

Redwood County Ditch No. 20 Improvement

Final Engineer's Report
Redwood County, Minnesota

February 27th, 2026

Project No. 23-28479



Architecture
Engineering
Environmental
Planning
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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.



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Redwood County Ditch No. 20 Improvement
Redwood County, Minnesota

Engineer's Project Number: 23-28479

Dated this 27th day of February, 2026

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EXECUTIVE SUMMARY

A petition was submitted to the drainage authority requesting to improve the Redwood County Ditch No. 20 (CD 20) drainage system. CD 20 drains a 4,635-acre watershed and was originally established in 1915.

Portions of the existing subsurface tile in the CD 20 system is undersized, aging, and beginning to fail. The current drainage system also exhibits several areas that lack adequate cover depth for current farming practices. Additionally, the system is experiencing severe channelized overland flow due to insufficient and degraded tile capacity.

The proposed project includes replacing a portion of the Mainline tile with a Mainline open ditch beginning at its terminus into the Redwood County Ditch No. 12 (CD 12) open ditch. A portion of this proposed Mainline open ditch will be a two-stage ditch to provide in-channel storage to mitigate downstream impacts. Additionally, the proposed project includes improving a portion of Mainline tile and Branch 4 tile. The preliminary cost for this project is approximately \$2,894,363.

ORDER TO PROCEED

A petition was received by the Redwood County Drainage Authority on June 17th, 2024. The petition requested an improvement to a portion of Mainline and Branch 4 subsurface tile by replacing and enlarging the existing tile lines. Additionally, the requested improvement included replacing a portion of Mainline tile with approximately 8,800 linear feet of Mainline open ditch.

On September 18th, 2024, the Redwood County Drainage Authority made an order in which it accepted the petition for Redwood County Ditch No. 20 and appointed Jen Widmer, PE, of ISG as Engineer. It did not order anything beyond what was stated in the petition. A copy of the petition and signed order can be found in Appendix B.

ISG completed the survey and preliminary engineer's report and submitted the information for the Board's approval. On July 15th, 2025, the Redwood County Board of Commissioners made an Order to Proceed in which it directed ISG to prepare a Final Engineer's Report (FER) and associated Preliminary Construction Plans. It did not order any further actions or stipulations. On October 23rd, 2025, Bailey Bocchino, PE, of ISG was appointed as Engineer due to staffing changes. A copy of the findings and order for final report and appointment of viewers can be found in Appendix B.

SYSTEM WATERSHED

Location

County Ditch No. 20 is located in Sections 1 – 4, 9 – 15, and 23 – 24 of Kintire Township in Redwood County and Sections 6, 7, and 18 of Delhi Township in Redwood County. The CD 20 Mainline tile runs generally east from its beginning in SE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 9 in Kintire Township to its outlet into Redwood County Ditch No. 12 in the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 7 in Delhi Township.

Watershed Description

The CD 20 system drains approximately 4,635 acres. Its watershed is characterized primarily of gently rolling agricultural lands, which is relatively flat, displaying an elevation difference of approximately 93 feet across the entire watershed. The predominant land use within the watershed is agricultural row crops. There are five wetlands within the CD 20 watershed that have been identified by a Level 1 wetland delineation. The Mainline tile outlet of CD 20 is CD 12. Their junction is located in the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 7 of Delhi Township in Redwood County. After consulting the historical DNR Public Waters Inventory Map, the DNR Buffer Map, and the GIS version of the Public Waters Inventory Map, the outlet is not a Public Water. The outlet also is not a Water of the US. This ditch is not listed as an MPCA Impaired Water. CD 12 subsequently drains to Rice Creek, a public water, approximately 0.38 miles downstream of the CD 20 outlet. There are 4.1 acres of CREP III land 7.8 acres of RIM land located within a mile downstream of the CD 20 watershed along Rice Creek. See the Public Waters, Public and Conservation Lands Map in Appendix C.

The predominant hydrologic soil type in the system's watershed is type "C/D," which is considered a dual hydrologic soil group, a soil that has the potential to be adequately drained. The "D" in this group corresponds to the soil having over 40 percent clay and restricted water movement. The "C" signifies the soil in its drained condition. That means if adequately drained, the soil would have moderately high runoff potential when thoroughly wet.

See Appendix C for maps depicting the watershed's location, elevation, hydrologic soils, unified soil classification, and Level 1 Wetland Delineation.

HISTORY

According to historic documents supplied by Redwood County, CD 20 was originally constructed in 1915. The original system consisted of approximately 105,050 linear feet of tile. This included the Mainline, Branches 1 - 9, Branch 3 Lateral A, Branch 4 Laterals A - D, Branch 4 Laterals A1, A2, B1, B2, and C1, and Branch 6 Lateral A tile. Later on, Branch 10 and Branch 11 were established, consisting of approximately 2,200 linear feet and 1,250 linear feet of tile, respectively. The tile sizes ranged from 28-inch to 5-inch with slopes ranging from 2.30% to 0.10%. A redetermination of benefits (ROB) was completed in 2022. There are no documented improvements or repairs historically done to the CD 20 system.

Early Coordination and Feasibility Report

Prior to the Petition for this drainage improvement, two landowner meetings were held to review potential improvement options. These meetings were attended by landowners within the CD 20 watershed, county drainage staff, and ISG staff. These meetings were held in February and March of 2024. Similarly, early coordination correspondence including Redwood County staff, ISG staff, and the Minnesota Department of Natural Resources (MN DNR) staff took place on March 12th, 2024, to discuss the upcoming improvement project and gather DNR input. County staff, DNR, and ISG staff held a meeting on May 28th, 2025, prior to the preliminary hearing and the submission of the advisory letter to review the project's environmental criteria. Following the meeting, ISG shared the Preliminary Hydrologic and Hydraulic Infoworks ICM model with the DNR on June 5th, 2025. DNR also completed a geomorphic stream assessment of CD 12 (outlet channel to improvement) with ISG representatives present. Data collected or findings from survey were not shared with ISG. An additional coordination meeting with the DNR is planned to be scheduled upon submission of this report.

Investigation of External Sources of Funding and Technical Assistance

Section 103E.015, Subd. 1a of the Drainage Code requires that an investigation of external sources of funding and technical assistance be conducted prior to an order on the engineer's preliminary survey report for a drainage project or the engineer's report for a repair. The funding can be used for wetland preservation or restoration or creation of water quality improvements, flood control, or alternative measures (per Section 103E.015, Subd. 1, clause (2)). The sources of funding authorized under this Section can be used outside the benefited area but must be used in the watershed of the system.

The investigation of external sources of funding and technical assistance for CD 20 was conducted by ISG on behalf of the drainage authority.

Funding options were explored for the two-stage ditch on the project. Because the storage area is mitigating impacts from the improvement, it is not eligible for state funding. Additional storage that goes above and beyond 103E drainage statute requirements, may be eligible for additional funding.

PRESENT CONDITION OF SYSTEM BY OBSERVATION AND ANALYSIS

The present condition of CD 20 was determined via a topographic survey, historic aerial images, and a drone flight. The images shown below were taken via drone on September 13th, 2024.

Present Condition of Drainage Infrastructure

TILE

The subsurface tile in the CD 20 system has been shown to be in a state of disrepair. Portions of the existing subsurface tile in the CD 20 system are undersized, aging, and beginning to fail. According to historical plans and profiles, the current drainage system also exhibits several areas that lack adequate cover depth for current farming practices. Additionally, the system is experiencing severe channelized overland flow, which suggests the tile does not have adequate capacity.

DRONE

In September of 2024, ISG completed a drone flight of the CD 20 system. The drone flight illustrated the severe channelized overland flow of the lands within CD 20, which supports the evidence that the system is undersized and in disrepair. Examples of these areas are shown below in Figures 1 and 2. Figure 3 illustrates the extent of the severe channelized flow and inundation. A full drone report can be found in Appendix J.



Figure 1. Channelized Overland Flow over the Mainline (NW ¼ Section 7 of Delhi TWP)



Figure 2. Channelized Overland Flow over the Mainline (NW ¼ Section 7 of Delhi TWP)

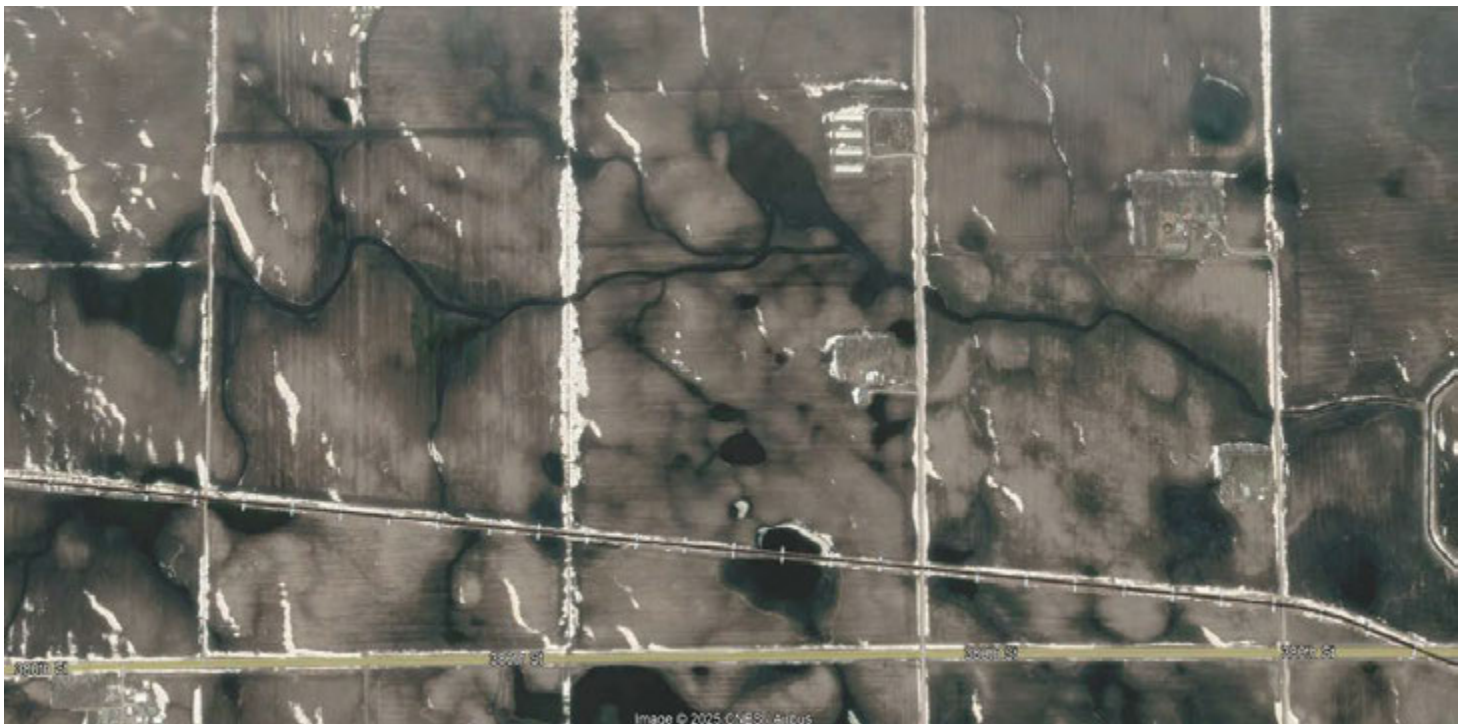


Figure 3. Channelized Overland Flow in CD 20 (4-15-2019) (Section 7 of Delhi TWP and Sections 11 and 12 of Kintire Township)

Outlet Location, Extent, and Adequacy

The project terminus is located at the CD 20 outlet illustrated in Figures 4, 5, and 6. As defined in the subcommittee's report, the terminus for an improvement is defined as the downstream end of the project. For the CD 20 improvement, the project's terminus is defined as the CD 20 Mainline tile outlet into the CD 12 open ditch. The outlet for CD 20 is Redwood County Ditch No. 12 (CD 12), which is another public drainage system. CD 12 is an engineered channel with the primary purpose of supporting agricultural drainage. Their junction is located in the NW ¼ of the SE ¼ of Section 7 of Delhi Township in Redwood County, Minnesota. The CD 12 open ditch was visually inspected and assessed through a stream survey in collaboration with the DNR and was deemed as stable channel with dense vegetation and no visual areas of sloughing or bank instability. CD 12 subsequently flows east for approximately 0.38 miles, before it outlets into Rice Creek east of County State Aid Highway 6 (CSAH 6). Rice Creek is classified as a Public Water. In the present condition, CD 20 is contributing severe overland flow to CD 12, which can contribute to erosion and turbidity in CD 12 and downstream watercourses. Controlling the CD 20 overland flow will improve the overall condition of CD 12 and subsequent downstream waters.

Images below illustrate the condition of the CD 20 outlet, CD 12, and Rice Creek.

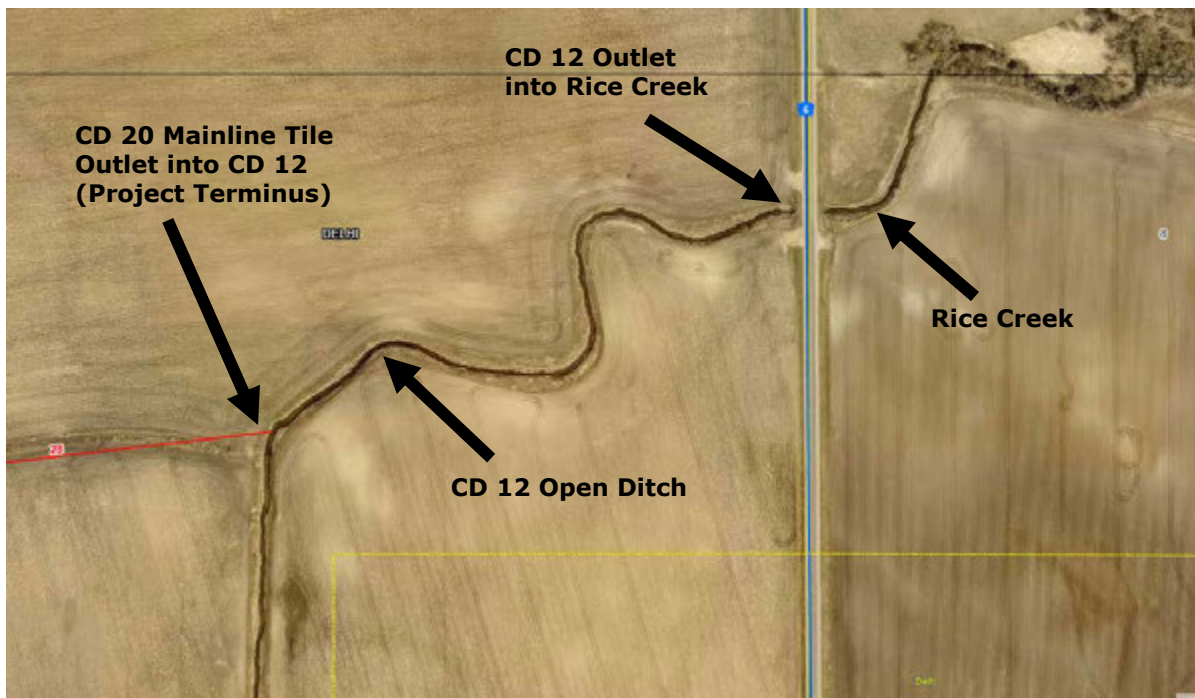


Figure 4. CD 20 Outlet into CD 12 and Rice Creek Extent (NW ¼ of SE ¼ of Section 7 of Delhi TWP)

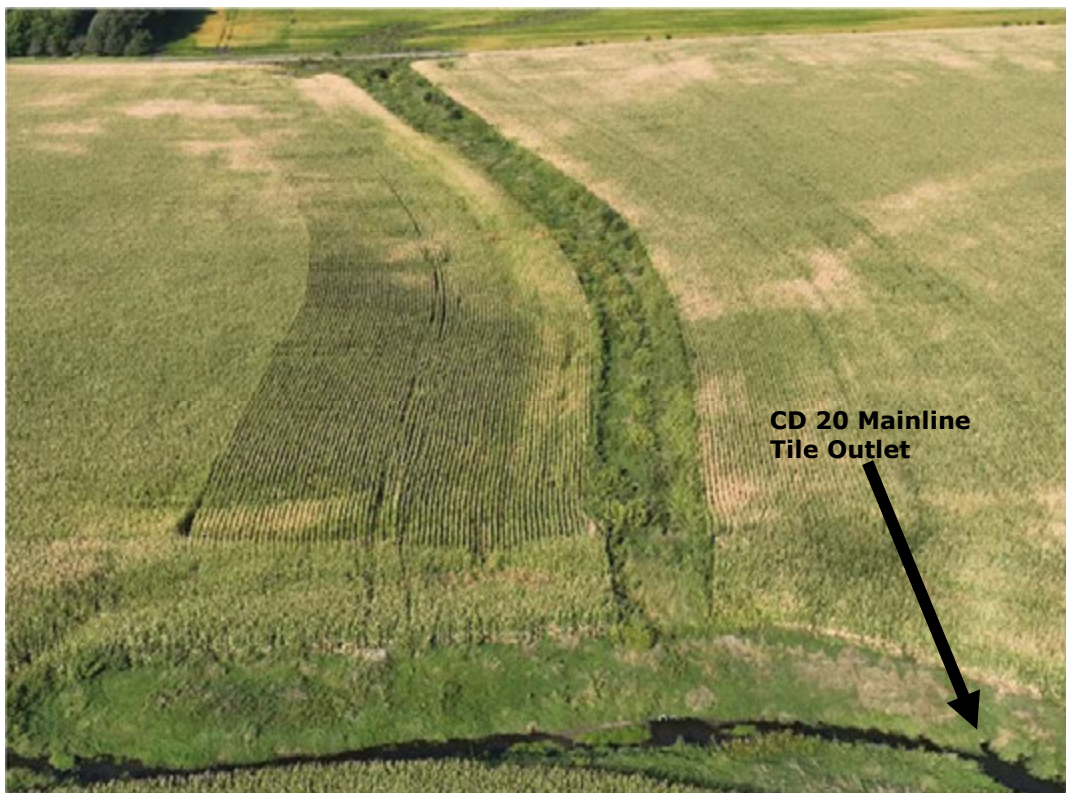


Figure 5. CD 20 Outlet into CD 12 (NW ¼ of SE ¼ of Section 7 of Delhi TWP)



Figure 6. CD 20 Mainline Tile Outlet into CD 12 (NW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Section 7 of Delhi TWP)



Figure 7. CD 12 Open Ditch (NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Section 7 of Delhi TWP)



Figure 8. CD 12 Terminus into Rice Creek at CSAH 6 (NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Section 7 of Delhi TWP)



Figure 9. Rice Creek East of CSAH 6 (NW $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 8 of Delhi TWP)



Figure 10. Rice Creek East of CSAH 6 (NW ¼ of SW ¼ of Section 8 of Delhi TWP)

System Capacity

The capacity of agricultural tile is expressed as a drainage coefficient, which is defined as the depth of water over the entire area of the upstream watershed that a tile or ditch can drain a 24-hour period (inches per day (in/day)).

Table 1 below summarizes the hydraulic capacity of the CD 20 culverts in the existing condition. These capacities are calculated from the surveyed culverts and represent their existing size and slope. These calculations do not take into consideration any flow restrictions from sediment buildup, vegetation, or damage to the culvert. Because CD 20 is a tile system, these culverts are not part of the public drainage system and don't have a legal capacity. ISG will coordinate with Delhi and Kintire Township's Road Authorities, to discuss these culvert crossings.

These culverts are allowing the severe overland flow to bypass these road crossings, channelize, and flow overland to the outlet of the CD 20 system.

TABLE 1. EXISTING CULVERT CAPACITIES

Crossing # on Map	Roadway	Existing Type	Existing Material	Existing Size (in)	Existing Width (ft)	Existing Height (ft)	Existing Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)	Combined Existing Drainage Coefficient (in/day)
1	Ironwood Ave	ROUND CULVERT	RCP	48	-	-	2.63%	4722	1.18	1.32
	Ironwood Ave	ROUND CULVERT	RCP	36	-	-	0.18%	4722	0.14	
2	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	6.08
	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	

Table 2 below summarizes the hydraulic capacity of the CD 20 tile. These calculations are computed for the As Constructed or Subsequently Improved Conditions (ACSIC) – meaning that the tile sizes and slopes come from the most recent repair or improvement plans if available, or the original construction plans if the system has not been improved. These calculations reflect the capacity of the tile as though it were brand new, and do not reflect the existing capacity, which likely has maintenance issues (i.e. offset joints, cracks, debris) that would reduce the current capacity of the tile.

TABLE 2. ACSIC TILE CAPACITIES

Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	28	0.10%	4869.6	0.05
	28	0.10%	4647.1	0.06
	28	0.10%	4304.5	0.06
	28	0.10%	4252.8	0.06
	28	0.10%	4104.2	0.06
	26	0.10%	3688.5	0.06
	26	0.10%	3177.3	0.07
	18	0.20%	1576.8	0.07
	16	0.20%	1371.3	0.06
	14	0.20%	794.0	0.07
	12	0.40%	531.6	0.10
	12	0.20%	473.5	0.08
	10	0.20%	232.2	0.10
	8	0.20%	218.4	0.06
	6	0.50%	95.9	0.10
	Branch 1	5	0.40%	80.3
5		0.40%	57.1	0.09
Branch 1	6	0.30%	123.5	0.06
Branch 2	10	0.50%	205.9	0.18
	10	0.10%	148.3	0.11
	8	0.20%	137.0	0.09
	7	0.20%	108.0	0.08
	7	0.10%	50.6	0.13
	7	0.10%	6.6	0.97
Branch 3	10	0.30%	365.3	0.08
	9	0.30%	335.5	0.06
	9	0.30%	290.7	0.07
	9	0.15%	233.2	0.07
	8	0.35%	155.1	0.11
	7	0.10%	100.2	0.06
Branch 3A	6	0.10%	43.1	0.10

TABLE 2. ACSIC TILE CAPACITIES (CONT)

Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Branch 4	20	0.32%	1565.8	0.12
	16	0.32%	875.3	0.12
	16	0.32%	843.3	0.12
	16	0.20%	795.1	0.10
	15	0.43%	705.9	0.14
	15	0.10%	695.9	0.07
	15	0.10%	519.6	0.09
	14	0.10%	339.0	0.12
	12	0.15%	217.2	0.15
	12	0.10%	214.9	0.13
	10	0.10%	193.5	0.09
	8	0.10%	141.6	0.06
	5	0.10%	26.0	0.10
Branch 4 Lat A	14	0.20%	627.0	0.09
	14	0.20%	607.5	0.09
	14	0.10%	539.4	0.08
	10	0.40%	263.1	0.13
	10	0.10%	261.1	0.06
	9	0.10%	205.8	0.06
	5	0.25%	53.2	0.08
	5	0.25%	33.1	0.12
Branch 4 Lat A1	10	0.10%	236.8	0.07
	8	0.10%	189.6	0.05
	6	0.10%	66.0	0.06
	6	0.30%	55.2	0.13
	6	0.30%	21.2	0.35
Branch 4 Lat A2	8	0.10%	116.0	0.08
	6	0.10%	83.0	0.05
Branch 4 Lat B	8	0.10%	85.2	0.11
	6	0.10%	59.5	0.07
	6	0.25%	59.5	0.11
	5	0.25%	20.5	0.20
Branch 4 Lat B1	6	0.10%	20.6	0.21
Branch 4 Lat B2	5	0.50%	6.6	0.88

TABLE 2. ACSIC TILE CAPACITIES (CONT)

Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Branch 4 Lat C	9	0.10%	146.2	0.09
	7	0.24%	74.7	0.13
	6	0.24%	40.4	0.16
	5	0.24%	17.0	0.24
Branch 4 Lat C 1	6	0.10%	32.4	0.13
	6	0.10%	15.1	0.28
Branch 4 Lat D	6	0.20%	78.7	0.08
Branch 5	6	0.20%	102.5	0.06
	5	0.60%	70.2	0.09
	5	0.20%	58.2	0.06
Branch 6	12	0.13%	551.5	0.05
	12	0.13%	494.6	0.06
	6	0.13%	17.2	0.28
	6	0.40%	13.2	0.64
Branch 6 Lat A	10	0.25%	346.9	0.08
	10	0.10%	232.9	0.07
	9	0.10%	190.9	0.07
	8	0.10%	131.8	0.07
	7	0.90%	191.0	0.10
	7	0.20%	139.3	0.06
	6	0.20%	119.6	0.05
	5	2.30%	27.0	0.46
	5	0.10%	27.0	0.10
Branch 7	7	0.20%	247.0	0.04
	6	0.50%	215.2	0.04
	5	0.80%	165.8	0.04
	5	0.20%	126.9	0.03
Branch 8	5	0.90%	117.3	0.07
	5	0.30%	108.3	0.04
Branch 9	5	0.30%	10.5	0.43
Branch 10	12	0.10%	207.4	0.13
Branch 11	10	0.10%	101.1	0.16

PROPOSED PROJECT

The following project has been proposed in response to the Petition with due regard to the results of the Preliminary Survey:

Project Design Parameters

While alternatives will be analyzed, there are certain things that will, by necessity, characterize any configuration of the proposed drainage project.

COEFFICIENT OF DRAINAGE

The industry standard drainage coefficient for agricultural tile is 0.50 in/day. Field crossing culverts are generally designed to a minimum of a 1.0 in/day drainage coefficient, with the hydrology and hydraulics of the system further influencing the design. Culverts under roads and highways are designed after completing a detailed hydraulic analysis; there are no standard drainage coefficients for these crossings.

SYSTEM DEPTH (TILE)

The tile depth of CD 20 is controlled by four criteria: 1. Provide a minimum of five feet of cover in low spots along public tile alignments, 2. Increase tile grades to improve capacity, and 3. Provide deeper outlets for private tile. 4. The proposed open ditch provides outlets for all existing and proposed public tile in the CD 20 system. The proposed open ditch depth is constrained by its outlet into CD 12.

EROSION CONTROL

Required temporary erosion control will consist of silt fence or bio-roll around all surface intakes, and ditches until vegetation is established. Temporary erosion control will be maintained throughout the construction process according to the Minnesota Pollution Control Agency (MPCA) regulations.

Permanent erosion control will consist of riprap around all tile outlets into ditches as necessary, as well as at the upstream and downstream end of ditch culvert crossings. Seeding and erosion control blanket will be placed on all disrupted areas around road crossings. All disturbed vegetation throughout the project will be reseeded with the appropriate seed mix and mulch.

A Storm Water Pollution Prevention Plan will be developed before final construction plans are complete and a National Pollution Discharge and Elimination System (NPDES) permit application will be filed before construction.

SYSTEM EASEMENT

Upon completion of the project, the existing public tile lines that were replaced with new tile will be legally abandoned. At that point, the existing tile easement will be removed and replaced with an easement centered over the new improved tile. An easement will be centered over the proposed open ditch, replacing the existing easement centered over the corresponding portion of Mainline tile. The Minnesota Buffer Law (103F.48) states that there must be a 16.5-foot (1-rod) buffer on public ditches. Buffer strips help to prevent sediment from entering the open ditch as well as preventing sloughing of the ditch side slopes. In accordance with this law, a 16.5-foot buffer will be established on both sides of the proposed open ditch and included in the newly established system easement. Buffer seeding will be completed after the final grading of spoils.

TILE AND CONNECTION MATERIALS

All public tile is solid non-perforated dual wall HDPE pipe with watertight gaskets at all straight-line pipe joints. All angle pipe joints, and prefabricated fitting connections, will be soil tight.

TILE REPLACEMENT AND CONNECTIONS

The existing public tile branches and mainline that will be replaced by the improvement tile will be legally abandoned after the improvement is constructed. This abandoned tile will be left in the ground to service any existing private tile that is connected to it. The abandoned tile will periodically be connected into the improvement tile, funneling all water through the new tile.

Project Components

DITCHES

This project includes constructing an open ditch and two-stage ditch to replace a portion of Mainline tile. This open ditch construction is necessary because there is severe channelized overland flow running parallel to the Mainline tile. Implementation of an open ditch will increase capacity of the system as a whole and will provide a controlled channel to eliminate the existing overland flow issues. The proposed open ditch will consist of an 8-foot bottom width, 2:1 side slopes, and will run at a 0.08% slope. The segment of two-stage ditch will be approximately 2,783-linear feet long, consist of an 8-foot bottom, have 20-foot

benches on both sides of the ditch, 2:1 side slopes, and will run at a 0.08% slope. The two-stage ditch will consist of an ellipse shaped inner channel. The bench height will be approximately 1.5-feet above the ditch bottom. Regional curves from data collected throughout the state of Minnesota was utilized to determine the inner channel dimensions which mimic bankfull stage in natural channels. Regional curves informed the depth, width, and cross sectional area. The excavated material will be leveled along the open ditch and into adjoining fields. Topsoil will be stripped and replaced over the spoils areas. Spoil material will be used to fill existing areas along the proposed open ditch alignment that flood and to fill channelized flow paths.

Culverts

Due to the implementation of the open ditch, two culvert crossings will need to be constructed. The proposed culverts sizes and locations are detailed in Table 3 below. There are existing culverts along the alignment of proposed Mainline open ditch, that will be removed and replaced with the proposed culverts displayed below. It is proposed that the Ironwood Avenue proposed culvert consists of an 8-foot by 4-foot box culvert, with a 0.10% slope, producing a proposed drainage coefficient of 0.93-inches/day. This culvert acts as the control structure for the two-stage ditch. Additionally, it is proposed that the Impala Avenue proposed culvert consists of an 8-foot by 7-foot box culvert, with a 0.10% slope, producing a proposed drainage coefficient of 2.17-inches/day.

TABLE 3. PROPOSED CULVERT CAPACITIES

Crossing # on Map	Ditch Description	Station	Roadway	Proposed Type	Proposed Material	Proposed Width (ft)	Proposed Height (ft)	Proposed Slope (%)	Drainage Area (Acres)	Proposed Drainage Coefficient (in/day)
1	Mainline Open Ditch	10+90	Ironwood Ave	BOX CULVERT	RCP	8	4	0.10%	4722	0.93
2	Mainline Open Ditch	39+49	Impala Ave	BOX CULVERT	RCP	8	7	0.10%	4145	2.17

Alternative Side Inlets

Ditch systems are designed to allow water to enter the ditch by surface sheet flow or, as flows concentrate, via field drainageways. However, the latter allows for head cutting (erosion along the drainageways) up into the field. To remedy the head cutting, the original (traditional) side inlet (side inlet control per Chapter 103E) was designed as a pipe from the field through the ditch berm to the ditch. While this eliminated the head cutting, any sediment laden water from the surrounding field entering the pipe inlet was allowed to go directly through the pipe to the ditch.

In more recent years, Alternative Side Inlets (ASI) have been proposed for locations along the ditch where concentrated surface flows are encountered. While there are a number of different configurations of ASIs, they are all designed to reduce sediment transport from the field to the ditch. They are characterized by two things: 1. Temporary ponding of water to settle out sediment (using one of many different intakes including rock filters), and 2. Energy dissipation (some using drop structures and others using rock filters).

Both types have their intakes located completely in the ditch buffer to reduce potential damage during field operations. The ditch berm with or without riprap along with a restricted intake creates a temporary pond. When large concentrations of flow are coming to a particular ASI, riprap will be used to form an emergency overflow, or an ASIRO. Details for the ASI and ASIRO can be seen in the preliminary plans.

The spoils from the construction of the open ditch will be placed on the proposed top of ditch. This will create a small berm along the top of the proposed open ditch and may restrict surface flow into the ditch. In existing low areas, ASIs are placed adjacent to the proposed open ditch to allow for surface flow to rain into the open ditch. 5 ASIROS are included in the improvement project. The proposed ditch will allow water via sheet flow and ASIs will be incorporated into the proposed design upon finalization of the ditch spoils design.

TILE

The proposed project includes improving portions of the Mainline and Branch 4 subsurface tile. The proposed Mainline tile improvement will consist of approximately 3,620-linear feet of tile extending from its outlet into the proposed open ditch in Section 12 of Kintire Township to its junction with the existing Mainline tile in Section 11 in Kintire Township. The proposed Branch 4 tile improvement will consist of approximately 1,905-linear feet of tile extending from its outlet into the proposed open ditch in Section 12 of Kintire Township to its junction with the existing Branch 4 tile in Section 11 of Kintire Township. The proposed improvement only consists of portions of the Mainline tile and Branch 4 tile. This improvement will relieve pressure and provide a better outlet for potential further improvements to upstream branches. The capacity of the proposed tile is shown in Table 4 below. The proposed tile is an improvement because it is deeper and has increased capacity when compared to the ACSIC system. Where the proposed tile replaces an existing branch, the existing system will be periodically connected into the proposed system and the existing tile and outlet will be abandoned.

TABLE 4. PROPOSED TILE CAPACITIES

Area	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	28	Open Ditch	0.10%	0.09%	4869.6	0.05	Open Ditch
	28		0.10%	0.08%	4647.1	0.06	
	28		0.10%	0.07%	4304.5	0.06	
	28		0.10%	0.07%	4252.8	0.06	
	28		0.10%	0.07%	4104.2	0.06	
	26		0.10%	0.17%	3688.5	0.06	
	26		0.10%	0.13%	3177.3	0.07	
	18	42	0.20%	0.12%	1576.8	0.07	0.53
	16	36	0.20%	0.20%	1371.3	0.06	0.52
Branch 4	20	36	0.32%	0.25%	1565.8	0.12	0.51

Drop Intakes

A drop intake is a structure used along a tile to aid in televising tile, accessing the tile to check for sediment accumulation, and draining surface water. They are installed periodically along tile alignments, generally in low areas and/or on each side of road crossings. They are also placed at property lines and as replacements for existing drop intakes.

Standard drop intakes are designed to provide surface drainage through slotted intakes during low flow events. The slots are cut in each rib from 10-inches above grade to as much as 4-feet below grade (surrounded with rock in order to promote sedimentation and infiltration). During high flow events, a standard surface inlet trash rack provides an overflow in order to prevent extensive flooding.

With the existing mainline and branch tile lines remaining in place, the new mainlines and branch tile may not be constructed through the lowest point of road ditches or fields. To ensure proper drainage, water quality intakes will be offset into these low areas and connected to the drop intake. Water quality intakes are designed to provide surface drainage infiltration through a washed rock filter during low flow events. This allows for increased settling out of sediment. An integrated slotted (or perforated) intake provides an overflow during high flow events, preventing extensive flooding similar to a standard drop intake.

