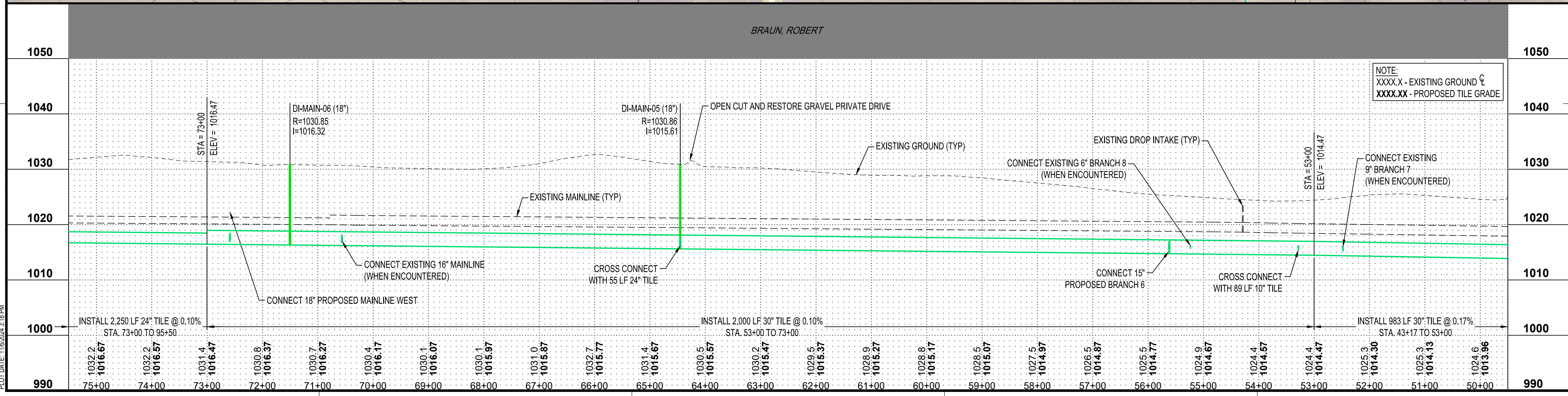
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FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

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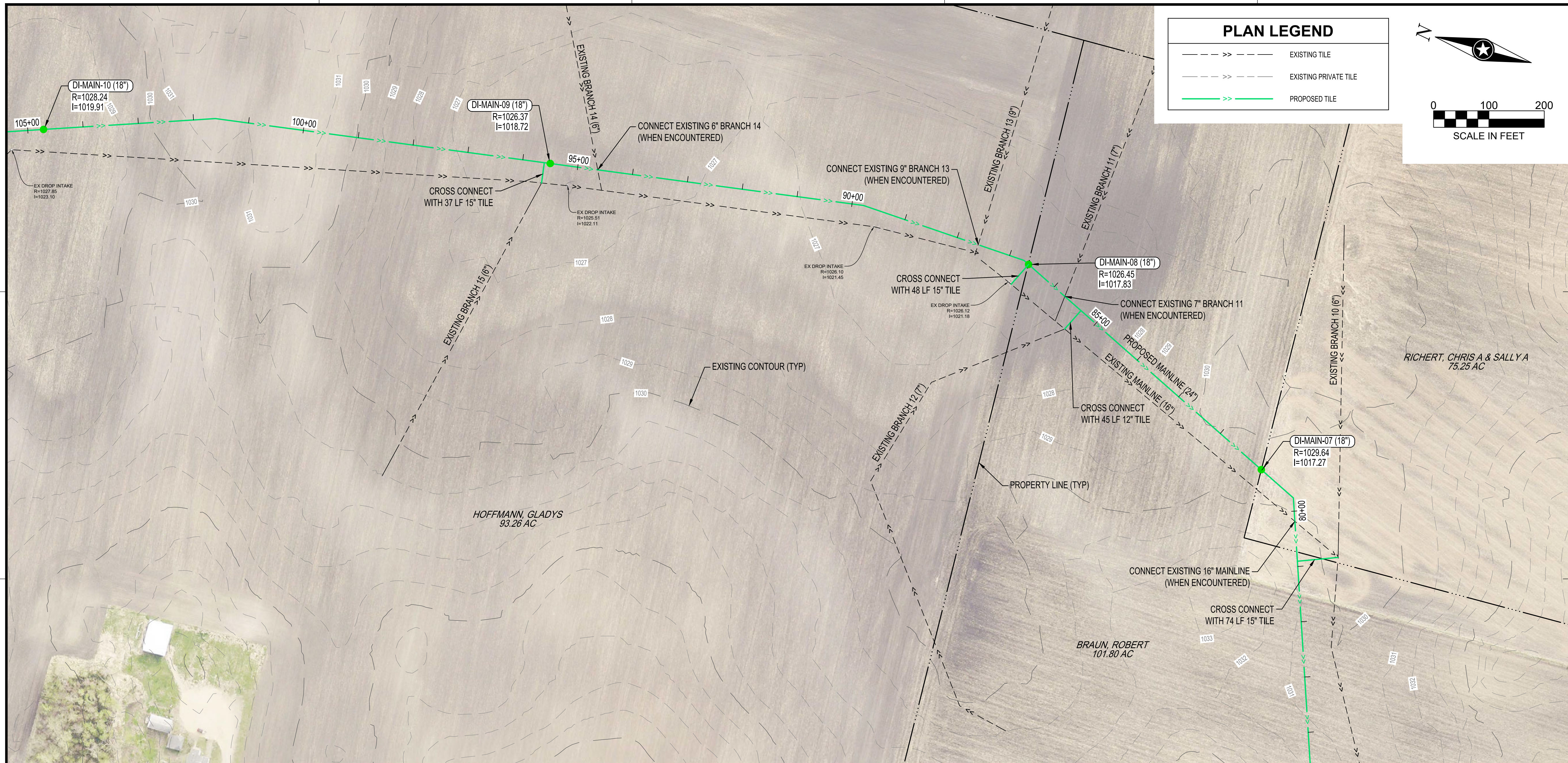
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13 OF 24

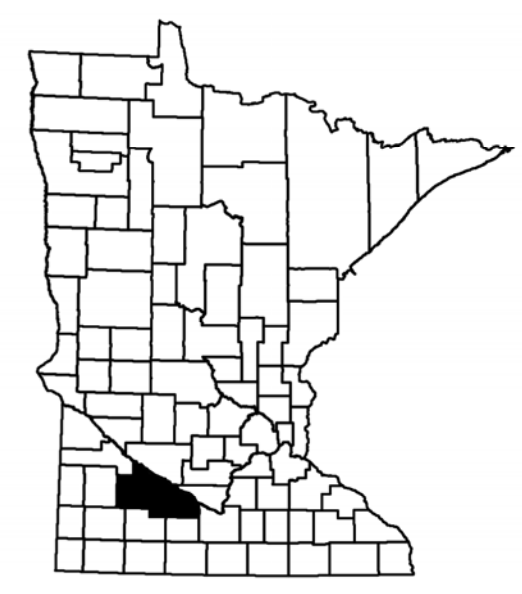
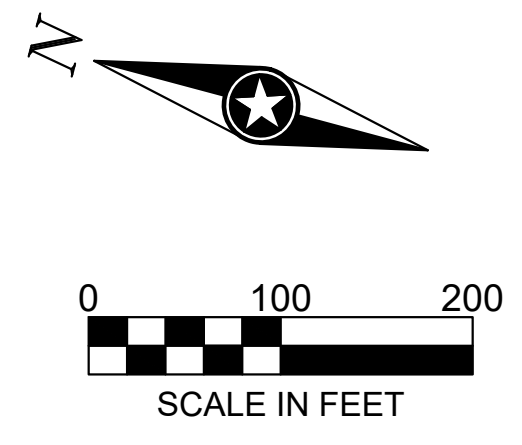


NOTE:
 XXXX.X - EXISTING GROUND E
 XXXX.XX - PROPOSED TILE GRADE

PLOT DATE: 11/6/2024 3:18 PM



PLAN LEGEND	
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

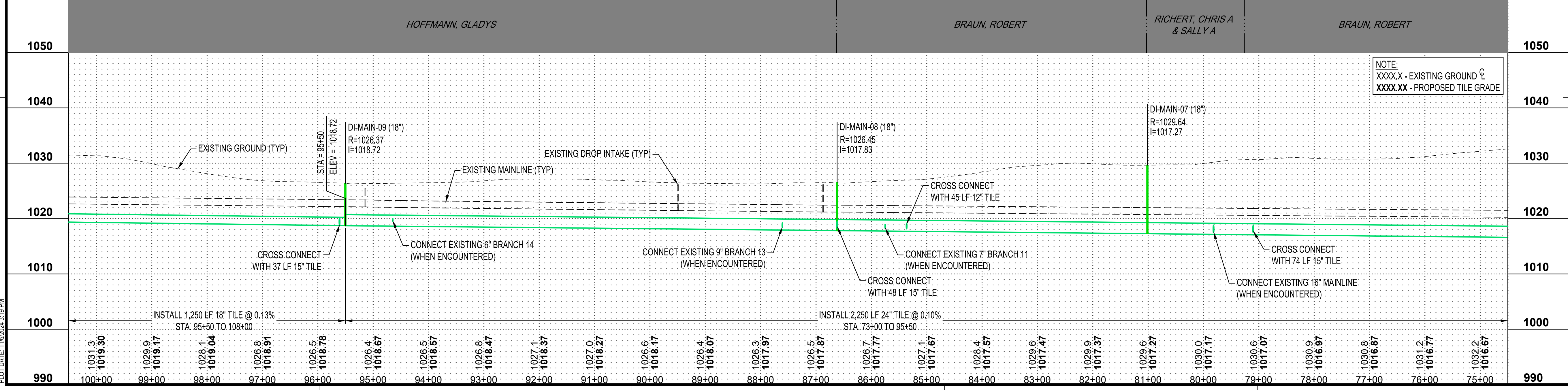
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FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

TITLE

PLAN - PROFILE MAINLINE

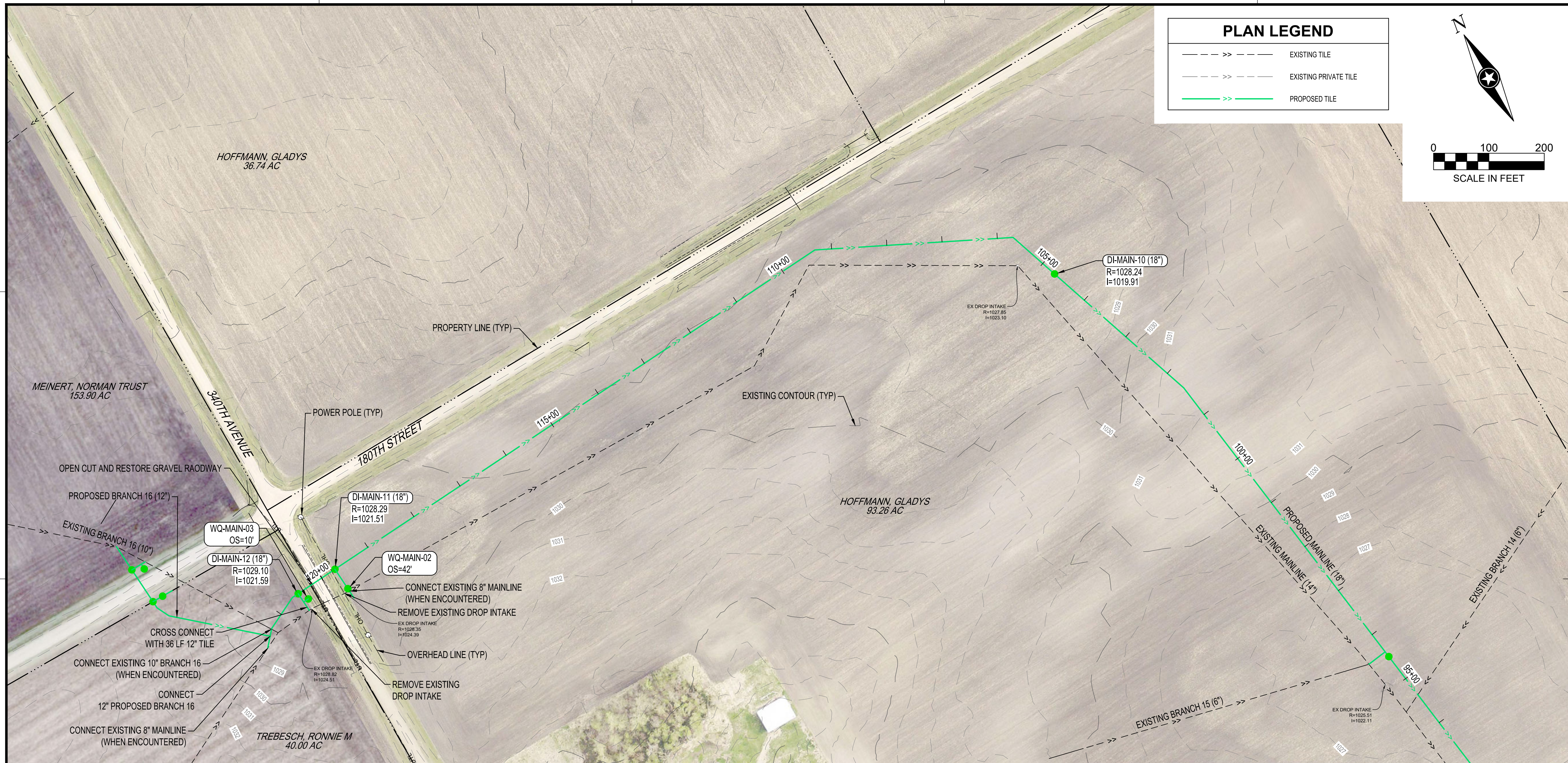
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14 OF 24

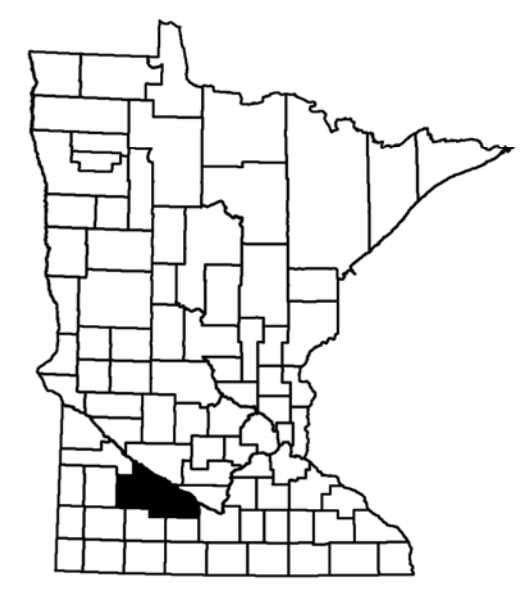
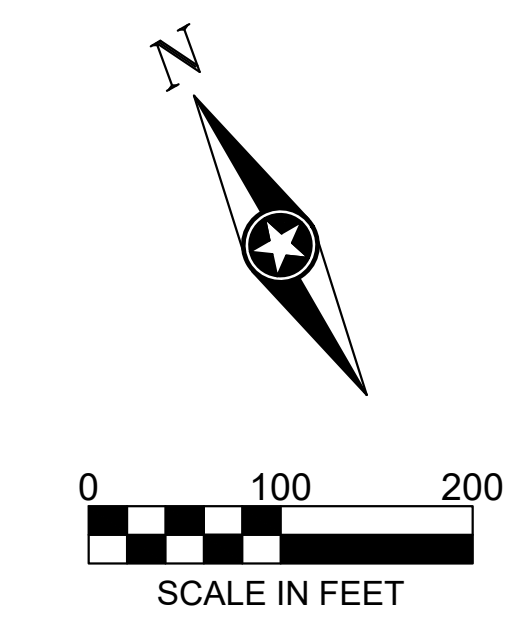


NOTE:
 XXXX.X - EXISTING GROUND E
 XXXX.XX - PROPOSED TILE GRADE

PLOT DATE: 11/6/2024 3:19 PM



PLAN LEGEND	
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



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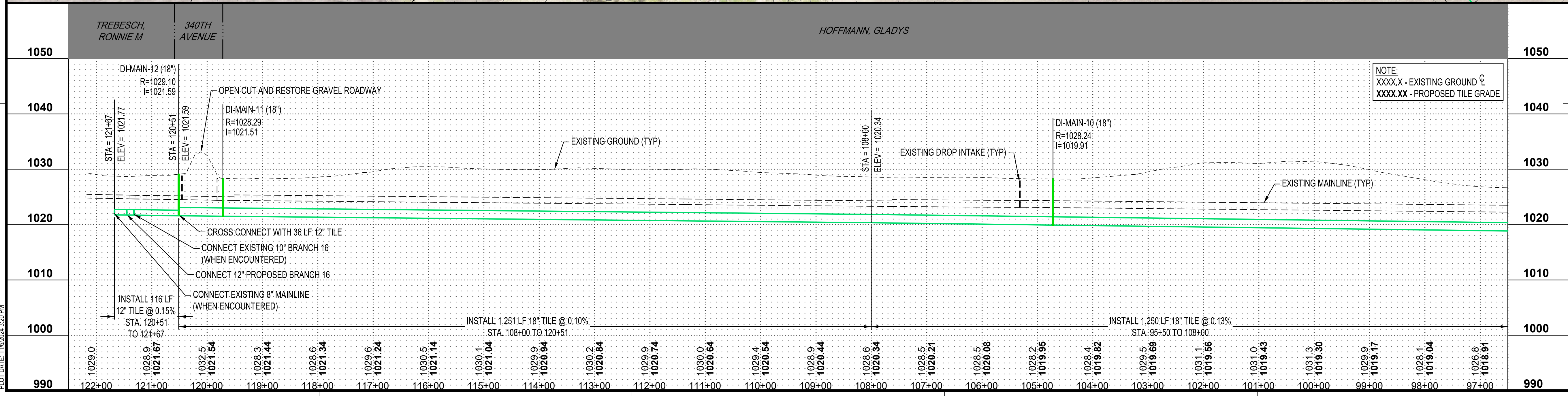
PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
 BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