Private Tile Headers

In areas where pattern tile present along the proposed open ditch, private tile headers are recommended. Private tile headers will be installed parallel to the proposed open ditch where private pattern tile is present. The pattern tile will be connected into the private tile header, and the private tile header will outlet into the proposed open ditch. With the private header in place, the number of outlets into the proposed open ditch will be reduced and therefore reduce erosion and future maintenance on the open ditch.

TWO-STAGE DITCH

Drainage improvements can increase flows, change timing of flows, and increase flooding downstream. Water storage practices are proposed to mitigate these impacts to receiving waters. It will also delay water from leaving the system, which will reduce flooding downstream. The proposed stretch of two-stage ditch in the CD 20 watershed is located in the N ½ of the SW ¼ of Section 7 in Delhi Township, between Ironwood Avenue and Impala Avenue. The two-stage ditch storage area will contribute an additional approximate 22.2 ac-ft of storage volume compared to a standard ditch in the same location. The two-stage ditch will be approximately 2,783-linear feet long, have 20-foot benches on either side of the ditch, and have 2:1 side slopes. The two-stage ditch will provide additional storage and reduce peak flowrates, therefore neutralizing any potential impacts to County State Aide Highway 6 (CSAH 6) and public waters downstream. In addition to slowing the flow of water downstream, the two-stage ditch will allow for additional nutrient uptake from the vegetated benches. The Redwood County Drainage Authority would have to secure a permanent easement over the extents of the proposed two-stage ditch with full cooperation of the impacted landowners to ensure future maintenance responsibility and access in the same manner as the rest of the open ditch construction.

Alternative Projects/Options

A project alternative was discussed in the preliminary engineer's report that involved the extension of the currently proposed two-stage ditch located in the SW ¼ of Section 7 in Delhi Township. The alternative two-stage ditch extension proposed extending the

two-stage ditch west, to the NW ¼ of the SW ¼ of Section 12 in Kintire Township. The only difference between the currently proposed design and the alternative is that the proposed ditch, west of Impala Avenue, would be a two-stage ditch rather than a standard open ditch. Per landowner request, this improvement alternative was sized to compensate for a full system improvement in the future considering remaining public open ditch branches and would include an additional cost. A preliminary cost comparison of this alternative from the preliminary engineer's report is illustrated below. Following the approval of the preliminary engineer's report, petitioners requested to not pursue this project alternative in the final engineer's report.

TABLE 5. PRELIMINARY ENGINEER'S REPORT PROPOSED DESIGN AND ALTERNATIVE DESIGN COST COMPARISON

Area	Currently Proposed Design Cost	Full Two-Stage Ditch Alternative Cost	Difference in Cost
CD 20 Mainline Open Ditch	\$ 1,086,331	\$ 1,543,709	\$ 457,378
CD 20 Mainline Tile	\$ 532,808	\$ 532,808	\$ -
CD 20 Branch 4 Tile	\$ 495,560	\$ 495,560	\$ -
Road Crossing Costs	\$ 235,876	\$ 235,876	\$ -
Total	\$ 2,350,575	\$ 2,807,953	\$ 457,378

PRELIMINARY CONSTRUCTION COSTS

Separable Maintenance

When proposing to do an improvement and a separable portion of a larger system needs repair, the drainage statute, Section 103E.215, Subd. 6, allows the separation of the cost of repair from the cost of the improvement project. Separable maintenance can be applied to the portions of the existing system that will be replaced or improved by the proposed project. Separable maintenance is applicable for this project, due to the fact that the existing tile system is in a state of disrepair. Detailed cost estimates of the potential repair and potential improvement costs have been included in Appendix G, which is summarized below in Table 6.

Road Authority Costs

The road authority is responsible for the cost to replace the crossing as it was originally installed within their right of way. Costs associated with increasing the size or depth of the crossing are improvement costs and are included in the landowner costs.

After reviewing the original records for the CD 20 system, it has been found that road authority costs do apply for a portion of the system. Road authority repair costs apply to the portion of the system that would need to be maintained under a repair. This includes the cost to repair the tile underneath Ironwood Avenue and Impala Avenue. The cost difference between the repair and improvement road costs, such as the implementation of the Ironwood Avenue and Impala Avenue proposed box culverts, are the responsibilities of the CD 20 landowners under the improvement. Landowners are responsible for the difference in cost because it is above and beyond the maintenance required by the road authority. The total cost to road authorities can be found in the Road Authority Repair Costs row in the table below.

Damages Costs

The estimated construction damages include 19.43 acres in permanent damages and 48.20 acres in temporary damages. Permanent damages were estimated for the cross section of the open ditch channel and 16.5-foot-wide buffers on each side of the ditch. The temporary damage estimate was determined assuming a 150-foot-wide construction easement over the proposed tile alignments and 50-foot to 150-foot wide construction easement extending past the open ditch buffer area where spoil material is planned to be placed. The construction easement is dependent on the quantity of spoil material and placement location.

Other Project Related Costs

All drainage projects have indirect costs that must be accounted for in project cost estimates and used in cost benefit analyses. They include costs related to drainage authority administration; topographic survey; reports, plans, and specifications; and construction staking and administration.

Cost Estimates

The following table summarizes the estimated cost for the proposed improvement.

TABLE 6. PROPOSED COST ESTIMATE

Area	Separable Maintenance	Improvement Cost	Net Cost
Mainline (Standard Ditch Segments)	\$ 625,870	\$ 901,169	\$ 275,298
Mainline (Two-Stage Ditch Segment)	\$ 260,590	\$ 547,958	\$ 287,368
Mainline (Tile Segment)	\$ 238,484	\$ 568,578	\$ 330,094
Branch 4 (Segment)	\$ 332,305	\$ 503,136	\$ 170,831
ASIs & ASIROs	\$ -	\$ 56,369	\$ 56,369
Road Crossing Costs	\$ -	\$ 317,154	\$ 317,154
Subtotal	\$ 1,457,249	\$ 2,894,363	\$ 1,437,114
Road Authority Repair Costs	\$ 31,725	\$ 31,725	\$ -
Total Project Costs	\$ 1,488,974	\$ 2,926,088	\$ 1,437,114
Subtotal Separable Maintenance Costs			\$ 1,457,249
Net Costs			\$ 1,437,114
Total Project Costs for Landowners			\$ 2,894,363
Benefits (Per Ditch Viewer Report)			\$ 1,753,027
Net Benefit			\$ 315,913

Project Cost vs Benefit

The costs associated with repairing the system components listed above to their ACSIC condition is approximately \$1,488,974 while the cost to improve the system is approximately \$2,926,088.

The viewers have assessed the overall watershed and determined there to be approximately \$2,883,199 of repair benefits and \$4,636,225 of improvement benefits, resulting in \$1,753,027 of net benefit to the system. Because the difference in the \$1,753,027 net benefit per ditch viewer report and the \$1,437,114 net project cost is \$315,913, the improvement is deemed cost effective.

STATUTE REQUIRED + SUGGESTED EFFORTS

Project Necessity

After examining the Petition, present condition, and ACSIC design of Redwood County Ditch No. 20 both observationally and by analysis, it is deemed necessary to improve the drainage capacity of CD 20 to meet the drainage standards for current farming practices. This improved drainage capacity will help increase crop yields and prevent crops from drowning out in depressional areas of the watershed and prevent channelized overland flow from developing across agricultural lands. This project will also add depth to the system in areas where there is inadequate cover for today's farming practices.

Environmental, Land Use, and Multipurpose Water Management Considerations (Section 103E.015, Subd. 1)

The Drainage Code requires that the drainage authority assess the necessity and feasibility of a drainage project in relation to the environmental, land use, and multipurpose water management criteria of Section 103E.015, Subd. 1. To assist in providing thoroughness and clarity, the law will be used as the outline for this portion of the report.

103E.015 CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE

Subdivision 1. Environmental, land use, and multipurpose water management criteria. Before establishing a drainage project, the drainage authority must consider each of the following criteria:

(1) private and public benefits and costs of the proposed drainage project;

The proposed drainage system will replace aging and deteriorating infrastructure and meet today's farming needs for drainage and support a sustainable agricultural economy. The proposed system will decrease the duration of standing water in farm fields, which reduces the potential for crop loss and improves the farmability of land within the watershed. The proposed project will also decrease the rate of overland flow, which will in turn decrease the amount of sediment and sediment-bound phosphorus that leaves the system.

Since the proposed improvements are for a public drainage system, the benefited landowners will bear their financial cost. The proposed project will improve the drainage of benefitted landowners and will not negatively impact the environment.

(2) alternative measures, including measures identified in applicable state-approved and locally adopted water management plans, to:

- (i) conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses;*
- (ii) reduce downstream peak flows and flooding;*
- (iii) provide adequate drainage system capacity;*
- (iv) reduce erosion and sedimentation; and*
- (v) protect or improve water quality;*

The following water management plans were consulted to see what alternative measures might be applicable to the proposed drainage project:

- MPCA Yellow Medicine River Watershed Biotic Stressor Identification Report
- MPCA Yellow Medicine River (and Surrounding Direct Minnesota River Tributaries) WRAPS Report
- MPCA Yellow Medicine River Watershed Total Maximum Daily Load
- DNR Minnesota River – Yellow Medicine River Watershed Context Report
- Redwood County Comprehensive Local Watershed Management Plan (Amendment 2016 – 2020)

Broadly, the MPCA reports are organized to identify watershed stressors that can lead to the impairment of surface waters for aquatic recreation and aquatic life. The Yellow Medicine River plans include data for nearby direct tributaries to the Minnesota River which includes Redwood County Ditch No. 20. When impairments occur, total maximum daily loads are established to set measurable reductions of the stressors that are contributing to the impairment. The outlet drains into Redwood County Ditch No. 12 which outlets into Rice Creek and subsequently joins the Minnesota River about 3 miles east of the CD 20 outlet. The MPCA does not list any impairments for Rice Creek. The reach of the Minnesota River that Rice Creek flows into (AUID 07020004-750) is listed as impaired for aquatic life and aquatic consumption. Biotic stressors that are contributing to this impaired reach of the Minnesota River include: Benthic macroinvertebrates, bioassessments, mercury in fish tissue, nutrients, PCBs in fish tissue, and turbidity.

The 2020 Redwood County Comprehensive Local Watershed Management Plan lists its priority concerns as:

- Groundwater protection that will focus on wellhead protection for public water supply (or private).
- Drainage management focusing on wetland restorations and floodwater retention opportunities (altered hydrology).
- Surface water quality addressing impaired waters by major watershed for these priority pollutants: phosphorus, nitrogen, and fecal coliform bacteria.
- Erosion and sediment control focusing on residue management county-wide, and gully and concentrated flow areas in the southwest portion of Redwood County.

Surface water goals within the 2020 Redwood County Comprehensive Local Watershed Management Plan that are relevant to the CD 20 project include:

- Implement the 2015 Buffer Law.
- Target practices that will store water on the land, reduce nitrogen, phosphorous, and sediment loading.
- Utilizing the Wetland Conservation Act to work with producers to understand the importance of wetlands and encourage restorations.
- Work to develop a drainage management plan for the county.
- Work with all WRAPs programs and One Watershed, One Plans as they occur in each watershed.
- Work with residents of the county to promote enrollment in land retirement programs to achieve high quality grasslands and wetlands.

(3) the present and anticipated land use within the drainage project or system, including compatibility of the project with local land use plans;

The 2017 Redwood County, Minnesota Comprehensive Plan (Final Draft Document) was reviewed for references to drainage tile and agricultural land use. The plan states that “the importance of agriculture as a major contributor to the county’s economy cannot be overstated” and that about 18% of jobs in Redwood County are located on farms. The comprehensive plan mentions that the county has constructed and maintains approximately 520 miles of open drainage ditches and 1,105 miles of county and judicial drainage tile. The comprehensive plan does not address any specific strategies or goals for the management of this public ditch and tile network.

The present land use for the system is primarily agricultural. No changes to land use is expected as part of this project.

(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, in-channel 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. An ACSIC and proposed model was developed for the 5-, 10-, 25-, and 50-year rainfall events for a 24-hour storm duration.

Results compiled in the tables below illustrate the comparison of peak flow, peak velocity, peak water elevation, and total volume at various locations near and around the outlet of the CD 20 public drainage system. The CD 20 public drainage system outlets into CD 12 which is another public drainage system. CD 12 subsequently flows east, before crossing County State Aid Highway 6 (CSAH 6) and outletting into Rice Creek. Rice Creek is a public water. The proposed improvement ends at the terminus of the CD 20 system. Modeling results presented herein referenced the CD 20 system outlet, downstream of the CD 20 and CD 12 public ditch confluence, and CSAH 6. Figure 11 below illustrates the locations at which modeling results are presented from. As defined in the subcommittee’s report, the project’s terminus for the improvement is defined as the downstream end of the project. For the CD 20 improvement, the project’s terminus is defined as the CD 20 Mainline tile outlet into the CD 12 open ditch. The CD 12 open ditch is an engineered channel with the primary purpose of supporting agricultural drainage. The CD 12 open ditch was visually inspected and assessed through a stream survey, in collaboration with the DNR, and was deemed a stable channel with dense vegetation and no visual areas of sloughing or bank instability.

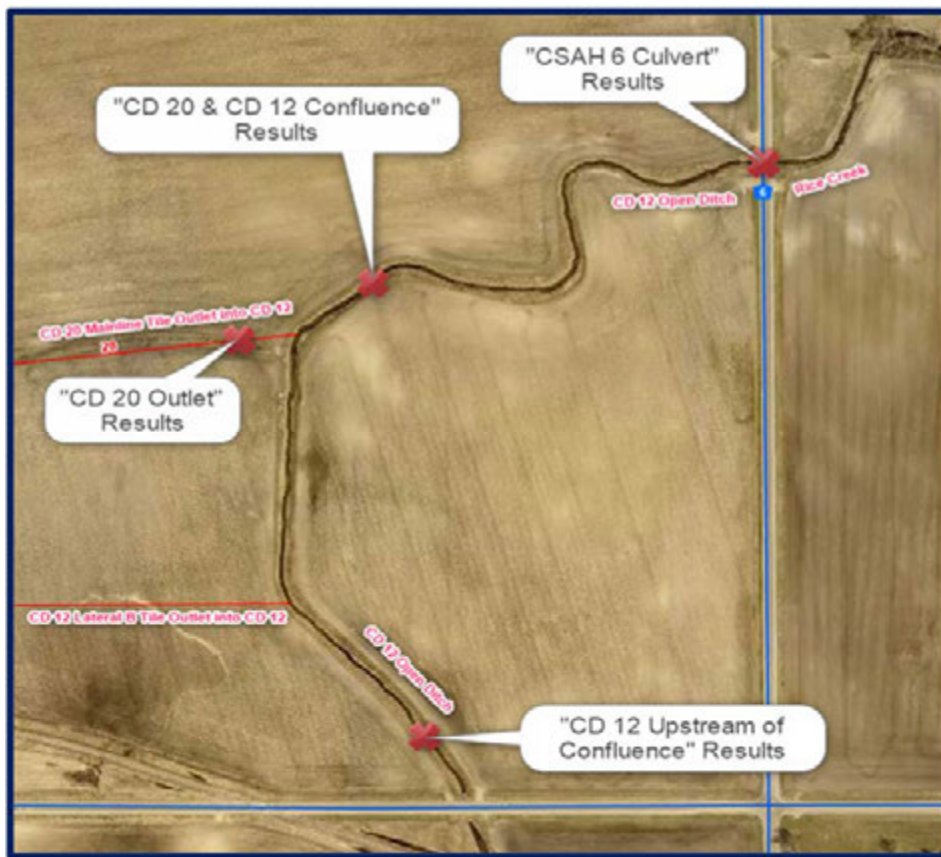


Figure 11. Reported Modeling Result Locations Map

Tables 7-10 below present the results from the “CD 20 Outlet” location as illustrated in Figure 11 above. The CD 20 outlet is the terminus of the proposed improvement

TABLE 7. CD 20 OUTLET PEAK FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	226.7	204.2	-10%
10-yr	283.1	216.4	-24%
25-yr	327.3	231.0	-29%
50-yr	363.0	244.1	-33%

TABLE 8. CD 20 OUTLET VELOCITY COMPARISON

Rainfall Event	ACSIC (Tile) (ft/s)	ACSIC (Overland) (ft/s)	Proposed (Overland) (ft/s)	Difference in Overland
5-yr	10.0	1.4	1.8	0.40
10-yr	10.1	1.5	1.5	0.00
25-yr	10.0	1.6	1.5	-0.10
50-yr	10.0	1.5	1.4	-0.10

TABLE 9. CD 20 PEAK ELEVATION COMPARISON

Rainfall Event	ACSIC (MSL)*	Proposed (MSL)**	Difference
5-yr	1012.2	1011.8	-0.40
10-yr	1012.8	1012.8	0.00
25-yr	1014.3	1014.5	0.20
50-yr	1016.2	1016.6	0.40

*Existing Minimum Ground Elevation is 1006.5'
 **Proposed Channel Bottom Elevation is 1003.7'

TABLE 10. CD 20 OUTLET VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	393.5	422.1	7%
10-yr	522.5	548.5	5%
25-yr	735.3	759.1	3%
50-yr	923.0	929.5	1%

In summary, the proposed model shows decreases in peak flowrates across all modeled storm events, an increase in peak velocity for the 5-year event, but no change or decrease in peak velocity for the 10-, 25-, and 50-year events. There was a decrease in peak elevation for the 5-year event but illustrated either no change or increase in peak elevation for the 10-, 25-, and 50-year event. An increase in outlet volume across all modeled storm events was observed at this location. The decrease in peak flows can be attributed to the implementation of the two-stage ditch with the Ironwood Avenue culvert acting as a control structure. A detailed model report and expanded analysis of the "CD 20 Outlet" results can be found in Appendix F.

Tables 11-14 below present the results from the "CD 20 & CD 12 Confluence" location as illustrated in Figure 11 above. The CD 20 outlet is the terminus of the proposed improvement. No work is proposed within CD 12 for the proposed improvement. For analysis at this location, an important factor is the contribution of CD 12 upstream of this confluence. CD 12 contributes approximately 10,925-acres at its confluence with the CD 20 outlet. ACSIC and proposed model results for CD 12 upstream of the CD 20 and CD 12 confluence were compiled to verify consistency between both models. Tables 15 and 16 below illustrate the peak flow and outlet volume of CD 12 upstream of the CD 20 and CD 12 confluence. As expected, no change in peak flows or outlet volume were observed at this location when comparing the ACSIC and proposed model.

TABLE 11. CD 20 & CD 12 CONFLUENCE

PEAK FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	367.1	369.6	1%
10-yr	484.4	485.8	0%
25-yr	674.5	677.3	0%
50-yr	810.2	834.1	3%

TABLE 12. CD 20 & CD 12 CONFLUENCE

VELOCITY COMPARISON

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	2.8	2.8	0%
10-yr	3.0	3.0	0%
25-yr	3.1	3.1	0%
50-yr	3.1	3.1	0%

TABLE 13. CD 20 & CD 12 CONFLUENCE

PEAK ELEVATION COMPARISON

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	1011.6	1011.6	0.00
10-yr	1012.5	1012.5	0.00
25-yr	1014.2	1014.3	0.10
50-yr	1016.2	1016.5	0.30
*Channel Bottom Elevation is 1003.9'			

TABLE 14. CD 20 & CD 12 CONFLUENCE

VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	1817.1	1845.6	2%
10-yr	2402.2	2428.3	1%
25-yr	3367.5	3391.6	1%
50-yr	4230.7	4236.2	0%

TABLE 15. CD 12 PEAK FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	340.4	340.4	0%
10-yr	451.2	451.1	0%
25-yr	632.7	632.7	0%
50-yr	795.0	795.2	0%

TABLE 16. CD 12 OUTLET VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	1405.3	1405.3	0%
10-yr	1862.1	1862.1	0%
25-yr	2611.8	2611.8	0%
50-yr	3288.4	3288.4	0%

In summary, the proposed model shows increases in peak flowrates for the 5-year and 50-year events, but no change in peak flowrate for the 10-year and 25-year events, and no change in velocity for all modeled events. There was a minor increase in peak water level elevation for the 25-year and 50-year events, but no change for the 5-year and 10-year events. An increase in outlet volume was observed for the 5-, 10-, and 25-year events. The increases in peak flows downstream of the CD 20 and CD 12 confluence can be attributed to the peak flow timing. CD 12 peak flows occur at the approximate 2.2-day timestep for both the ACSIC and proposed models. CD 20 peak flows are decreasing across all events, but the CD 20 and CD 12

confluence illustrate an increase in flow when comparing ACSIC and proposed models, which is occurring around the 2.2-day timestep in the proposed model. This is illustrated in the lagging limb of the hydrographs in Appendix F. Due to this slight increase at that timestep, the CD 20 and CD 12 confluence depicts an increase in flow. A detailed model report and expanded analysis of the "CD 20 and CD 12 Confluence" results can be found in Appendix F.

Tables 17-20 below present the results from the "CSAH 6 Culvert" location as illustrated in Figure 11 above. CSAH 6 results are presented in this analysis, as it is the next downstream crossing in relation to the proposed improvement. No work is proposed within the CD 12 open ditch or downstream of the CD 20 outlet.

TABLE 17. CSAH 6 CULVERT PEAK FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	366.7	369.3	1%
10-yr	483.7	485.0	0%
25-yr	668.5	669.5	0%
50-yr	802.3	825.8	3%

TABLE 18. CSAH 6 CULVERT VELOCITY COMPARISON

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	3.6	3.6	0%
10-yr	3.9	3.8	-3%
25-yr	4.4	4.3	-2%
50-yr	4.8	4.8	0%

TABLE 19. CSAH 6 CULVERT COMPARISON

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	1007.6	1007.7	0.10
10-yr	1008.4	1008.4	0.00
25-yr	1009.3	1009.3	0.00
50-yr	1009.8	1009.9	0.10
*Channel Bottom Elevation is 1003.1'			

TABLE 20. CSAH 6 CULVERT VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	1827.2	1855.7	2%
10-yr	2415.1	2441.2	1%
25-yr	3383.2	3406.9	1%
50-yr	4245.4	4250.1	0%

In summary, the proposed model shows slight increases in peak flowrates for the 5-year and 50-year events, but no change in peak flowrate for the 10-year and 25-year events. No change in velocity is observed for the 5-year and 50-year events, but a decrease in velocity was observed for the 10-year and 25-year event. There was an increase in peak elevation for the 5-year and 50-year events, but no change for the 10-year and 25-year events. An increase in outlet volume was observed for the 5-, 10-, and 25-year events. The increases in peak flows at the CSAH 6 culvert can be attributed to peak flow timing. The CD 12 peak flows occur at the approximate 2.2-day timestep for both the ACSIC and proposed models. CD 20 peak flows are decreasing across all events, but an increase in flow when comparing ACSIC and proposed models, is occurring around the 2.2-day timestep in the proposed model, which is illustrated in the lagging limb of the hydrographs in Appendix F. Due to this slight increase at that timestep, the CSAH 6 culvert is depicting an increase in flow. A detailed model report and expanded analysis of the "CSAH 6 Culvert" results can be found in Appendix F.

(5) *the effects of the proposed drainage projects on wetlands;*

Drainage projects must comply with a variety of state and federal wetland regulations: USACE 404, Minnesota Wetland Conservation Act (WCA), and USDA Swampbuster. An application to the Technical Evaluation Panel (TEP) will be submitted after the Preliminary Engineer's Report is submitted. There are five wetlands within the CD 20 watershed that have been identified by a Level 1 wetland delineation. The proposed project does not encroach identified wetland areas. Connections of existing private tiles will not be enlarged with the improvement of these areas. Spoils from the open ditch deepening will not be placed within Level 1 delineated wetlands. There are no anticipated wetland impacts with this drainage project.

(6) *the effects of the proposed drainage project on water quality;*

Water quality issues pertinent to drainage projects can include erosion, sediment transport potential, and non-point source pollution (e.g. nutrients, pesticides, and bacteria). CD 20 drains directly into CD 12 which subsequently drains into Rice Creek which is mapped on the Public Water Inventory as Public Ditch/Altered Natural Watercourse. About 0.3 miles downstream (East of CSAH 6), Rice Creek is categorized as a Public Water Watercourse. This meandering reach of Rice Creek joins the Minnesota River about 3 miles downstream. The MPCA does not list any impairments for CD 12 or Rice Creek. The stretch of

the Minnesota River that Rice Creek flows into (AUID 07020004-750 is listed as impaired for aquatic life and aquatic consumption.

Although the outlet watercourse does not have any listed impairments, a multi-purpose drainage management (MDM) plan was developed for CD 20. Please refer to the multi-purpose drainage management plan in Appendix D for additional water quality and best management practices. The multi-purpose drainage management plan was shared with landowners for opportunities to implement preventative, control, and treatment measures. The Redwood County SWCD can assist landowners with implementation. Other preventative practices can be incorporated throughout the watershed by private landowners to further improve water quality and soil health.

(7) the effects of the proposed drainage project on fish and wildlife resources;

The proposed project is not expected to impact fish and wildlife resources as no landscape changes are anticipated.

Natural Heritage Information System (NHIS) data for Redwood County has been made available to ISG via a license agreement with the Minnesota DNR. A NHIS database search was conducted by ISG staff to identify any documented state or federally listed species within or adjacent (within 1 mile) to the CD 20 watershed. No state or federally listed species (endangered, threatened, or of special concern) were identified within the CD 20 watershed as part of this review.

As part of this NHIS database search, ISG generated a conservation planning report using an automated search tool in the Minnesota Conservation Explorer database. The Redwood Fen and Swede's Forest were identified within the standardized 5-mile calcareous fen search area of this review. These fens are not located downstream of the proposed project. No other ecologically sensitive areas were identified within this review. Rare features that were evaluated include: MBS Sites of Biodiversity Significance; DNR Native Plant Communities; Calcareous Fens; DNR Old Growth Stands; MN Prairie Conservation Plan; Important Bird Areas; Lakes of Biological Significance; USFWS Habitat Conservation Plans; and High potential areas for Rusty Patched Bumblebee.

(8) the effects of the proposed drainage project on shallow groundwater availability, distribution, and use; and

According to the Minnesota Geologic Atlas, the CD 20 watershed is part of a complex of calcareous glacial till that has low to medium groundwater susceptibility. Bedrock is generally 150-feet or more below the ground surface. There are no established Wellhead Protection Areas or groundwater Drinking Water Supply Management Areas (DWSMA) within the CD 20 watershed. Depth to water table is generally mapped at less than 10-feet.

The Minnesota Well index maps 12 private wells within the project's watershed. All of these wells are mapped on farmsteads. The closest well is approximately 500-feet away from the proposed drainage project. Therefore, the wells are not located within a proximity that would be affected by the drainage tiles of the proposed improvement.

(9) the overall environmental impact of all the above criteria.

The project will have a negligible environmental impact as there are no major land use changes, wetland impacts, fish and wildlife habitat changes, or any adverse effects to water quality.

Statement of Necessity and Feasibility, Section 103E.015, Subd. 1

After assessing the necessity and feasibility of this drainage project on behalf of the Redwood County Drainage Authority in relation to the environmental, land use, and multipurpose water management criteria of Section 103E.015, Subd. 1, the Engineer deems the proposed project to be both necessary and feasible.

Soil Survey

Through a review of the USGS soil survey, the soil through much of the construction area was found to be clay, clay loam, sandy loam, and silty clay loam. The Engineer has determined at this time that no additional soil survey investigation is needed as the soil characteristics are consistent with other projects in the area.

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 Redwood County Ditch No. 12 is not a public water and the proposed design will not substantially change downstream hydrology. The DNR will continue to be consulted through the CD 20 improvement process to evaluate this need. ISG conducted a stream survey of the downstream public water in collaboration with the MN DNR and will coordinate a meeting following the submission of this report.

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

Response to DNR's PER Advisory Review and H & H Model Review

The Minnesota Department of Natural Resources (DNR) submitted their Preliminary Advisory Report and H & H Model Review Memo on July 14th, 2025, which was read into the Preliminary Engineer's Report record as part of the hearing. Comments and discussion points are compiled and addressed below and in Appendix F. Comments relating specifically to preliminary modeling are discussed in detail within the H & H Report in Appendix F. All other advisory comments are addressed below.

RESPONSE TO DNR'S PER ADVISORY COMMENTS

1. **DNR Comment #1** – The project narrative indicates that there is significant overland flow under existing conditions for flows exceeding the 10-year event. During the review of the ICM hydraulic model, it was noted that the top elevation of Ironwood Avenue changed between the existing and proposed condition simulation. As this is the last crossing before the system outlet into CD 12, this road elevation has significant effect on discharge calculations to downstream receiving waters. In order to evaluate the proposed project results, please update the final elevation of the proposed road crossing at Ironwood Avenue.

ISG Response: The inconsistency in the ACSIC and proposed Ironwood Avenue elevation has been corrected in the final engineer's report (FER) ACSIC and proposed model. Final elevation determination and explanation is described in the "FER Modeling Updates & DNR Advisory Comments" section in Appendix F.

2. **DNR Comment #2** – Flow duration curves were provided for the system under ACSIC and proposed conditions. Please clarify if the discharge under ACSIC conditions outlined includes overland flow as well as discharge from the existing 28-inch Mainline.

ISG Response: Peak flowrates and outlet volume are presented as the sum of 1D tile flow and 2D overland/in-channel flow in the ACSIC model. Expanded analysis and explanation for CD 20 outlet results and updates to narrative have been made within Appendix F.

3. **DNR Comment #3** – Discussion of peak velocity indicate there will be a slight increase for the 5-year and 10-year events, respectively but decreasing during the 25-year and 50-year events. It is then stated that the increase in velocity will not result in additional erosion as it is concentrated in an open channel, but it is noted that the velocities are for overland flow only. Please clarify if velocities are for in-channel or overland flow.

ISG Response: Peak velocity at the CD 20 outlet is presented as both peak tile velocity and peak overland/in-channel velocity in the tables above. The purpose of presenting velocity separately as 1D tile velocity and 2D overland/in-channel velocity is to provide an "apples to apples" comparison between the ACSIC and proposed models. Analysis and discussion relating peak velocities at this location are located in the "FER Modeling Updates & DNR Advisory Comments" section in Appendix F.

4. **DNR Comment #4** – The improvement report includes information on the inclusion of a two-stage channel between Ironwood Avenue and Impala Avenue, which is presented as an alternative in the preliminary engineer's report (PER). All channel hydraulics and flow calculations are presented for the two-stage channel option offered in this alternative. If any other design criteria are to be considered, including a proposed improvement without the two-stage channel, information on flow duration, peak flows, and channel velocity must be presented for consideration. Please clarify if other options are under consideration or if the alternative design is being offered as the primary alternative.

ISG Response: The PER report included a primary proposed design of a two-stage ditch between Ironwood Avenue and Impala Avenue with a standard ditch west of Impala Avenue and a standard ditch east of Ironwood Avenue. Per landowner request in the PER, an alternative and cost analysis was investigated to determine necessary ditch geometry to account for a full system improvement in the future. In the PER, the alternative was maintaining the two-stage ditch between Ironwood Avenue and Impala Avenue in addition to extending the two-stage geometry west of Impala Avenue, opposed to constructing the standard ditch for this same extent. The alternative extended the two-stage ditch by approximately 4,880-linear feet. Following the preliminary hearing, petitioners requested to not pursue this alternative option at this time. In the FER, the original ditch configuration was selected from the PER, which was standard ditch from the beginning of the proposed open ditch to Ironwood Avenue, two-stage ditch from Ironwood Avenue to Impala Avenue, and standard ditch from Impala Avenue, west. At this time, the improvement project without the two-stage ditch is not being considered.

5. **DNR Comment #5** – In the discussion on project alternatives, it is stated that this improvement will be sized to compensate for a full system improvement in the future. Please note that any future improvements will be subject to the same concerns for increased discharge to receiving waters and may require a Public Waters permit to proceed if determined to impact downstream waters.

ISG Response: It is noted that future improvements are subject to the same concerns for increased discharge and impact to downstream waters. The currently proposed FER design does not include the alternative discussed in comment #4 above. It is noted herein that any future system improvement may be subject to expanding the currently proposed two-stage geometry or other storage considerations.

6. **DNR Comment #6** – We appreciate the inclusion of the discussion detailing the possibility of multipurpose drainage management/BMP practices within the CD 20 watershed to facilitate water storage and infiltration. DNR strongly supports the inclusion of practices that increase water storage, as these areas have the potential to effectively mitigate peak flow increases to receiving waters, thereby reducing downstream impacts.

ISG Response: A multi-purpose drainage management plan was investigated and provided in Appendix D. BMP implementation in the FER design includes a segment of two-stage ditch and ASI implementation.

7. **DNR Comment #7** – The proposed two-stage ditch will be constructed in clay soils, which are highly prone to sedimentation and erosion, especially during the first year before vegetation becomes well-established. A proposed plan for immediate stabilization should be included to minimize erosion potential prior to bank and side-slope stabilization.

ISG Response: Required temporary erosion control will consist of silt fence or bio-roll around all surface intakes. Temporary erosion control will be maintained throughout the construction process according to the Minnesota Pollution Control Agency (MPCA) regulations. Permanent erosion control will consist of riprap around all tile outlets into ditches as necessary, as well as at the upstream and downstream end of ditch culvert crossings. Seeding and erosion control blanket will be placed on all disrupted areas around road crossings. All disturbed vegetation throughout the project will be reseeded with the appropriate seed mix and mulch. A Storm Water Pollution Prevention Plan will be developed before final construction plans are completed and a National Pollution Discharge and Elimination System (NPDES) permit application will be filed before construction. Additionally, the two-stage ditch channel design geometry is being adjusted from trapezoidal to an ellipse geometry to prevent erosion. The construction schedule will be set intentionally to provide the best window for seeding establishment.

8. **DNR Comment #8** – The provided design plans indicate that the proposed two-stage channel has a bottom width of 8 feet and would provide approximately 22.2 acre-feet of in-channel storage. Please provide information on how the proposed channel size was determined, as well as any design rationale for the sizing of the two-stage channel.

ISG Response: The proposed two-stage ditch channel was designed under the guidance and consideration of Minnesota's Hydraulic Geometry Regional Curves from the DNR's geomorphology dataset. These curves provided guidance in appropriately sizing the inset channel of the two-stage ditch based on drainage area. Drainage area could be used to estimate the appropriate bankfull width, mean bankfull depth, and cross-sectional area of the channel. The inset channel mimics the bankfull characteristics of natural channels. The benches were sized to be approximately 2-3 times the width of the inset channel. This is the design standard for two-stage ditches and mimics the dimensions of natural floodplains. The proposed designs were evaluated within the model considering elevations, flowrates, and velocities in the channel. Findings from this analysis align with the currently proposed two-stage ditch channel geometry.

A copy of the DNR preliminary advisory report and H&H Model review are included in Appendix I.

SUMMARY OF FINDINGS, CONCLUSIONS + RECOMMENDATIONS

After a review of the CD 20 system, it was found that the existing subsurface tile is failing and displays a lack of adequate drainage capacity and cover. Additionally, through drone footage review, overland flow has channelized and is flowing across the agricultural landscape. The system is approximately 110 years old, which is above the life expectancy for public drainage system tile. This improvement would be a public benefit and contribute to the public welfare of the area.

The proposed improvements would provide the CD 20 landowners with better drainage capacity, deeper heads for private tile connections, increased cover depth for public system tile, reduced overland flow, and reduced sediment loads downstream.

A hydraulic/hydrologic model was created to compare the ACSIC drainage system with the proposed improvement to compare flood extents, durations, and outlet flows. The proposed model indicates negligible changes in peak flow, velocity, water level, and total outlet volume across all result locations. The proposed model results at the existing CD 20 Mainline tile outlet and proposed Mainline open ditch outlet are attributed to the implementation of the two-stage ditch between Ironwood Avenue and Impala Avenue. The negligible changes presented herein do not have substantial impacts and are considered a cost effective and feasible improvement and is recommended by the Engineer.

In accordance with Section 103E.245, Subd. 1: Whereas the Engineer has examined the petition and order and conducted a preliminary survey and, whereas the Engineer has found the proposed drainage project to be necessary due to problems found and clarified during the survey, and 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 determined that the proposed drainage project does not substantially affect Public Waters, and whereas the Engineer has examined the nature and capacity of the outlet and any extension of the outlet, therefore the Engineer recommends the proposed project to the Redwood County Drainage Authority for final approval.

PRELIMINARY CONSTRUCTION PLANS

Since the Engineer finds the proposed drainage project in the petition is feasible and comply with the environmental, land use, and multipurpose water management criteria in Section 103E.015, Subd. 1, the Engineer has in accordance with Section 103E.245, Subd. 4 included a set of preliminary construction plans of the drainage project in Appendix A. They are preliminary plans and are therefore unsigned.

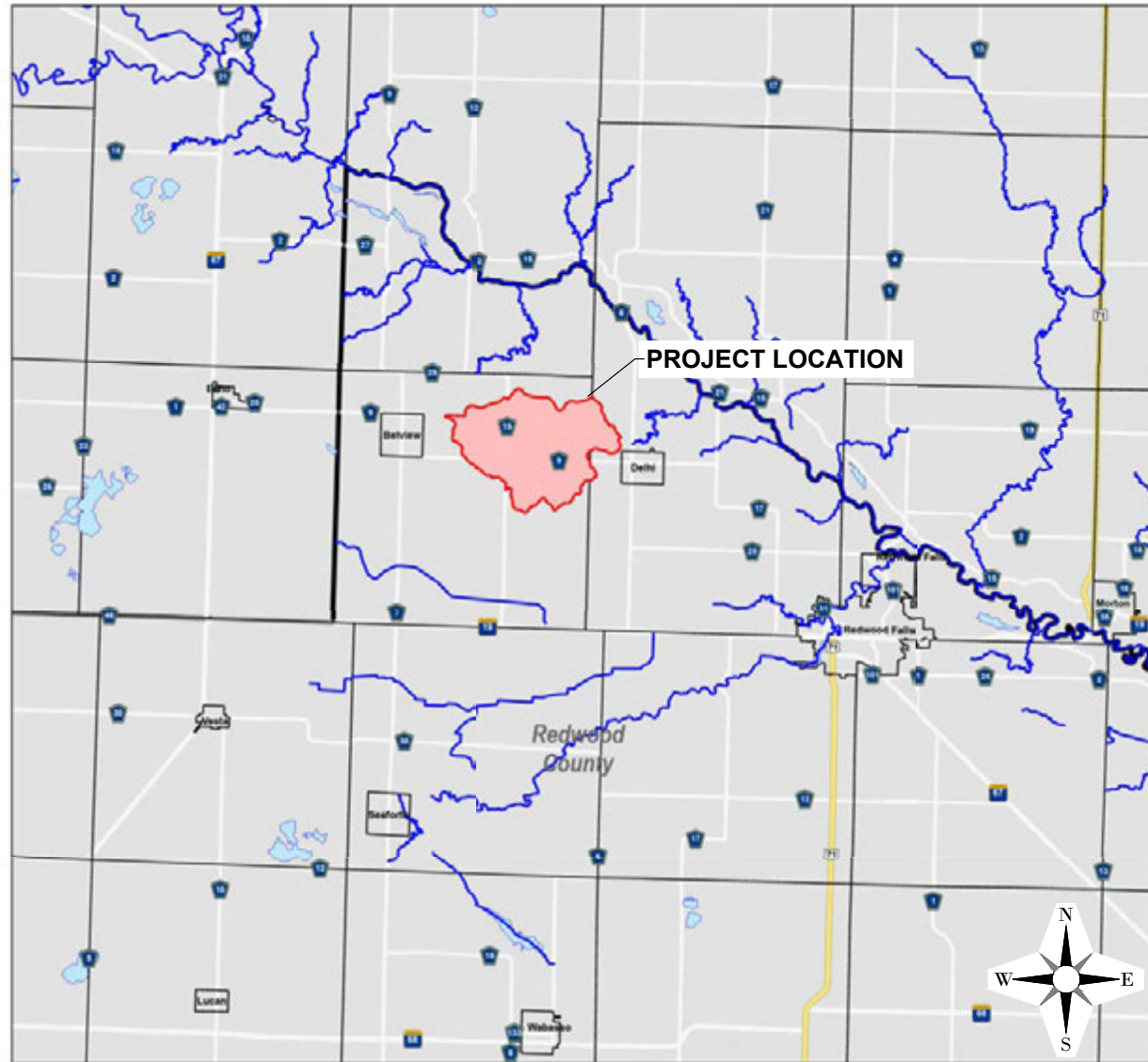
Appendix A: Preliminary Construction Plans

REDWOOD COUNTY COUNTY DITCH No. 20

REDWOOD COUNTY, MINNESOTA

FINAL ENGINEERING REPORT

ISG PROJECT # 23-28479



LOCATION MAP

SHEET INDEX

1	TITLE
2	LEGENDS
3	ESTIMATED QUANTITIES AND SCHEDULES
4	CONSTRUCTION NOTES
5	EXISTING WATERSHED MAP
6	PROPOSED WATERSHED MAP
7-13	DETAILS
14-17	PLAN - PROFILE MAINLINE OPEN DITCH
18-19	PLAN - PROFILE MAINLINE TILE
20	PLAN - PROFILE BRANCH 4
21-49	CROSS SECTIONS MAINLINE

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.

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

- 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.
- 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.
- WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
- FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
- 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.
- 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.
- ALL DISSIMILAR METALS SHALL BE EFFECTIVELY ISOLATED FROM EACH OTHER TO AVOID GALVANIC CORROSION.
- 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.
- 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
**REDWOOD COUNTY
COUNTY DITCH
No. 20**
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 TITLE
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

PROJECT INDEX:

OWNER:
REDWOOD COUNTY
DRAINAGE AUTHORITY
403 SOUTH MILL STREET
P.O. BOX 130
REDWOOD FALLS, MN 56283
507.637.4023

PROJECT ADDRESS / LOCATION:
SECTION 7, DELHI TWP.
SECTIONS 11-12, KINTIRE TWP.
REDWOOD COUNTY, MINNESOTA

MANAGING OFFICE:
I & S GROUP, INC. (ISG)

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

PROJECT MANAGER: JEN WIDMER
EMAIL: JEN.WIDMER@ISGINC.COM



SPECIFICATIONS REFERENCE
ALL CONSTRUCTION SHALL COMPLY WITH REDWOOD COUNTY'S REQUIREMENTS AND MnDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2020 EDITION, THE STANDARD SPECIFICATIONS FOR SANITARY SEWER, STORM DRAIN AND WATERMAIN AS PROPOSED BY THE CITY ENGINEERS ASSOCIATION OF MINNESOTA, 2023 EDITION, AND THE CURRENT VERSION OF THE MINNESOTA STATE PLUMBING CODE UNLESS DIRECTED OTHERWISE.

PROJECT DATUM
HORIZONTAL COORDINATES HAVE BEEN REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83), 1996 ADJUSTMENT (NAD83(1996)) ON THE REDWOOD 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=1023.91
MnDOT GEODETIC MONUMENT "DE 7 NE" SW CORNER OF COUNTY ROAD 6 AND 390TH ST, 6 FT NW OF A POWER POLE

TOPOGRAPHIC SURVEY
THIS PROJECT'S TOPOGRAPHIC SURVEY CONSISTS OF DATA COLLECTED IN NOVEMBER 2024 BY ISG.

TITLE	TITLE
SHEET	1

PRELIMINARY NOT FOR CONSTRUCTION



PRELIMINARY NOT FOR CONSTRUCTION

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.

DATE _____ LIC. NO. _____
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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 TITLE
 DRAWN BY KJH
 DESIGNED BY AJJ
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. -

TITLE
LEGENDS

SHEET
2
 OF 49

SYMBOL LEGEND

EXISTING		PROPOSED
	STORM MANHOLE	
	STORM CULVERT	
	RCP CULVERT	
	CMP CULVERT	
	HDPE CULVERT	
	SANITARY MANHOLE	
	LIFT STATION	
	WATER VALVE	
	WELL	
	MONITORING WELL	
	HYDRANT	
	YARD HYDRANT	
	UTILITY POLE	
	LIGHT POLE	
	GUY WIRE	
	TRANSFORMER	
	HANDHOLE	
	ELECTRIC MANHOLE	
	ELECTRIC METER	
	SOIL BORING	
	SIGN	
	RAILROAD CROSSING SIGN	
	POST	
	DECIDUOUS TREE	
	CONIFEROUS TREE	
	REMOVE TREE	
	TREE CLEARING	
	WETLAND / MARSH	
	SLOUGH REPAIR	
	SPOIL PLACEMENT	
	BUFFER	

NOTE:
 CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES.

LINETYPE LEGEND

EXISTING		PROPOSED
	TILE	
	PRIVATE TILE	
	OPEN DITCH	
	OPEN DITCH CLEANING	
	SANITARY SEWER	
	SANITARY SEWER FORCE MAIN	
	WATER MAIN	
	GAS	
	OVERHEAD ELECTRIC	
	UNDERGROUND ELECTRIC	
	UNDERGROUND TELEPHONE	
	UNDERGROUND TV	
	OVERHEAD UTILITY	
	UNDERGROUND UTILITY	
	FIBER OPTIC	
	WETLAND	
	WATER EDGE	
	FENCE LINE	
	TREE LINE	
	PROPERTY / LOT LINE	
	RIGHT OF WAY LINE	
	ACCESS CONTROL	
	EASEMENT LINE	
	WATERSHED BOUNDARY	
	MINOR CONTOUR	
	MAJOR CONTOUR	

NOTE:
 CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES.

ABBREVIATIONS:

ADA AMERICANS WITH DISABILITIES ACT	EOF EMERGENCY OVERFLOW	J-BOX JUNCTION BOX	REBAR REINFORCING BAR
ADD ADDENDUM	EQ EQUAL	JT JOINT	REM REMOVE
AFF ABOVE FINISHED FLOOR	EX EXISTING	LF LINEAR FEET	ROW RIGHT OF WAY
AGG AGGREGATE	FIG FORM GRADE	LIN LINEAR	RW RIGHT OF WAY
APPROX APPROXIMATE	FDC FIRE DEPARTMENT CONNECTION	LPS LOW PRESSURE STEAM	SAN SANITARY
ARCH ARCHITECT, ARCHITECTURAL	FDN FOUNDATION	LS LUMP SUM	SCH SCHEDULE
BFE BASEMENT FLOOR ELEVATION	FES FLARED END SECTION	LSO LOWEST STRUCTURAL OPENING	SF SQUARE FOOT
BIT BITUMINOUS	FFE FINISHED FLOOR ELEVATION	MAX MAXIMUM	SPEC SPECIFICATION
BLDG BUILDING	FBM FEET PER MINUTE	ME MACH BOX	SQ SQUARE
BM BENCHMARK	FPS FEET PER SECOND	MECH MECHANICAL	STA STATION
CAD COMPUTER-AIDED DESIGN	FT FOOT, FEET	MH MANHOLE	STM STORM
CB CATCH BASIN	FTG FOOTING	MIN MINIMUM	SY SQUARE YARD
CFS CUBIC FEET PER SECOND	GA GAUGE	MISC MISCELLANEOUS	TIC TOP OF CURB
CF CUBIC FOOT	GAL GALLON	NO NUMBER	TEL TELEPHONE
CI CAST IRON	GALV GALVANIZED	NTS NOT TO SCALE	TEMP TEMPORARY
CIP CAST IRON PIPE	GC GENERAL CONTRACTOR	NWL NORMAL WATER LEVEL	THRU THROUGH
CIPC CAST IN PLACE CONCRETE	GFE GARAGE FLOOR ELEVATION	OC ON CENTER	TNFH TOP NUT OF FIRE HYDRANT
CJ CONTROL JOINT	GL GUTTER LINE	OCEW ON CENTER EACH WAY	TRANS TRANSFORMER
CL CENTERLINE	GPM GALLONS PER MINUTE	OH OVERHEAD	TV TELEVISION
CMP CORRUGATED METAL PIPE	GV GATE VALVE	OHML ORDINARY HIGH WATER LEVEL	TW TOP OF WALL
CO CLEANOUT	HDPE HIGH DENSITY POLYETHYLENE	OHD OVERHEAD DOOR	TYP TYPICAL
CONC CONCRETE	HD HEAVY DUTY	OZ OUNCE	UTILITY, UNDERGROUND
CONST CONSTRUCTION	HH HANDHOLE	PCC PORTLAND CEMENT CONCRETE	UT TELEPHONE
CONT CONTINUOUS	HMA HOT MIX ASPHALT	PED PEDESTAL, PEDESTRIAN	VCP VITRIFIED CLAY PIPE
CR COUNTY ROAD	HORIZ HORIZONTAL	PERF PERFORATED	WO WITHOUT
CY CUBIC YARD	HR HOUR	PL PROPERTY LINE	W WITH
C&G CURB AND GUTTER	HML HIGH WATER LEVEL	PP POLYPROPYLENE	YD YARD
DEMO DEMOLITION	HWY HIGHWAY	PSI POUNDS PER SQUARE INCH	YR YEAR
DI DROP INTAKE	HYD HYDRANT	PVC POLYVINYL CHLORIDE	
DIA DIAMETER	I INVERT	PVMT PAVEMENT	
DIM DIMENSION	ID INSIDE DIAMETER	QTY QUANTITY	
DS DOWNSPOUT	IN INCH	R RIM	
EA EACH	INV INVERT	RAD RADIUS	
ELEC ELECTRICAL	IP IRON PIPE	RCP REINFORCED CONCRETE PIPE	
ELEV ELEVATION	IPS IRON PIPE SIZE	RD ROOF DRAIN	



TOTAL ESTIMATED QUANTITIES			
Item Code	Item	Unit	Estimated Quantity
01.7113.1000.01	MOBILIZATION	LS	1
01.7113.1000.01	RAILROAD CROSSING	LS	1
31.2316.1000.05	TOP SOIL STRIP & PLACE SPOILS	AC	48.61
31.2316.1000.07	CONSTRUCT STANDARD DITCH (P) (EV)	CY	68560
31.2316.1000.07	CONSTRUCT TWO-STAGE DITCH (P) (EV)	CY	63814
31.3700.1000.07	CLASS III RIPRAP WITH GEOTEXTILE FABRIC (FOR ASIRO)	CY	190
31.3700.1000.07	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	538.0
32.9219.1000.04	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	400
32.9219.1000.10	SIDESLOPE SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 8 MULCH)	AC	2.8
32.9219.1000.10	TWO-STAGE DITCH SIDESLOPE SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 8 MULCH)	AC	1.3
32.9219.1000.10	TWO-STAGE DITCH BENCH SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 8 MULCH)	AC	2.6
32.9219.1000.10	MOWING	AC	6.6
32.9219.1000.10	WEED SPRAYING	AC	13.2
32.9219.1000.10	16.5' BUFFER STRIP SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 3 MULCH)	AC	3.32
33.0513.1000.02	INSTALL 18-INCH ASI OUTLET ASSEMBLY	EA	2
33.0513.1000.02	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	5
33.0513.1000.02	INSTALL 24-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	3
33.0513.1000.02	INSTALL 18-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	2
33.0513.1000.02	INSTALL DROP INTAKE (18-INCH)	EA	7
33.0513.1000.02	CAP DROP INTAKE (18-INCH)	EA	2
33.0513.1000.02	INSTALL 24-INCH ASI OUTLET ASSEMBLY	EA	3
33.0523.1000.03	SAND OR CLSM FILL PIPE UNDER ROAD (13-INCH)	LF	103
33.0523.1000.03	BORING 36-INCH TILE FOR RAILROAD	LF	110
33.4510.1000.02	REMOVE EXISTING DROP INTAKE	EA	2
33.4510.1000.02	CONNECT EXISTING PRIVATE TILE	EA	71
33.4510.1000.02	BULKHEAD EXISTING TILE	EA	5
33.4510.1000.02	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2
33.4510.1000.02	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3
33.4510.1000.02	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2
33.4510.1000.02	36-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1
33.4510.1000.02	30-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2
33.4510.1000.02	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	23
33.4510.1000.02	CONNECT EXISTING 24-INCH TILE	EA	2
33.4510.1000.02	CONNECT EXISTING 15-INCH TILE	EA	2
33.4510.1000.02	CONNECT EXISTING 18-INCH TILE	EA	1
33.4510.1000.02	CONNECT EXISTING 12-INCH TILE	EA	1
33.4510.1000.02	CONNECT EXISTING 6-INCH TILE	EA	1
33.4510.1000.02	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1
33.4510.1000.02	42-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1
33.4510.1000.02	10-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2
33.4510.1000.02	8-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2
33.4510.1000.02	ARMOR TILE OUTLET (RIPRAP & GEOTEXTILE FABRIC)	EA	3
33.4510.1000.03	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	2635
33.4510.1000.03	10" PRIVATE TILE HEADER (PERFORATED SINGLE WALL TILE)	LF	4605
33.4510.1000.03	30-INCH AGRICULTURAL TILE	LF	134
33.4510.1000.03	42-INCH AGRICULTURAL TILE	LF	2000
33.4510.1000.03	36-INCH AGRICULTURAL TILE	LF	3522
33.4510.1000.07	GRANULAR PIPE FOUNDATION	CY	238
33.4510.1000.10	TILE INVESTIGATION	HR	13
33.4520.1000.02	REMOVE EXISTING HDPE CULVERT	EA	2
33.4520.1000.02	REMOVE RCP CULVERT	EA	2
33.4520.1000.02	REMOVE RC BOX CULVERT	EA	2
33.4520.1000.03	8-FOOT x 4-FOOT RC BOX CULVERT	LF	76
33.4520.1000.03	8-FOOT x 7-FOOT RC BOX CULVERT	LF	80
34.0100.1000.02	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	2

ALTERNATIVE SIDE INLET W/RIPRAP (ASIRO)													
Description			Elevations				Bid Item			Bid Item			Bid Item
ID	BRANCH (LOCATION)	STATION	RIM ELEVATION	INVERT ELEVATION	EXISTING BERM ELEVATION	PROPOSED BERM ELEVATION	INTAKE TYPE	RISER SIZE (in)	RISER DEPTH (LF)	OUTLET SIZE (in)	OUTLET LENGTH (LF)	OUTLET GRADE (%)	RIPRAP (CY)
ASIRO 1	MAINLINE	26+03	1014.8	1007.8	1014.8	1016.8	TRASH GRATE	24	7	24	40	2.0%	35
ASIRO 2	MAINLINE	43+72	1016.3	1009.4	1016.3	1018.3	TRASH GRATE	24	7	24	40	2.0%	35
ASIRO 3	MAINLINE	60+28	1020.1	1010.6	1020.1	1022.1	TRASH GRATE	18	9	18	45	2.0%	40
ASIRO 4	MAINLINE	72+06	1020.7	1011.3	1020.7	1022.7	TRASH GRATE	18	9	18	45	2.0%	40
ASIRO 5	MAINLINE	76+19	1020.5	1011.8	1020.5	1022.5	TRASH GRATE	24	9	24	45	2.0%	40

Roadside Seeding Schedule				
Description				Quantities
ID	BRANCH (LOCATION)	CROSSING	STATION	SEED MIX 25-142 W/ CATEGORY 20 EROSION CONTROL BLNKET (SY)
1	MAINLINE	Ironwood Avenue	11+30	200
2	MAINLINE	Impala Avenue	39+90	200

RIPRAP Schedule											
Description				Upstream				Downstream			
ID	BRANCH (LOCATION)	CROSSING	STATION	MnDOT RIPRAP Size	Length (FT)	Width (FT)	Volume (CY)	MnDOT RIPRAP Size	Length (FT)	Width (FT)	Volume (CY)
1	Mainline	Ironwood Avenue	11+30	Class III	25	80	111	Class III	50	38	106
2	Mainline	Impala Avenue	39+90	Class III	25	46	64	Class III	50	80	222

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.

DATE: _____ LIC. NO. _____

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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 DETAILS
DRAWN BY KJH
DESIGNED BY AJJ
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
ESTIMATED QUANTITIES AND SCHEDULES

SHEET
3 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

GENERAL PROJECT NOTES:

- DURING CONSTRUCTION, CONTRACTOR SHALL MAINTAIN A DRAINAGE OUTLET FOR THE ENTIRE CD 20 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.

UTILITY NOTES:

- THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF C/ASCE 38-22, ENTITLED, "STANDARD GUIDELINES FOR INVESTIGATING AND DOCUMENTING EXISTING UTILITIES".

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 OPEN DITCH NOTES:

- UNLESS OTHERWISE NOTED, CONTRACTOR SHALL LIMIT CONSTRUCTION ACTIVITY TO WITHIN A 33-FOOT WIDE AREA ALONG TOP OF DITCH ALIGNMENTS. DISTURBANCE THROUGH ROAD CROSSINGS, ROAD DITCHES, AND GRASS BUFFERS SHALL BE LIMITED TO THE TRENCH WIDTH NECESSARY FOR SAFE CONSTRUCTION PRACTICES.
- A 16.5-FOOT GRASS STRIP SHALL BE ESTABLISHED IN AREAS THAT DO NOT HAVE AN EXISTING 16.5-FOOT GRASS STRIP. FINAL SEEDING SHALL OCCUR AFTER ALL WORK HAS BEEN COMPLETED IN THE AREA AND SHALL COMPLY WITH THE CONTRACT DOCUMENTS. TEMPORARY SEEDING MAY BE REQUIRED AND SHALL BE INCIDENTAL.
- DITCH CLEANING SHALL BE PERFORMED ON THE SIDE OF THE DITCH THAT IS THE LOWEST FOR THE GREATEST DISTANCE ALONG THE OPEN DITCH SEGMENT. DITCH CLEANING SPOILS SHALL BE PLACED AND LEVELED (INCIDENTAL) WITHIN THE 16.5-FOOT WIDE GRASS STRIP FROM THE TOP OF DITCH SLOPE UNLESS OTHERWISE DETERMINED BY THE ENGINEER.
- TOPSOIL IN TOPSOIL STRIP AREAS DESIGNATED ON THE PLANS SHALL BE STRIPPED PRIOR TO THE PLACEMENT OF FILL MATERIAL FROM DITCH EXCAVATION. TOPSOIL STRIP AREAS MAY ADJUST BASED ON ACTUAL TOPSOIL THICKNESS. RECLAIMING AND LEVELING OF THE TOPSOIL ON TOP OF THE SPOILS SHALL BE INCIDENTAL TO TOPSOIL STRIPPING.
- SHAPING AROUND SIDE INLETS, ASIS, ASIROS, AND CULVERT INLETS SHALL BE INCIDENTAL TO THEIR RESPECTIVE PAY ITEMS.
- ALL EXISTING TILE OUTLETS INTO THE OPEN DITCH, INCLUDING ANY NOT SHOWN ON THE PLANS, SHALL BE REPAIRED OR ARMORED. UNLESS SPECIFICALLY NOTED, HDPE OR PVC SHALL BE THE ONLY ACCEPTABLE MATERIAL FOR ALL TILE REPAIRS (SEE DETAILS).
- EXISTING TILE OUTLETS MAY BE SALVAGED, REUSED, AND PROTECTED WITH RIPRAP IF THE OUTLET IS DETERMINED TO BE IN GOOD CONDITION BY THE ENGINEER. TILE REPAIR AT THESE LOCATIONS SHALL BE PAID FOR AS BID ITEM "ARMOR TILE OUTLET" (SEE DETAILS).
- MISCELLANEOUS TREE CLEARING SHALL BE INCIDENTAL TO DITCH PAY ITEM(S), UNLESS SPECIFICALLY CALLED OUT IN THE PLANS.
- HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL IS REQUIRED ON DITCH SIDE SLOPES AND WITHIN THE 1-ROD BUFFER (UNLESS OTHERWISE SPECIFIED) AND WILL BE PAID FOR BY THE ACRE. APPROXIMATE LOCATIONS ARE INCLUDED ON THE MAP FOR REFERENCE. TREES SHALL BE CLEARED, GRUBBED, AND THE AREA AROUND THE TREE SPRAYED AFTER COMPLETE.
- DITCH BANKS SHALL BE SEEDED WITHIN TWO (2) DAYS OF FINISHED EXCAVATION UNLESS OTHERWISE DIRECTED BY THE ENGINEER.



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 DETAILS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE
CONSTRUCTION NOTES

SHEET
4 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	28	0.10%	4869.6	0.05	Branch 4 Lat C1	6	0.10%	32.4	0.13
	28	0.10%	4647.1	0.06		6	0.10%	15.1	0.28
	28	0.10%	4304.5	0.06		6	0.20%	78.7	0.08
	28	0.10%	4252.8	0.06	Branch 4 Lat D	6	0.20%	102.5	0.06
	28	0.10%	4104.2	0.06		5	0.60%	70.2	0.09
	26	0.10%	3688.5	0.06		3	0.20%	28.2	0.06
	26	0.10%	3177.3	0.07	Branch 5	12	0.13%	551.5	0.05
	18	0.20%	1576.8	0.07		12	0.13%	494.6	0.06
	16	0.20%	1371.3	0.06		6	0.13%	17.2	0.28
	14	0.20%	794.0	0.07	Branch 6	6	0.40%	13.2	0.64
	12	0.40%	531.6	0.10		10	0.25%	246.9	0.08
	12	0.20%	473.5	0.08		10	0.10%	232.9	0.07
	10	0.20%	232.2	0.10	Branch 6 Lat A	9	0.10%	190.9	0.07
	8	0.20%	218.4	0.06		8	0.10%	131.8	0.07
	6	0.50%	95.9	0.10		7	0.90%	191.0	0.10
5	0.40%	80.3	0.06	Branch 7	7	0.20%	139.3	0.06	
5	0.40%	57.1	0.09		6	0.20%	119.6	0.05	
6	0.30%	123.5	0.06		5	2.30%	27.0	0.46	
10	0.50%	205.9	0.18	Branch 8	5	0.10%	27.0	0.10	
10	0.10%	148.3	0.11		7	0.20%	247.0	0.04	
8	0.20%	137.0	0.09		6	0.50%	215.2	0.04	
7	0.20%	108.0	0.08	Branch 9	5	0.80%	165.8	0.04	
7	0.10%	50.6	0.13		5	0.20%	126.9	0.03	
7	0.10%	6.6	0.97		5	0.90%	117.3	0.07	
10	0.30%	265.3	0.08	Branch 10	5	0.30%	108.3	0.04	
9	0.30%	235.5	0.06		9	0.30%	10.5	0.43	
9	0.30%	290.7	0.07		12	0.10%	207.4	0.13	
9	0.15%	232.2	0.07	Branch 11	10	0.10%	101.1	0.10	
8	0.25%	155.1	0.11		7	0.10%	100.2	0.06	
7	0.10%	100.2	0.06		6	0.10%	43.1	0.10	
6	0.10%	43.1	0.10	Branch 3A	20	0.32%	1565.8	0.12	
16	0.32%	875.3	0.12		16	0.32%	843.3	0.12	
16	0.20%	795.1	0.10		15	0.43%	705.9	0.14	
15	0.43%	705.9	0.14	Branch 4	15	0.10%	695.9	0.07	
15	0.10%	695.9	0.07		15	0.10%	519.6	0.09	
14	0.10%	339.0	0.12		12	0.15%	217.2	0.15	
12	0.15%	217.2	0.15	Branch 4 Lat A	12	0.10%	214.9	0.13	
12	0.10%	193.5	0.09		10	0.10%	141.6	0.06	
8	0.10%	141.6	0.06		5	0.10%	26.0	0.10	
5	0.10%	26.0	0.10	Branch 4 Lat A1	14	0.20%	627.0	0.09	
14	0.20%	627.0	0.09		14	0.20%	607.5	0.09	
14	0.10%	539.4	0.08		10	0.40%	363.1	0.13	
10	0.40%	363.1	0.13	Branch 4 Lat A2	10	0.10%	261.1	0.06	
10	0.10%	261.1	0.06		9	0.10%	205.8	0.06	
9	0.10%	205.8	0.06		5	0.25%	53.2	0.08	
5	0.25%	53.2	0.08	Branch 4 Lat B	5	0.25%	33.1	0.12	
5	0.25%	33.1	0.12		10	0.10%	236.8	0.07	
8	0.10%	189.9	0.05		8	0.10%	66.0	0.06	
6	0.10%	66.0	0.06	Branch 4 Lat B1	6	0.30%	55.2	0.13	
6	0.30%	55.2	0.13		6	0.30%	21.2	0.35	
6	0.30%	21.2	0.35		8	0.10%	116.0	0.08	
8	0.10%	116.0	0.08	Branch 4 Lat B2	8	0.10%	83.0	0.05	
8	0.10%	83.0	0.05		8	0.10%	85.2	0.11	
8	0.10%	85.2	0.11		6	0.10%	59.5	0.07	
6	0.10%	59.5	0.07	Branch 4 Lat B3	6	0.25%	59.5	0.11	
3	0.25%	59.5	0.11		3	0.25%	20.3	0.20	
3	0.25%	20.3	0.20		5	0.50%	6.6	0.88	
5	0.50%	6.6	0.88	Branch 4 Lat C	9	0.10%	146.2	0.09	
9	0.10%	146.2	0.09		7	0.24%	74.7	0.13	
7	0.24%	74.7	0.13		6	0.24%	40.4	0.16	
6	0.24%	40.4	0.16		5	0.24%	17.0	0.24	
5	0.24%	17.0	0.24						

Crossing # on Map	Roadway	Existing Type	Existing Material	Existing Size (in)	Existing Width (ft)	Existing Height (F)	Existing Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)	Combined Existing Drainage Coefficient (in/day)
1	Ironwood Ave	ROUND CULVERT	RCP	48	-	-	2.63%	4722	1.18	1.32
	Ironwood Ave	ROUND CULVERT	RCP	36	-	-	0.18%	4722	0.14	
2	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	6.08
	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	



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PROJECT
REDWOOD COUNTY DITCH No. 20
 REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 WATERSHED MAPS
 DRAWN BY KJH
 DESIGNED BY AUS
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. --

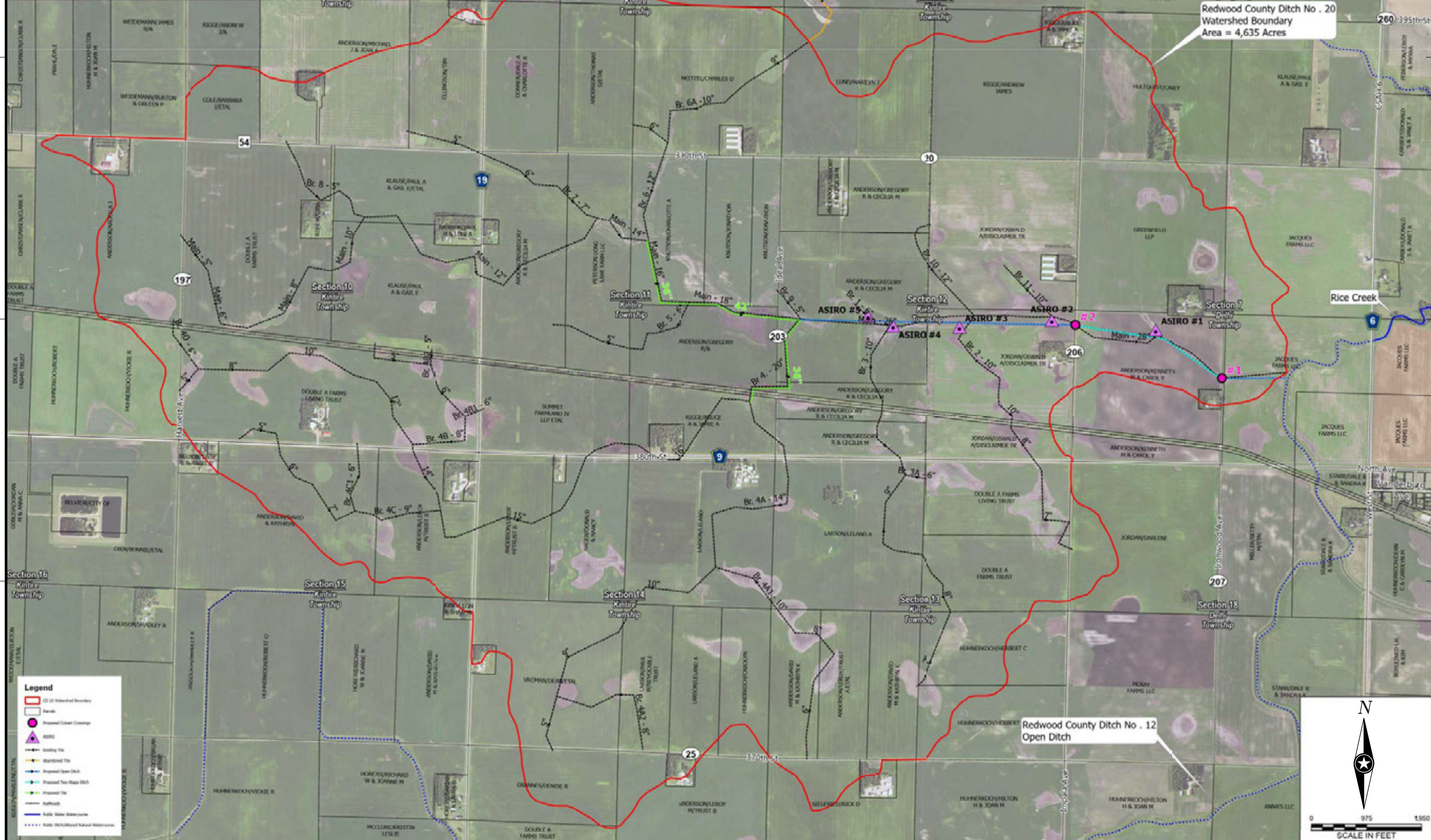
TITLE
EXISTING WATERSHED MAP

SHEET
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 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