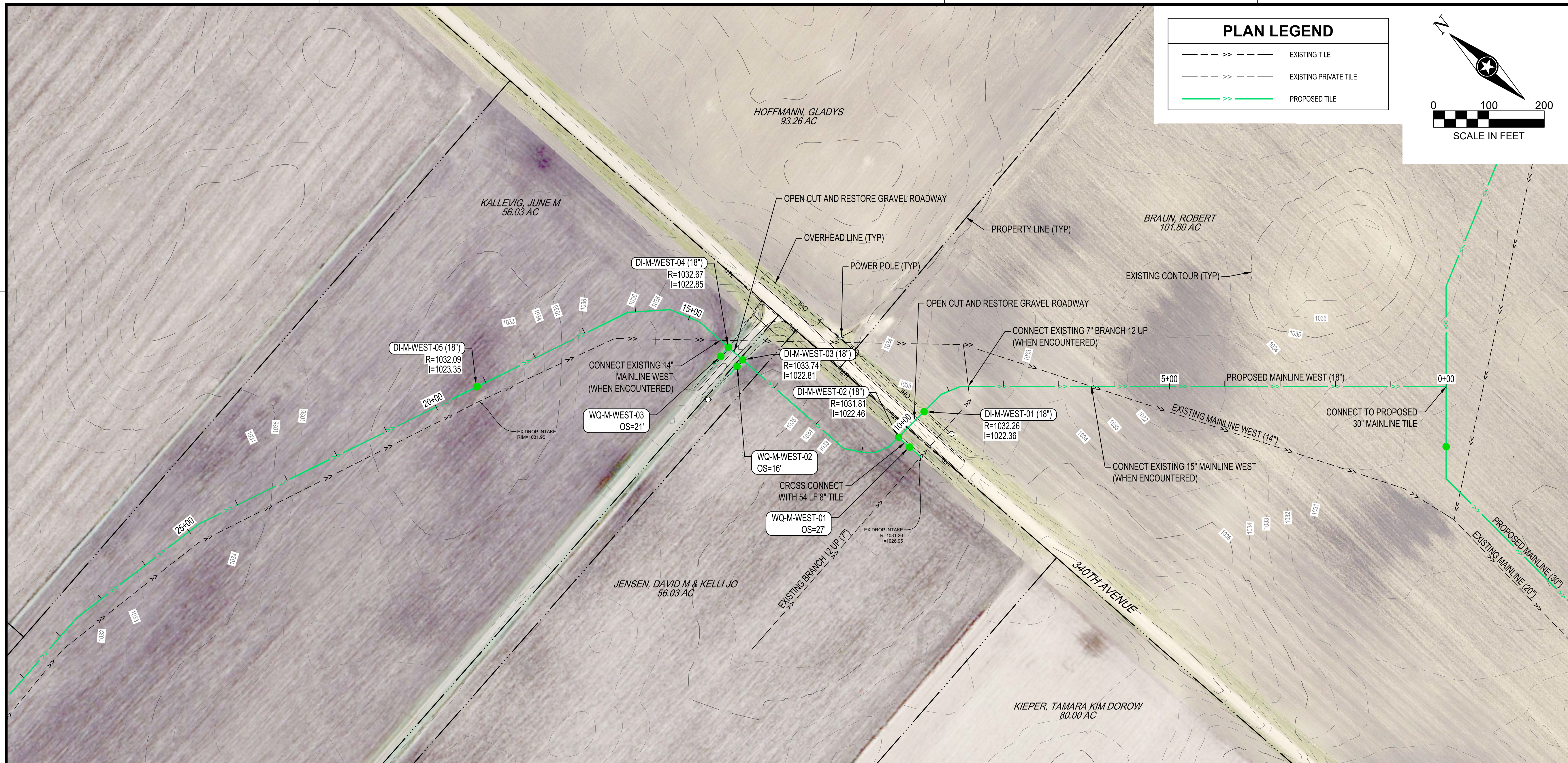
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PLAN - PROFILE MAINLINE

SHEET
15 OF 24

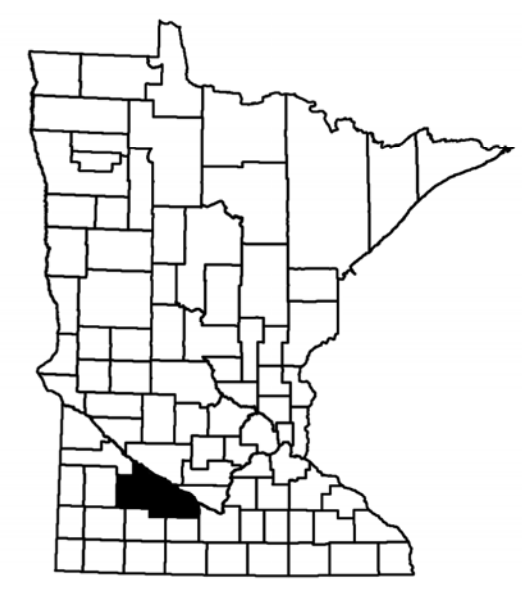
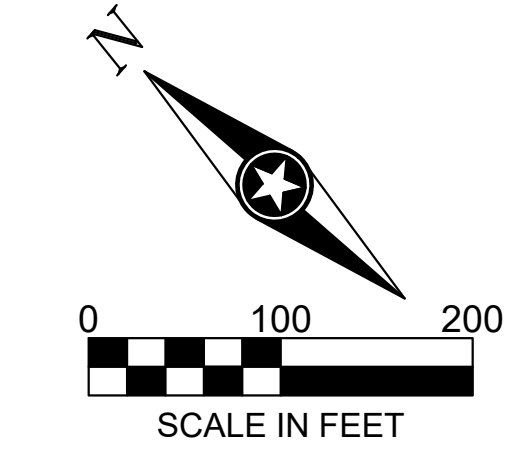


NOTE:
 XXXX.X - EXISTING GROUND E
 XXXX.XX - PROPOSED TILE GRADE

PLOT DATE: 11/6/2024 3:20 PM



PLAN LEGEND	
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



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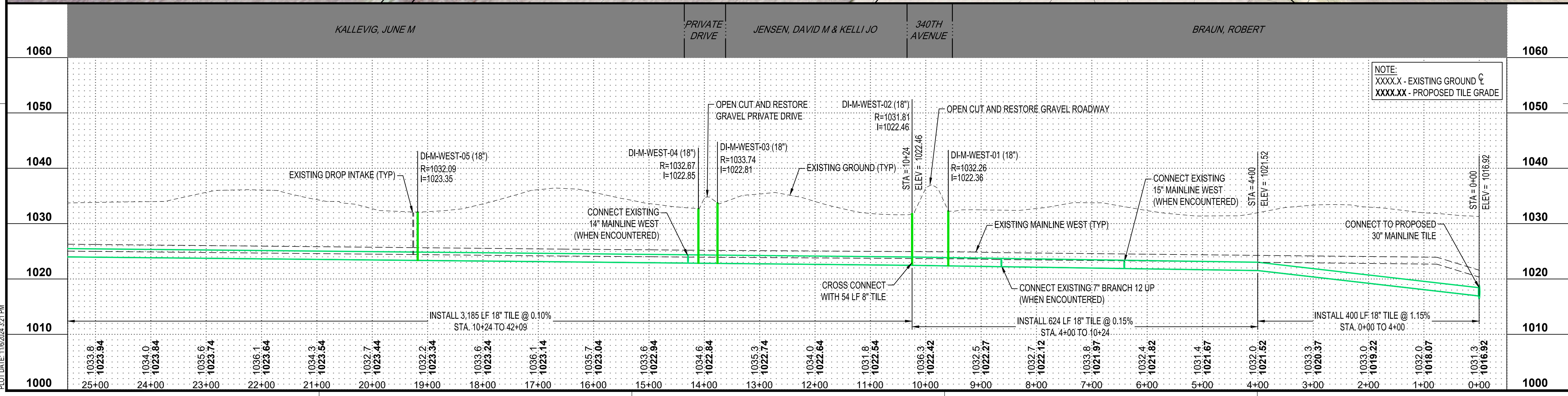
PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
 BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338
 FILE NAME 23338 MAINLINE WEST PROFILES
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. --

TITLE
PLAN - PROFILE MAINLINE WEST

SHEET
16 OF 24

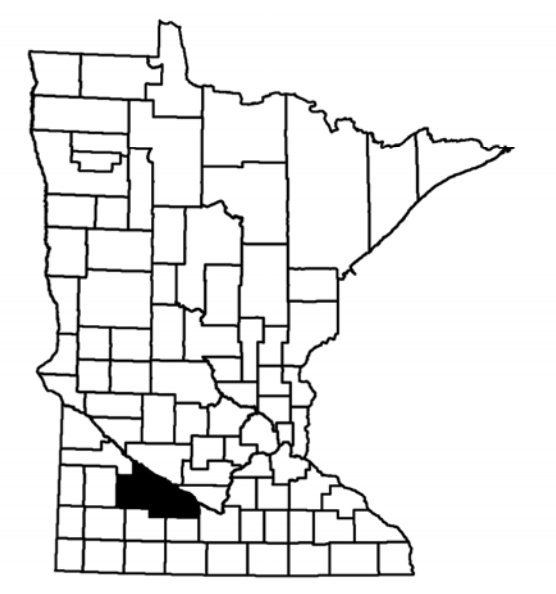
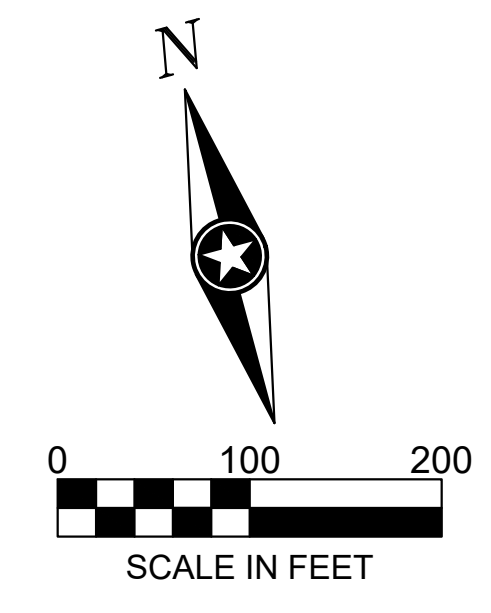


NOTE:
 XXXX.X - EXISTING GROUND
 XXXX.XX - PROPOSED TILE GRADE

PLOT DATE: 11/6/2024 3:21 PM



PLAN LEGEND	
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



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DATE: _____ LIC. NO. _____

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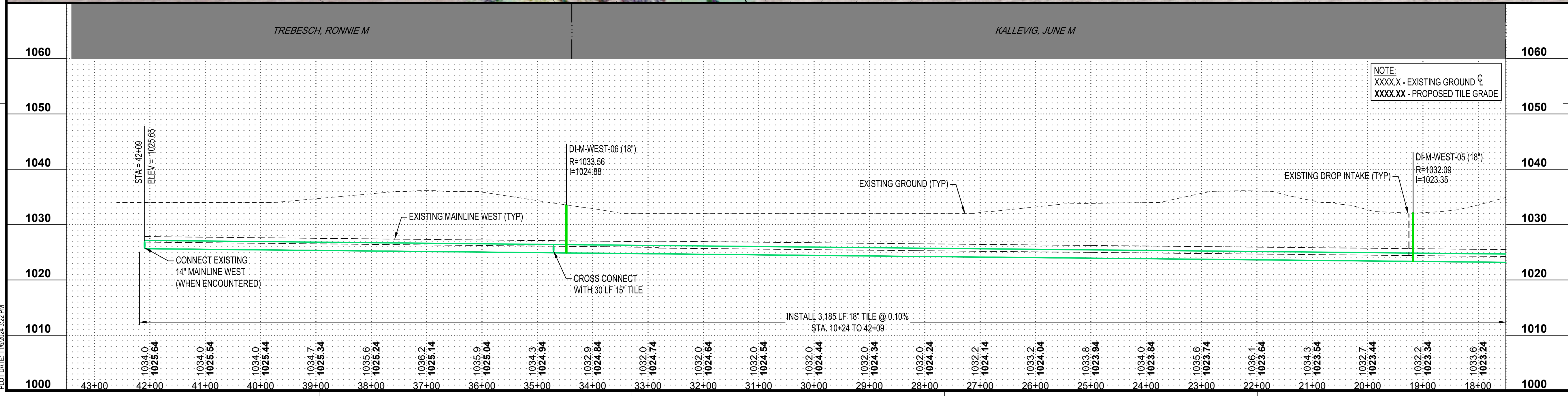
PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
 BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 MAINLINE WEST PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

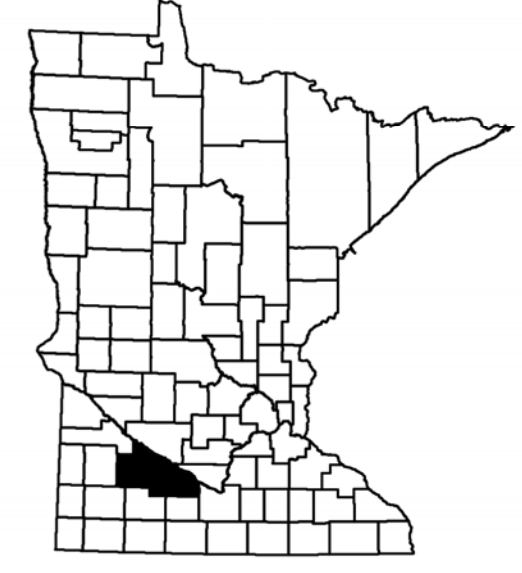
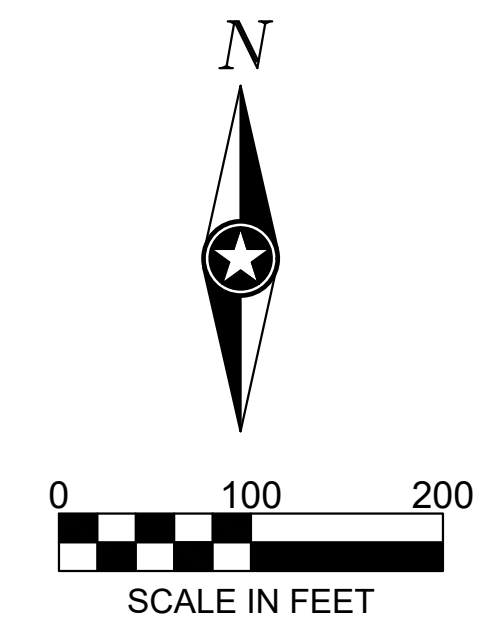
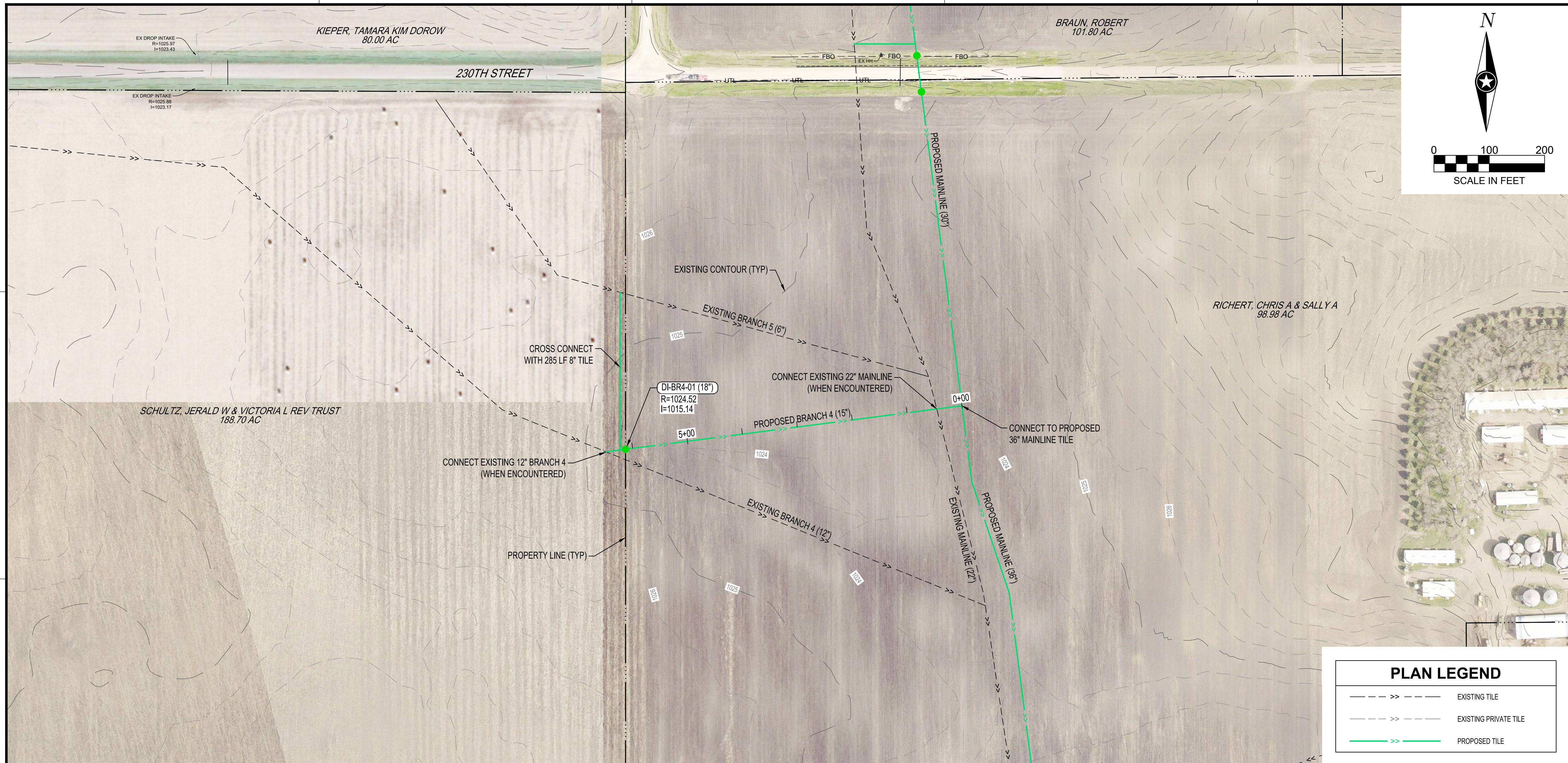
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PLAN - PROFILE MAINLINE WEST