Area	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	28	Open Ditch	0.10%	0.09%	4869.6	0.05	Open Ditch
	28		0.10%	0.08%	4647.1	0.06	
	28		0.10%	0.07%	4304.5	0.06	
	28		0.10%	0.07%	4252.8	0.06	
	28		0.10%	0.07%	4104.2	0.06	
	26		0.10%	0.17%	3688.5	0.06	
	26		0.10%	0.13%	3177.3	0.07	
	18		42	0.20%	0.12%	1576.8	
Branch 4	16	36	0.20%	0.20%	1371.3	0.06	0.52
	20	36	0.32%	0.25%	1565.8	0.12	0.51

Crossing # on Map	Ditch Description	Station	Roadway	Proposed Type	Proposed Material	Proposed Width (ft)	Proposed Height (ft)	Proposed Slope (%)	Drainage Area (Acres)	Proposed Drainage Coefficient (in/day)
1	Mainline Open Ditch	10+90	Ironwood Ave	BOX CULVERT	RCP	8	4	0.10%	4722	0.93
2	Mainline Open Ditch	39+49	Impala Ave	BOX CULVERT	RCP	8	7	0.10%	4145	2.17



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 WATERSHED MAPS
 DRAWN BY KJH
 DESIGNED BY AUS
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. --

TITLE
PROPOSED WATERSHED MAP

SHEET
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 OF 49

Legend

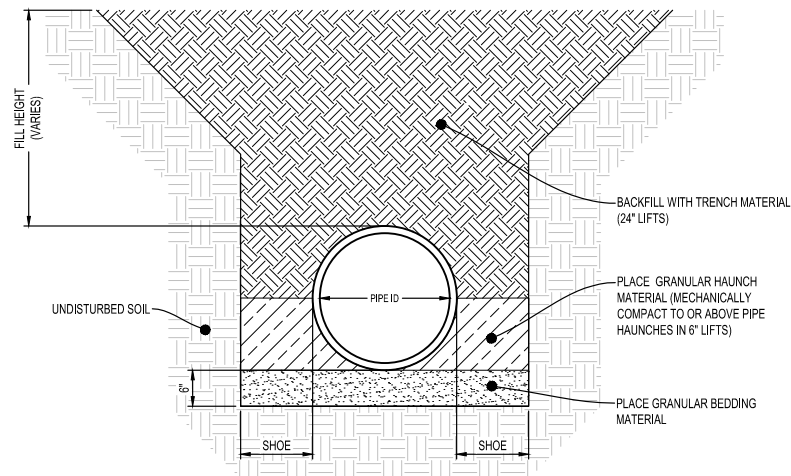
- CS 20 Watershed Boundary
- Ditch
- Proposed Culvert Crossing
- ASIRO
- Existing Tie
- Abandoned Tie
- Proposed Open Ditch
- Proposed Two Stage Ditch
- Proposed Tie
- Proposed Tie
- Asphalt
- Public Water Substation
- Public Water Station
- Public Water Station

North Arrow

SCALE IN FEET

0 975 1,950

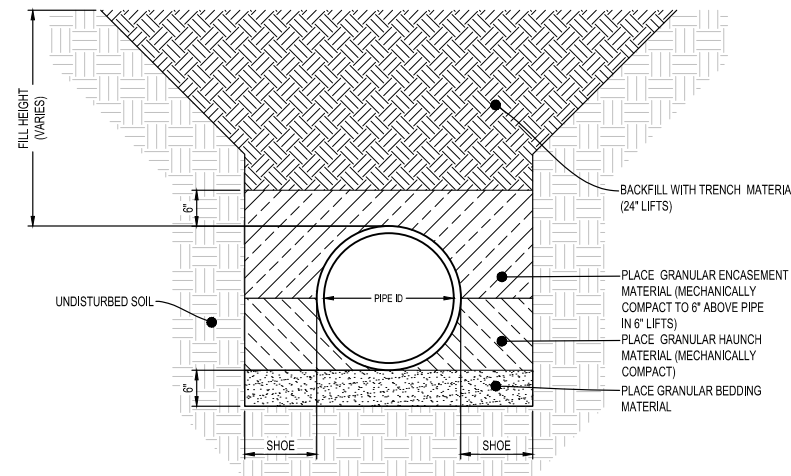
PRELIMINARY NOT FOR CONSTRUCTION



NOTES:

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

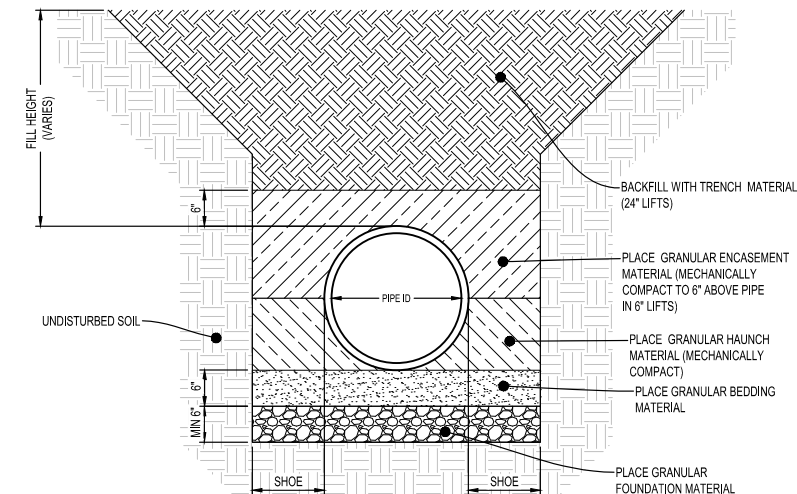
RCP FLAT BOTTOM TRENCH
NTS



NOTE:

1. GRANULAR BEDDING, GRANULAR ENCASEMENT, AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.
2. ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.
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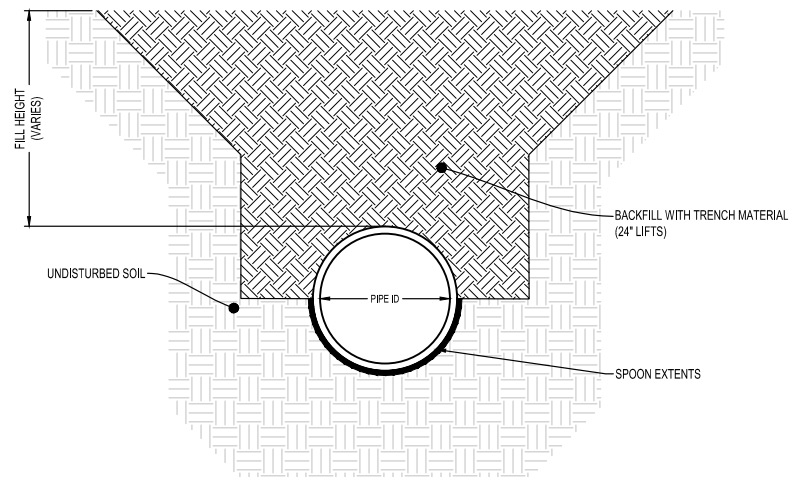
HDPE FLAT BOTTOM TRENCH
NTS



NOTES:

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

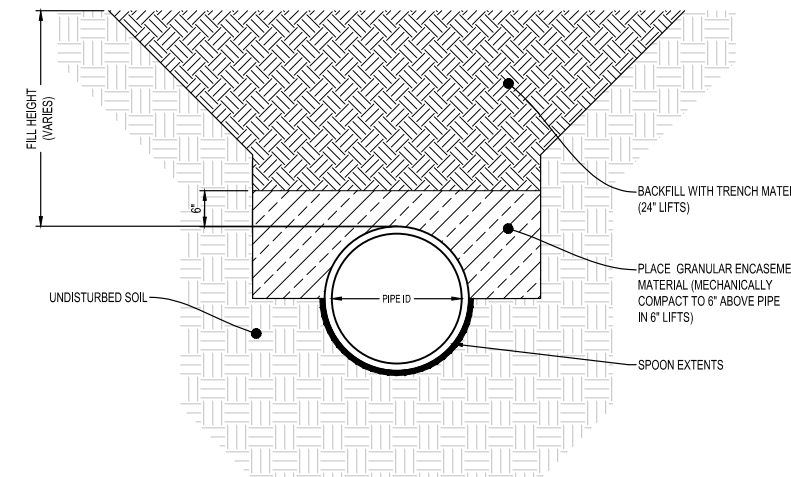
HDPE FLAT BOTTOM TRENCH WITH GRANULAR FOUNDATION
NTS



NOTES:

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

RCP SPOON TRENCH
NTS



NOTES:

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

HDPE SPOON TRENCH
NTS

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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 DETAILS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE
DETAILS

SHEET
7 OF 49

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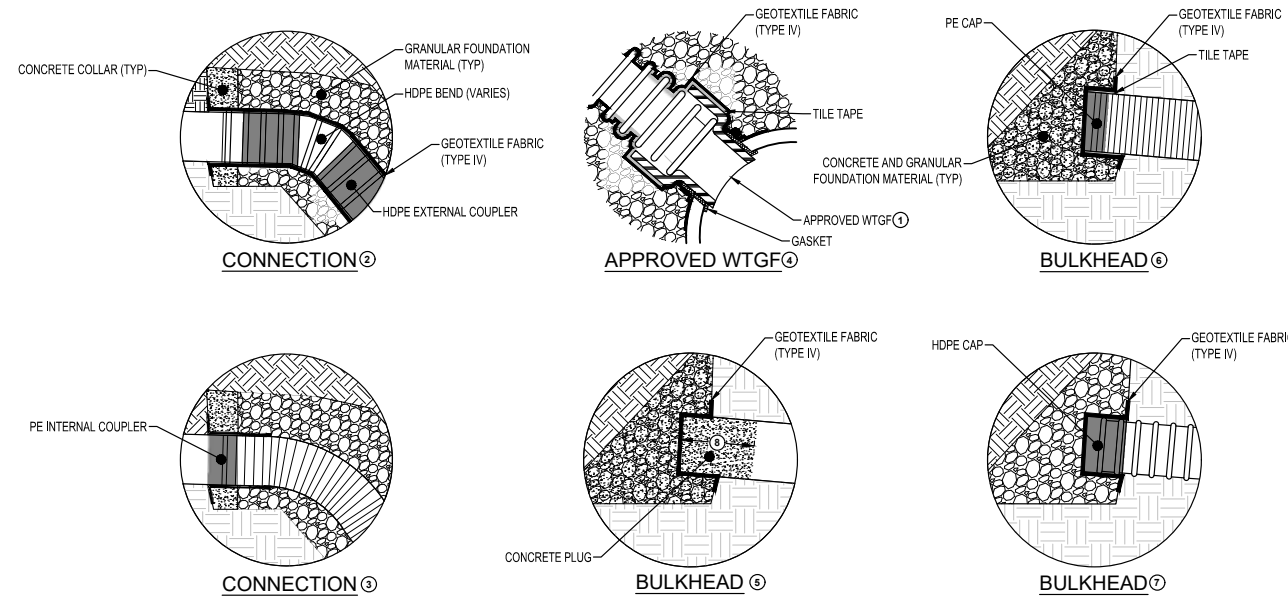
PRELIMINARY NOT FOR CONSTRUCTION

KEY NOTES:

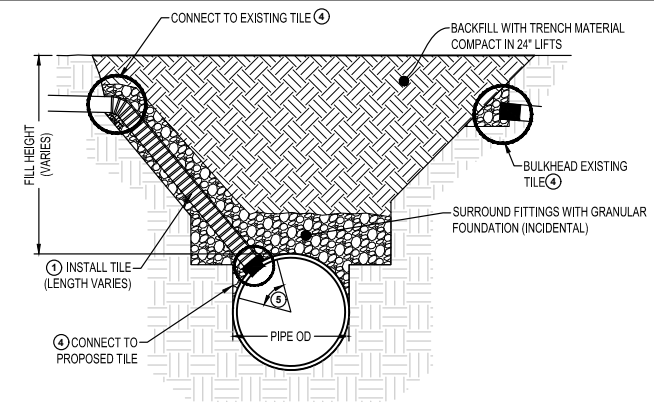
- ① APPROVED WATERTIGHT GASKETED FITTING (WTGF) SHALL ONLY BE USED WHEN THE PIPE TO BE CONNECTED IS 1/2 (OR SMALLER) THE DIAMETER OF THE PIPE TO BE TAPPED. A MOLDED TEE SHALL BE USED IN ALL OTHER SITUATIONS. APPROVED WTGF SHALL NOT BE INSTALLED COMPLETELY VERTICAL OR INTO THE BOTTOM HALF OF THE PIPE TO BE TAPPED.
- ② CONNECTION OF HDPE TO CLAY, CONCRETE, OR PE TILE.
- ③ CONNECTION OF PE TO CLAY, CONCRETE, OR PE TILE.
- ④ CONNECTION OF PE OR HDPE TO PIPE TO BE TAPPED.
- ⑤ BULKHEAD OF EXISTING CLAY OR CONCRETE TILE.
- ⑥ BULKHEAD OF EXISTING PE TILE.
- ⑦ BULKHEAD OF EXISTING HDPE TILE.
- ⑧ CONCRETE BULKHEAD SHALL EXTEND INTO THE PIPE A MINIMUM LENGTH EQUIVALENT TO ONE DIAMETER OF THE PIPE.

NOTES:

1. ALL TILE, FITTINGS, GEOTEXTILE FABRIC, FOUNDATION ROCK, TILE TAPE, CONCRETE, AND EXCAVATION SHALL BE INCIDENTAL TO RESPECTIVE BID ITEM UNLESS OTHERWISE NOTED.
2. NOT ALL SITUATIONS OR APPROVED EQUALS ARE DEMONSTRATED IN DETAIL. ENGINEER SHALL APPROVE OF EQUALS.



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:

- ① 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.
- ② HDPE SHALL BE USED IF THE EXISTING TILE IS HDPE, REGARDLESS OF THE FILL HEIGHT.
- ③ HDPE SHALL BE USED WITHIN 5' FROM THE PROPOSED PIPE AND THEN PE MAY BE USED.
- ④ REFER TO TYPICAL CONNECTION DETAILS.
- ⑤ CONNECTION TO PROPOSED TILE SHALL BE LIMITED TO 15 TO 75 DEGREES FROM SPRING LINE.

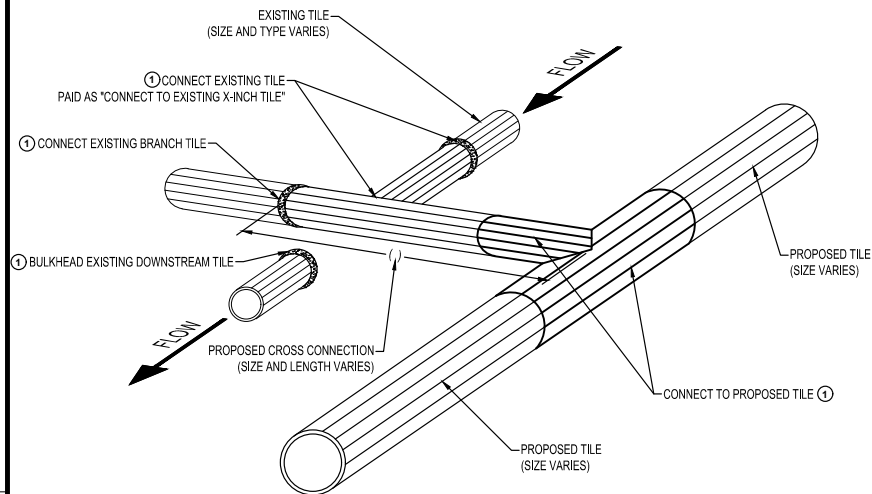
ALL TILE, FITTINGS, GEOTEXTILE FABRIC, FOUNDATION ROCK, TILE TAPE, CONCRETE, AND EXCAVATION SHALL BE INCIDENTAL.

CONNECT TO EXISTING TILE
NTS

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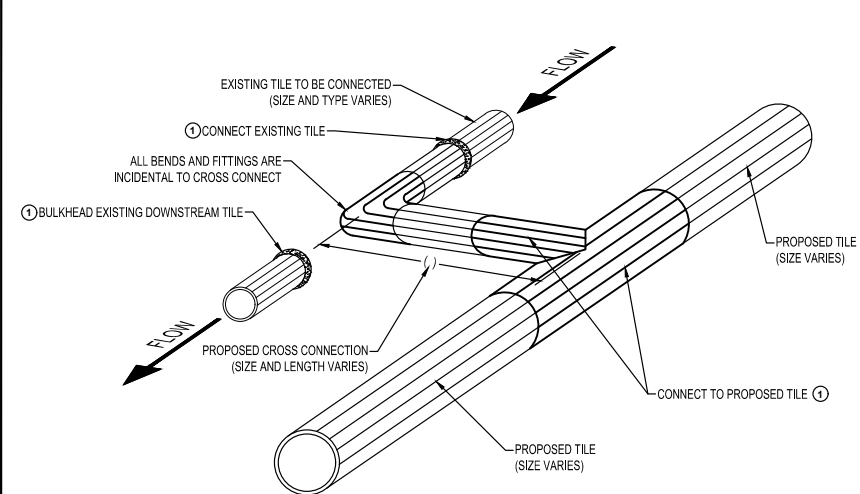
KEY NOTE:

- ① REFER TO TYPICAL CONNECTION DETAILS.

NOTES:

1. CROSS CONNECTION SHALL BE CONSTRUCTED WITH HDPE TILE.
2. CONNECTION TO PROPOSED TILE AND EXISTING BRANCH TILE ARE INCIDENTAL TO CROSS CONNECT. BULKHEAD IS INCIDENTAL TO CONNECTION TO EXISTING "X" TILE.
3. TILE CONNECTIONS SHALL NOT BE INSTALLED COMPLETELY VERTICAL FROM TOP OF PIPE.
4. CROSS CONNECT SHALL BE PAID AS THREE (3) SEPARATE PAY ITEMS:
 - A. X-INCH CROSS-CONNECT W/ 40 LF OF SPECIFIED PIPE
 - B. X-INCH AGRICULTURAL TILE (FOR LENGTHS GREATER THAN 40')
 - C. CONNECT TO EXISTING X-INCH TILE

CROSS CONNECT TO EXISTING BRANCH TILE
NTS



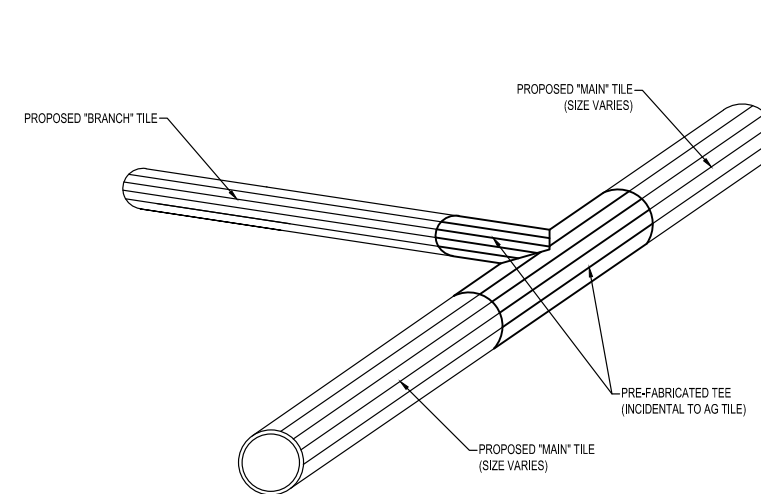
KEY NOTE:

- ① REFER TO TYPICAL CONNECTION DETAILS.

NOTES:

1. CROSS CONNECTION SHALL BE CONSTRUCTED WITH HDPE TILE.
2. CONNECTION TO PROPOSED TILE AND EXISTING BRANCH TILE ARE INCIDENTAL TO CROSS CONNECT. BULKHEAD IS INCIDENTAL TO CONNECTION TO EXISTING "X" TILE.
3. TILE CONNECTIONS SHALL NOT BE INSTALLED COMPLETELY VERTICAL FROM TOP OF PIPE.
4. CROSS CONNECT SHALL BE PAID AS THREE (3) SEPARATE PAY ITEMS:
 - A. X-INCH CROSS-CONNECT W/ 40 LF OF SPECIFIED PIPE
 - B. X-INCH AGRICULTURAL TILE FOR LENGTHS GREATER THAN 40'
 - C. CONNECT TO EXISTING X-INCH TILE

CROSS CONNECT TO EXISTING TILE
NTS



NOTES:

1. CONNECTION TO PROPOSED TILE SHALL BE INCIDENTAL TO TILE INSTALLATION.
2. PRE-FABRICATED TEE SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL.

CONNECT TO PROPOSED BRANCH TILE
NTS

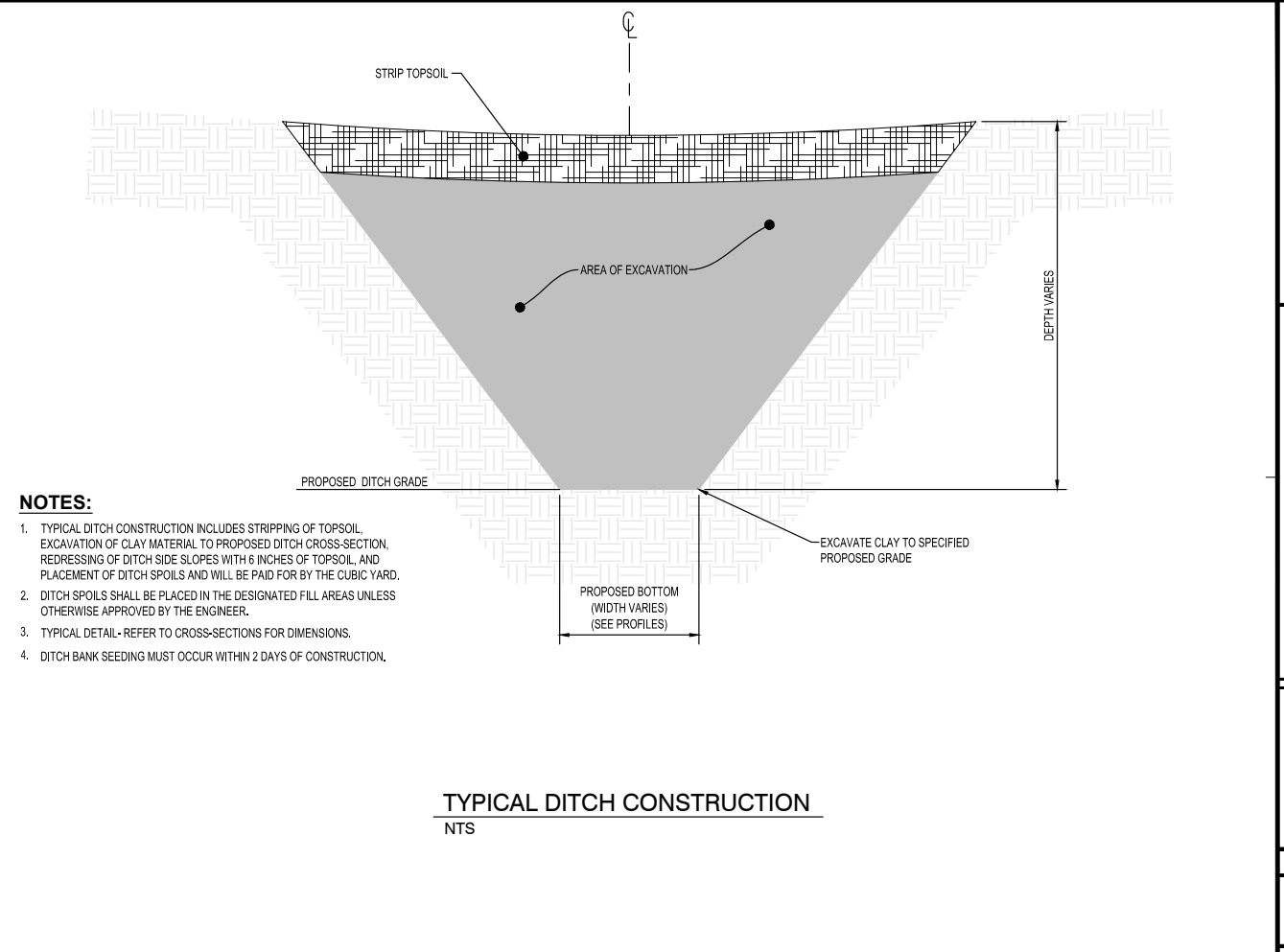
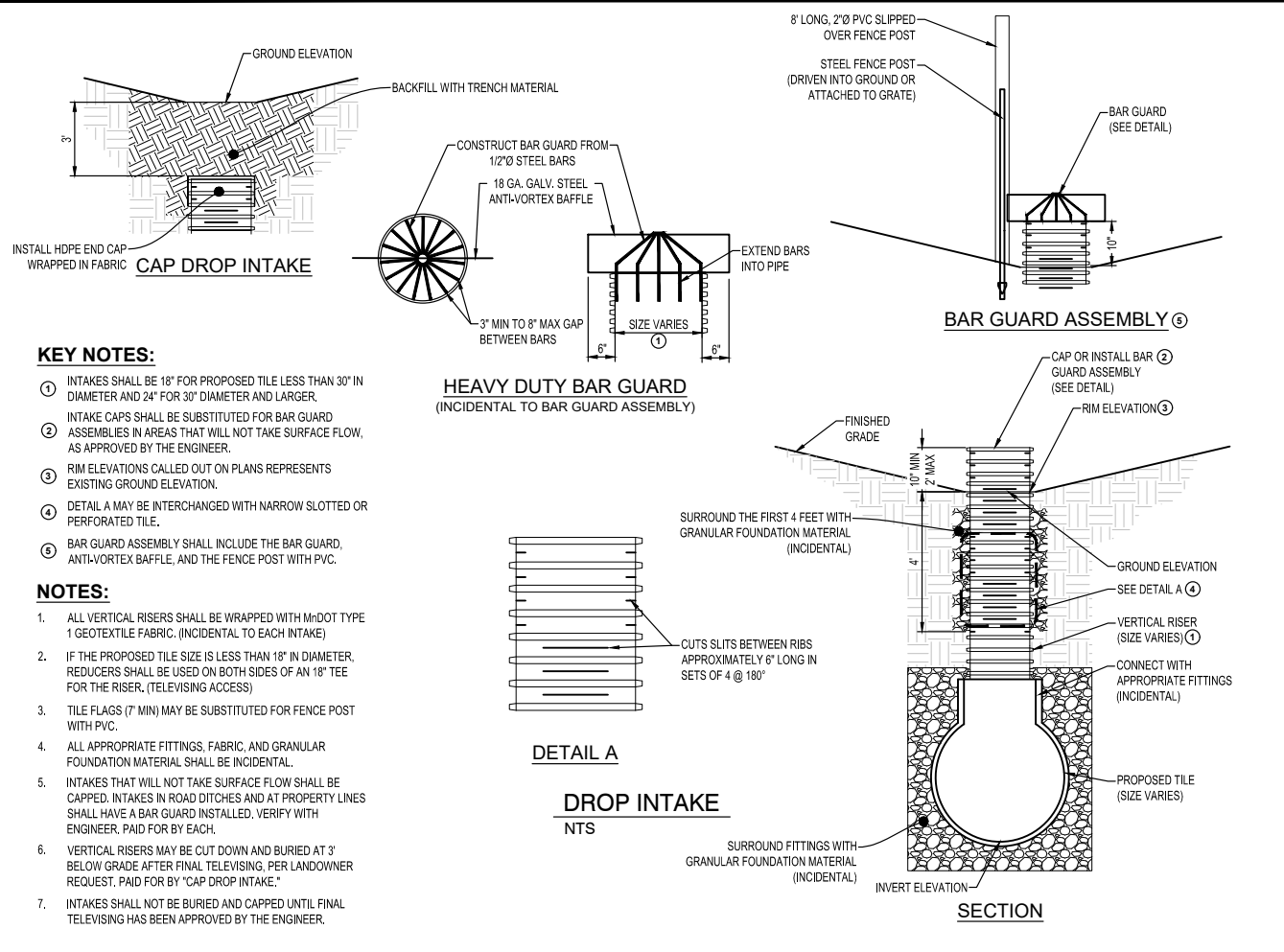
PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 DETAILS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	-

TITLE
DETAILS

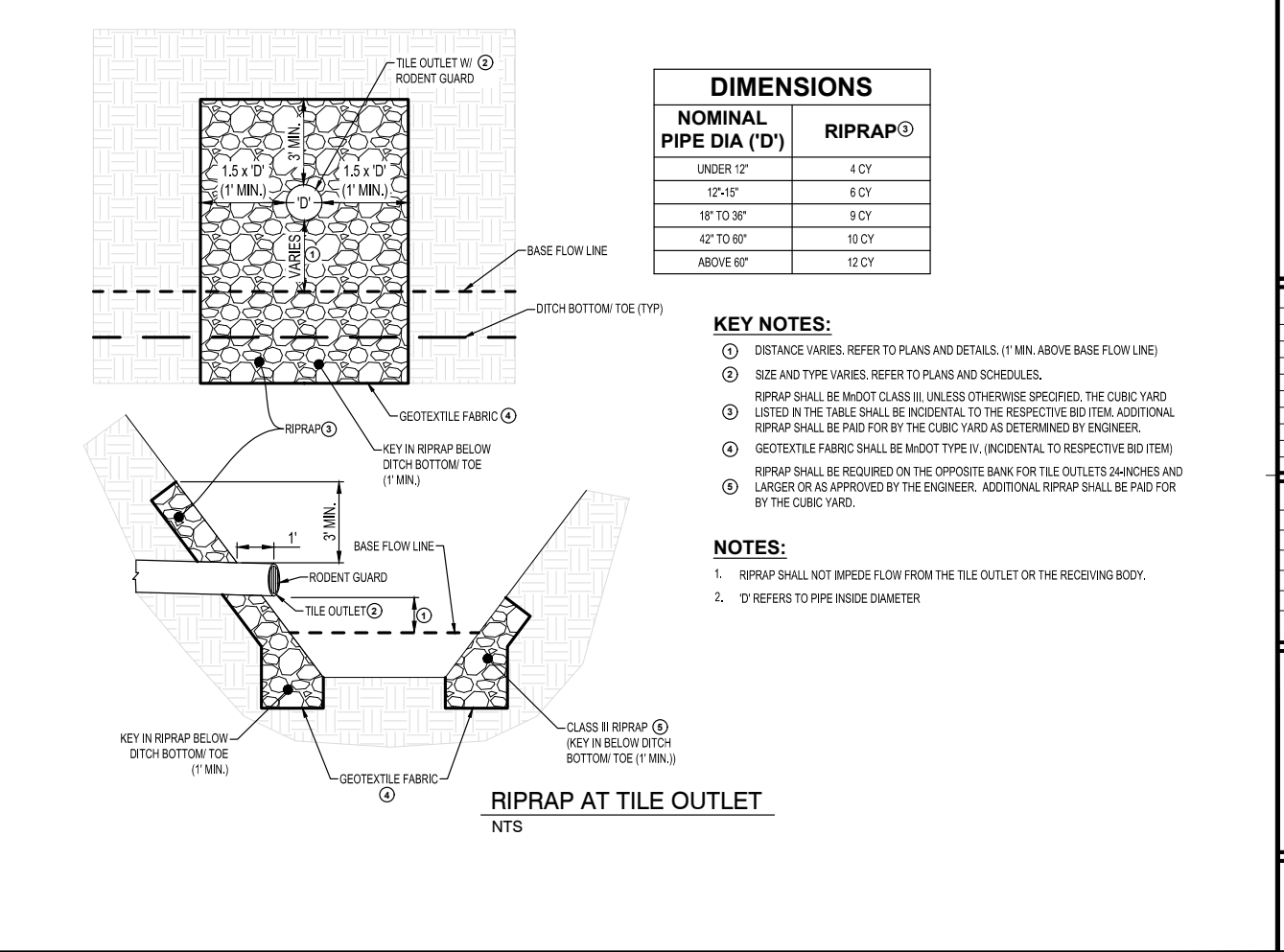
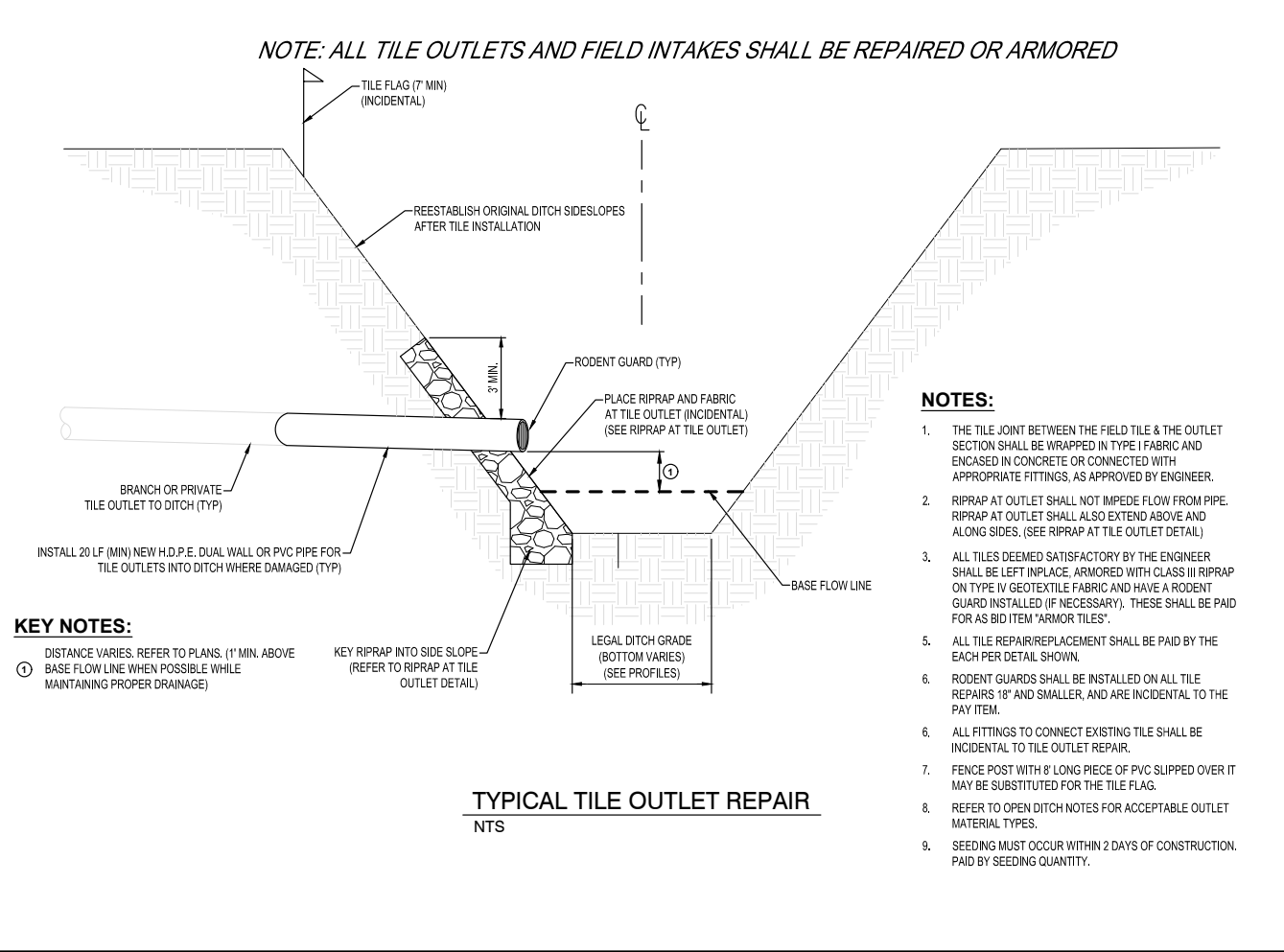
SHEET
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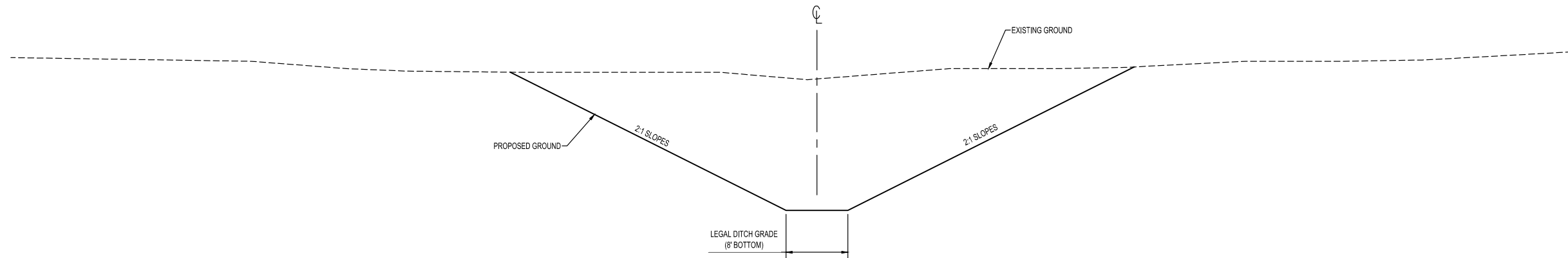
PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 DETAILS
 DRAWN BY KJH
 DESIGNED BY AJJ
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. -