SHEET
17 OF 24



NOTE:
 XXXX.X - EXISTING GROUND ζ
 XXXX.XX - PROPOSED TILE GRADE

PLT DATE: 11/6/2024 3:22 PM



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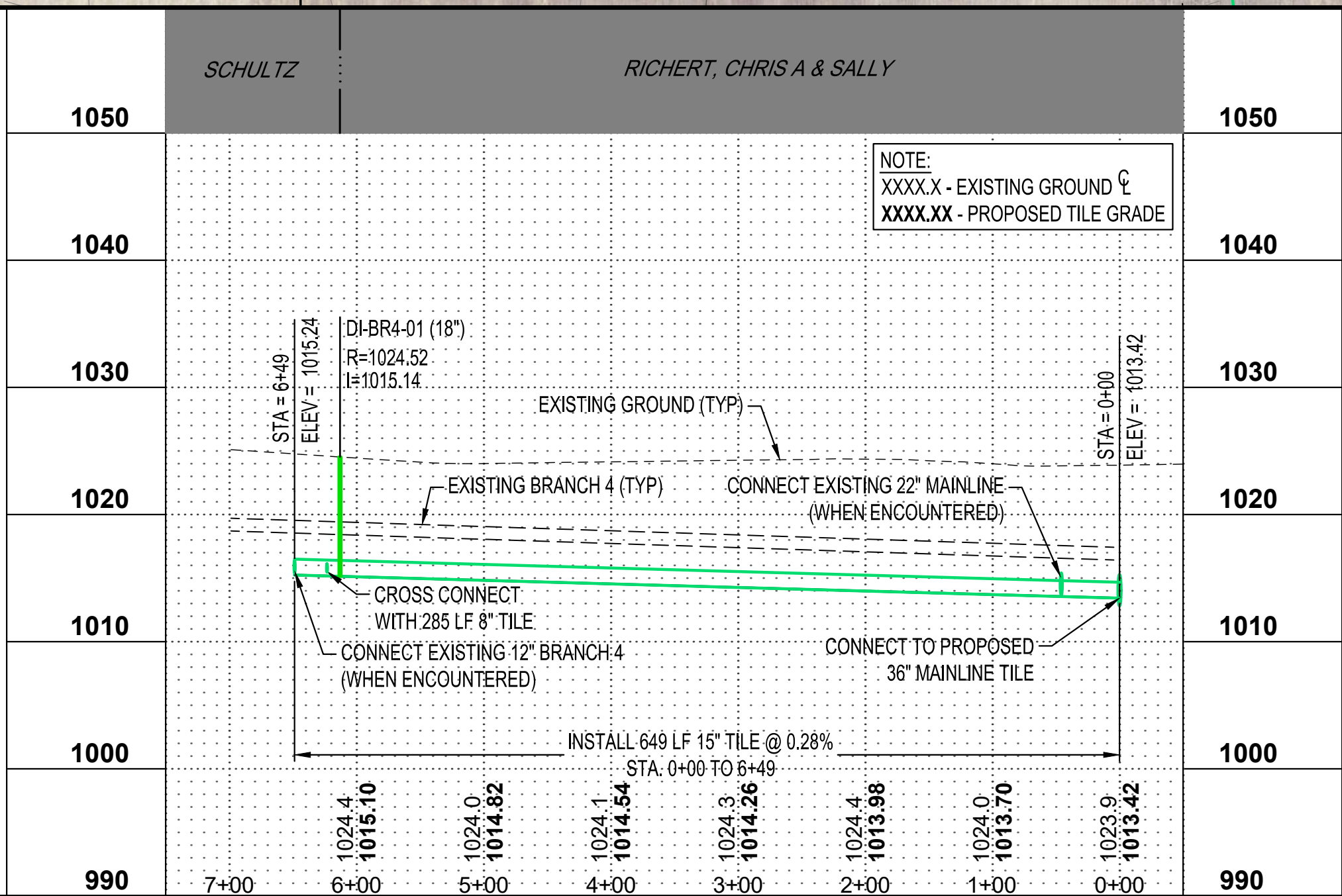
PRELIMINARY NOT FOR CONSTRUCTION

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PROJECT
BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
 BROWN COUNTY MINNESOTA

PLAN LEGEND	
--- >> ---	EXISTING TILE
--- >> ---	EXISTING PRIVATE TILE
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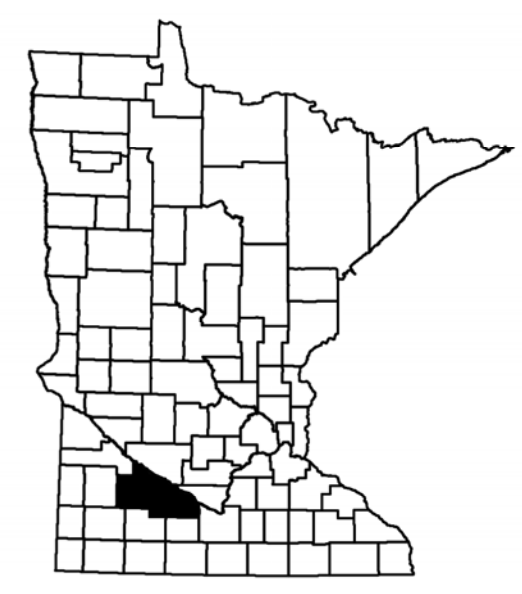
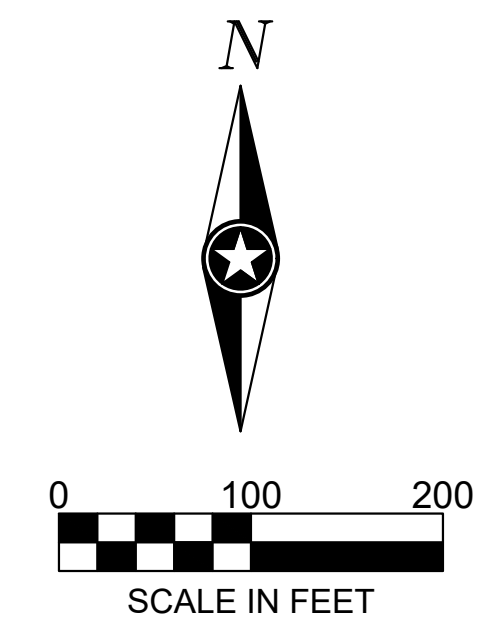
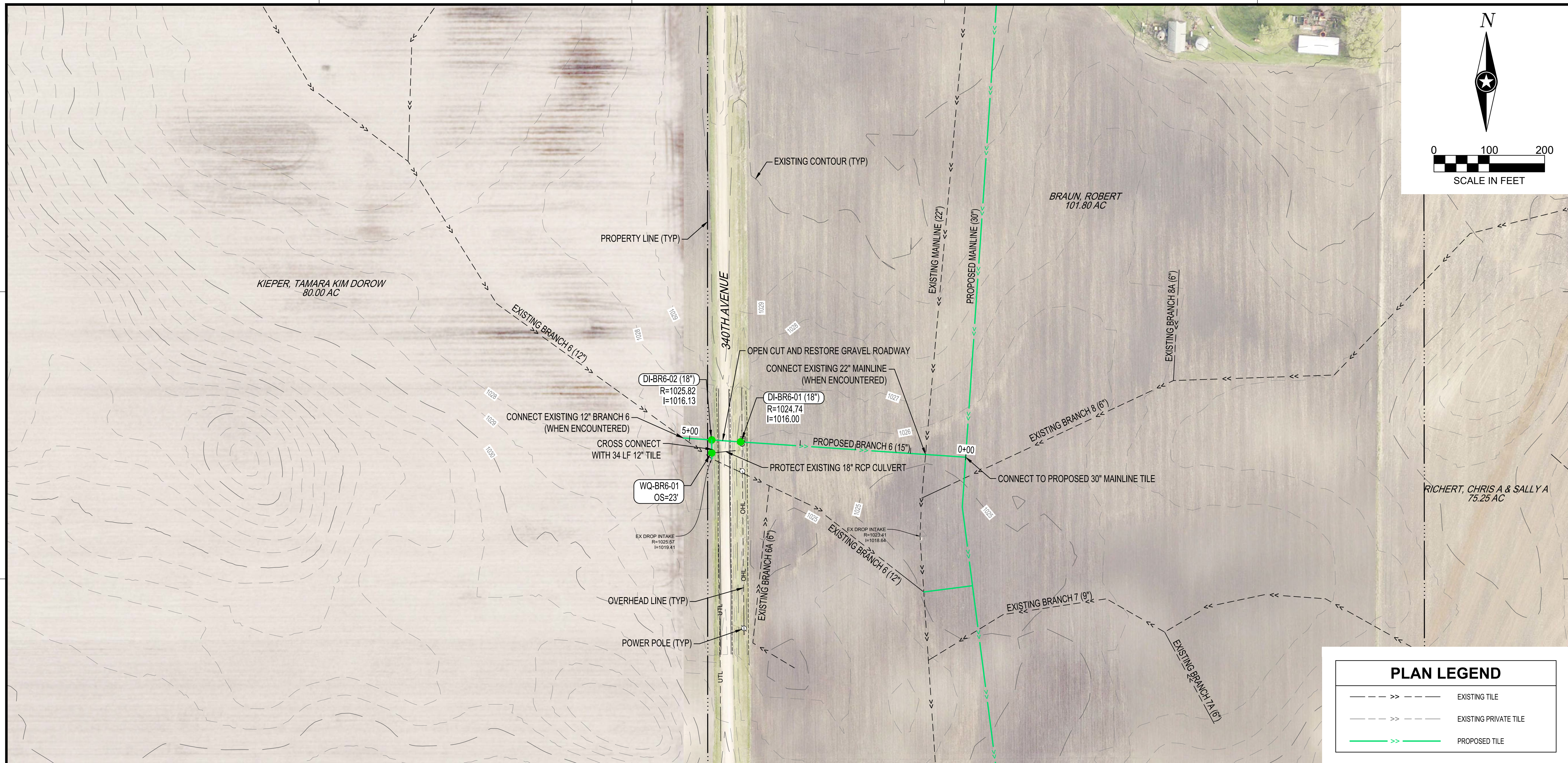


REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	2338 BRANCH 4 PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	-

TITLE
PLAN - PROFILE BRANCH 4

SHEET
18 OF 24



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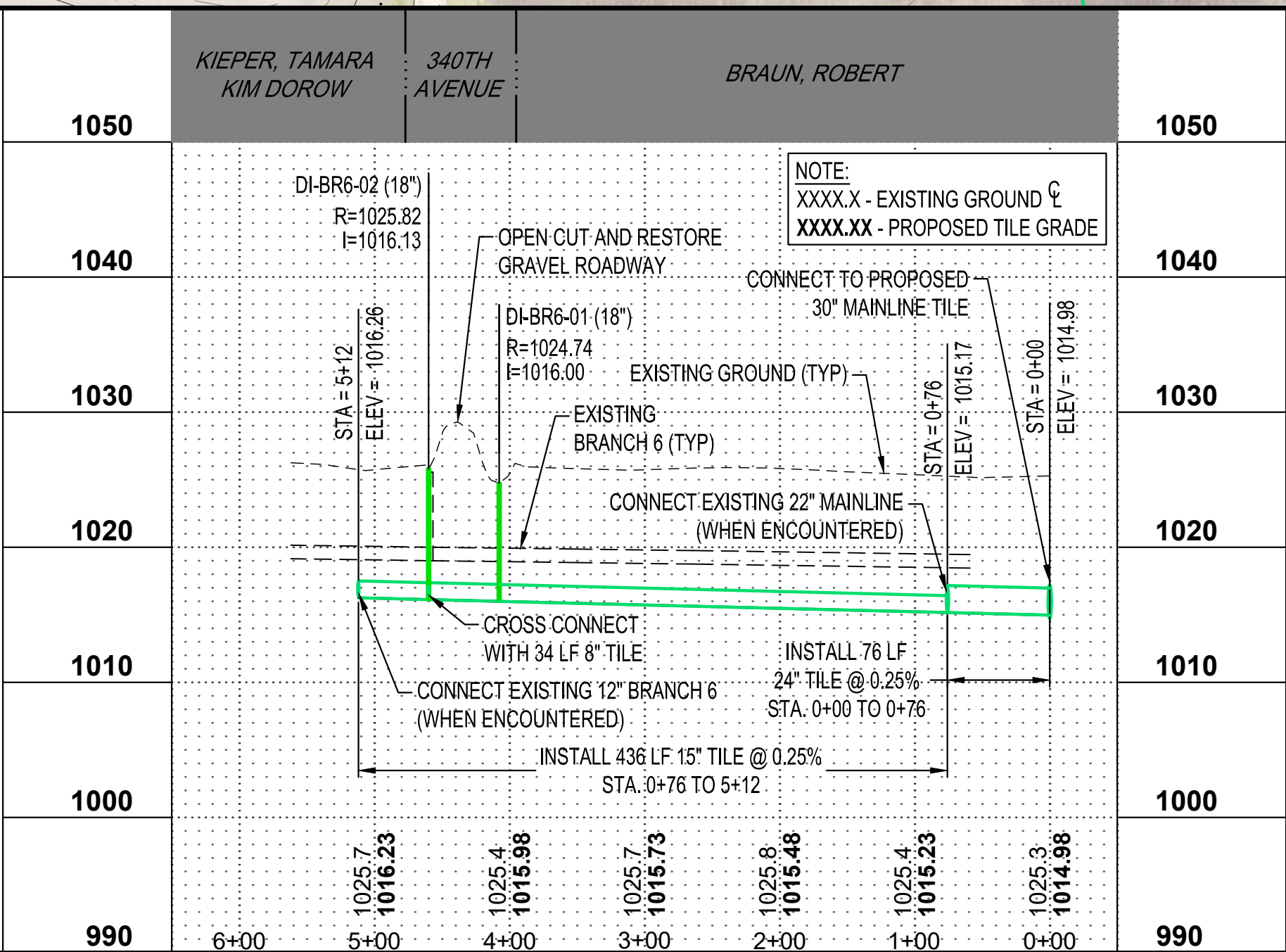
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	PROPOSED TILE

PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

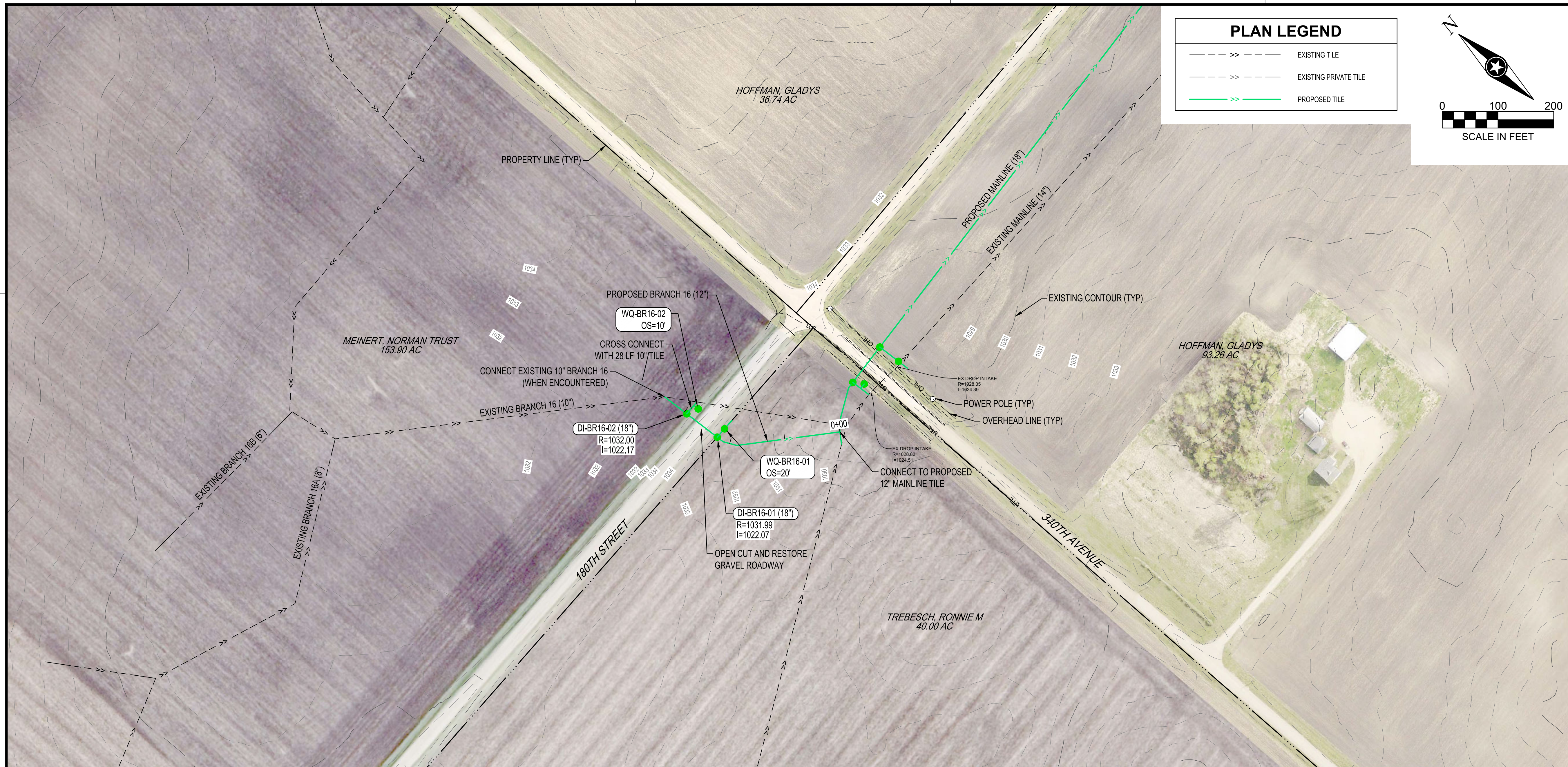
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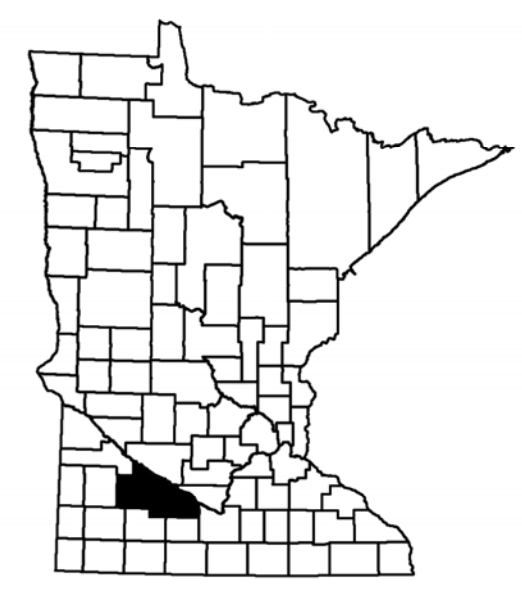
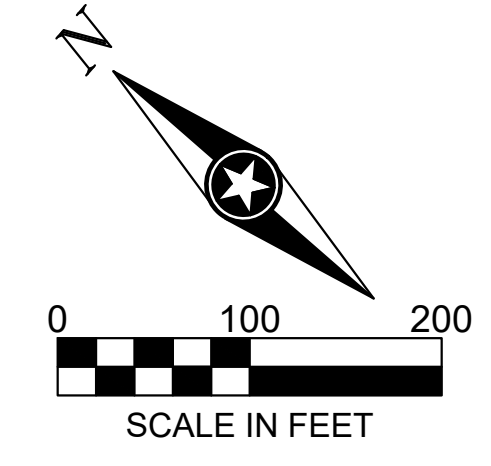
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DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 BRANCH 6 PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE	PLAN - PROFILE BRANCH 6
SHEET	19 OF 24



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	PROPOSED TILE



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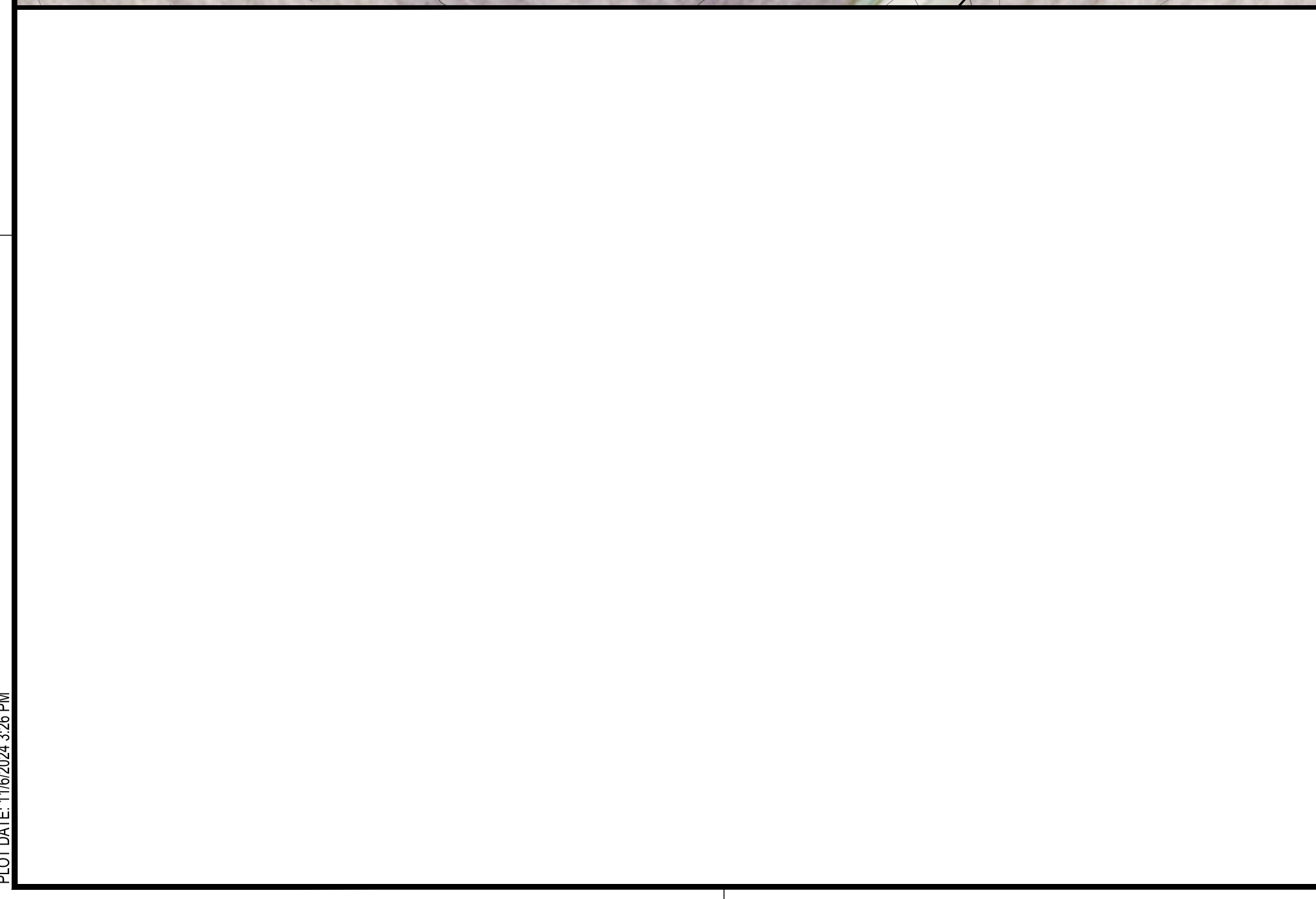
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 BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

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 FILE NAME 23338 BRANCH 16 PROFILES
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. -

TITLE
PLAN - PROFILE BRANCH 16

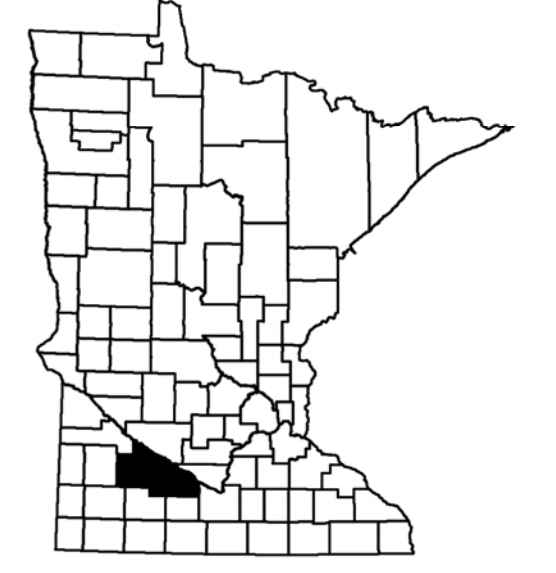
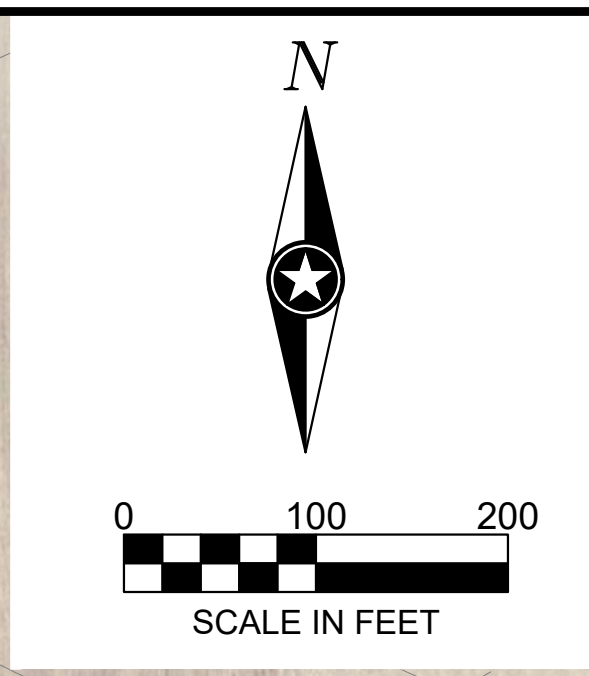
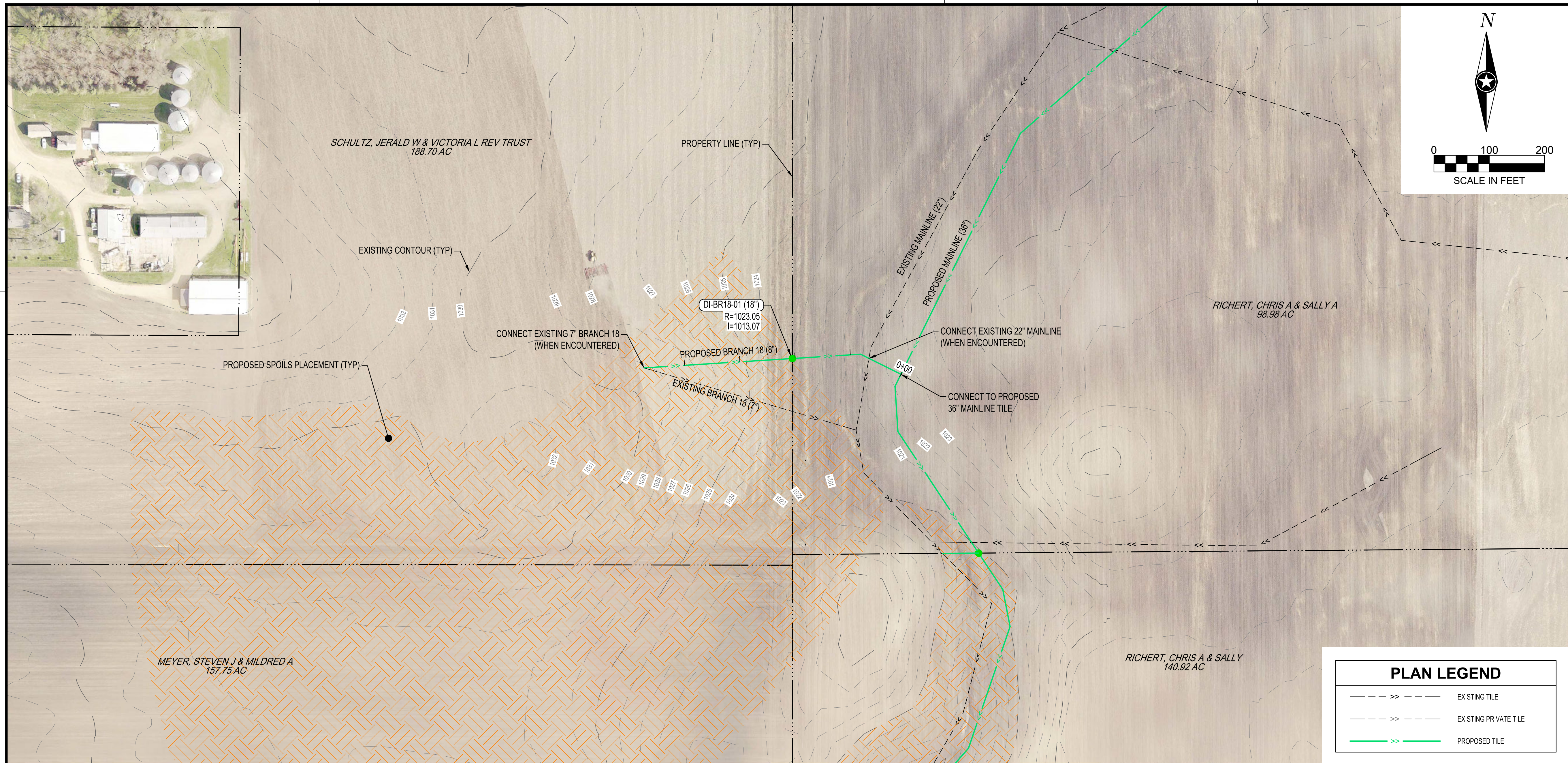
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20 OF 24



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NOTE:
 XXXX.X - EXISTING GROUND ζ
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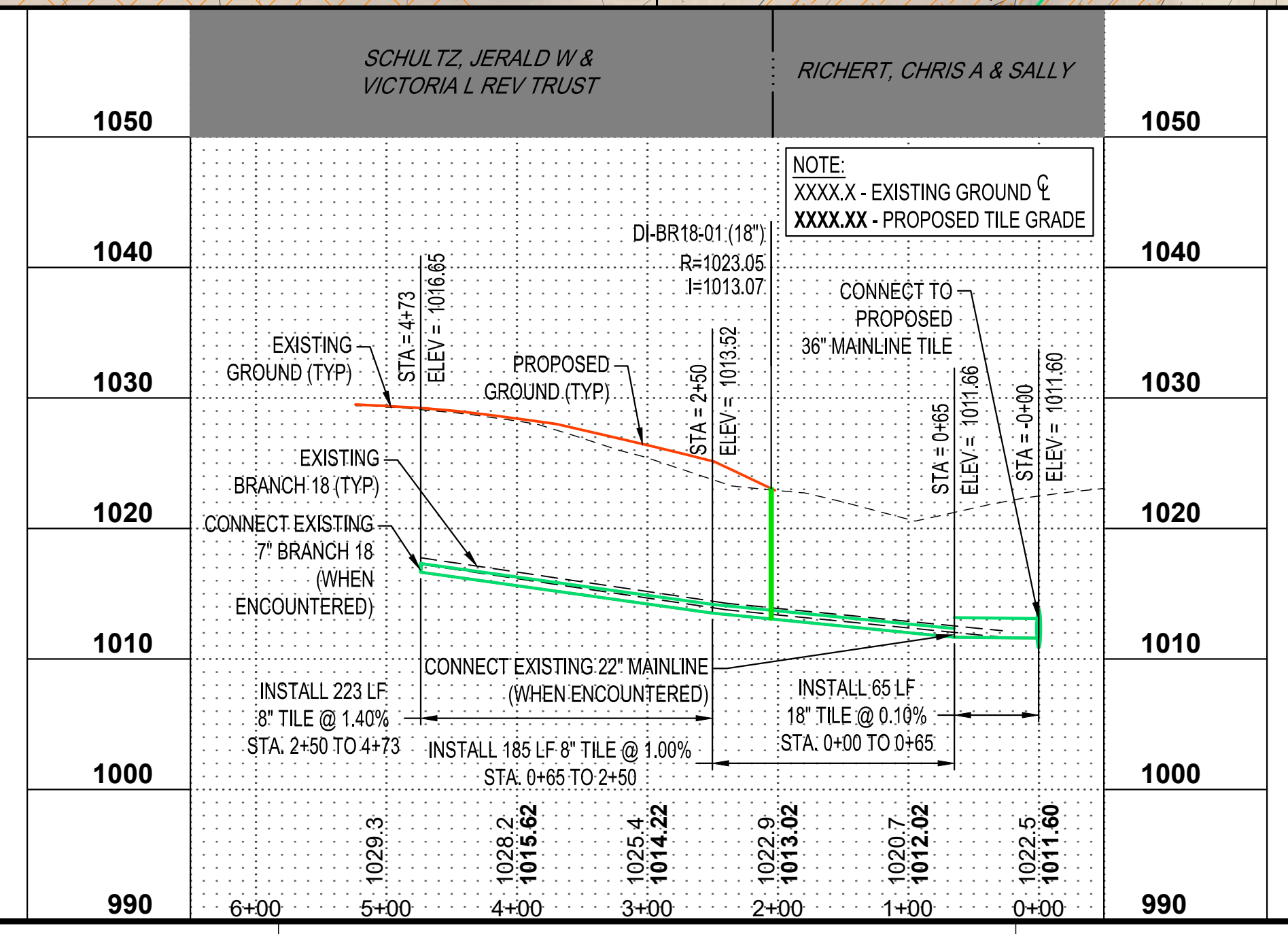
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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