TITLE
DETAILS

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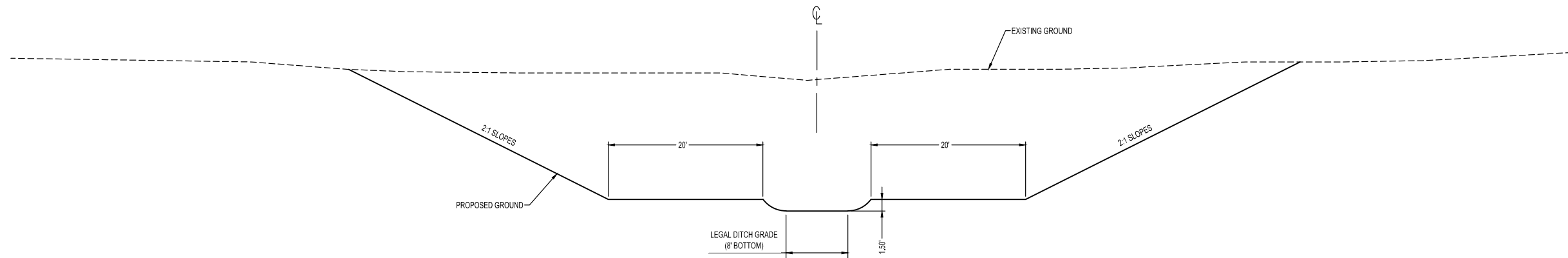
TYPICAL DITCH SECTION
NTS

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TYPICAL TWO-STAGE DITCH SECTION
NTS

PROJECT
REDWOOD COUNTY
COUNTY DITCH No. 20

REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 DETAILS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

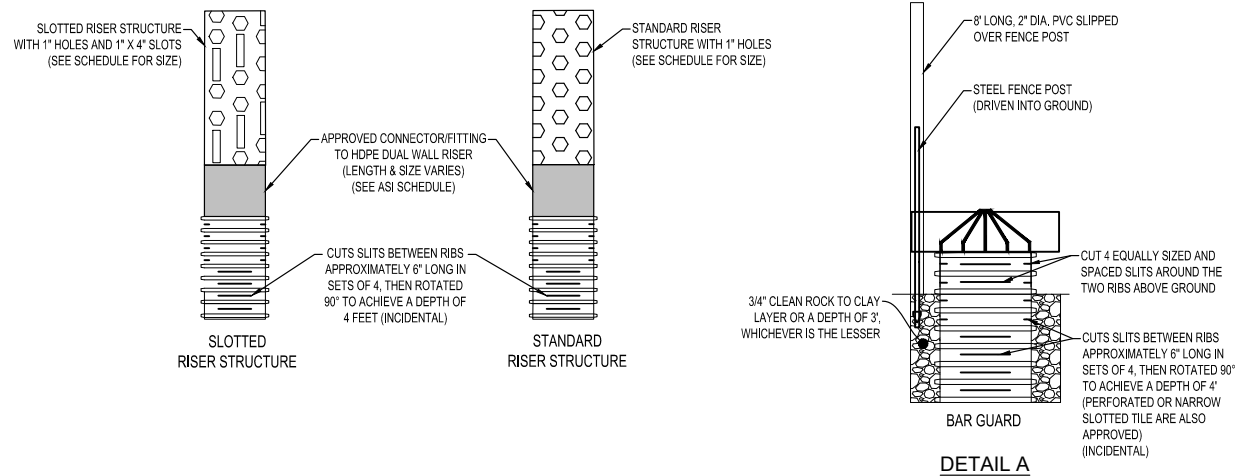
TITLE
DETAILS

SHEET
10 OF 49

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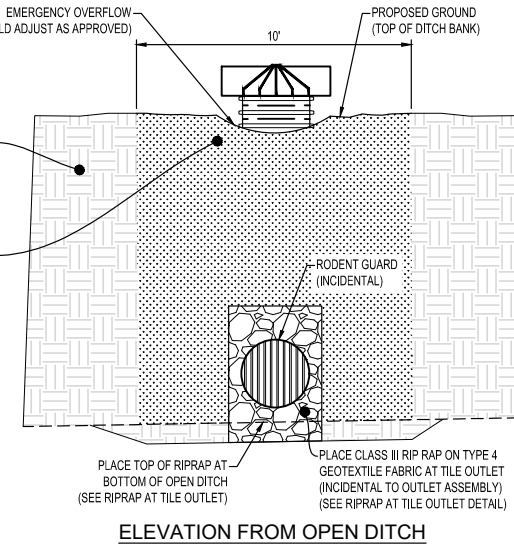


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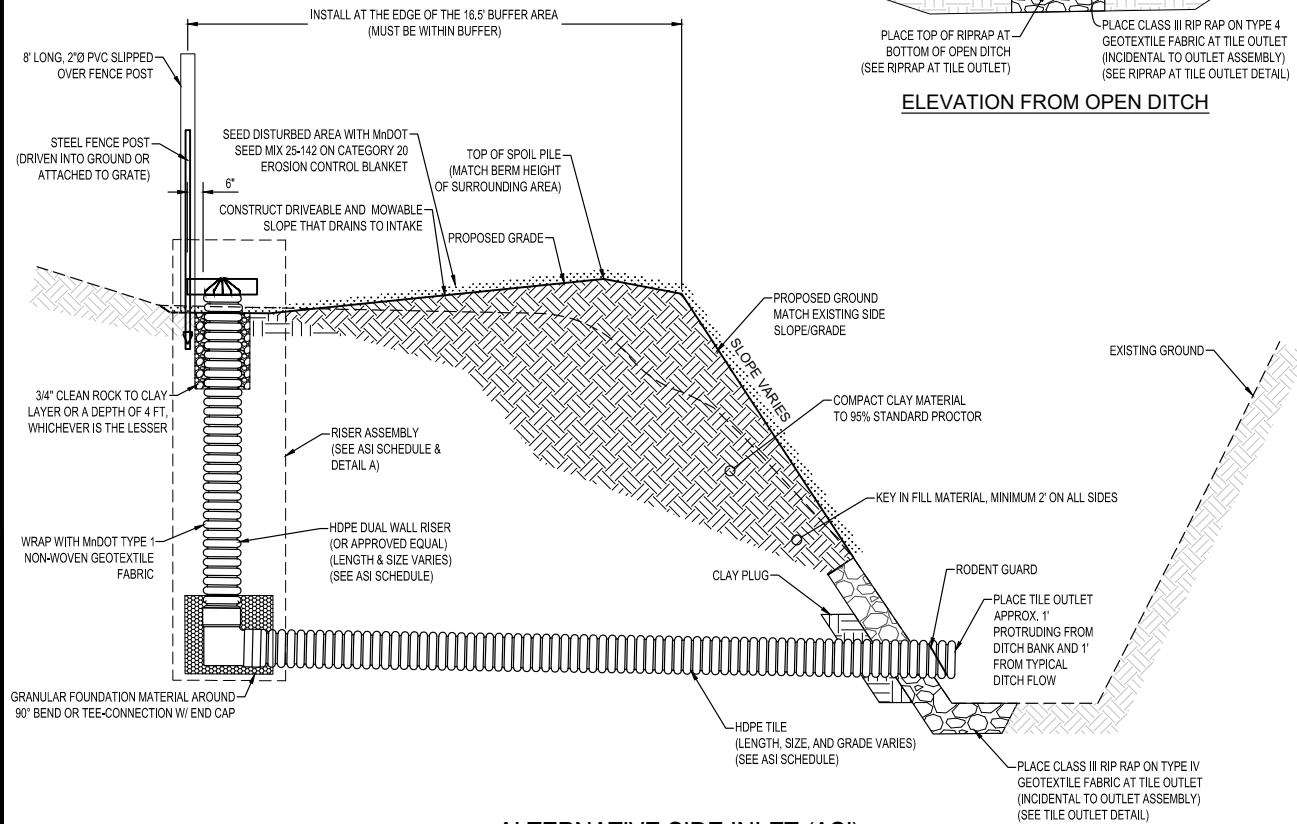


NOTES:

1. INTAKE TYPE AND TILE SIZE VARIES PER ASI. (SEE SCHEDULE)
2. RISER ASSEMBLY SHALL BE A SEPARATE PAY ITEM THAN THE OUTLET ASSEMBLY.
3. ALL DISTURBED AREAS WITHIN BUFFER EASEMENT SHALL BE SEEDED WITH MNDOT SEED MIX 25-142 ON CATEGORY 20 EROSION CONTROL BLANKET. (INCIDENTAL)
4. ALL EFFORTS SHALL BE MADE 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 6", OR UNIFORM TO THE TOPSOIL DEPTH OF THE SURROUNDING AREA. 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.
5. ALL INTAKES SHALL BE WRAPPED WITH MNDOT TYPE 1 GEOTEXTILE FABRIC. (INCIDENTAL TO RISER ASSEMBLY)
6. ALL SLITS CUT INTO RISER ARE INCIDENTAL TO RISER ASSEMBLY.
7. ALL 3/4" CLEAN ROCK AND GRANULAR FOUNDATION MATERIAL IS INCIDENTAL TO RISER ASSEMBLY.
8. ALL OUTLET RIPRAP IS INCIDENTAL TO OUTLET ASSEMBLY.
9. INTAKES SHALL BE FIELD ADJUSTED BASED ON ACTUAL LOCATION OF LOW AREAS, AS DETERMINED BY THE ENGINEER.
10. TILE OUTLET ASSEMBLY SHALL CONFORM TO STANDARD TILE INSTALLATION.
11. SHAPING OF LOW AREA TO GRADE TO DROP INTAKE SHALL BE INCIDENTAL TO PAY ITEM.
12. TRASH GRATE, ANTI-VORTEX PLATE, AND FENCE POST WITH PVC SHALL BE INCIDENTAL.
13. TILE FLAGS (7" MIN) MAY BE SUBSTITUTED FOR FENCE POST WITH PVC.

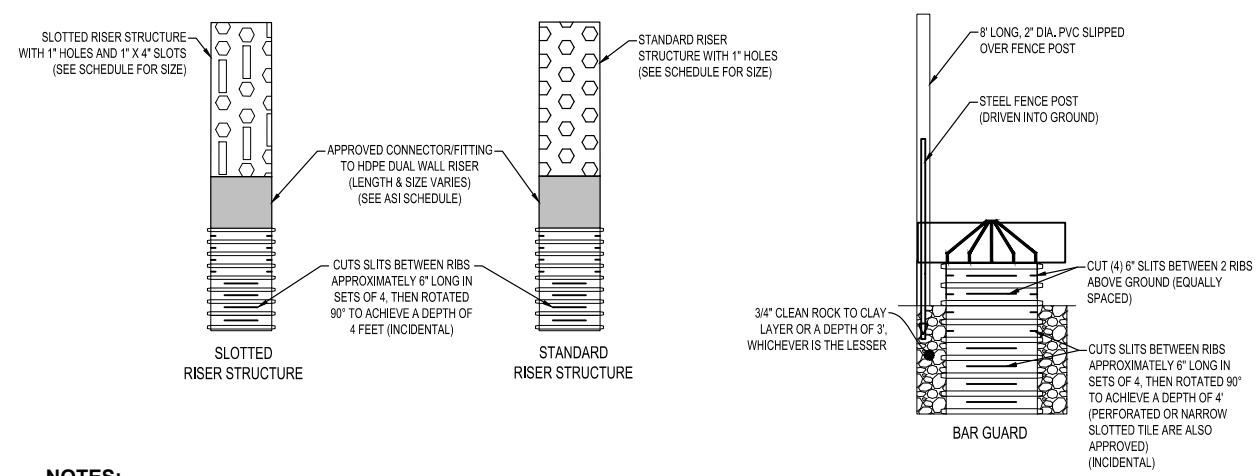


ELEVATION FROM OPEN DITCH



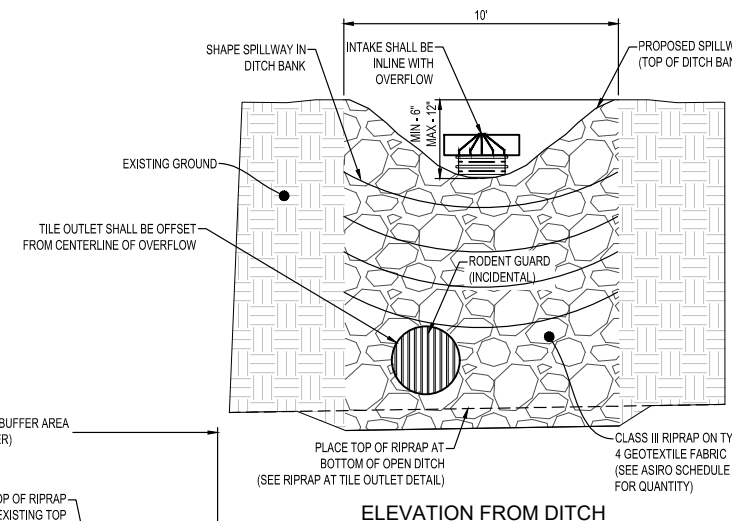
ALTERNATIVE SIDE INLET (ASI)

NTS

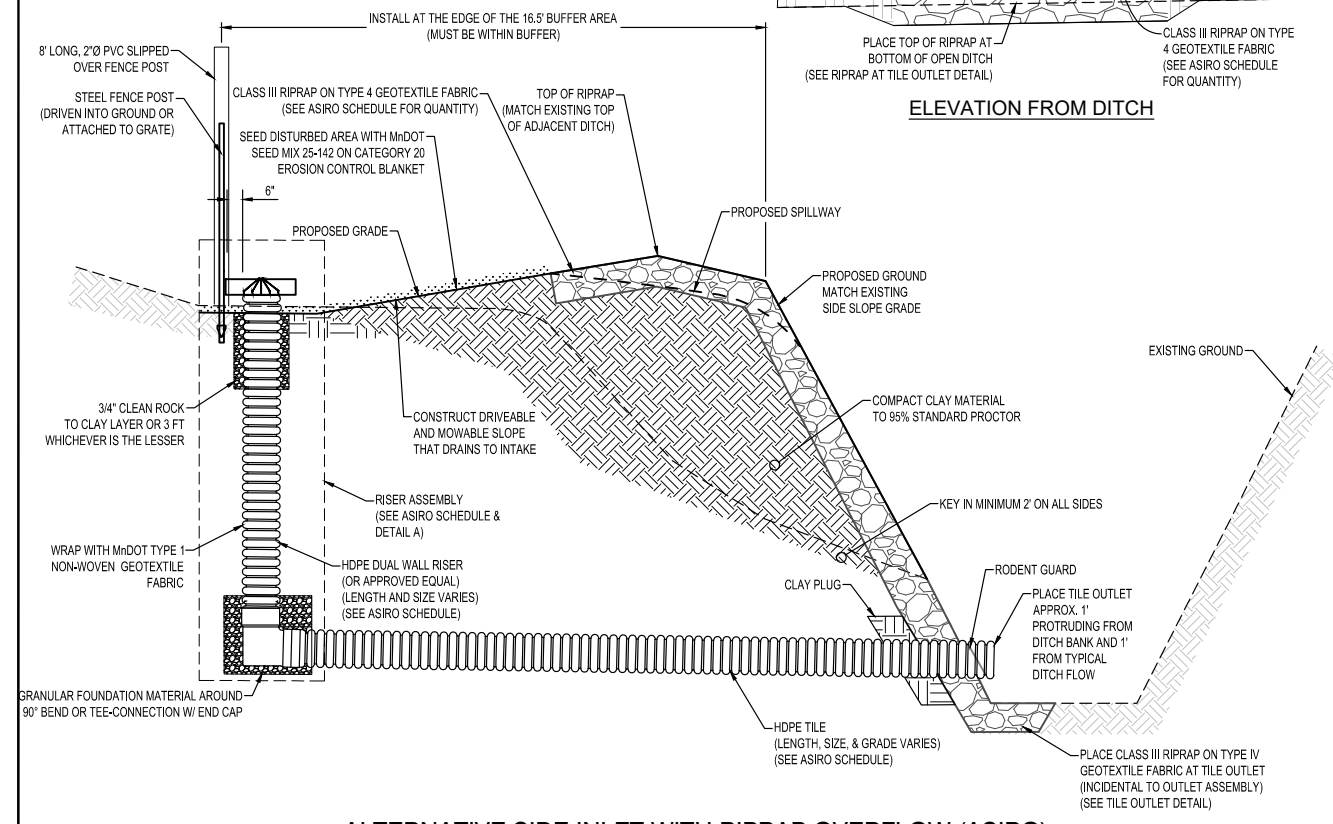


NOTES:

1. INTAKE TYPE & TILE SIZE VARIES PER ASI. (SEE SCHEDULE)
2. RISER ASSEMBLY SHALL BE A SEPARATE PAY ITEM THAN THE OUTLET ASSEMBLY.
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4. ALL EFFORTS SHALL BE MADE 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 6", OR UNIFORM TO THE TOPSOIL DEPTH OF THE SURROUNDING AREA. 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.
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8. ALL OUTLET RIPRAP IS INCIDENTAL TO OUTLET ASSEMBLY
9. INTAKES SHALL BE FIELD ADJUSTED BASED ON ACTUAL LOCATION OF LOW AREAS, AS DETERMINED BY THE ENGINEER.
10. TILE OUTLET ASSEMBLY SHALL CONFORM TO STANDARD TILE INSTALLATION.
11. SHAPING OF LOW AREA TO GRADE TO DROP INTAKE SHALL BE INCIDENTAL TO PAY ITEM.
12. TRASH GRATE, ANTI-VORTEX PLAT, AND FENCE POST WITH PVC SHALL BE INCIDENTAL.
13. TILE FLAGS (7" MIN) MAY BE SUBSTITUTED FOR FENCE POST WITH PVC.



ELEVATION FROM DITCH



ALTERNATIVE SIDE INLET WITH RIPRAP OVERFLOW (ASIRO)

NTS

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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
REDWOOD COUNTY MINNESOTA

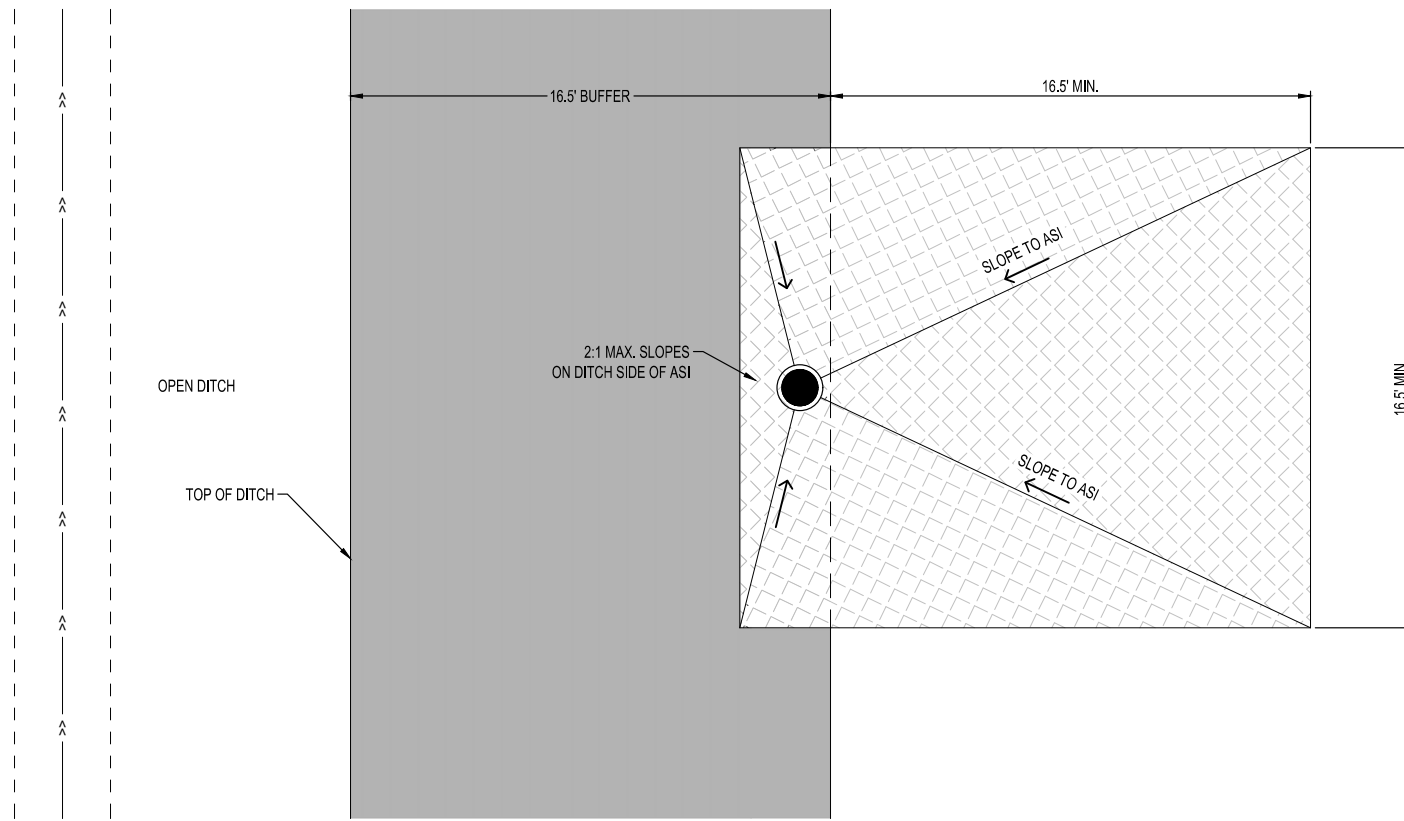
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 DETAILS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	-

TITLE
DETAILS



PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW

NOTES:

1. CONTRACTOR SHALL ENSURE THAT THE RIM OF ASI/ASIRO IS THE LOWEST POINT IN THE ADJACENT AGRICULTURAL FIELD WITHIN A 50-FOOT RADIUS.
2. SHOULD DEPRESSIONS LOWER IN ELEVATION AS COMPARED TO THE RIM ELEVATION BEYOND 50-FOOT RADIUS EXIST WITHIN A 150-FOOT RADIUS, THE CONTRACTOR SHALL CONFIRM PROPOSED GRADING PLAN WITH ENGINEER PRIOR TO ANY INSTILLATION EFFORTS.
3. BERM SHALL BE BUILT WITHIN THE BUFFER TO THE ELEVATION DISPLAYED WITHIN THE ASI/ASIRO SCHEDULE TO ENSURE PROPER FUNCTION.

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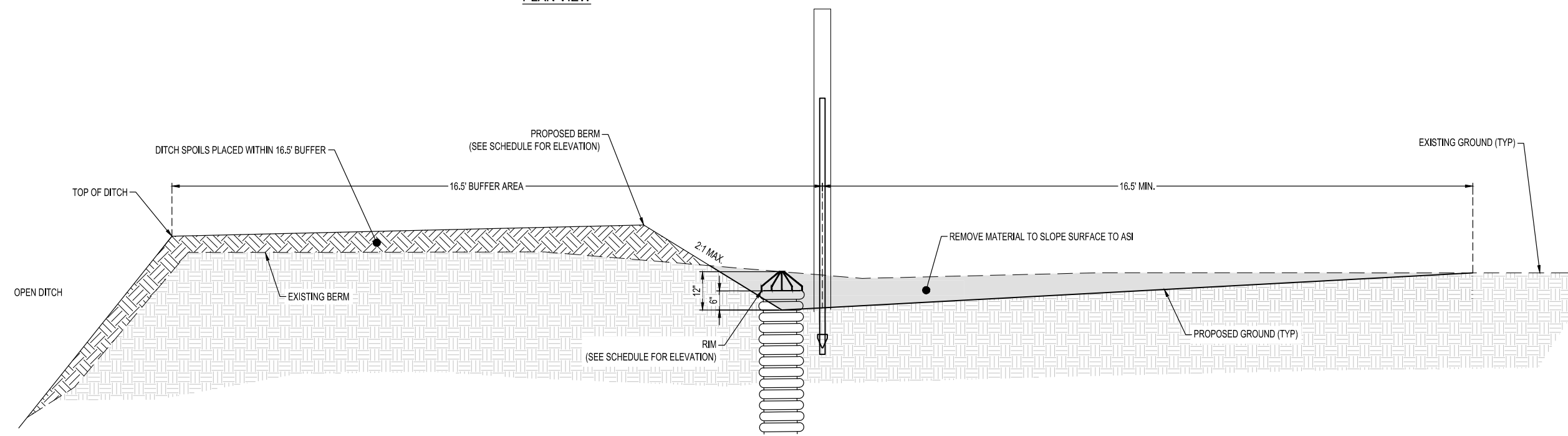
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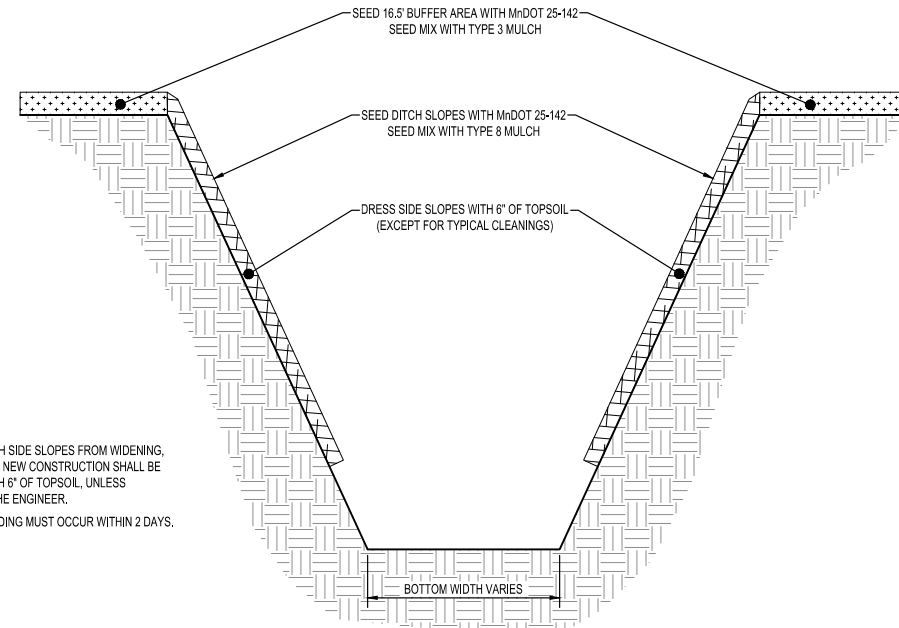
TITLE
DETAILS

SHEET
12 OF 49



PROFILE VIEW

ASI AND ASIRO GRADING
NTS



- NOTES:**
1. DISTURBED DITCH SIDE SLOPES FROM WIDENING, DEEPENING, AND NEW CONSTRUCTION SHALL BE REDRESSED WITH 6" OF TOPSOIL, UNLESS APPROVED BY THE ENGINEER.
 2. DITCH BANK SEEDING MUST OCCUR WITHIN 2 DAYS.