PLAN LEGEND	
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 BRANCH 18 PROFILES
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	-

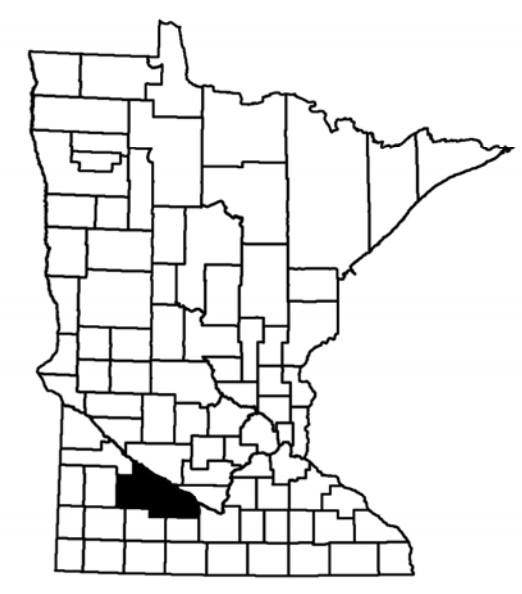
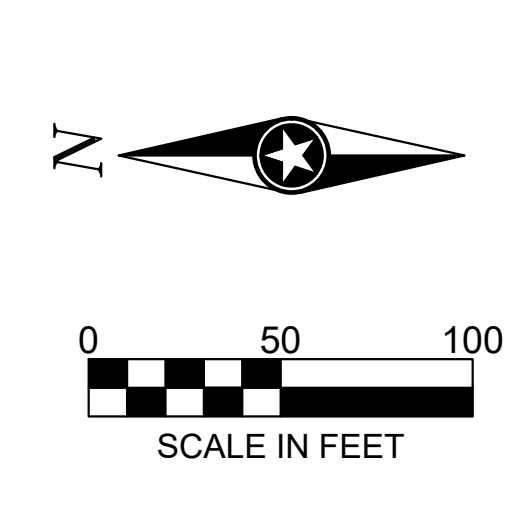
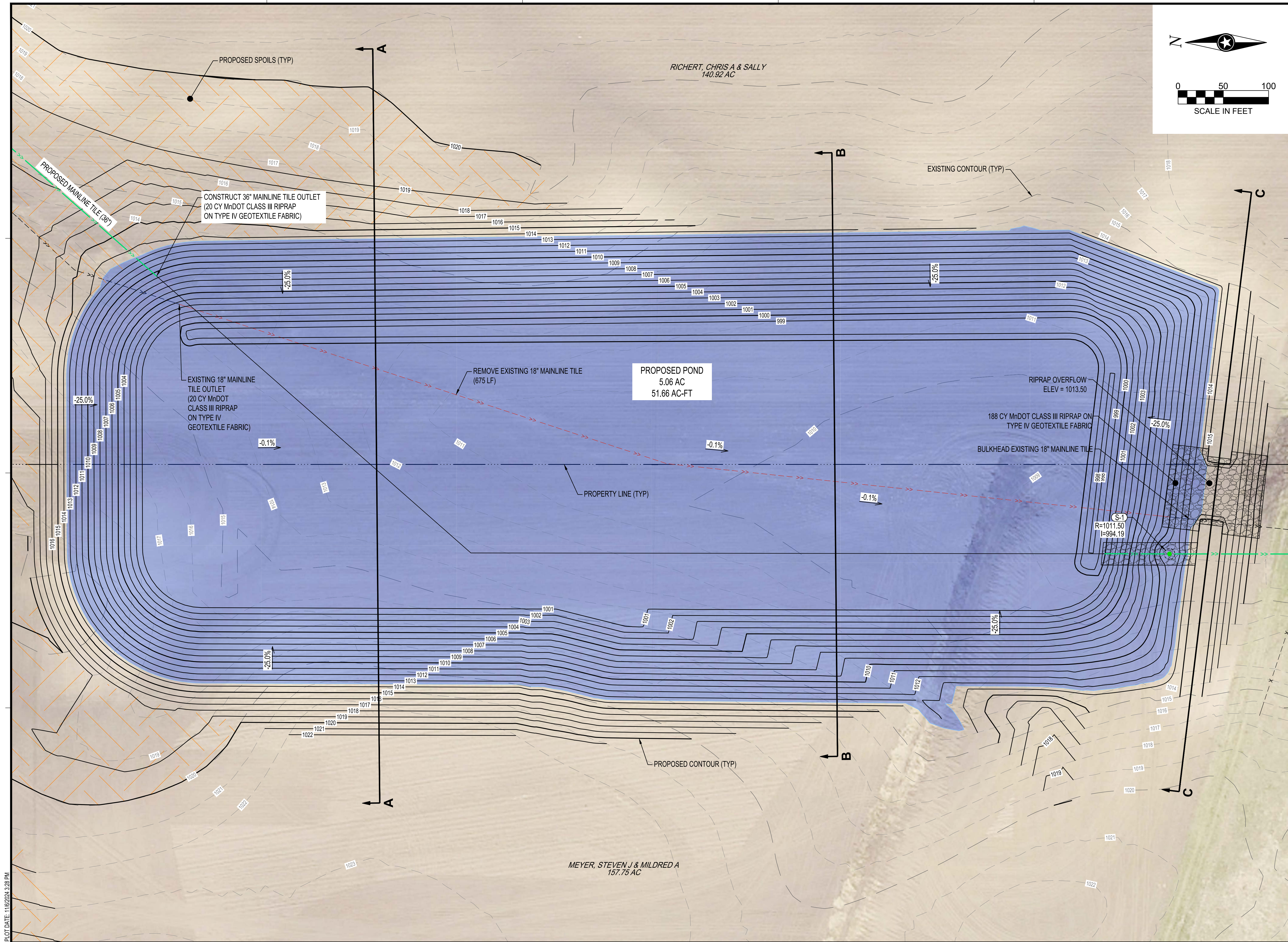
TITLE

PLAN - PROFILE BRANCH 18

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21 OF 24

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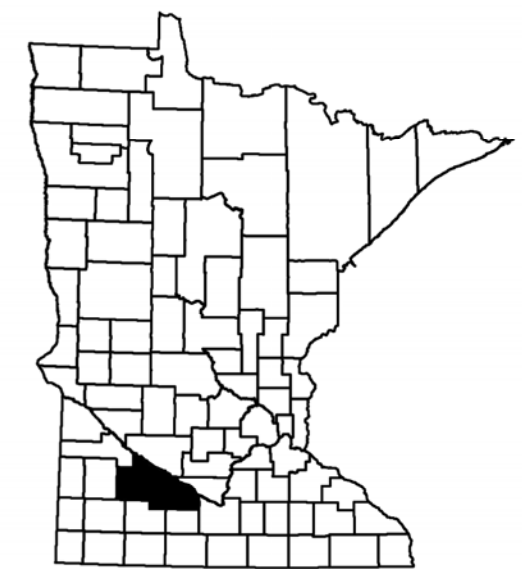
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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5
 BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 22-23338
 FILE NAME 23338 POND
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. -

TITLE
POND GRADING

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22 OF 24



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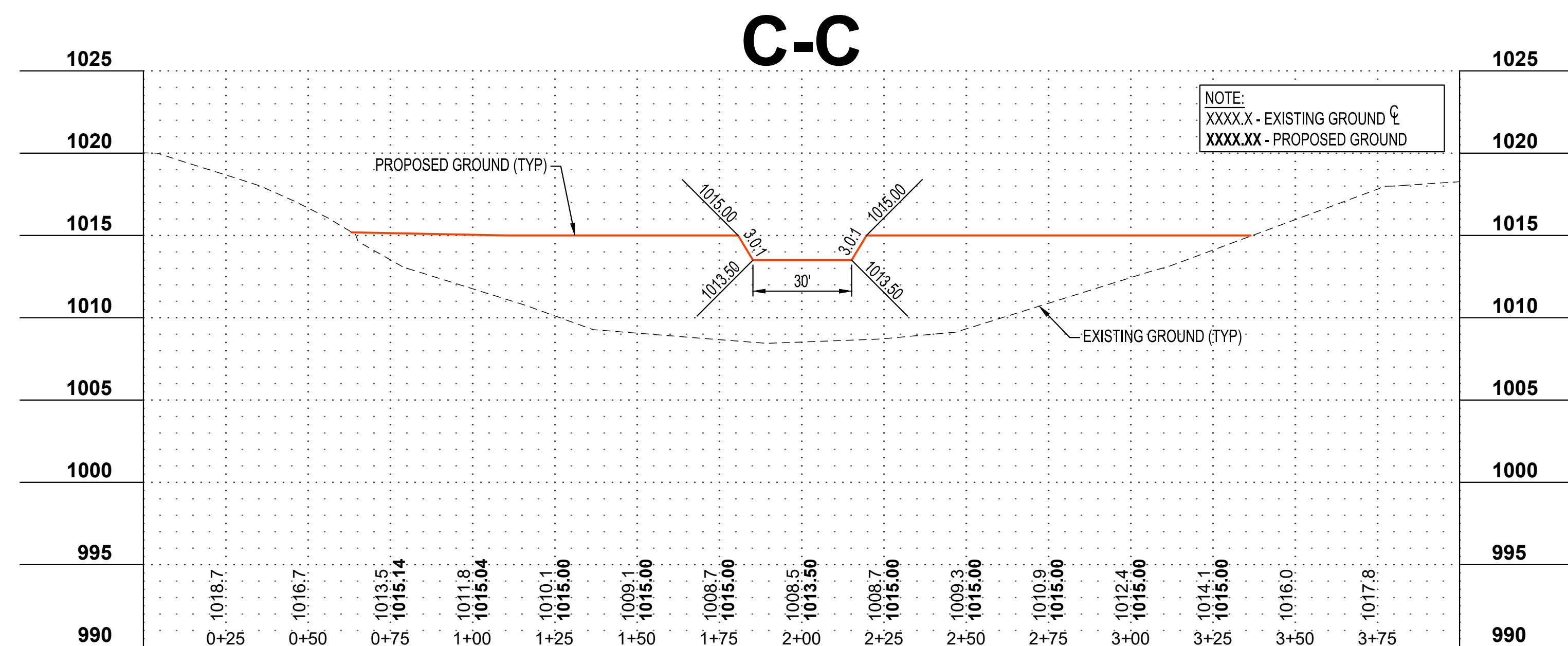
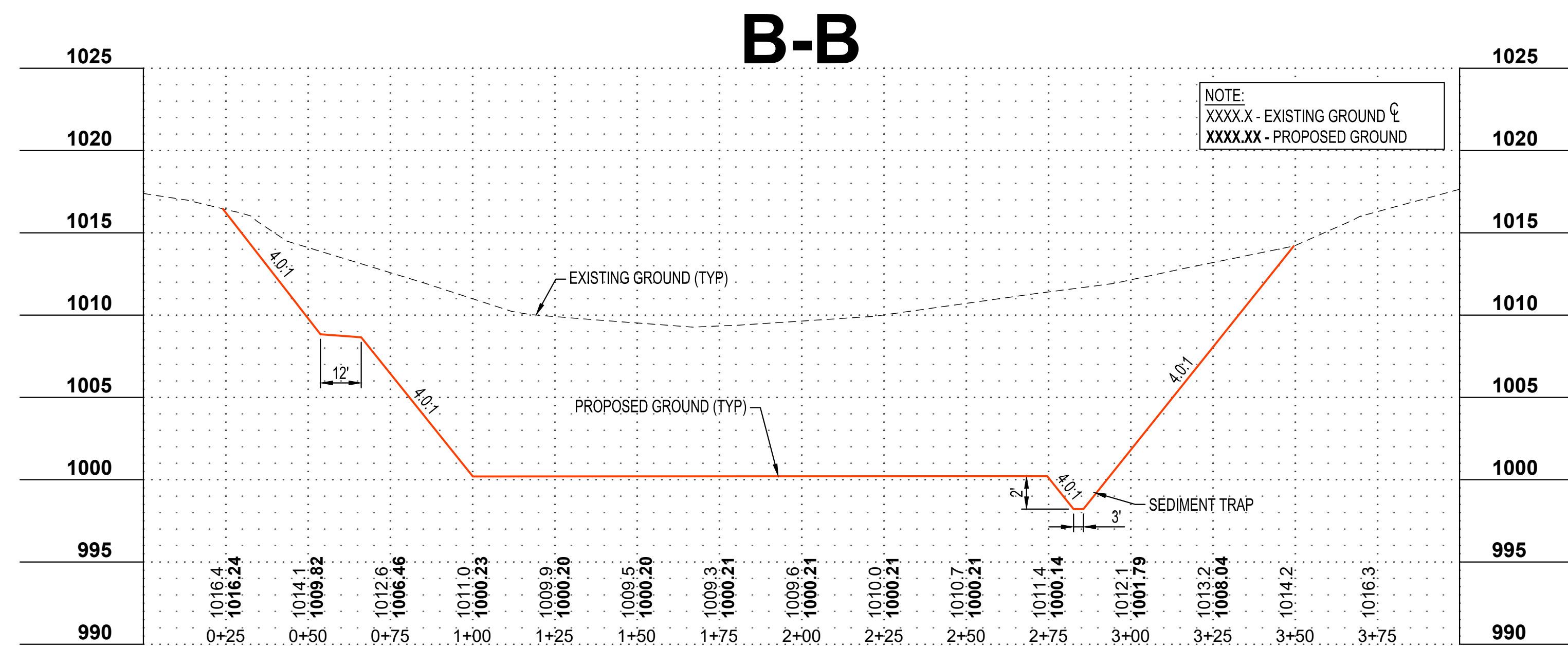
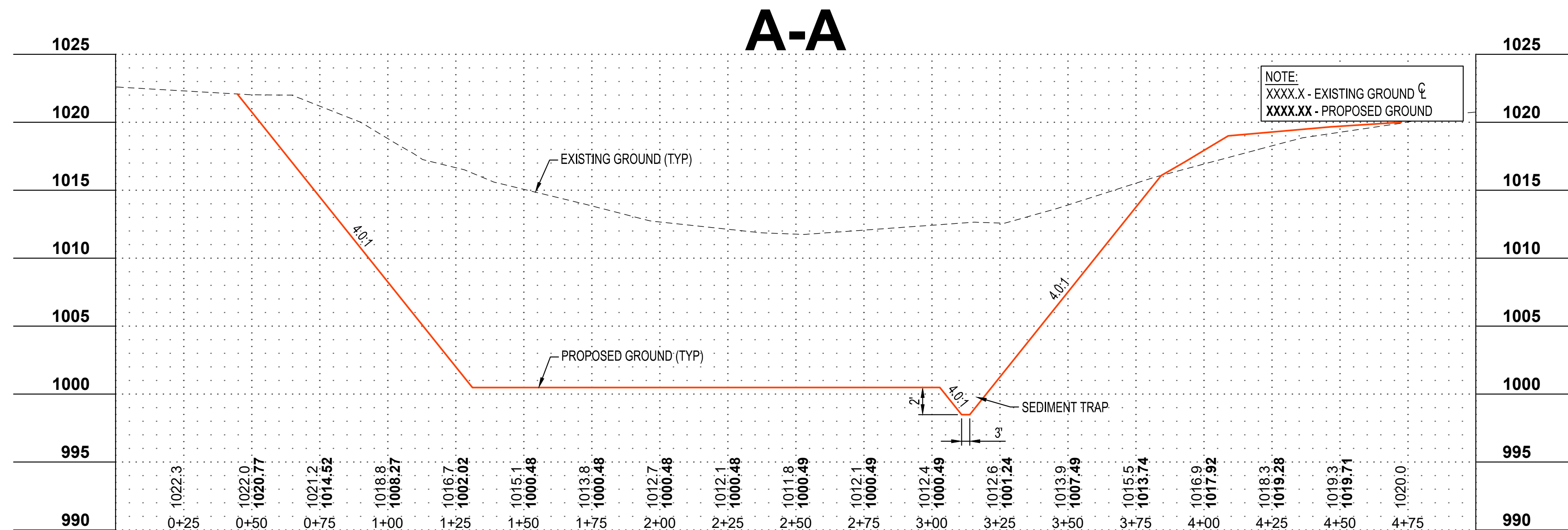
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 BROWN COUNTY MINNESOTA