TYPICAL OPEN DITCH SEEDING SECTION
NTS

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PROJECT
REDWOOD COUNTY
COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

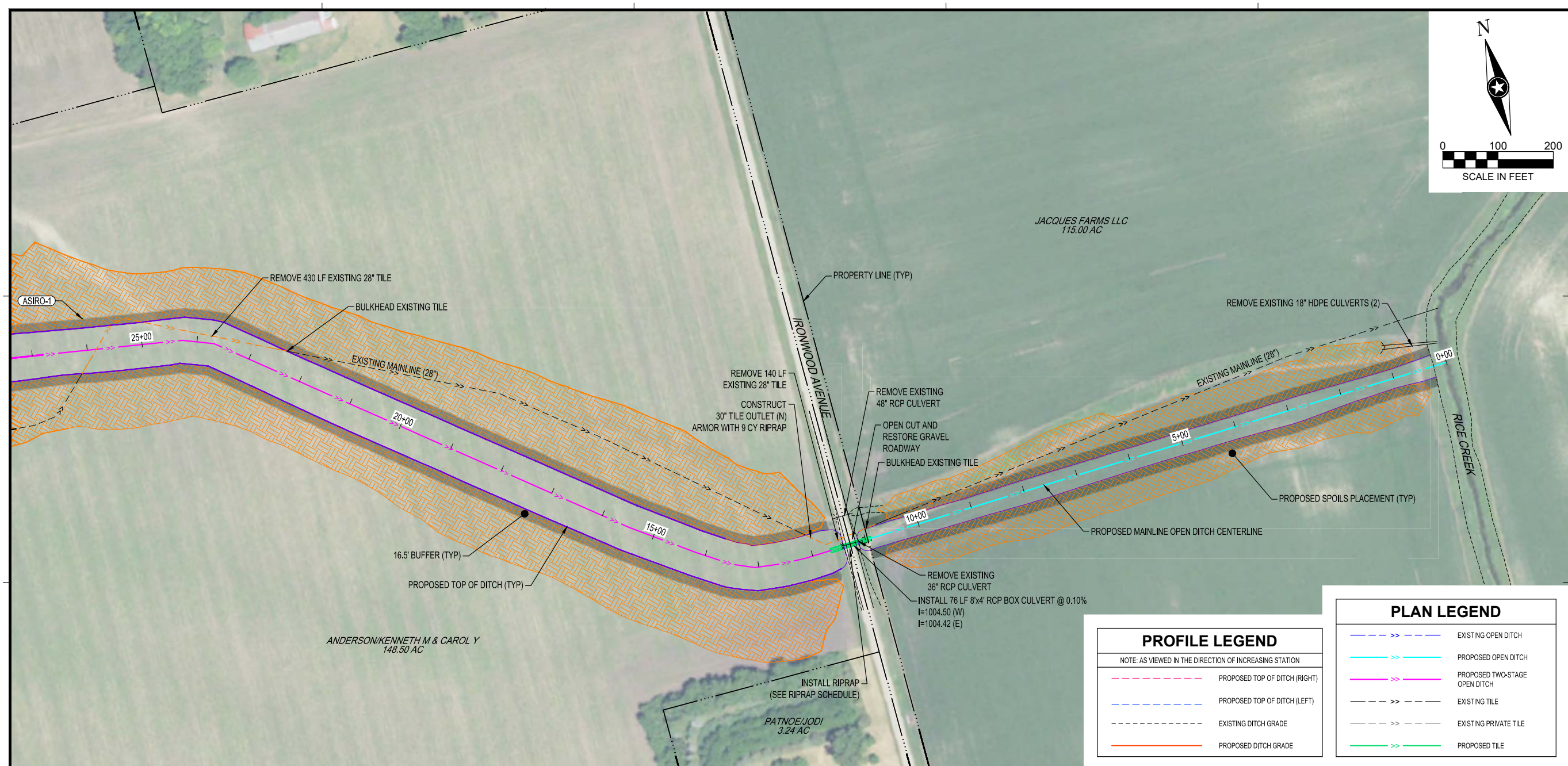
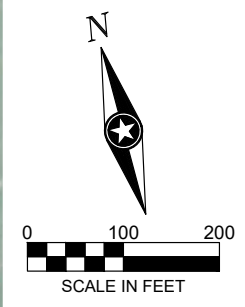
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TITLE
DETAILS

SHEET
13 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



PROFILE LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

	PROPOSED TOP OF DITCH (RIGHT)
	PROPOSED TOP OF DITCH (LEFT)
	EXISTING DITCH GRADE
	PROPOSED DITCH GRADE

PLAN LEGEND

	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	PROPOSED TWO-STAGE OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE

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PROJECT

REDWOOD COUNTY

COUNTY DITCH No. 20

REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

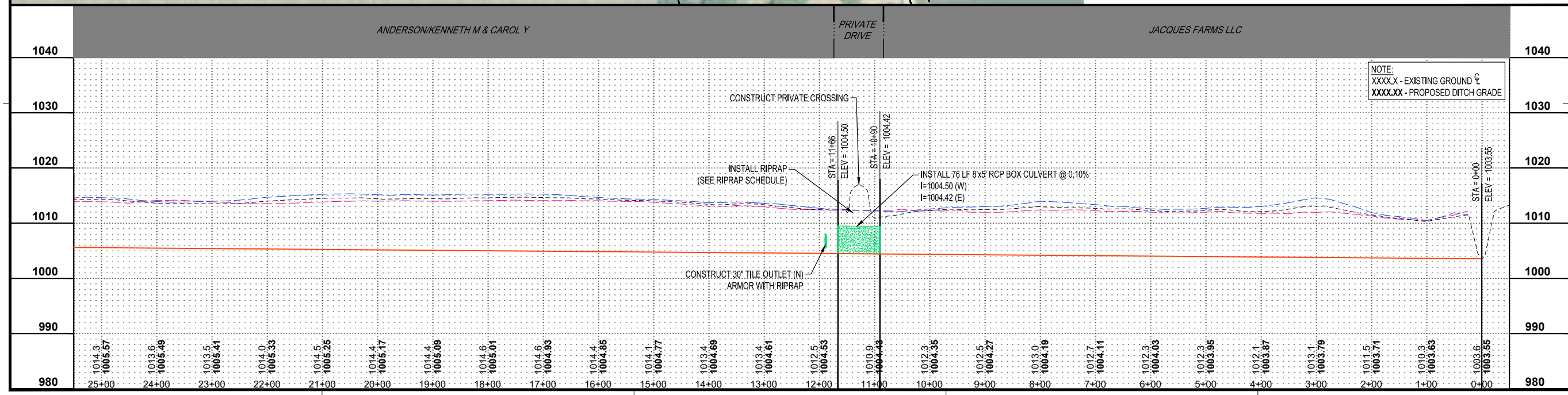
PROJECT NO.	23-28479
FILE NAME	28479 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

TITLE

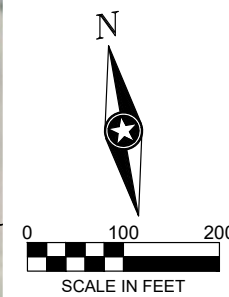
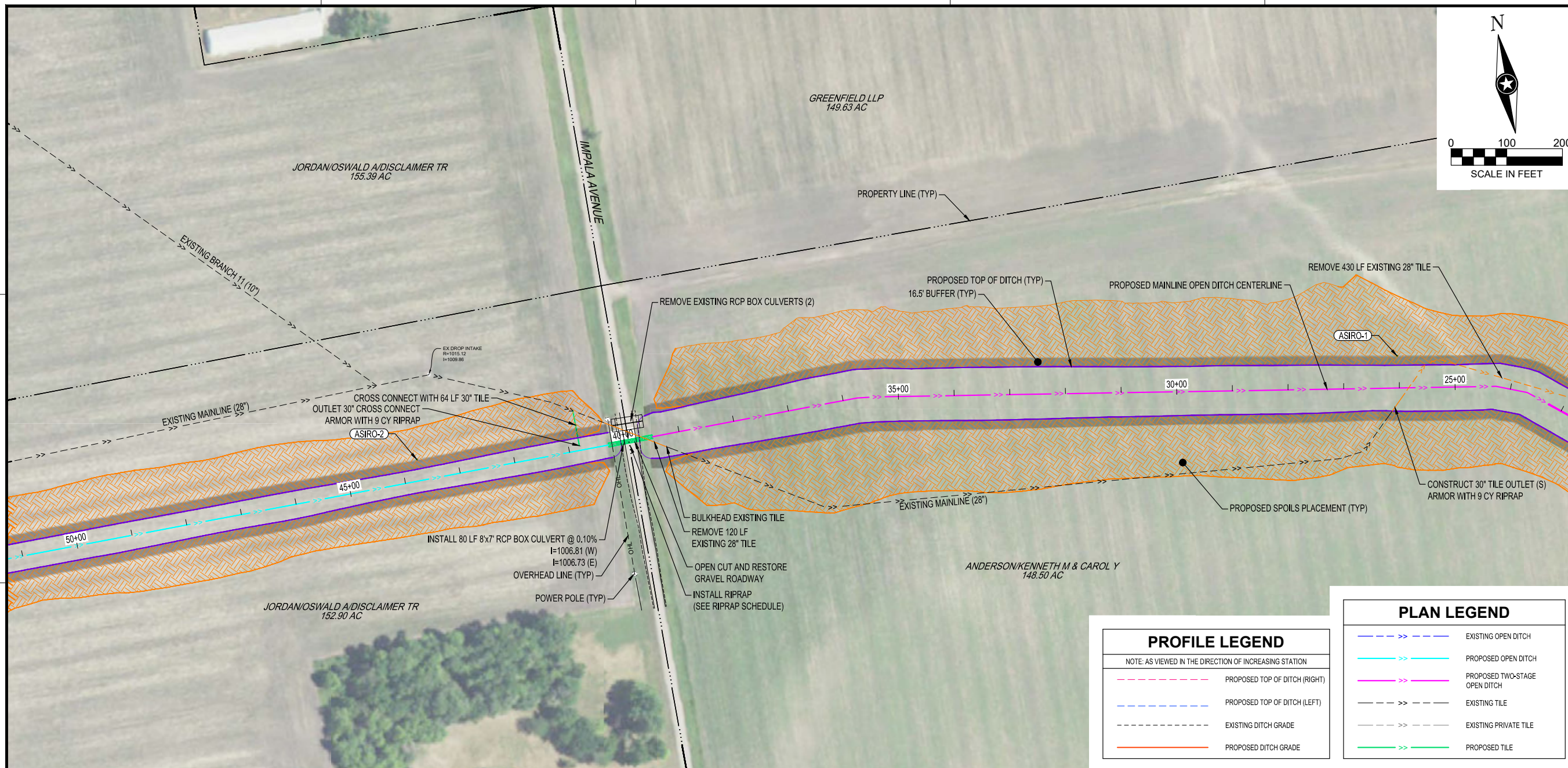
PLAN - PROFILE MAINLINE OPEN DITCH

SHEET

14 OF 49



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PROFILE LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	PROPOSED TOP OF DITCH (RIGHT)
	PROPOSED TOP OF DITCH (LEFT)
	EXISTING DITCH GRADE
	PROPOSED DITCH GRADE

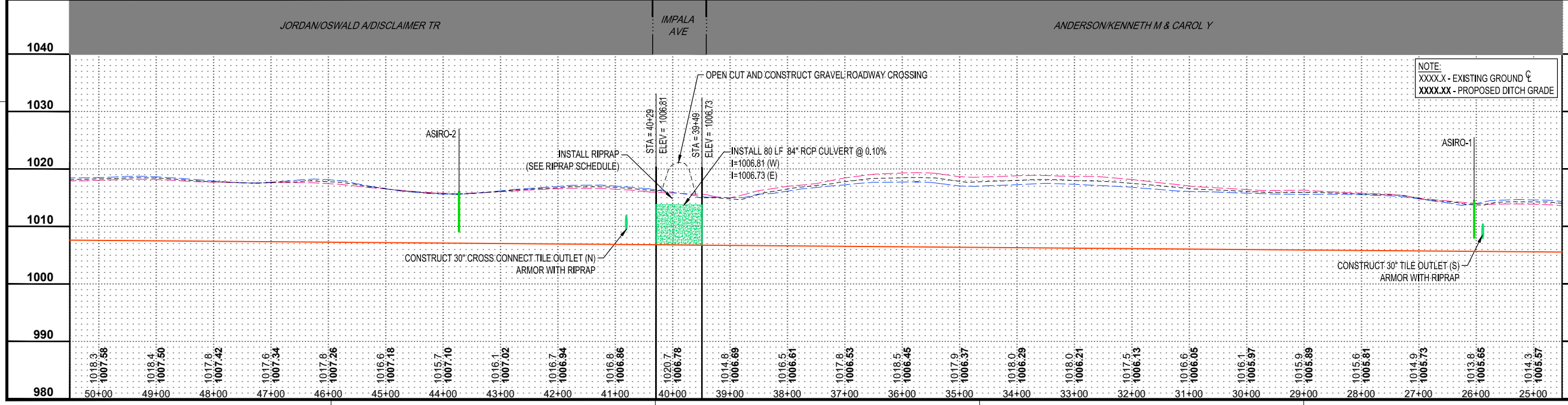
PLAN LEGEND	
	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	PROPOSED TWO-STAGE OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE

PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

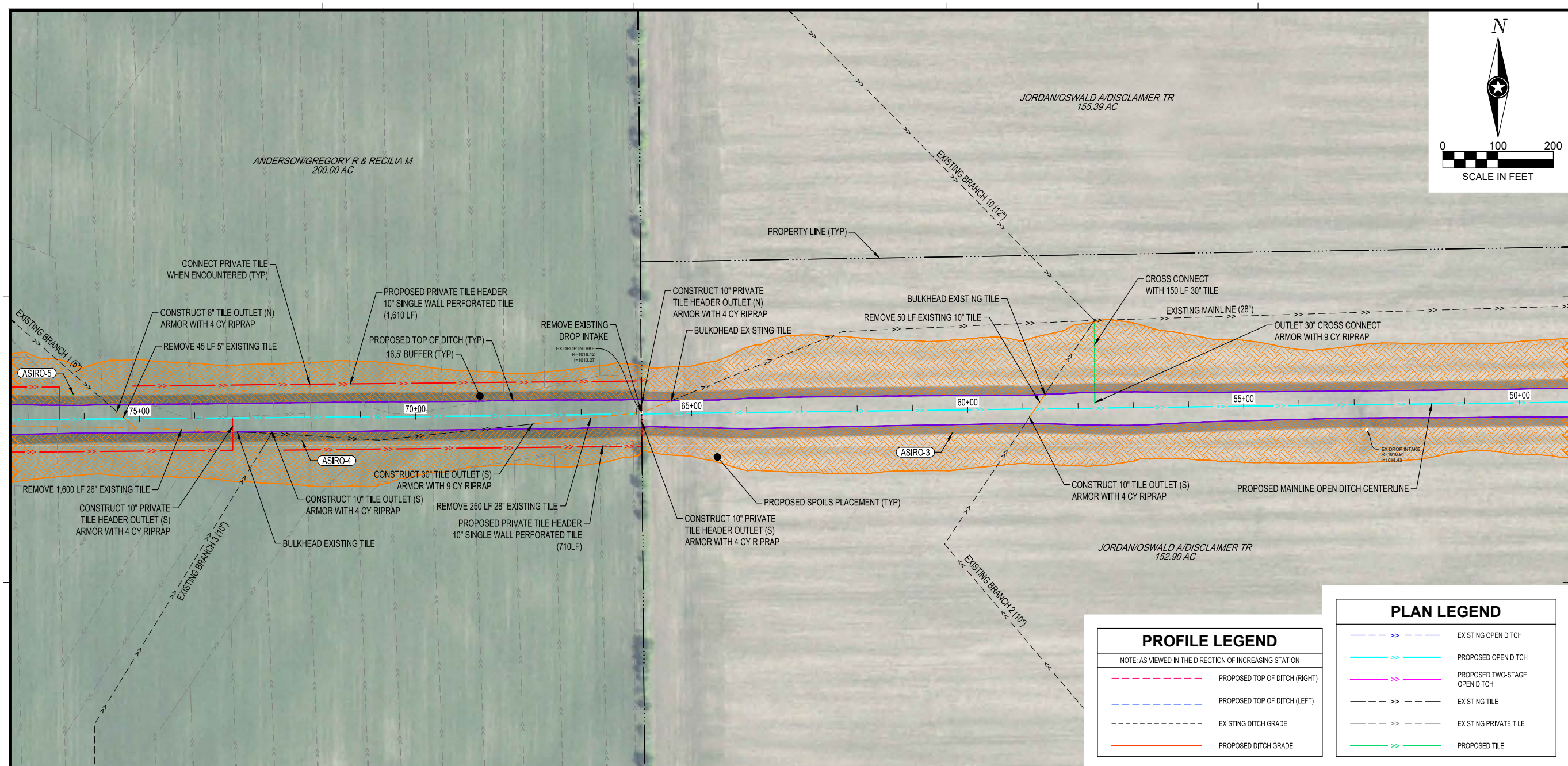
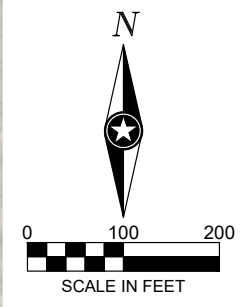
PROJECT NO.	23-28479
FILE NAME	28479 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

TITLE
PLAN - PROFILE
MAINLINE OPEN
DITCH



1040	JORDAN/OSWALD A/DISCLAIMER TR	IMPALA AVE	ANDERSON/KENNETH M & CAROL Y	1040																							
1030					1030																						
1020					1020																						
1010					1010																						
1000					1000																						
990					990																						
980	50+00	49+00	48+00	47+00	46+00	45+00	44+00	43+00	42+00	41+00	40+00	39+00	38+00	37+00	36+00	35+00	34+00	33+00	32+00	31+00	30+00	29+00	28+00	27+00	26+00	25+00	980

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PROFILE LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

	PROPOSED TOP OF DITCH (RIGHT)
	PROPOSED TOP OF DITCH (LEFT)
	EXISTING DITCH GRADE
	PROPOSED DITCH GRADE

PLAN LEGEND

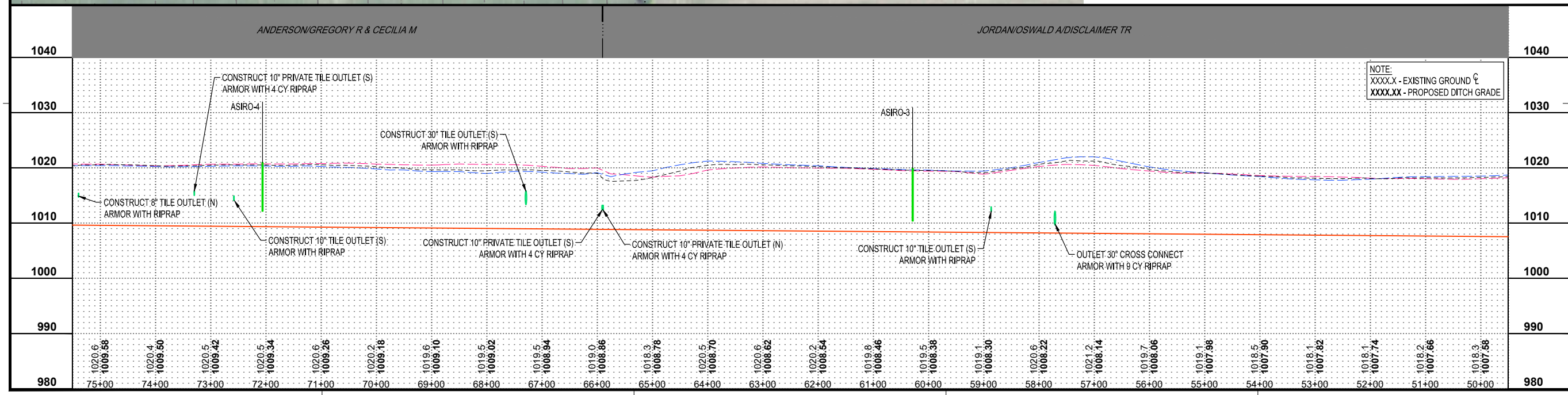
	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	PROPOSED TWO-STAGE OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE

PROJECT

REDWOOD COUNTY COUNTY DITCH No. 20

REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY



PROJECT NO. 23-28479

FILE NAME 28479 MAINLINE PROFILES

DRAWN BY KJH

DESIGNED BY AJJ

REVIEWED BY JMW

ORIGINAL ISSUE DATE --/--

CLIENT PROJECT NO. --

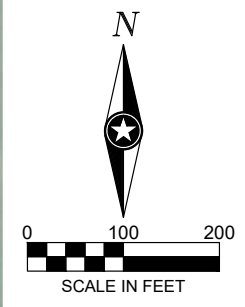
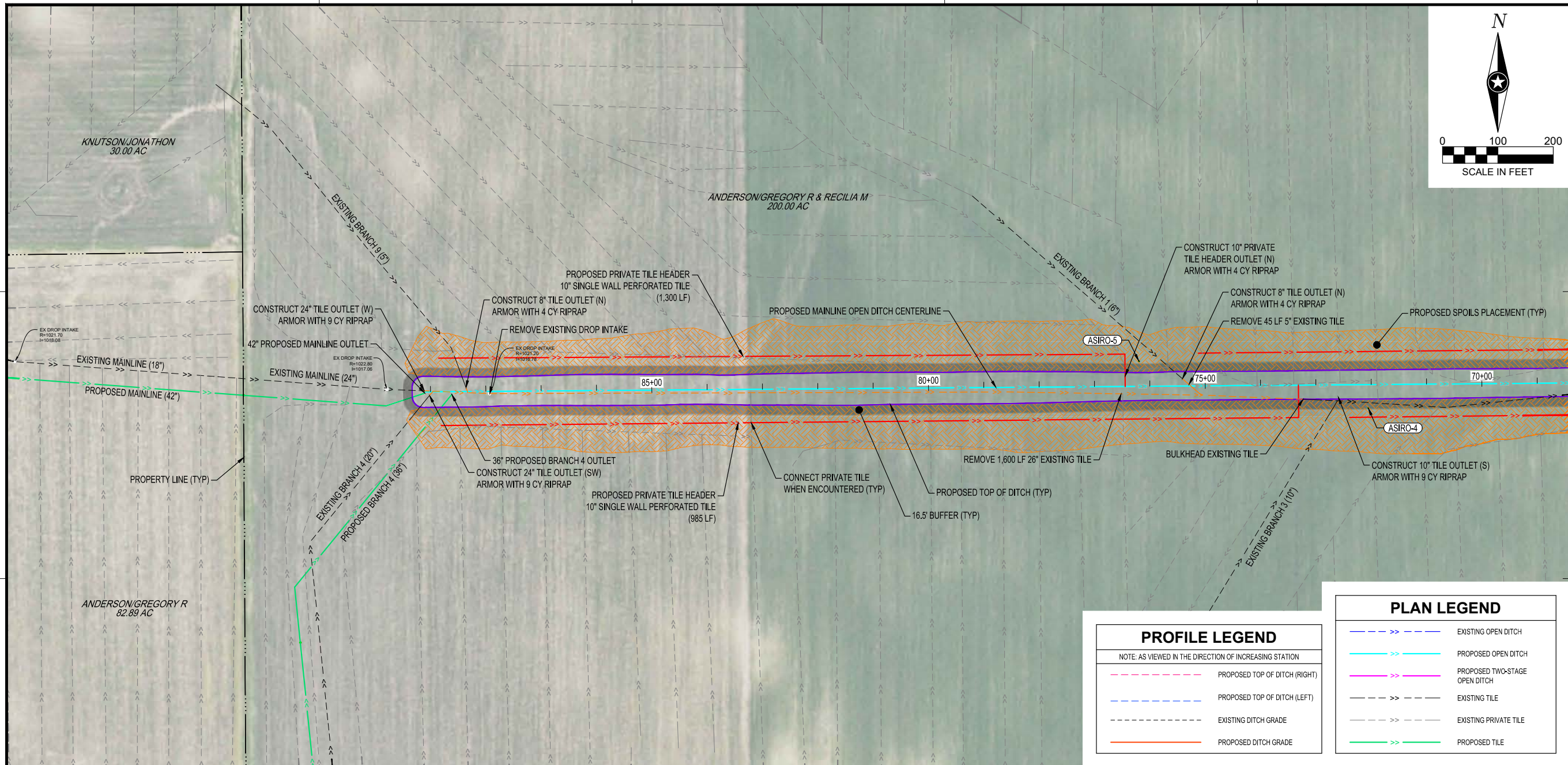
TITLE

PLAN - PROFILE MAINLINE OPEN DITCH

SHEET

16 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



PROFILE LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

	PROPOSED TOP OF DITCH (RIGHT)
	PROPOSED TOP OF DITCH (LEFT)
	EXISTING DITCH GRADE
	PROPOSED DITCH GRADE

PLAN LEGEND

	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	PROPOSED TWO-STAGE OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE

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PROJECT

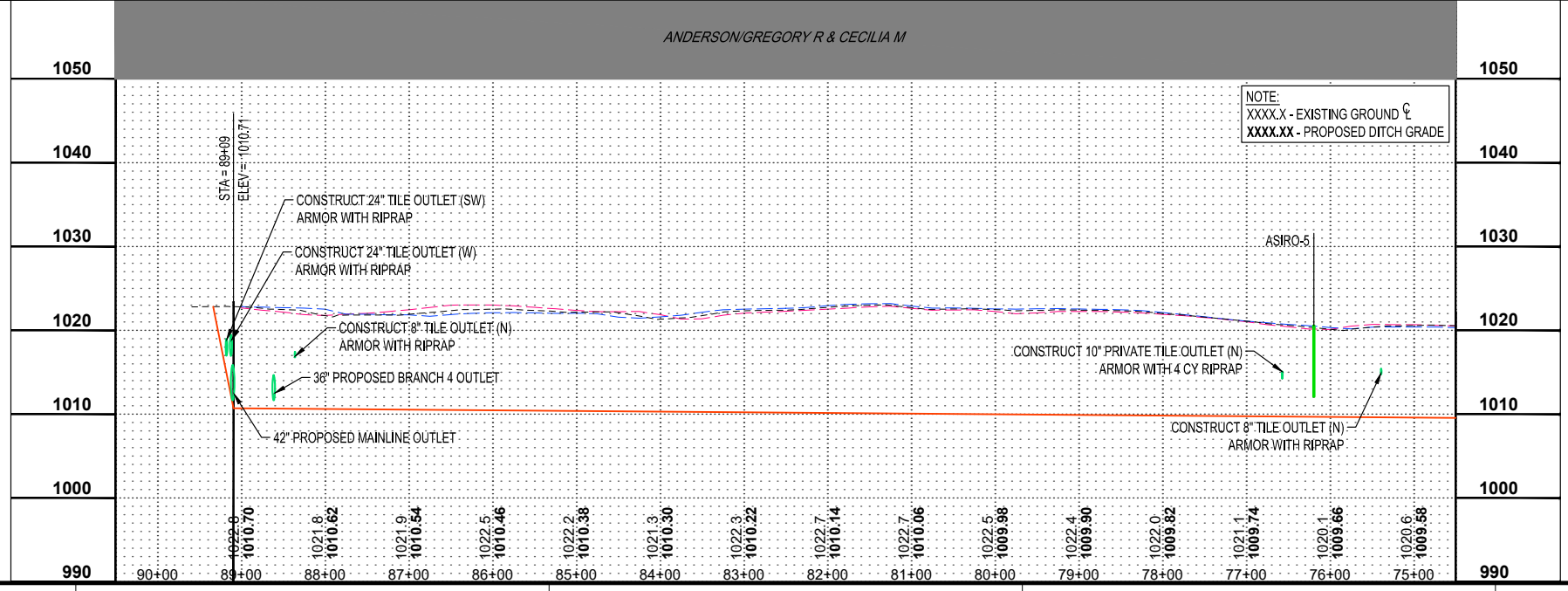
REDWOOD COUNTY

COUNTY DITCH

No. 20

REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY



PROJECT NO.	23-28479
FILE NAME	28479 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	-

TITLE

PLAN - PROFILE

MAINLINE OPEN

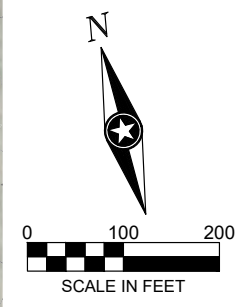
DITCH

SHEET

17

OF 49

PRELIMINARY NOT FOR CONSTRUCTION



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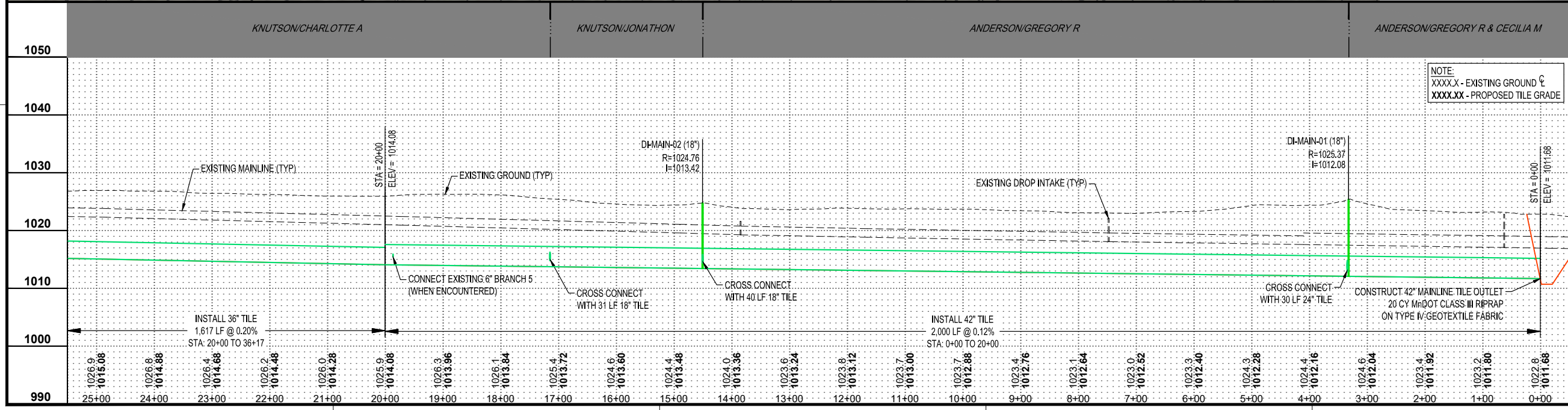
PLAN LEGEND	
	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE

PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 MAINLINE TILE PROFILES
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	---/---/---
CLIENT PROJECT NO.	

TITLE
PLAN - PROFILE MAINLINE TILE

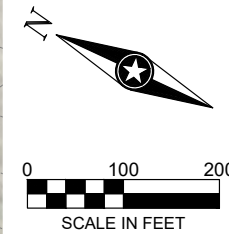


NOTE:
XXXX.X - EXISTING GROUND ϕ
XXXX.XX - PROPOSED TILE GRADE

1050	KNUTSON/CHARLOTTE A	KNUTSON/JONATHON	ANDERSON/GREGORY R	ANDERSON/GREGORY R & CECILIA M	1050	
1040						1040
1030						1030
1020						1020
1010						1010
1000						1000
990						990

SHEET
18
OF 49

PRELIMINARY NOT FOR CONSTRUCTION



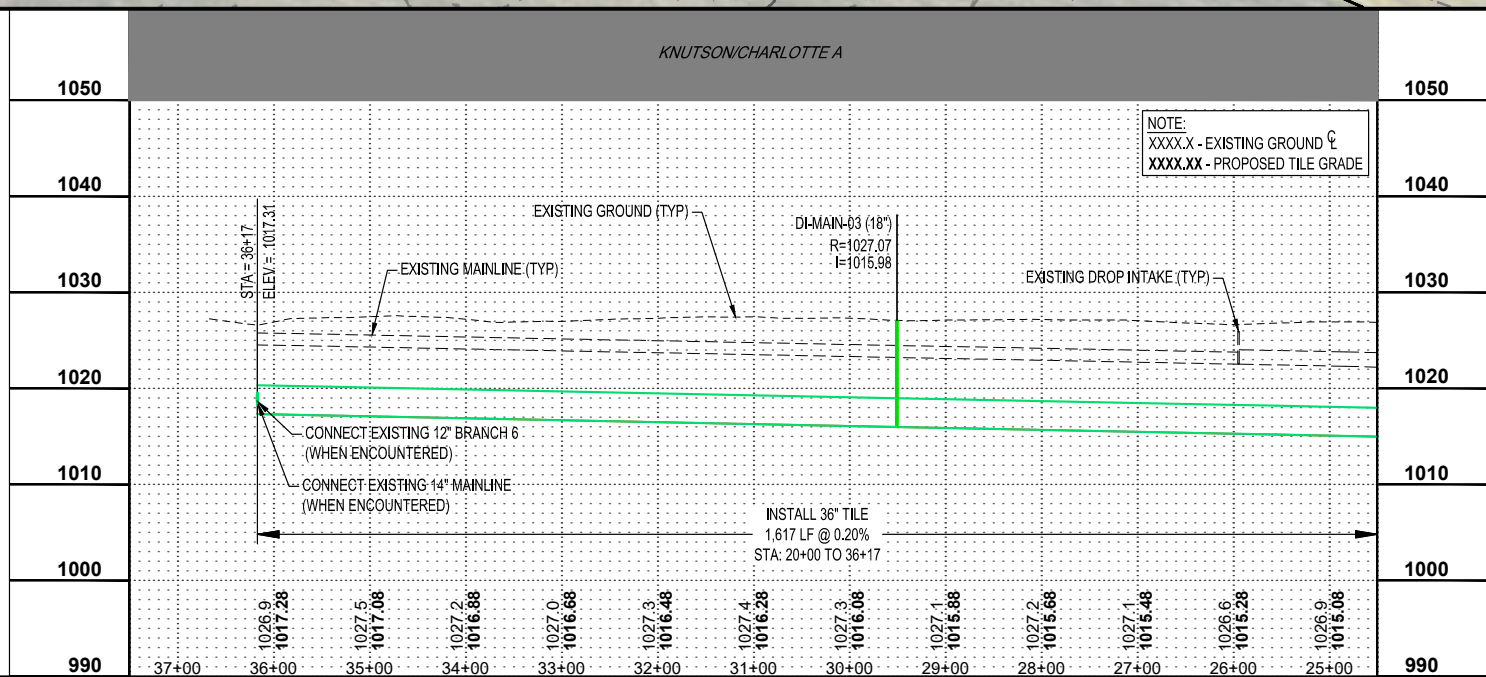
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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

PLAN LEGEND	
	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE



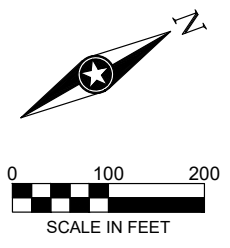
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 MAINLINE TILE PROFILES
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE
PLAN - PROFILE
MAINLINE TILE

SHEET
19
 OF 49

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PLAN LEGEND	
	EXISTING OPEN DITCH
	PROPOSED OPEN DITCH
	EXISTING TILE
	EXISTING PRIVATE TILE
	PROPOSED TILE

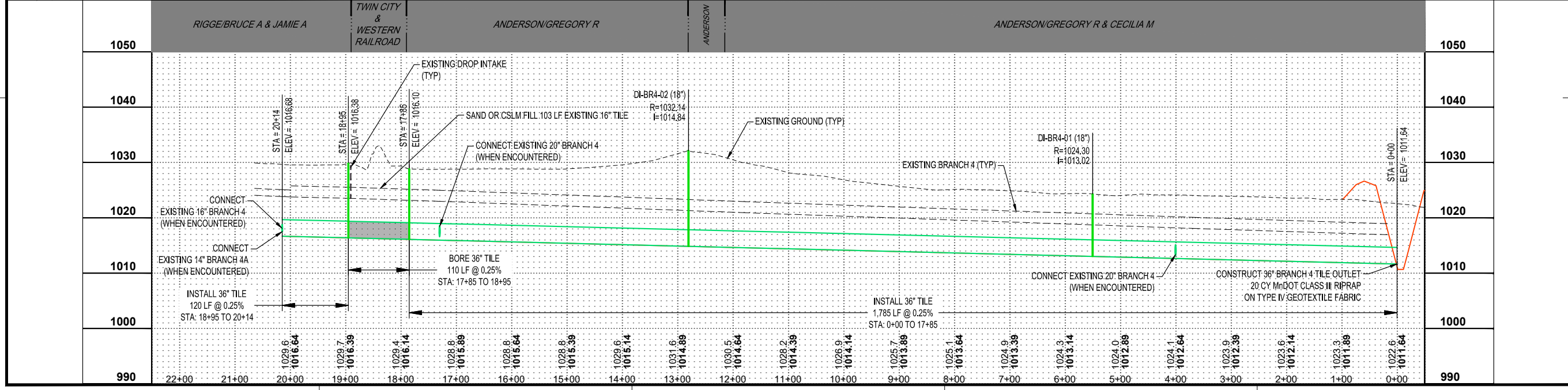
PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 BRANCH 4 PROFILES
 DRAWN BY KJH
 DESIGNED BY AJG
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. --

TITLE
PLAN - PROFILE
BRANCH 4

SHEET
20
 OF 49



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NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
1000.0 1000.00	XXX.X - EXISTING GROUND ζ XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
REDWOOD COUNTY MINNESOTA

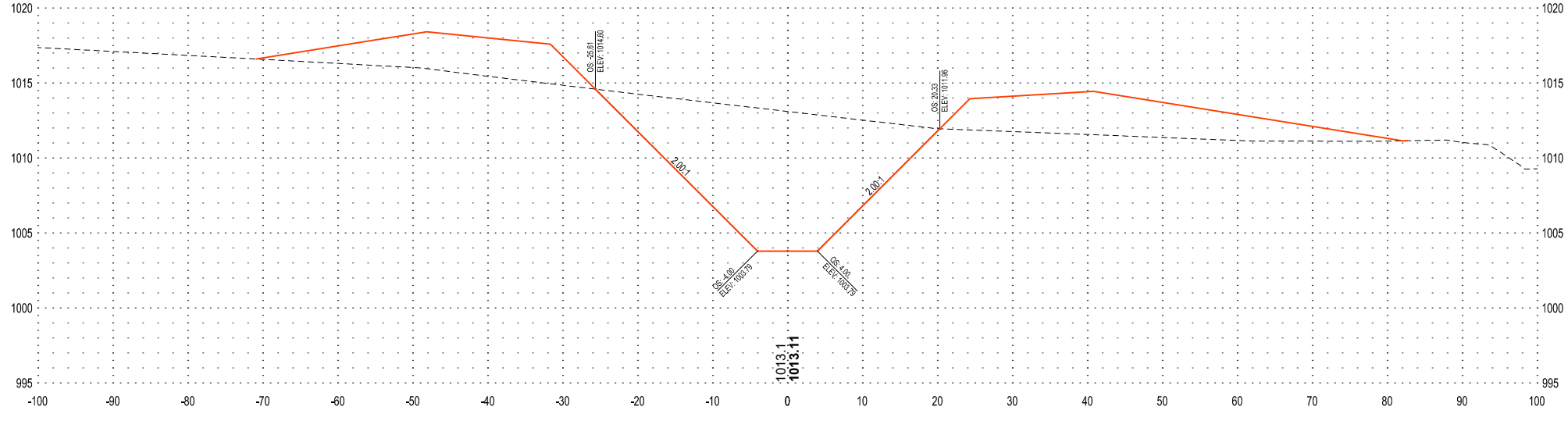
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