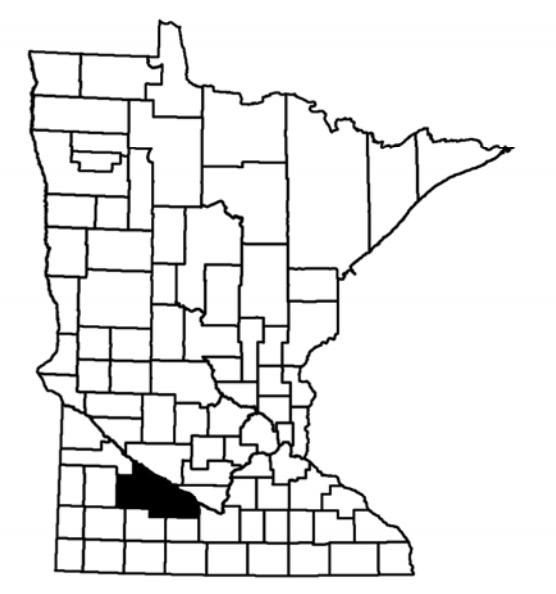
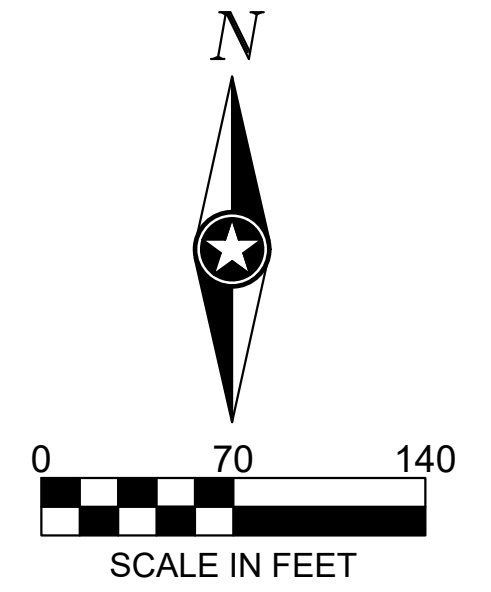
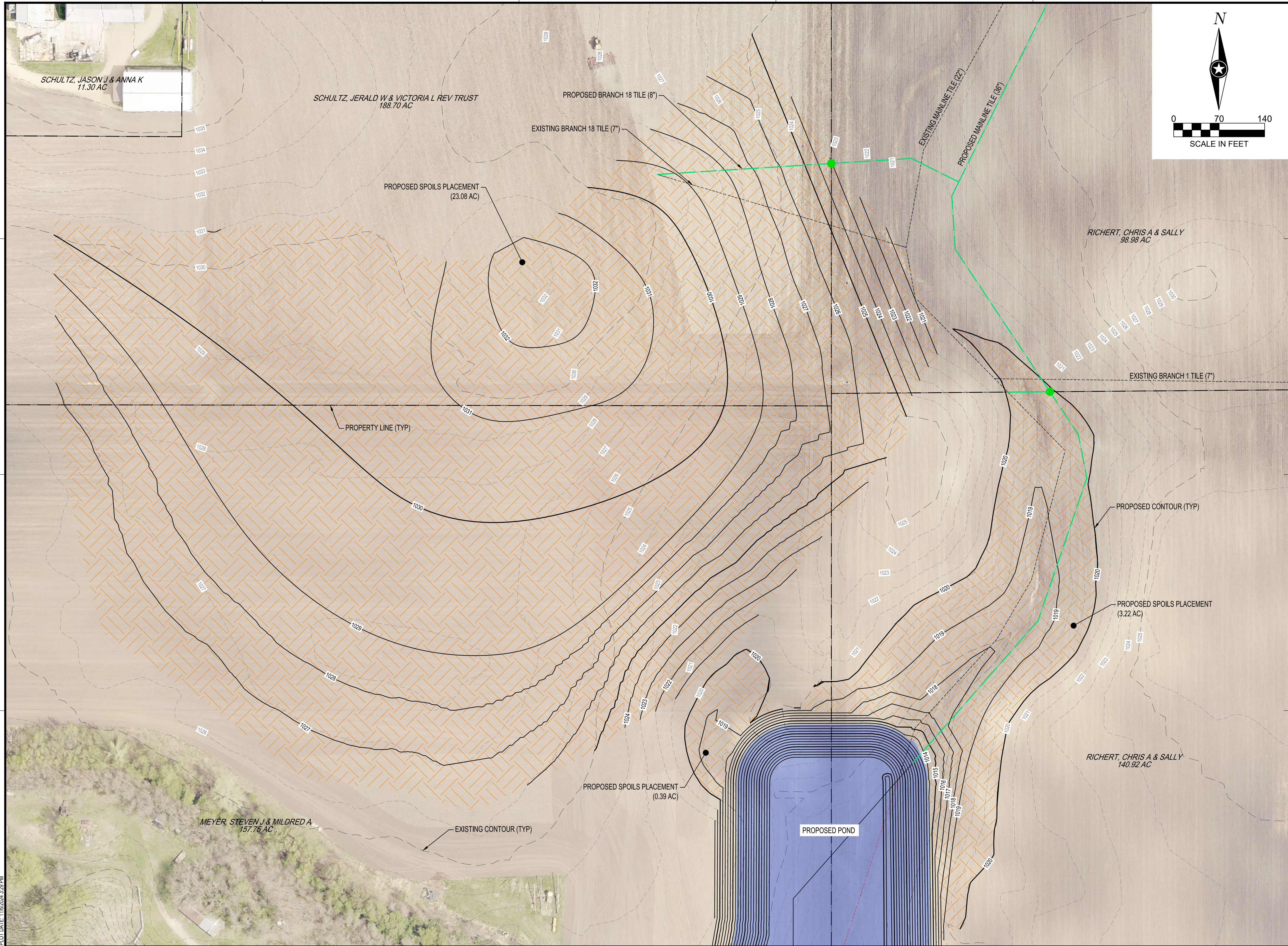
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DATE	DESCRIPTION	BY

PROJECT NO. 22-23338
 FILE NAME 2338 POND
 DRAWN BY KJH
 DESIGNED BY JMW
 REVIEWED BY JRR
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TITLE
POND SECTIONS

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23 OF 24





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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 SPOILS
DRAWN BY	KJH
DESIGNED BY	JMW
REVIEWED BY	JRR
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE

SPOILS GRADING

SHEET

24 OF 24

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Appendix B: Hydraulic Modeling Report

Brown & Redwood Counties JD5 Amended Hydrology Report

PROJECT OVERVIEW

The Brown and Redwood Counties Judicial Ditch No. 5 (JD 5) public drainage improvement proposes to replace the majority of the Main, Main West subsurface tile lines, as well as the downstream portions of Branches 4 and 6 and the entirety of Branch 18. The improvement project also proposes the establishment of a 5-acre storage basin near the JD 5 system outlet to generate additional retention capacity to control and reduce peak flowrates resultant from the tile improvements. See Preliminary Construction Plans within Appendix A for sizing and extents of proposed infrastructure replacements along with the location and characteristics of the proposed storage basin. This report has been amended to show the results of the enhanced storage basin described in the Amended FER.

MODEL REVIEW

The following results and discussion comprise the detailed analysis of the ACSIC and proposed models. Tables 2 - 5 show a comparison of the peak flow, velocity, and elevation at the outlet of JD 5 respectively. Table 6 compares the water volumes leaving the system.

TABLE 2. SYSTEM PEAK FLOW COMPARISON AT TERMINUS

TILE				OVERLAND				COMBINED			
Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change	Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change	Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	26.5	41.3	56%	5-yr	51.5	0.0	-100%	5-yr	78.0	41.3	-47%
10-yr	29.7	66.0	122%	10-yr	86.0	0.0	-100%	10-yr	115.7	66.0	-43%
25-yr	34.7	80.4	132%	25-yr	158.5	19.6	-88%	25-yr	193.2	100.0	-48%
50-yr	37.9	85.9	127%	50-yr	230.1	100.0	-57%	50-yr	268.0	185.9	-31%

TABLE 3. SYSTEM TILE PEAK VELOCITY COMPARISON AT TERMINUS

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	7.9	8.2	4%
10-yr	8.7	9.1	5%
25-yr	9.9	9.5	-4%
50-yr	10.7	9.7	-9%

TABLE 4. SYSTEM ELEVATION COMPARISON AT TERMINUS (TILE)

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	992.43	992.85	0.42
10-yr	992.48	992.94	0.46
25-yr	992.66	993.03	0.37
50-yr	992.80	993.16	0.36

*Channel Bottom Elevation is 991.94

TABLE 5. SYSTEM ELEVATION COMPARISON AT TERMINUS (OVERLAND)

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	1002.81	1002.30	-0.51
10-yr	1002.92	1002.30	-0.62
25-yr	1003.10	1002.75	-0.35
50-yr	1003.24	1003.11	-0.13

*Ground Elevation is 1002.30

TABLE 6. SYSTEM VOLUME COMPARISON AT TERMINUS

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	137.7	140.9	2%
10-yr	177.6	182.5	3%
25-yr	239.8	249.5	4%
50-yr	294.2	309.5	5%

The proposed design will reduce peak flow rate for all modeled storm events when considering runoff delivered through both system tile and overland. These reductions range in magnitude from a minimum of 31% on the 50-year event to 48% on the 25-year event, which will benefit downstream stability and reduce bank erosion. These reductions in peak flowrate are from two factors, the 5-acre storage basin and increased tile capacity. The southern half of the JD 5 watershed displays relatively few isolated basins, and a large, unencumbered overland flow paths which can transmit large volumes of runoff at a rapid rate. Increased capacity within the public system allows more runoff to enter the subsurface system. This results in less overland flow, which leads to less sediment entering the receiving waters. The 5-acre storage basin is also situated near the terminus of the public system where overland flow becomes concentrated, allowing added retention and minimizing the ability of runoff to simply exit the system. Velocities are minimally altered, showing slight increases for smaller events and slight decreases for larger events.

The following Figures 1 and 2 compare the ACSIC and proposed flow hydrographs at the outlet of the JD 5 drainage system for the 10-year and 25-year events. Figures 3 and 4 compare the ACSIC and proposed velocity hydrographs for the 10-year and 25-year events.

The inundation maps shown in Figures 5 - 8 show the time that water deeper than 0.1-foot sits on the landscape. Generally, crop stress from excess water occurs above 24-hours and crops generally die if they remain flooded for longer than 48-hours. These maps illustrate the faster drainage times across the system and where the project will have the greatest impacts.

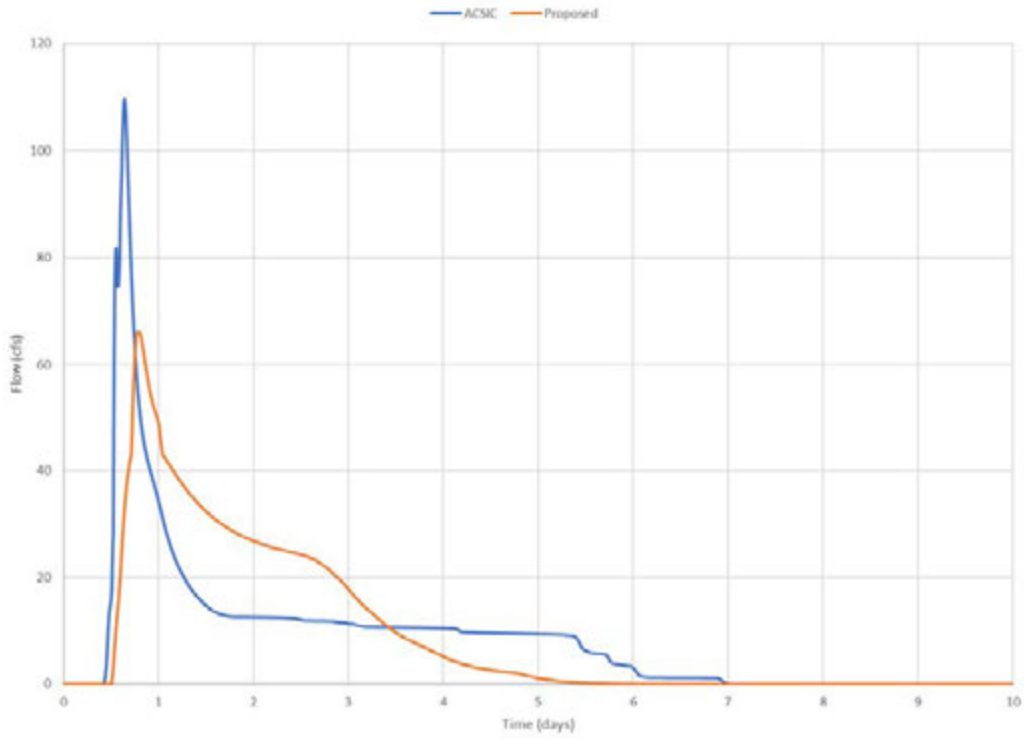


Figure 1. JD 5 10-Year Peak Flow Hydrograph Comparison at Terminus

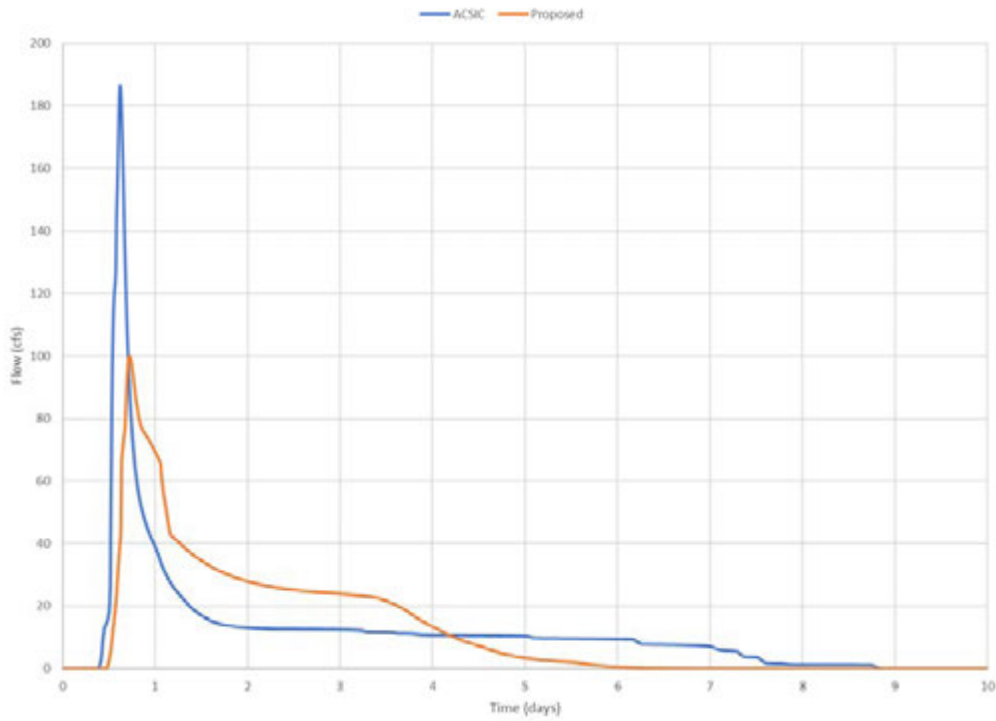


Figure 2. JD 5 25-Year Peak Flow Hydrograph at Terminus

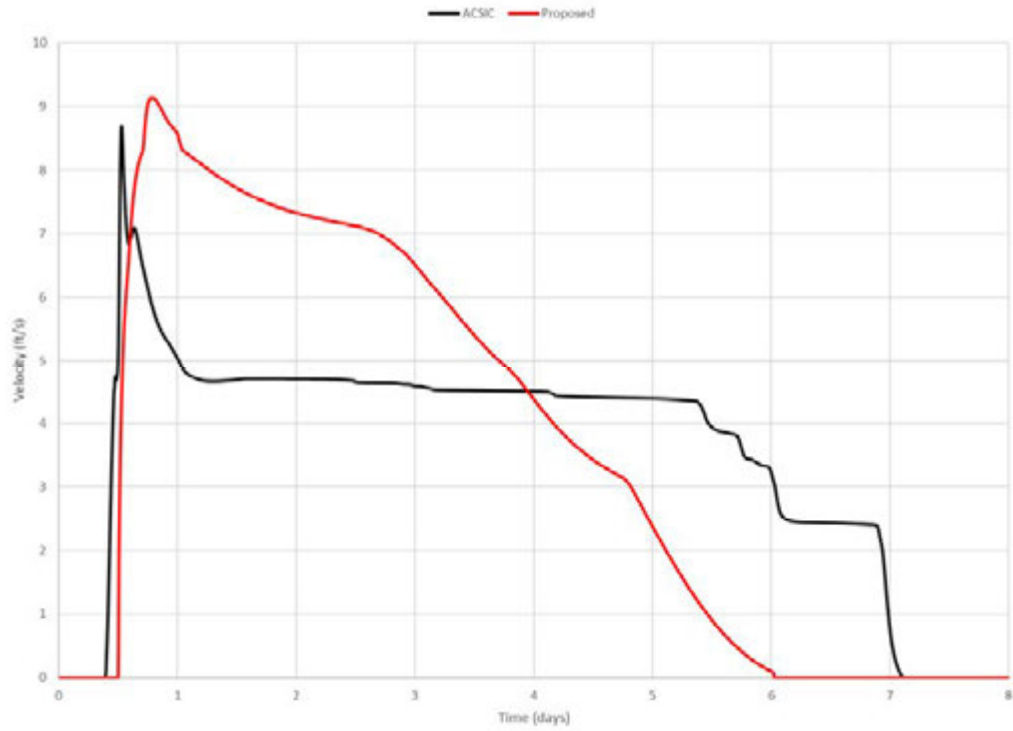


Figure 3. JD 5 10-Year Peak Tile Velocity Hydrograph

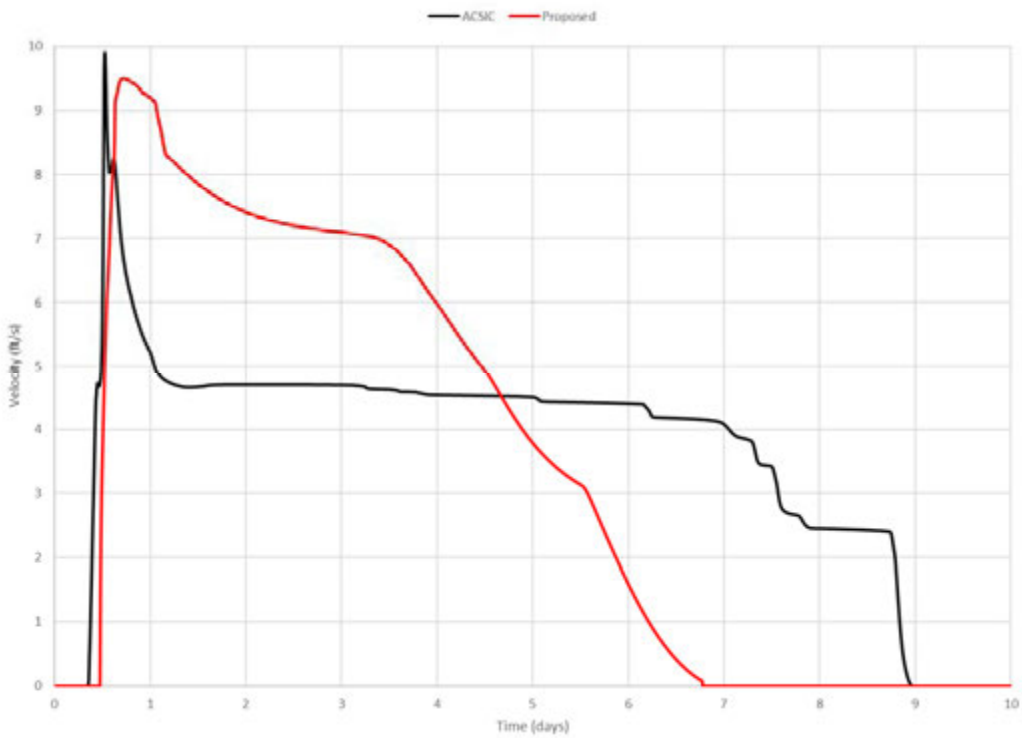


Figure 4. JD 5 25-Year Peak Tile Velocity Hydrograph

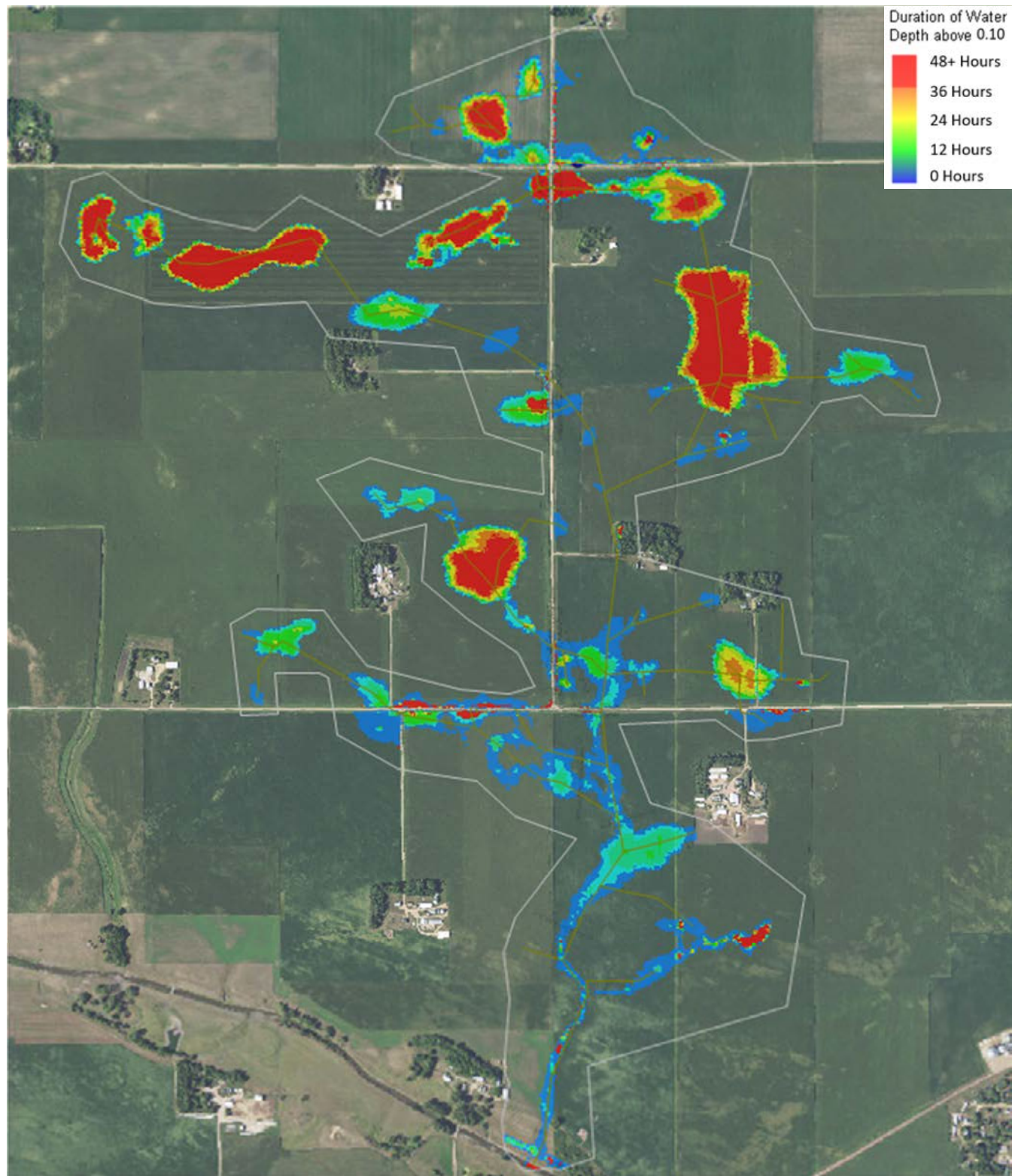


Figure 5. ACSIC 10-Year Inundation Map

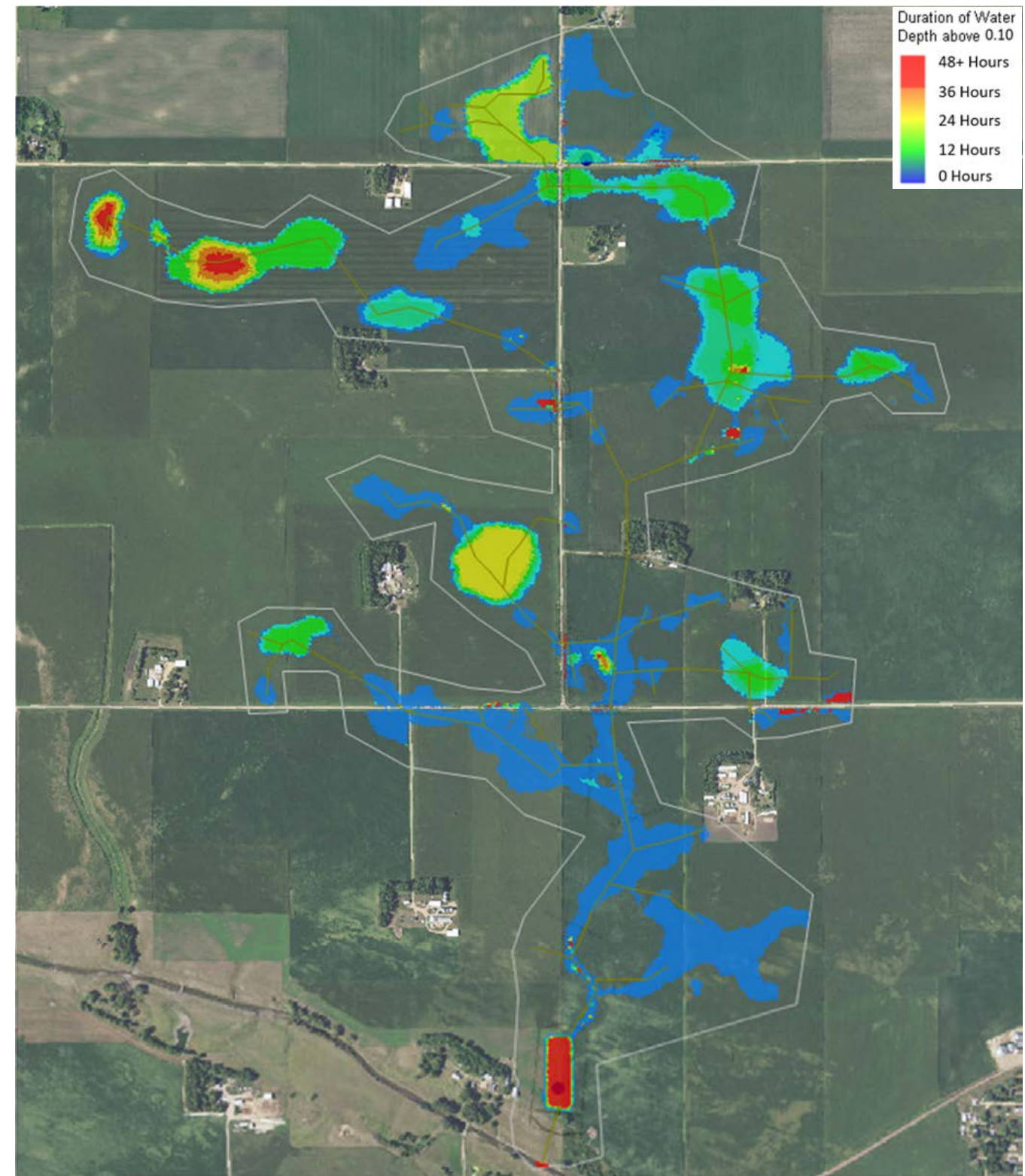


Figure 6. Proposed 10-Year Inundation Map

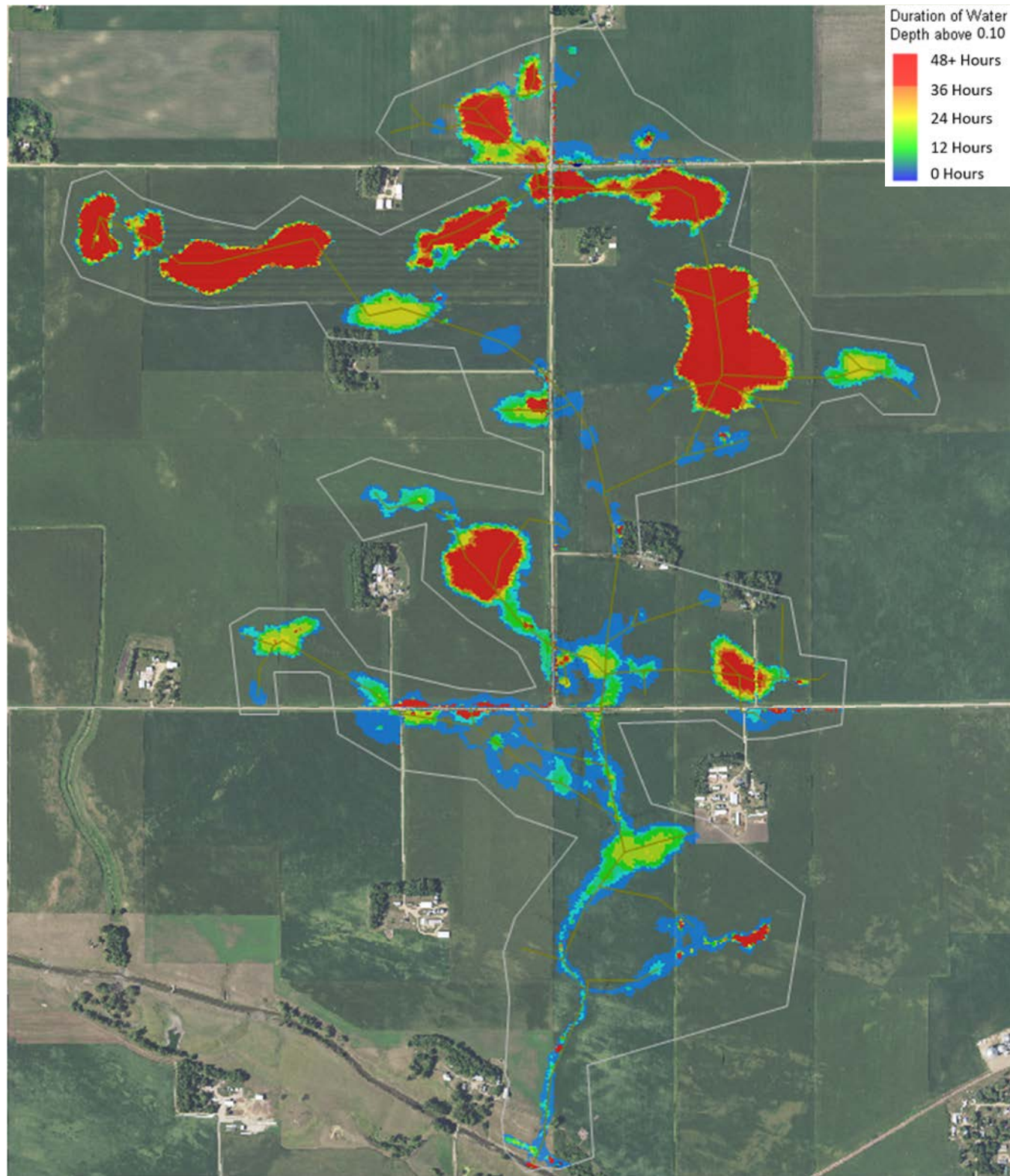


Figure 7. ACSIC 25-Year Inundation Map

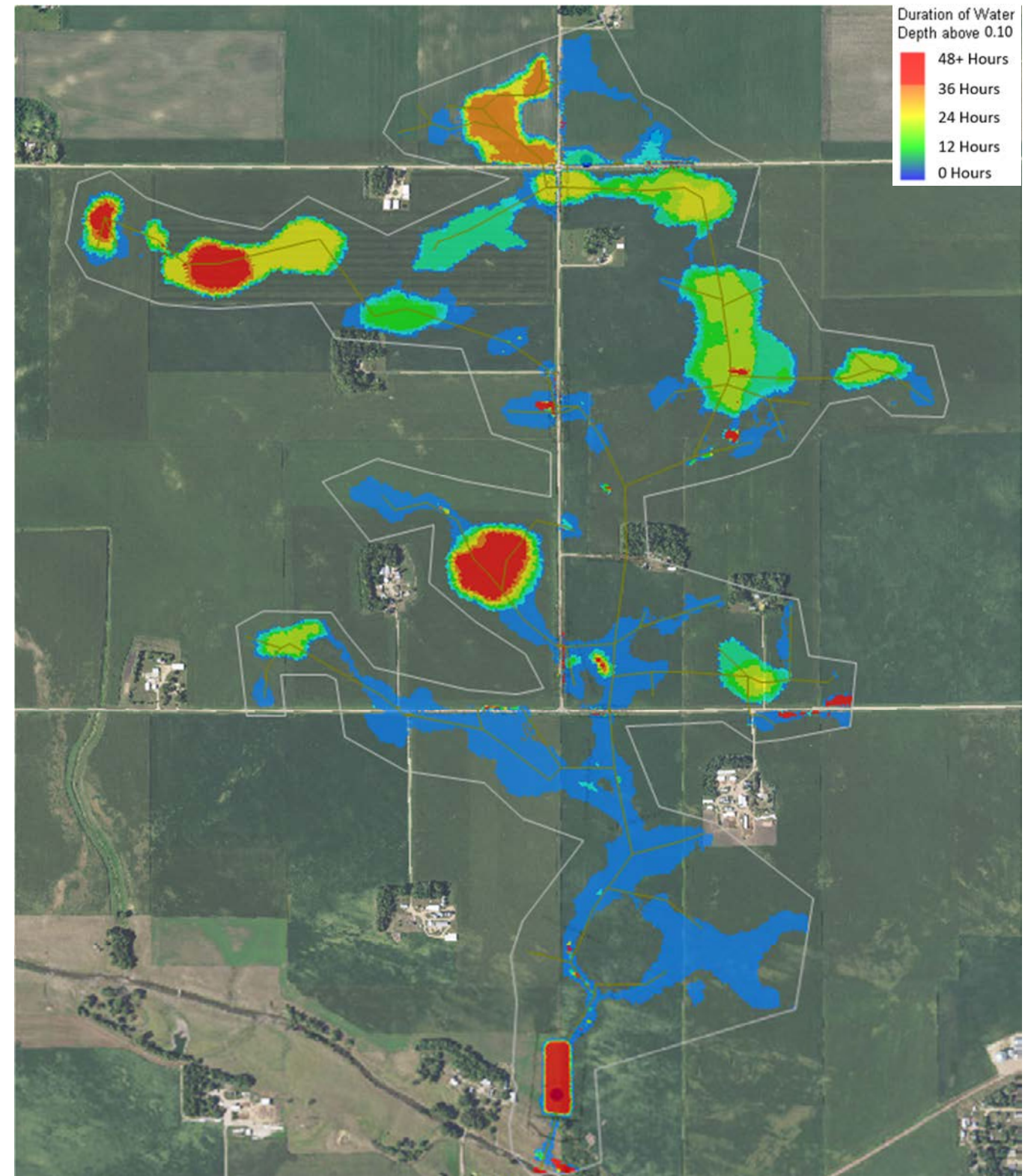


Figure 8. Proposed 25-Year Inundation Map

VOLUME BALANCE ERRORS

The volume balance error is calculated by comparing the initial water volume in the 2D model and conduits to infiltration, system outflows, and final water volume in the 2D system and conduits. Table 7 shows the volume balance error for each modeled storm event. The maximum absolute volume balance error was 0.04%, which was for the 50-year ACSIC model. This is below ICM's 5% allowable percent volume balance error.