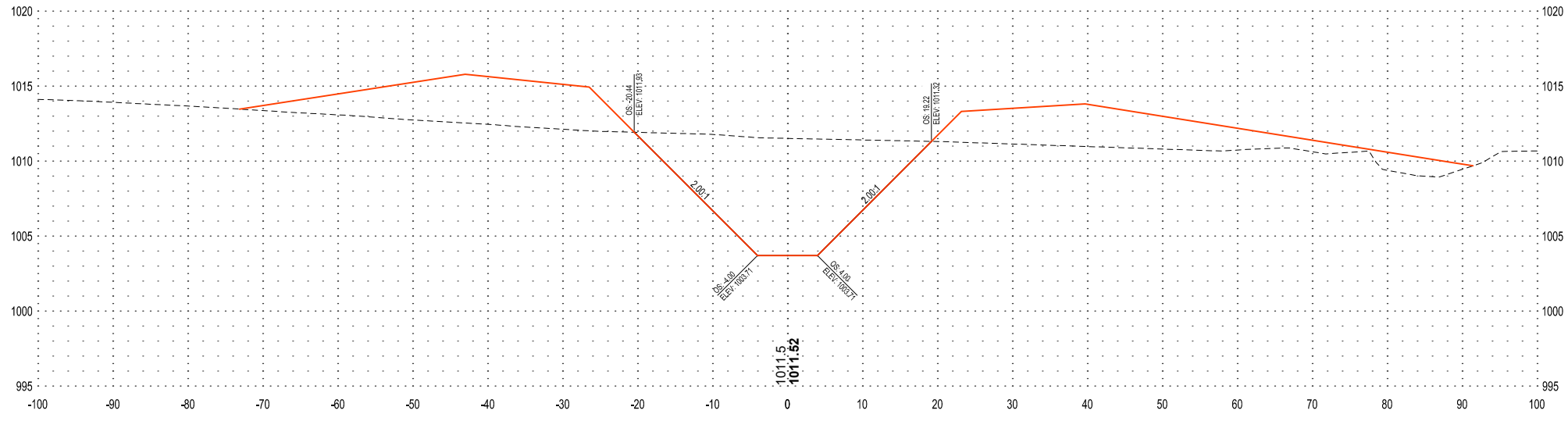
TITLE
CROSS SECTIONS
MAINLINE

SHEET
21 OF 49

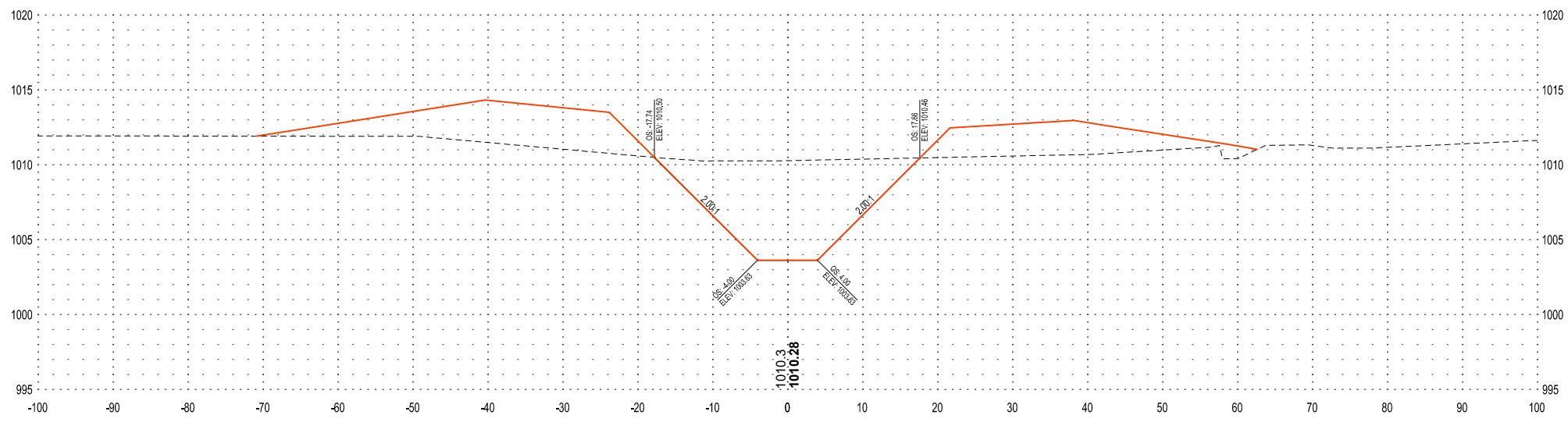
3+00



2+00



1+00

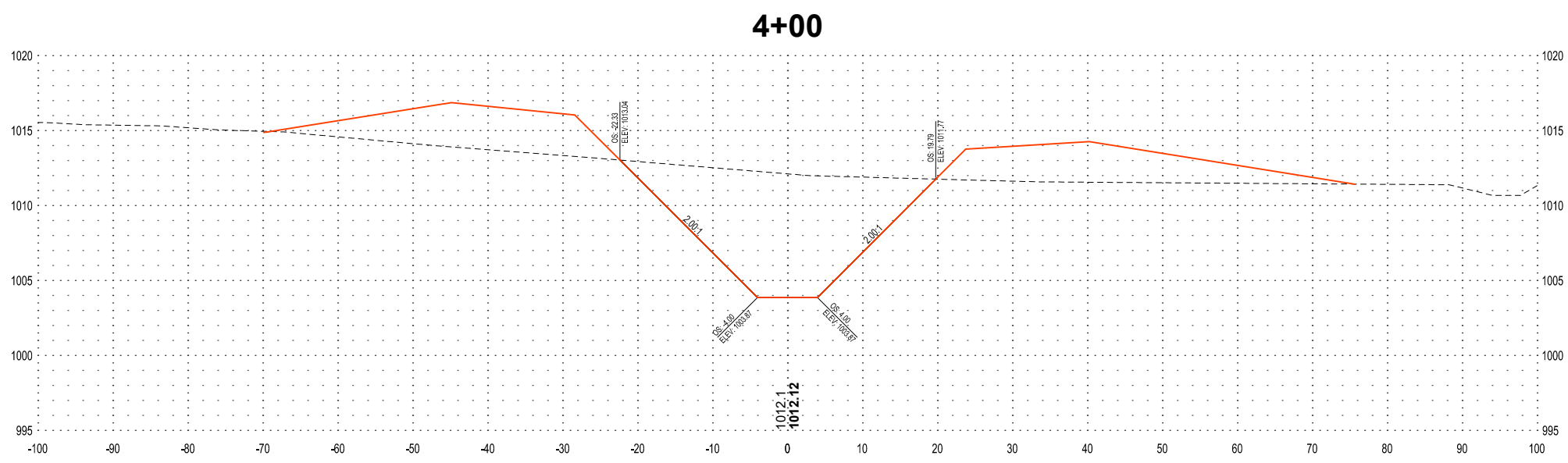
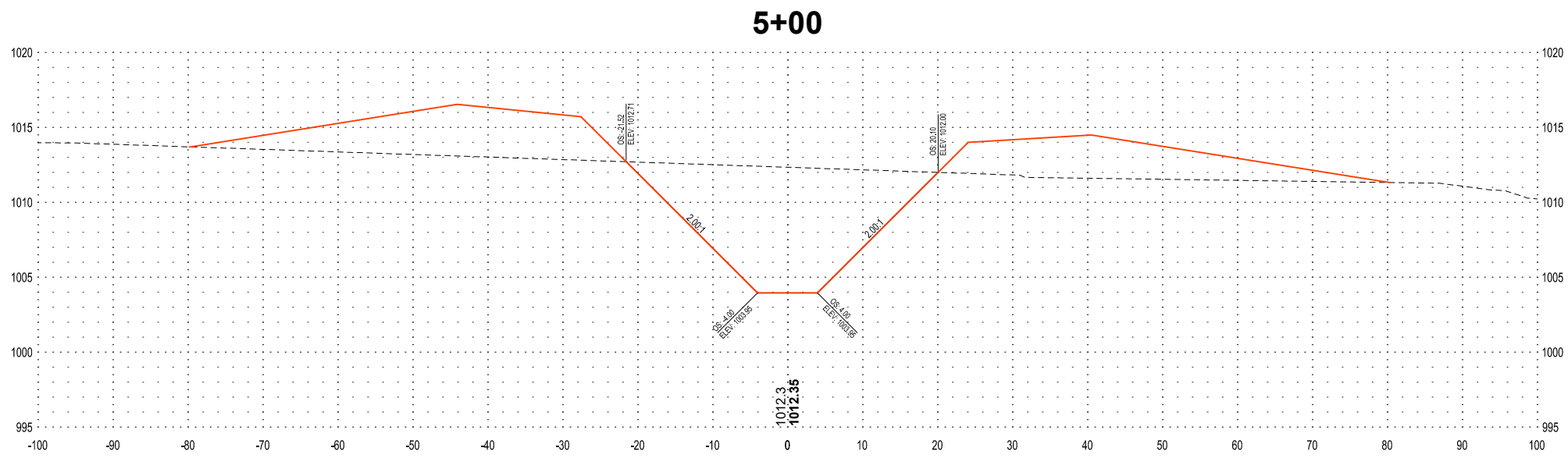
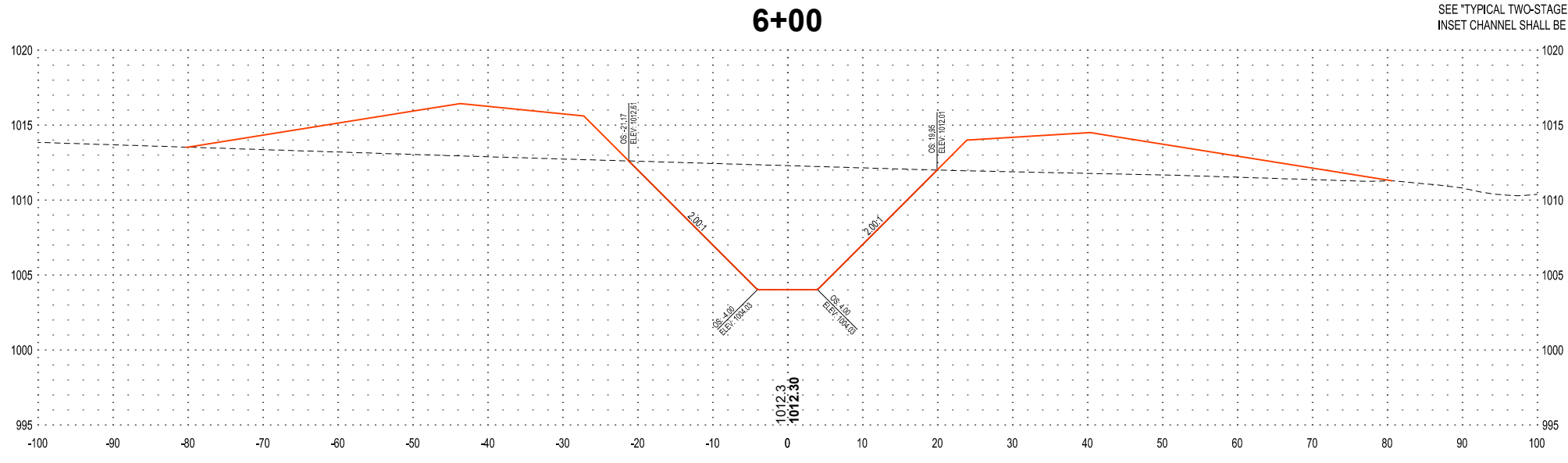


PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 SECTIONS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET
22 OF 49

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NOTE:

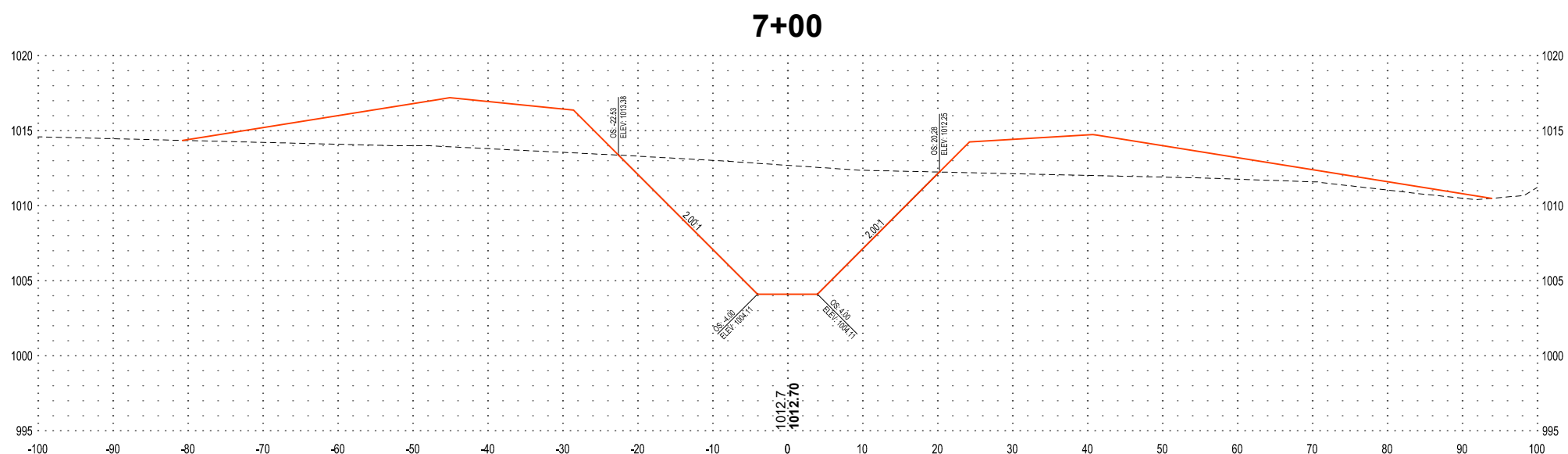
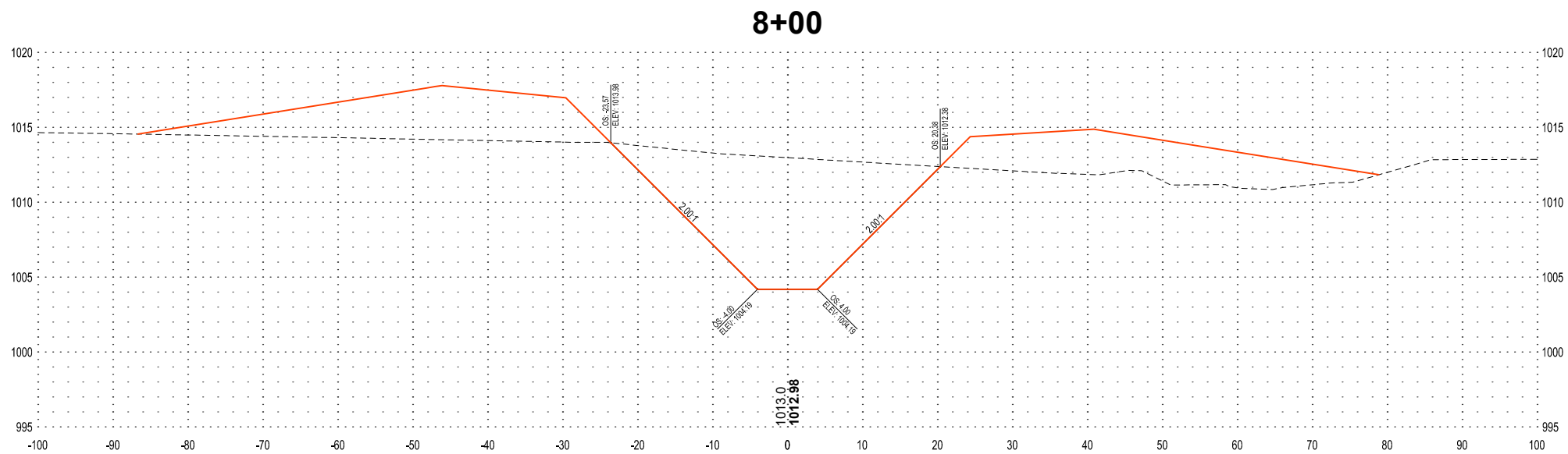
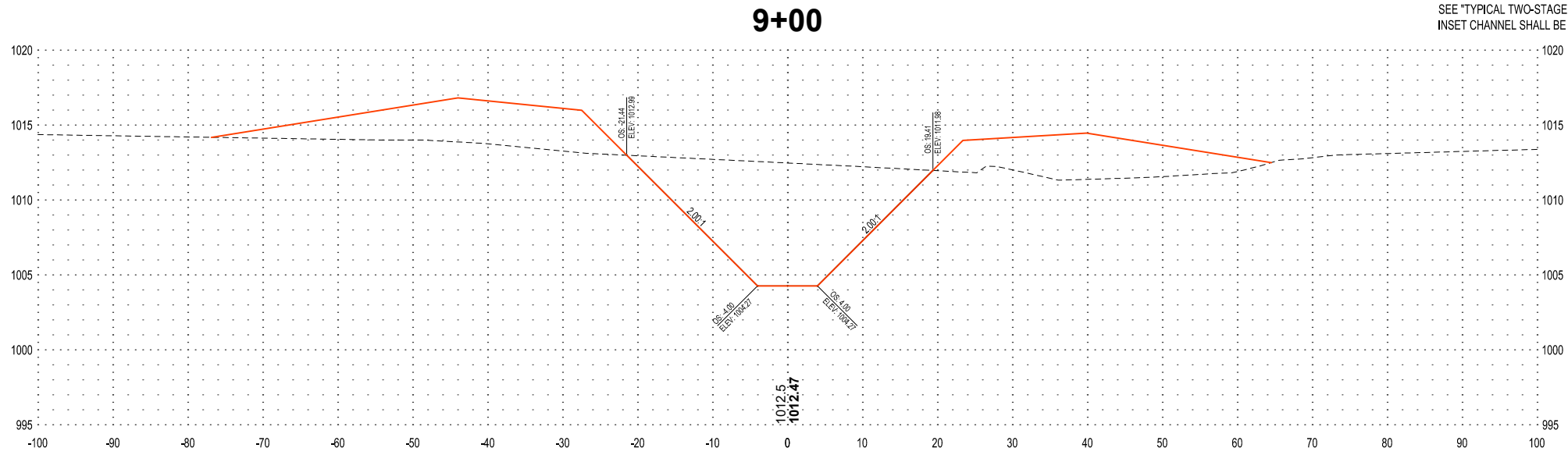
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



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PROJECT

**REDWOOD COUNTY
COUNTY DITCH
No. 20**

REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE

**CROSS SECTIONS
MAINLINE**

SHEET

23

OF 49

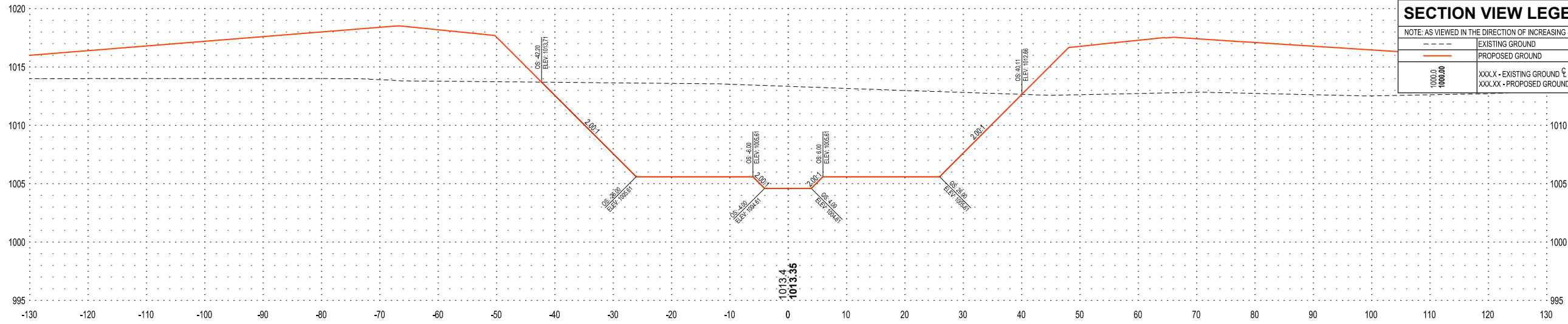
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13+00

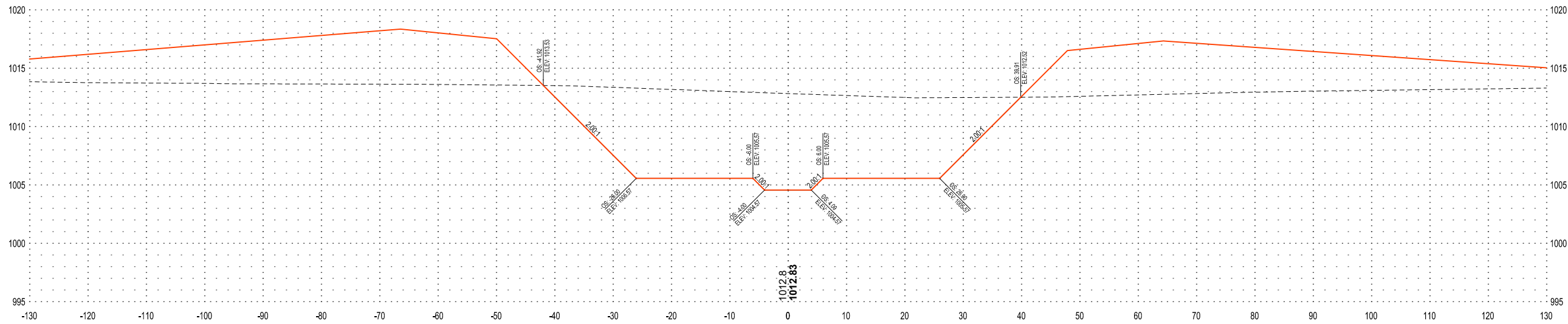
NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



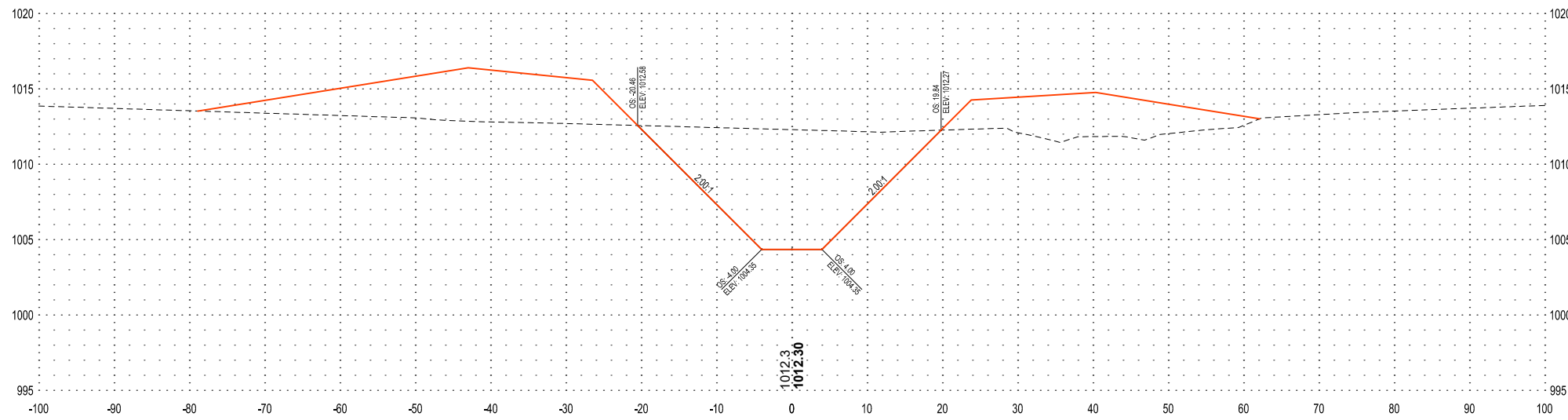
SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
	XXX.X - EXISTING GROUND ϕ
	XXX.XX - PROPOSED GROUND ϕ



12+50



10+00



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 SECTIONS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET
24 OF 49

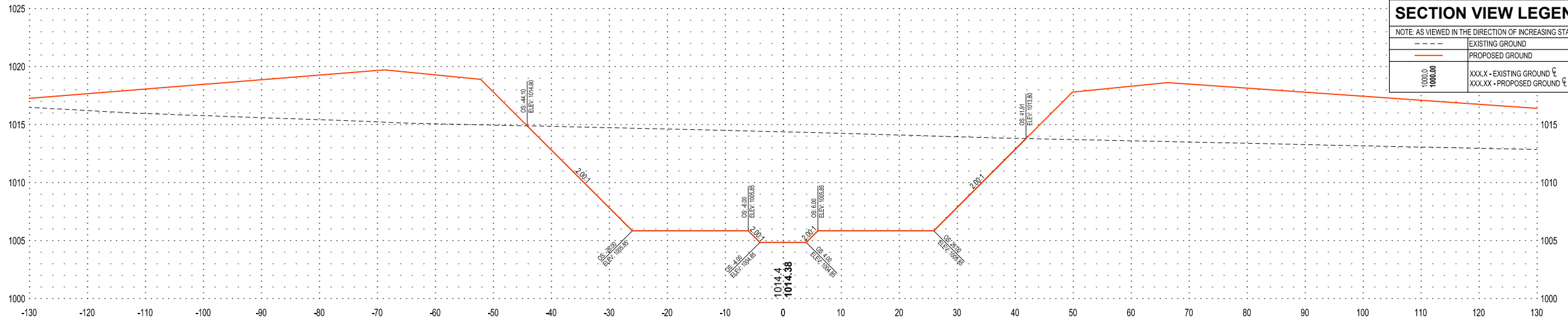
PRELIMINARY NOT FOR CONSTRUCTION

16+00

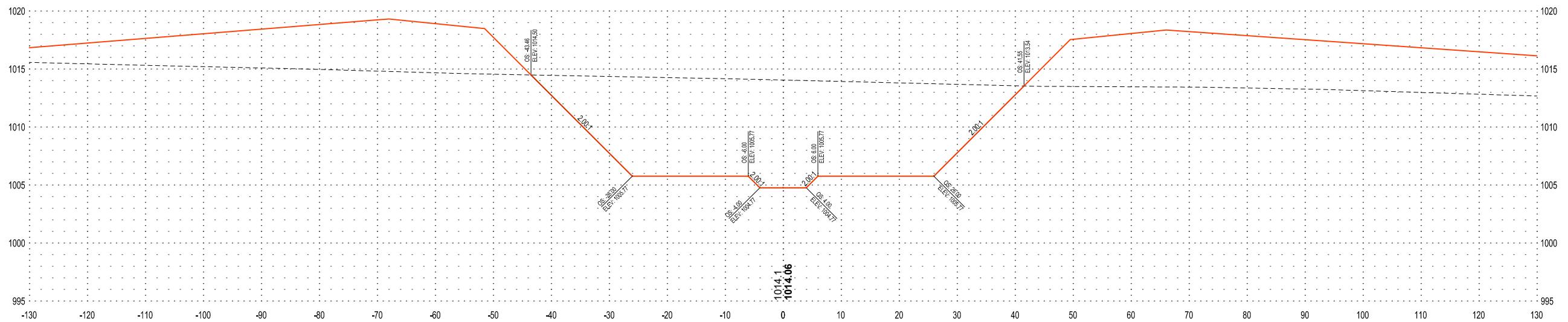
NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



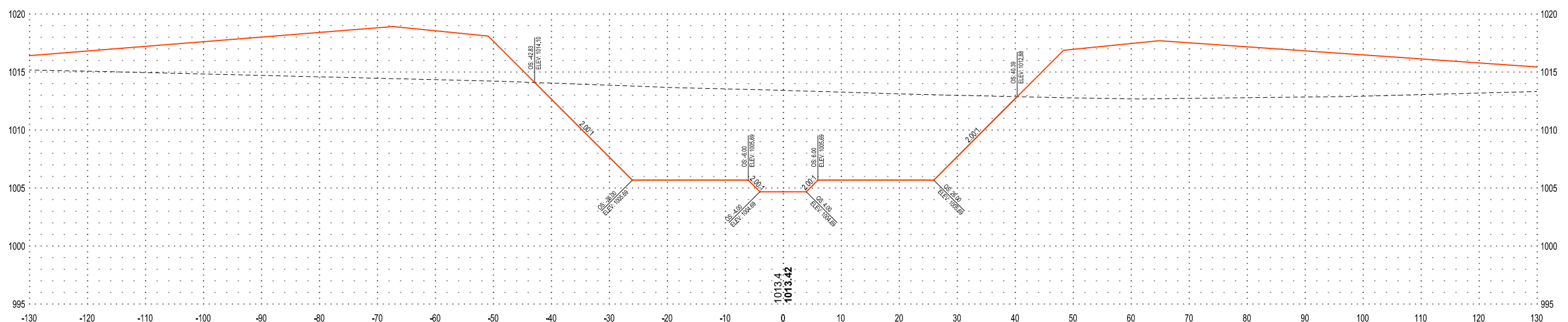
SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



15+00



14+00



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE
CROSS SECTIONS MAINLINE

SHEET
25 OF 49

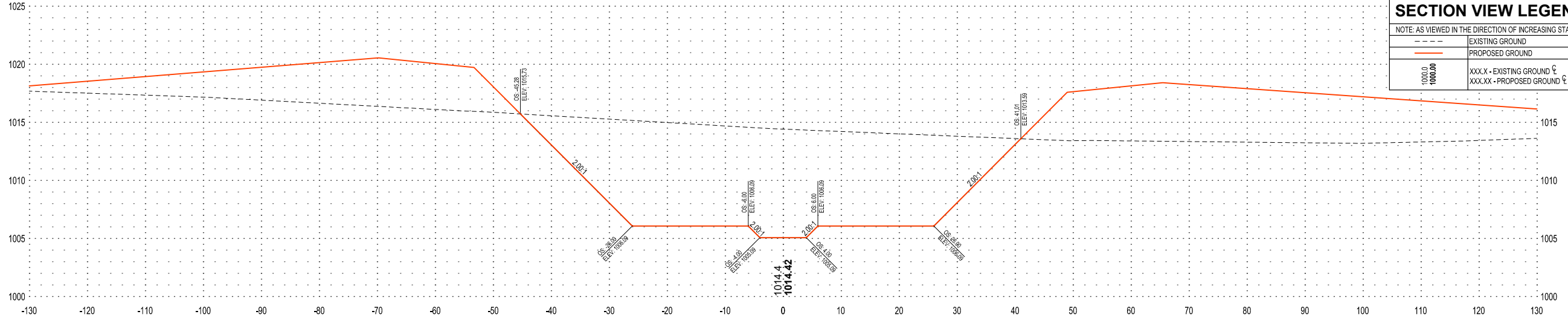
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19+00

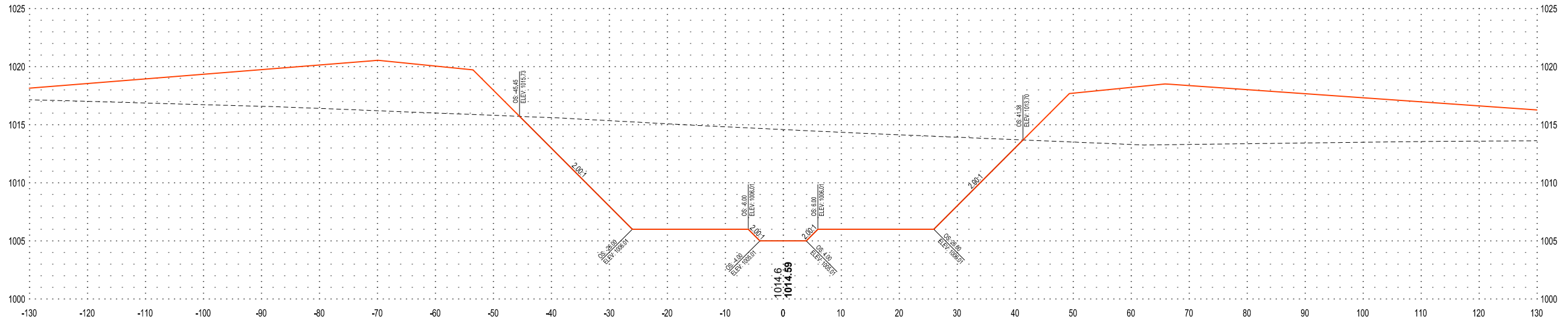
NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



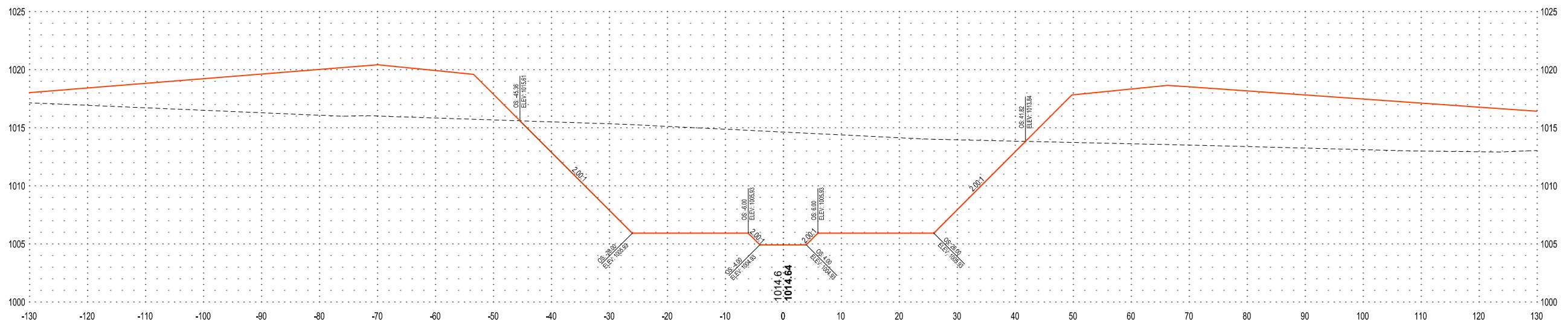
SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
	XXX.X - EXISTING GROUND \bar{c}
	XXX.XX - PROPOSED GROUND \bar{c}