TABLE 7. MODELING VOLUME BALANCE ERRORS

Rainfall Event	ACSIC (% Error)	Proposed (% Error)
5-yr	-0.01%	0.03%
10-yr	-0.01%	0.02%
25-yr	0.01%	0.01%
50-yr	0.04%	0.02%

Appendix C: Preliminary Cost Estimates

**Brown & Redwood Counties
Judicial Ditch No. 5**



PROPOSED IMPROVEMENT COST SUMMARY

Area	Separable Maintenance	Improvement Cost	Net Cost
Mainline Tile	\$ 875,144	\$ 1,193,400	\$ 318,255
Mainline West Tile	\$ 251,310	\$ 308,285	\$ 56,975
Branch 4 Tile	\$ 43,369	\$ 57,594	\$ 14,225
Branch 6 Tile	\$ 32,953	\$ 55,520	\$ 22,567
Branch 16 Tile	\$ 23,983	\$ 41,927	\$ 17,944
Branch 18 Tile	\$ 29,507	\$ 29,722	\$ 215
Storage Pond (5 AC)	\$ -	\$ 740,221	\$ 740,221
Road Authority Costs	\$ -	\$ -	\$ -
Total Project Costs	\$ 1,256,266	\$ 2,426,667	\$ 1,170,401
Subtotal Separable Maintenance Costs			\$ 1,256,266
Net Costs			\$ 1,170,401
Total Project Costs for Landowners			\$ 2,426,667
Benefits (Per Ditch Viewer Report)			\$ 1,619,179
Net Benefit			\$ 448,778

PROPOSED IMPROVEMENT

Mainline Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 38,500.00	\$ 38,500
102	TILE INVESTIGATION	HR	24	\$ 149.40	\$ 3,586
103	42-INCH AGRICULTURAL TILE	LF	589	\$ 85.00	\$ 50,065
104	36-INCH AGRICULTURAL TILE	LF	2987	\$ 66.55	\$ 198,785
105	30-INCH AGRICULTURAL TILE	LF	2983	\$ 55.95	\$ 166,899
106	24-INCH AGRICULTURAL TILE	LF	2265	\$ 42.07	\$ 95,289
107	18-INCH AGRICULTURAL TILE	LF	2526	\$ 32.04	\$ 80,933
108	15-INCH AGRICULTURAL TILE	LF	42	\$ 29.38	\$ 1,234
109	12-INCH AGRICULTURAL TILE	LF	191	\$ 25.72	\$ 4,913
110	10-INCH AGRICULTURAL TILE	LF	49	\$ 22.71	\$ 1,113
111	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	47	\$ 1,031.00	\$ 48,457
112	CONNECT EXISTING 24-INCH TILE	EA	1	\$ 2,413.77	\$ 2,414
113	CONNECT EXISTING 18-INCH TILE	EA	2	\$ 1,997.89	\$ 3,996
114	CONNECT EXISTING 10-INCH TILE	EA	3	\$ 939.57	\$ 2,819
115	CONNECT EXISTING 8-INCH TILE	EA	4	\$ 680.72	\$ 2,723
116	CONNECT EXISTING 6-INCH TILE	EA	3	\$ 581.71	\$ 1,745
117	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 4,833.06	\$ 4,833
118	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 2,750.03	\$ 2,750
119	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	3	\$ 2,529.36	\$ 7,588
120	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	3	\$ 1,794.83	\$ 5,384
121	10-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 1,677.17	\$ 1,677
122	GRANULAR PIPE FOUNDATION	CY	409	\$ 46.36	\$ 18,961
123	FURNISH & INSTALL WATER QUALITY INLET	EA	3	\$ 1,458.17	\$ 4,375
124	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	107	\$ 27.69	\$ 2,963
125	INSTALL DROP INTAKE (18-INCH)	EA	12	\$ 1,423.74	\$ 17,085
126	CAP DROP INTAKE (18-INCH)	EA	5	\$ 571.34	\$ 2,857
127	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	7	\$ 428.47	\$ 2,999
128	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	3	\$ 3,139.65	\$ 9,419
129	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	900	\$ 3.48	\$ 3,132
130	INSTALL INLET PROTECTION	EA	9	\$ 182.03	\$ 1,638
131	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	60	\$ 90.70	\$ 5,442
132	REMOVE EXISTING DROP INTAKE	EA	2	\$ 446.75	\$ 894
133	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	675	\$ 10.60	\$ 7,155
SUBTOTAL CONSTRUCTION COST					\$ 802,621
10% UNFORSEEN					\$ 80,262
TOTAL CONSTRUCTION COST					\$ 882,883
TEMPORARY DAMAGES		AC	33.50	\$ 800.00	\$ 26,800
TELEVISIONING (POST CONSTRUCTION)		LF	11632	\$ 1.00	\$ 11,632
COUNTY ADMINISTRATION COSTS					\$ 44,145
TOPOGRAPHIC SURVEY					\$ 11,632
REPORTS, PLANS AND SPECIFICATIONS					\$ 97,118
CONSTRUCTION STAKING & ADMINISTRATION					\$ 119,190
TOTAL MAINLINE TILE IMPROVEMENT COST					\$ 1,193,400



PROPOSED IMPROVEMENT

Mainline West Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 9,840.00	\$ 9,840
102	TILE INVESTIGATION	HR	9	\$ 149.40	\$ 1,345
103	18-INCH AGRICULTURAL TILE	LF	4209	\$ 32.04	\$ 134,856
104	8-INCH AGRICULTURAL TILE	LF	14	\$ 21.52	\$ 301
105	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	17	\$ 1,031.00	\$ 17,527
106	CONNECT EXISTING 15-INCH TILE	EA	3	\$ 1,319.51	\$ 3,959
107	CONNECT EXISTING 8-INCH TILE	EA	1	\$ 680.72	\$ 681
108	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 2,529.36	\$ 2,529
109	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 1,261.31	\$ 1,261
110	GRANULAR PIPE FOUNDATION	CY	120	\$ 46.36	\$ 5,563
111	FURNISH & INSTALL WATER QUALITY INLET	EA	3	\$ 1,458.17	\$ 4,375
112	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	79	\$ 27.69	\$ 2,188
113	INSTALL DROP INTAKE (18-INCH)	EA	6	\$ 1,423.74	\$ 8,542
114	CAP DROP INTAKE (18-INCH)	EA	1	\$ 571.34	\$ 571
115	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	5	\$ 428.47	\$ 2,142
116	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	2	\$ 3,139.65	\$ 6,279
117	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	600	\$ 3.48	\$ 2,088
118	INSTALL INLET PROTECTION	EA	6	\$ 182.03	\$ 1,092
SUBTOTAL CONSTRUCTION COST					\$ 205,140
10% UNFORSEEN					\$ 20,514
TOTAL CONSTRUCTION COST					\$ 225,654
TEMPORARY DAMAGES		AC	9.52	\$ 800.00	\$ 7,616
TELEVISIONING (POST CONSTRUCTION)		LF	4223	\$ 1.00	\$ 4,223
COUNTY ADMINISTRATION COSTS					\$ 11,283
TOPOGRAPHIC SURVEY					\$ 4,223
REPORTS, PLANS AND SPECIFICATIONS					\$ 24,822
CONSTRUCTION STAKING & ADMINISTRATION					\$ 30,464
TOTAL MAINLINE WEST TILE IMPROVEMENT COST					\$ 308,285



PROPOSED IMPROVEMENT

Branch 4 Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 1,850.00	\$ 1,850
102	TILE INVESTIGATION	HR	2	\$ 149.40	\$ 299
103	15-INCH AGRICULTURAL TILE	LF	649	\$ 29.38	\$ 19,068
104	8-INCH AGRICULTURAL TILE	LF	245	\$ 21.52	\$ 5,272
105	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	4	\$ 1,031.00	\$ 4,124
106	CONNECT EXISTING 24-INCH TILE	EA	1	\$ 2,413.77	\$ 2,414
107	CONNECT EXISTING 12-INCH TILE	EA	1	\$ 1,079.47	\$ 1,079
108	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 1,261.31	\$ 1,261
109	GRANULAR PIPE FOUNDATION	CY	22	\$ 46.36	\$ 1,020
110	INSTALL DROP INTAKE (18-INCH)	EA	1	\$ 1,423.74	\$ 1,424
111	CAP DROP INTAKE (18-INCH)	EA	1	\$ 571.34	\$ 571
SUBTOTAL CONSTRUCTION COST					\$ 38,382
10% UNFORSEEN					\$ 3,838
TOTAL CONSTRUCTION COST					\$ 42,221
TEMPORARY DAMAGES		AC	1.41	\$ 800.00	\$ 1,128
TELEVISIONING (POST CONSTRUCTION)		LF	894	\$ 1.00	\$ 894
COUNTY ADMINISTRATION COSTS					\$ 2,112
TOPOGRAPHIC SURVEY					\$ 894
REPORTS, PLANS AND SPECIFICATIONS					\$ 4,645
CONSTRUCTION STAKING & ADMINISTRATION					\$ 5,700
TOTAL BRANCH 4 TILE IMPROVEMENT COST					\$ 57,594



PROPOSED IMPROVEMENT

Branch 6 Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 1,810.00	\$ 1,810
102	TILE INVESTIGATION	HR	2	\$ 149.40	\$ 299
103	24-INCH AGRICULTURAL TILE	LF	76	\$ 42.07	\$ 3,197
104	15-INCH AGRICULTURAL TILE	LF	436	\$ 29.38	\$ 12,810
105	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	3	\$ 1,031.00	\$ 3,093
106	CONNECT EXISTING 24-INCH TILE	EA	1	\$ 2,413.77	\$ 2,414
107	CONNECT EXISTING 12-INCH TILE	EA	1	\$ 1,079.47	\$ 1,079
108	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 1,794.83	\$ 1,795
109	GRANULAR PIPE FOUNDATION	CY	14	\$ 46.36	\$ 649
110	FURNISH & INSTALL WATER QUALITY INLET	EA	1	\$ 1,458.17	\$ 1,458
111	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	28	\$ 27.69	\$ 775
112	INSTALL DROP INTAKE (18-INCH)	EA	2	\$ 1,423.74	\$ 2,847
113	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	\$ 428.47	\$ 857
114	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 3,139.65	\$ 3,140
115	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	300	\$ 3.48	\$ 1,044
116	INSTALL INLET PROTECTION	EA	2	\$ 182.03	\$ 364
SUBTOTAL CONSTRUCTION COST					\$ 37,632
10% UNFORSEEN					\$ 3,763
TOTAL CONSTRUCTION COST					\$ 41,395
TEMPORARY DAMAGES		AC	1.11	\$ 800.00	\$ 888
TELEVISIONING (POST CONSTRUCTION)		LF	512	\$ 1.00	\$ 512
COUNTY ADMINISTRATION COSTS					\$ 2,070
TOPOGRAPHIC SURVEY					\$ 512
REPORTS, PLANS AND SPECIFICATIONS					\$ 4,554
CONSTRUCTION STAKING & ADMINISTRATION					\$ 5,589
TOTAL BRANCH 6 TILE IMPROVEMENT COST					\$ 55,520



PROPOSED IMPROVEMENT

Branch 16 Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 1,370.00	\$ 1,370
102	TILE INVESTIGATION	HR	1	\$ 149.40	\$ 149
103	12-INCH AGRICULTURAL TILE	LF	345	\$ 25.72	\$ 8,873
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	2	\$ 1,031.00	\$ 2,062
105	CONNECT EXISTING 10-INCH TILE	EA	1	\$ 939.57	\$ 940
106	10-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 1,677.17	\$ 1,677
107	GRANULAR PIPE FOUNDATION	CY	8	\$ 46.36	\$ 371
108	FURNISH & INSTALL WATER QUALITY INLET	EA	2	\$ 1,458.17	\$ 2,916
109	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	55	\$ 27.69	\$ 1,523
110	INSTALL DROP INTAKE (18-INCH)	EA	2	\$ 1,423.74	\$ 2,847
111	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	\$ 428.47	\$ 857
112	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 3,139.65	\$ 3,140
113	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	300	\$ 3.48	\$ 1,044
114	INSTALL INLET PROTECTION	EA	4	\$ 182.03	\$ 728
SUBTOTAL CONSTRUCTION COST					\$ 28,498
10% UNFORSEEN					\$ 2,850
TOTAL CONSTRUCTION COST					\$ 31,348
TEMPORARY DAMAGES		AC	0.80	\$ 800.00	\$ 640
TELEVISIONING (POST CONSTRUCTION)		LF	345	\$ 1.00	\$ 345
COUNTY ADMINISTRATION COSTS					\$ 1,568
TOPOGRAPHIC SURVEY					\$ 345
REPORTS, PLANS AND SPECIFICATIONS					\$ 3,449
CONSTRUCTION STAKING & ADMINISTRATION					\$ 4,232
TOTAL BRANCH 16 TILE IMPROVEMENT COST					\$ 41,927

Branch 18 Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 1,000.00	\$ 1,000
102	TILE INVESTIGATION	HR	1	\$ 149.40	\$ 149
103	18-INCH AGRICULTURAL TILE	LF	65	\$ 32.04	\$ 2,083
104	8-INCH AGRICULTURAL TILE	LF	408	\$ 21.52	\$ 8,780
105	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	2	\$ 1,031.00	\$ 2,062
106	CONNECT EXISTING 24-INCH TILE	EA	1	\$ 2,413.77	\$ 2,414
107	CONNECT EXISTING 8-INCH TILE	EA	1	\$ 680.72	\$ 681
108	GRANULAR PIPE FOUNDATION	CY	10	\$ 46.36	\$ 464
109	INSTALL DROP INTAKE (18-INCH)	EA	1	\$ 1,423.74	\$ 1,424
110	CAP DROP INTAKE (18-INCH)	EA	1	\$ 571.34	\$ 571
SUBTOTAL CONSTRUCTION COST					\$ 19,627
10% UNFORSEEN					\$ 1,963
TOTAL CONSTRUCTION COST					\$ 21,590
TEMPORARY DAMAGES		AC	1.02	\$ 800.00	\$ 816
TELEVISIONING (POST CONSTRUCTION)		LF	473	\$ 1.00	\$ 473
COUNTY ADMINISTRATION COSTS					\$ 1,080
TOPOGRAPHIC SURVEY					\$ 473
REPORTS, PLANS AND SPECIFICATIONS					\$ 2,375
CONSTRUCTION STAKING & ADMINISTRATION					\$ 2,915
TOTAL BRANCH 18 TILE IMPROVEMENT COST					\$ 29,722



PROPOSED IMPROVEMENT

Storage Pond (5 AC)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 20,960.00	\$ 20,960
102	BULKHEAD EXISTING TILE	EA	1	\$ 513.06	\$ 513
103	COMMON EXCAVATION - POND (P) (EV)	CY	78953	\$ 2.75	\$ 217,121
104	TOP SOIL STRIP & PLACE SPOILS	AC	26.69	\$ 5,229.97	\$ 139,588
105	30-INCH CLASS III RCP PIPE	LF	43	\$ 184.46	\$ 7,932
106	INSTALL STRUCTURE S-1 WITH GALVINIZED GRATE	EA	1	\$ 25,327.13	\$ 25,327
107	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	1105	\$ 3.48	\$ 3,845
108	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	240	\$ 90.70	\$ 21,768
SUBTOTAL CONSTRUCTION COST					\$ 437,054
10% UNFORSEEN					\$ 43,705
TOTAL CONSTRUCTION COST					\$ 480,760
TEMPORARY DAMAGES		AC	15.42	\$ 800.00	\$ 12,336
LAND ACQUISTION/ PERMANENT DAMAGES		AC	5.85	\$ 18,000.00	\$ 105,300
COUNTY ADMINISTRATION COSTS					\$ 24,038
REPORTS, PLANS AND SPECIFICATIONS					\$ 52,884
CONSTRUCTION STAKING & ADMINISTRATION					\$ 64,903
TOTAL STORAGE POND (5 AC) IMPROVEMENT COST					\$ 740,221

TOTAL IMPROVEMENT COST

	Mainline Tile	\$ 1,193,400
	Mainline West Tile	\$ 308,285
	Branch 4 Tile	\$ 57,594
	Branch 6 Tile	\$ 55,520
	Branch 16 Tile	\$ 41,927
	Branch 18 Tile	\$ 29,722
	Storage Pond (5 AC)	\$ 740,221
COMPLETE IMPROVEMENT COST		\$ 2,426,667