18+00



17+00



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 SECTIONS
 DRAWN BY KJH
 DESIGNED BY AJS
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET **26** OF 49

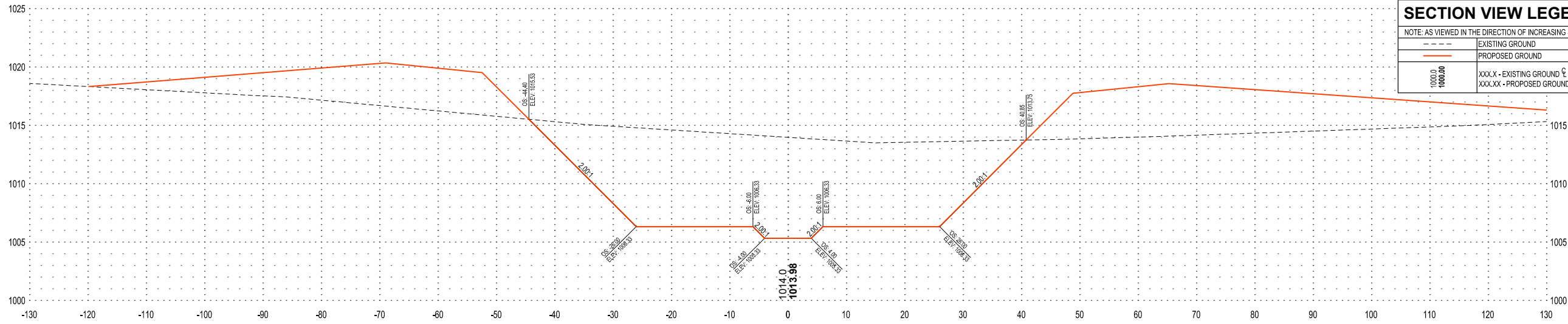
PRELIMINARY NOT FOR CONSTRUCTION

22+00

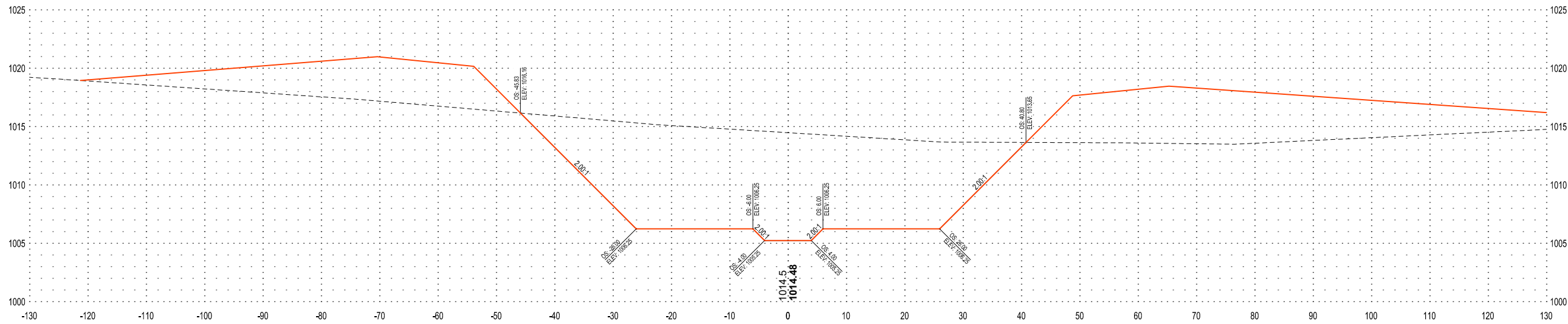
NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



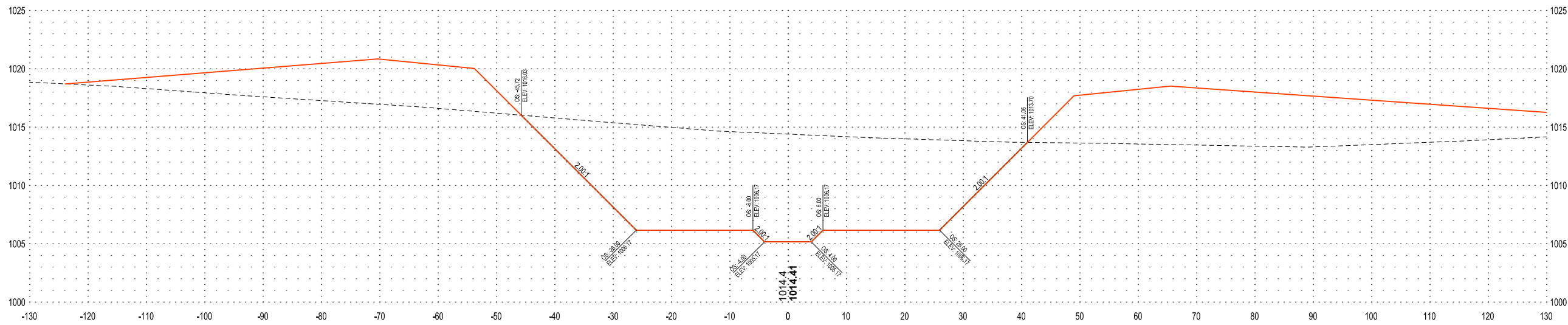
SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
	XXX.X - EXISTING GROUND \bar{c}
	XXX.XX - PROPOSED GROUND \bar{c}



21+00



20+00



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PROJECT

REDWOOD COUNTY

COUNTY DITCH No. 20

REDWOOD COUNTY MINNESOTA

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DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
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DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE

CROSS SECTIONS MAINLINE

SHEET

27 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

25+00

NOTE:

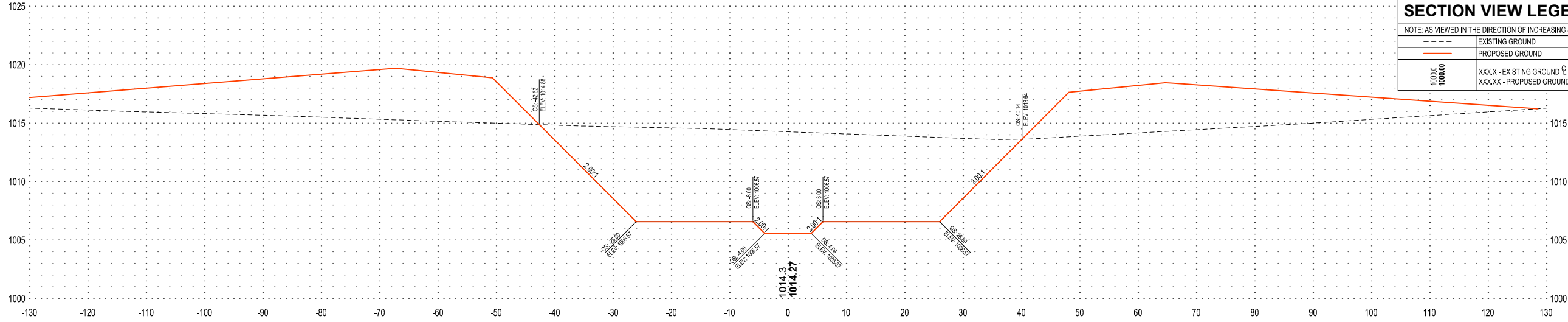
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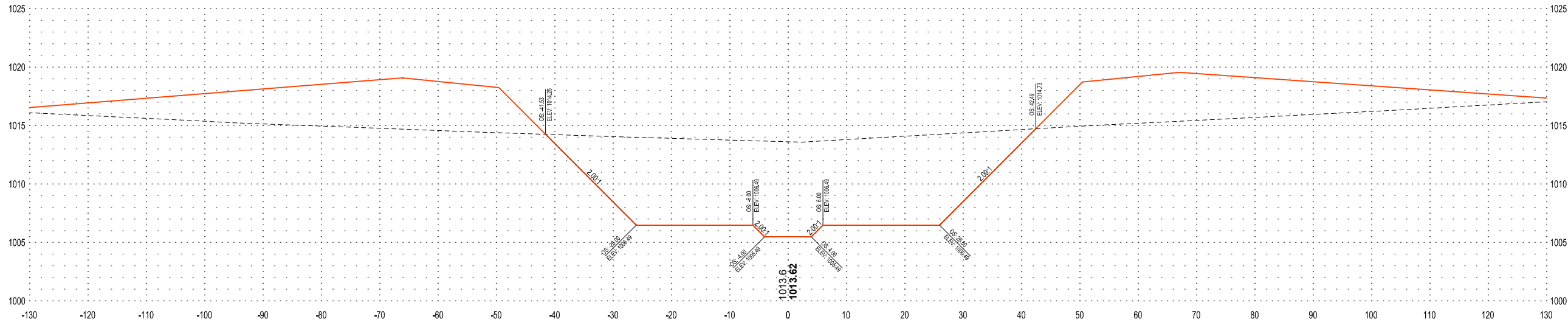
SECTION VIEW LEGEND

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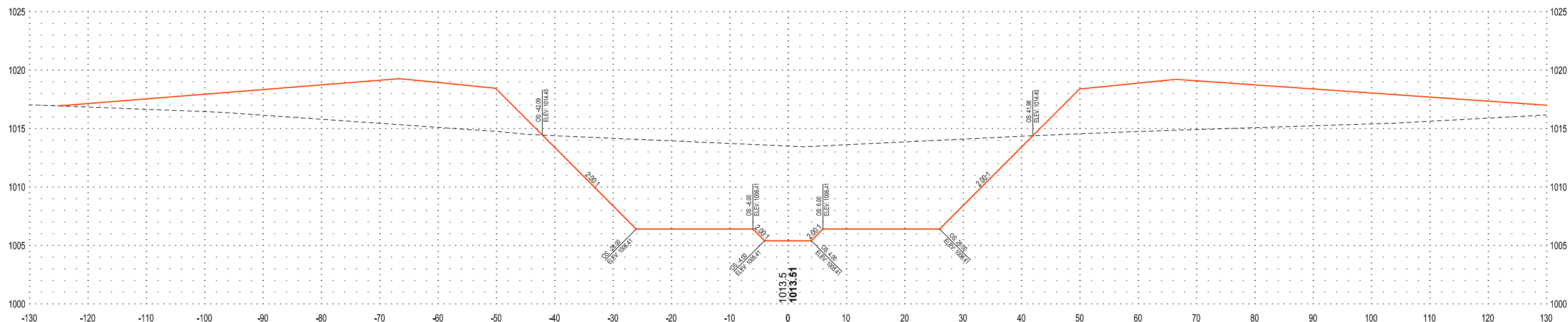
---	EXISTING GROUND
---	PROPOSED GROUND
XXX.X	EXISTING GROUND E
XXX.XX	PROPOSED GROUND E



24+00



23+00



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REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

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CLIENT PROJECT NO.	-

TITLE
CROSS SECTIONS MAINLINE

SHEET
28 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

28+00

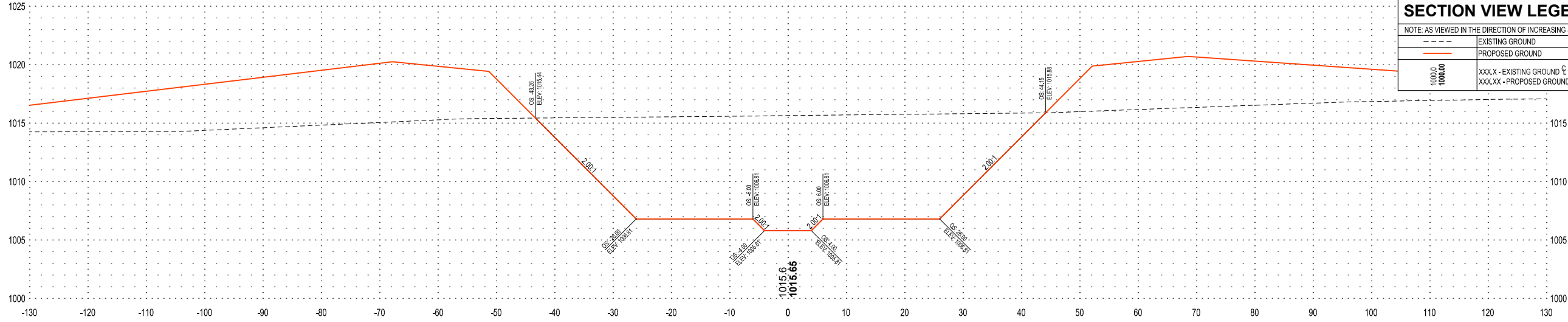
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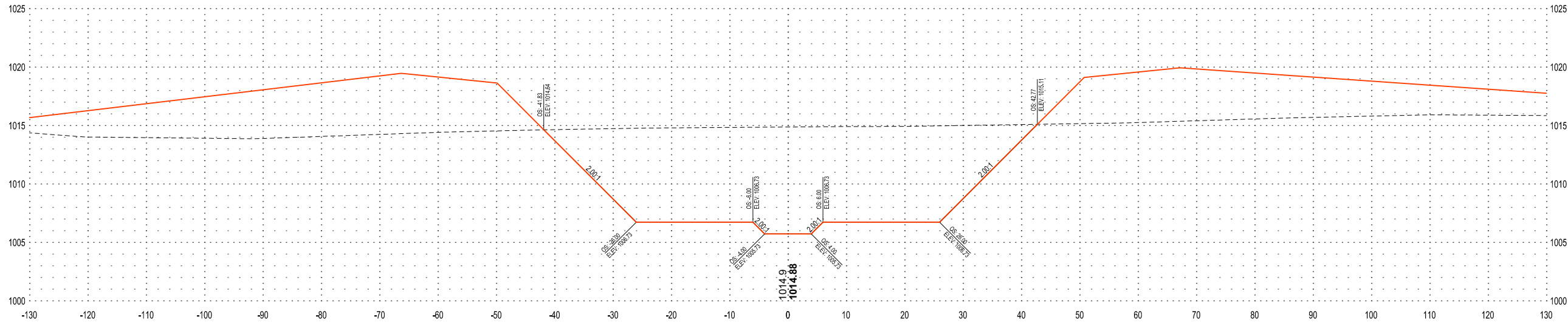


SECTION VIEW LEGEND

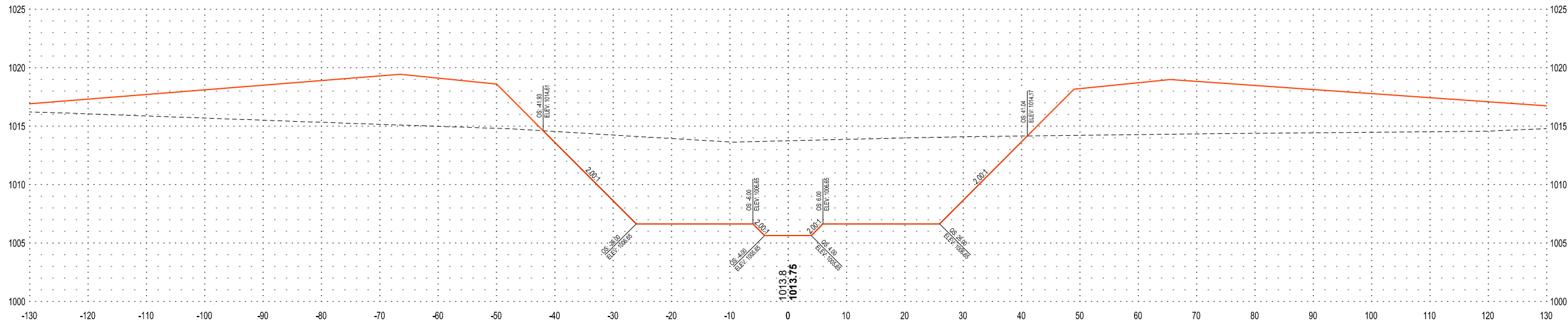
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
	XXX.X - EXISTING GROUND ϕ
	XXX.XX - PROPOSED GROUND ϕ



27+00



26+00



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PROJECT

REDWOOD COUNTY

COUNTY DITCH No. 20

REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
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CLIENT PROJECT NO.	-

TITLE

CROSS SECTIONS MAINLINE

SHEET

29 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

31+00

NOTE:

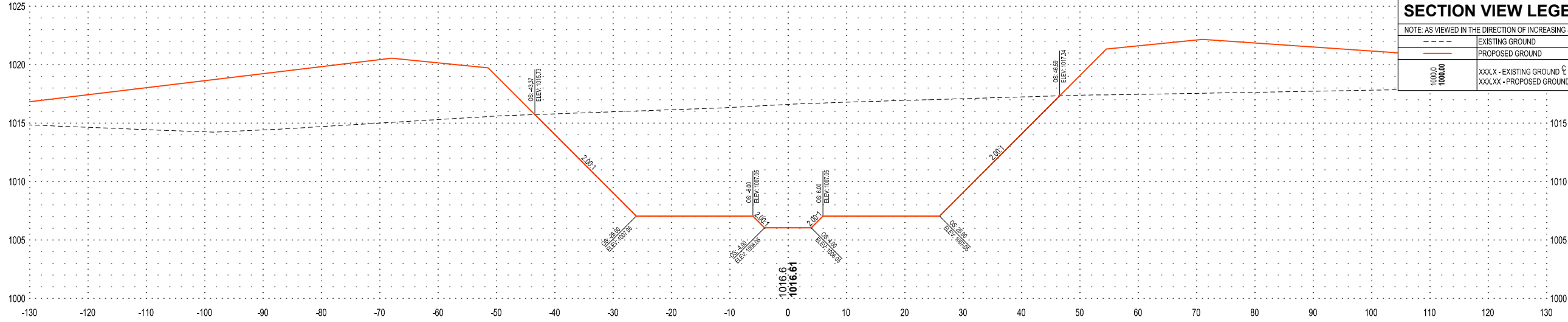
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
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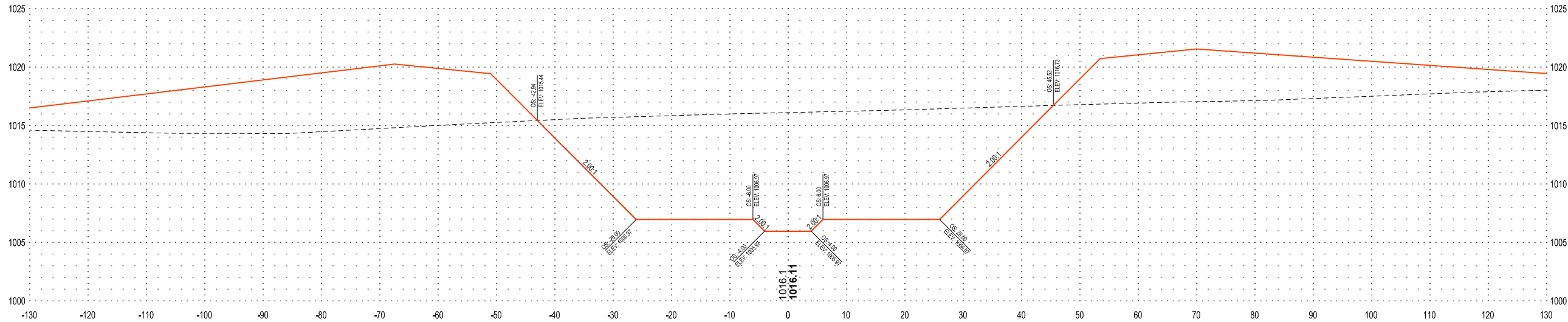
SECTION VIEW LEGEND

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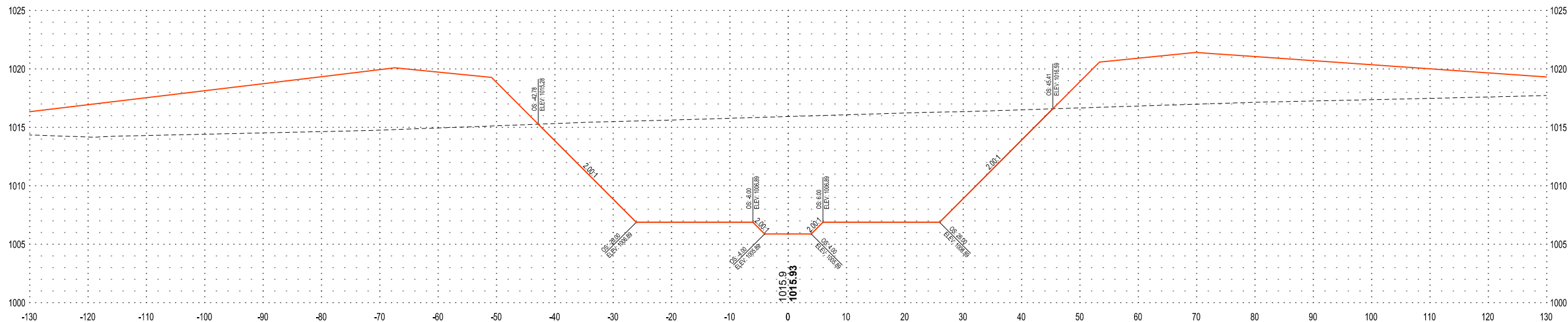
	EXISTING GROUND
	PROPOSED GROUND
	XXX.X - EXISTING GROUND ϵ
	XXX.XX - PROPOSED GROUND ϵ



30+00



29+00



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PROJECT
**REDWOOD COUNTY
COUNTY DITCH
No. 20**
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

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FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
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CLIENT PROJECT NO.	-

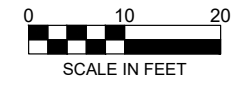
TITLE
**CROSS SECTIONS
MAINLINE**

SHEET
30
OF 49

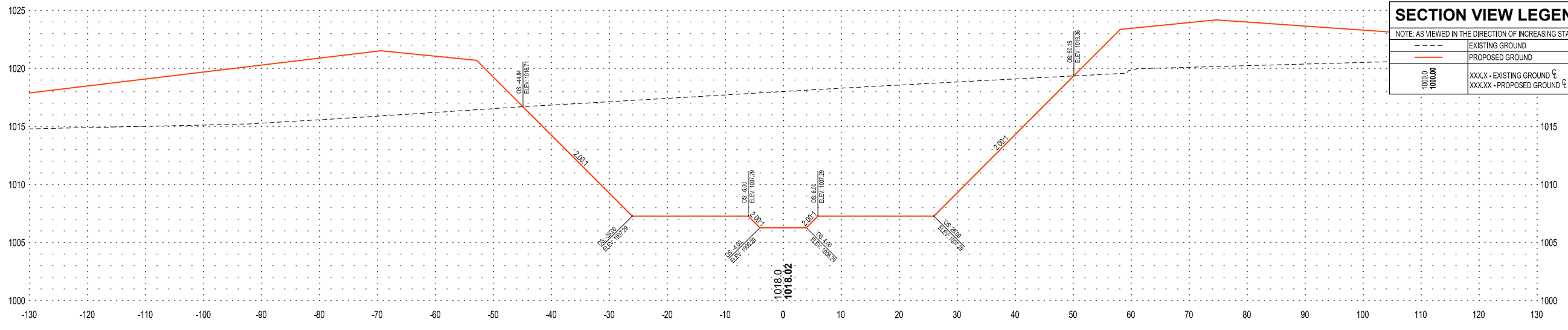
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34+00

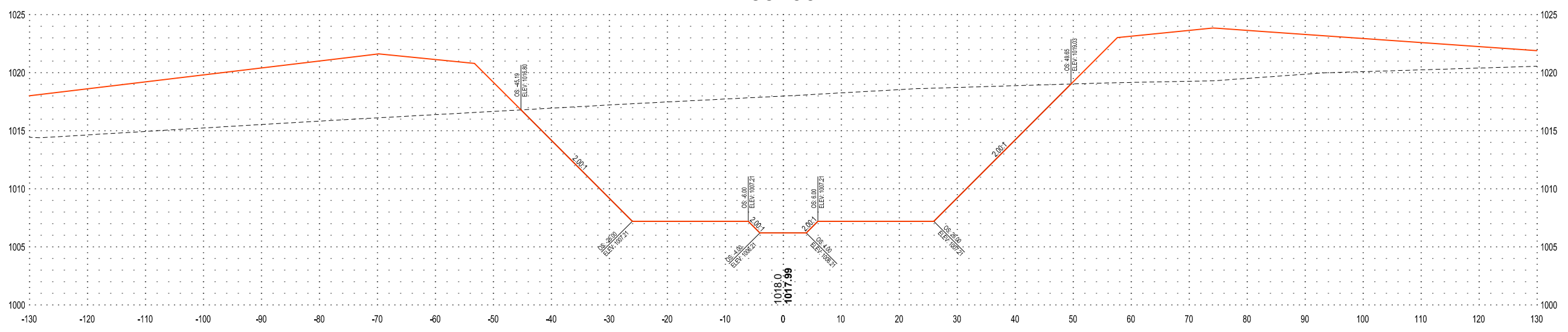
NOTE:
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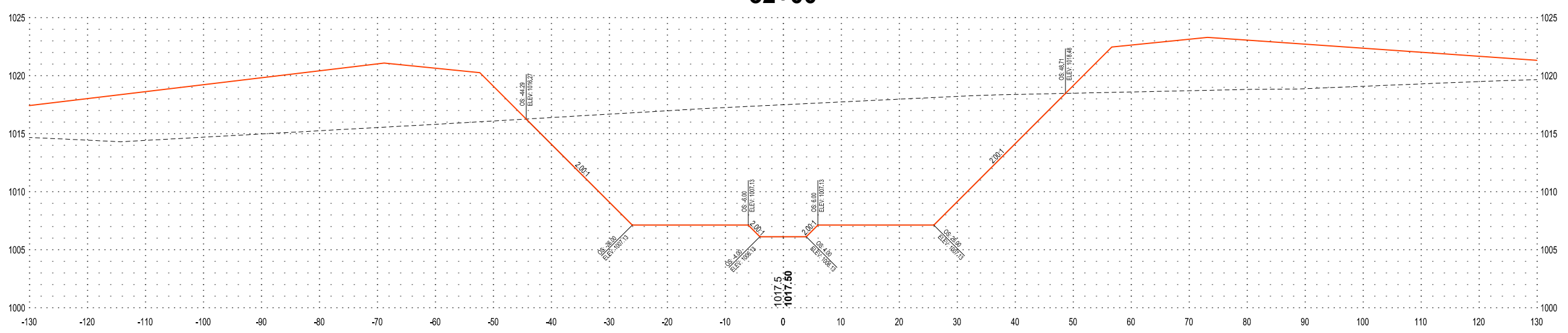
SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
	XXX.X - EXISTING GROUND ϵ
	XXX.XX - PROPOSED GROUND ϵ



33+00



32+00



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PROJECT
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REDWOOD COUNTY MINNESOTA

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DRAWN BY KJH
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ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET **31** OF 49

PRELIMINARY NOT FOR CONSTRUCTION

37+00

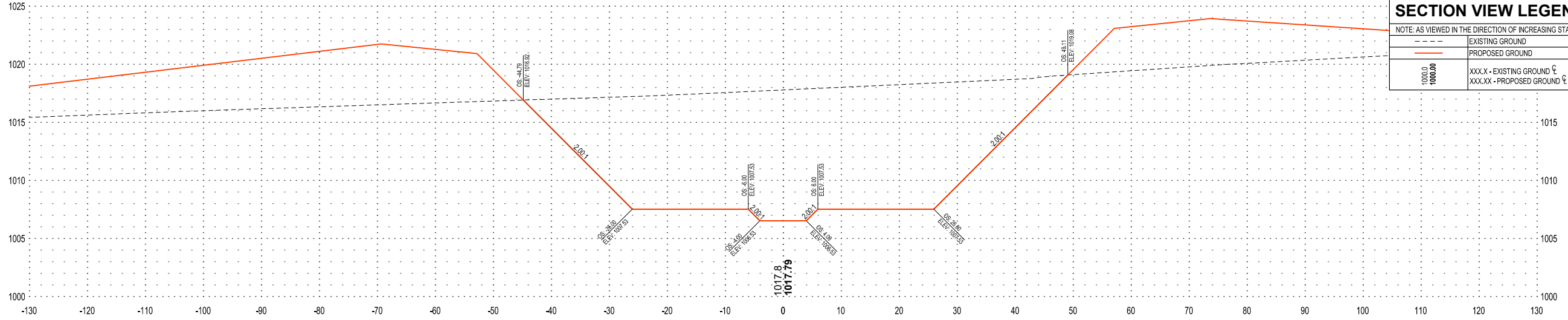
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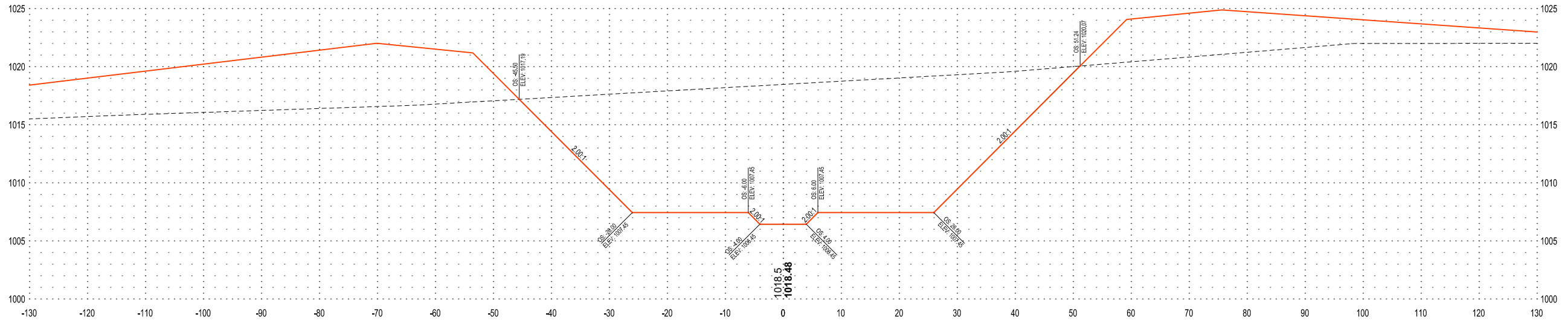
SECTION VIEW LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

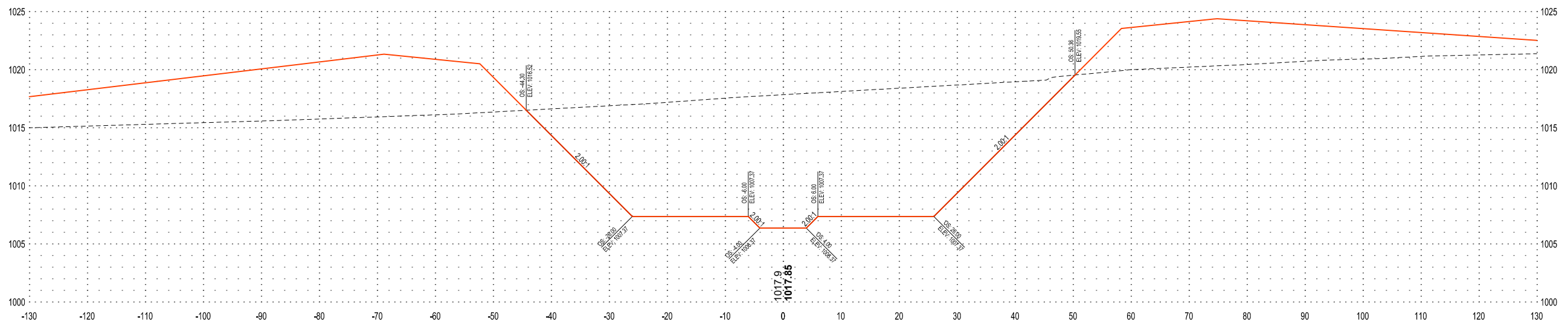
---	EXISTING GROUND
—	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



36+00



35+00



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

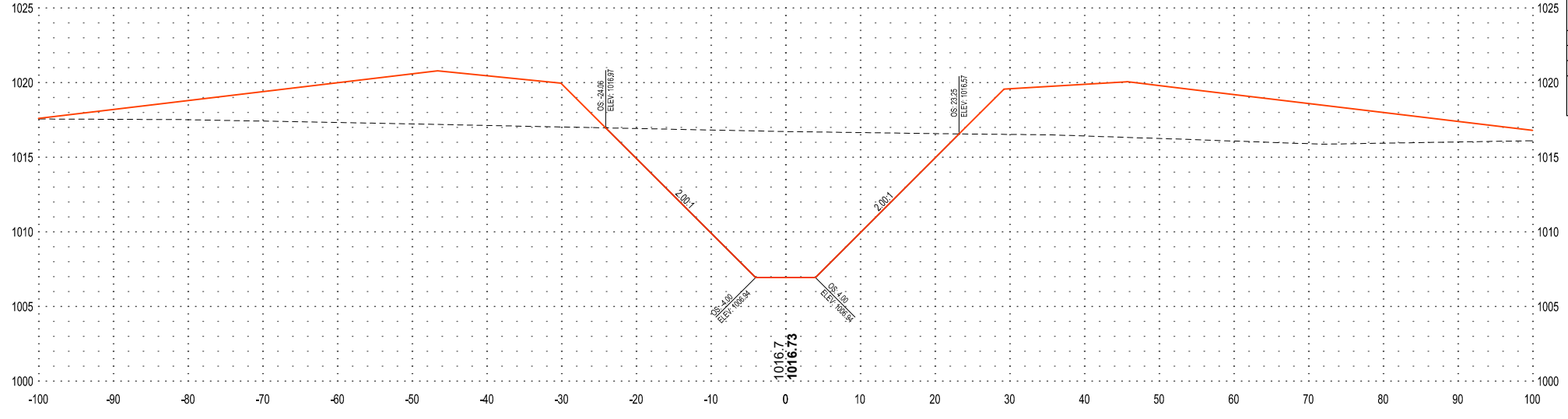
PROJECT NO. 23-28479
 FILE NAME 28479 SECTIONS
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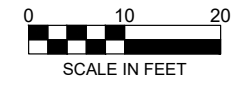
SHEET **32** OF 49

PRELIMINARY NOT FOR CONSTRUCTION

42+00



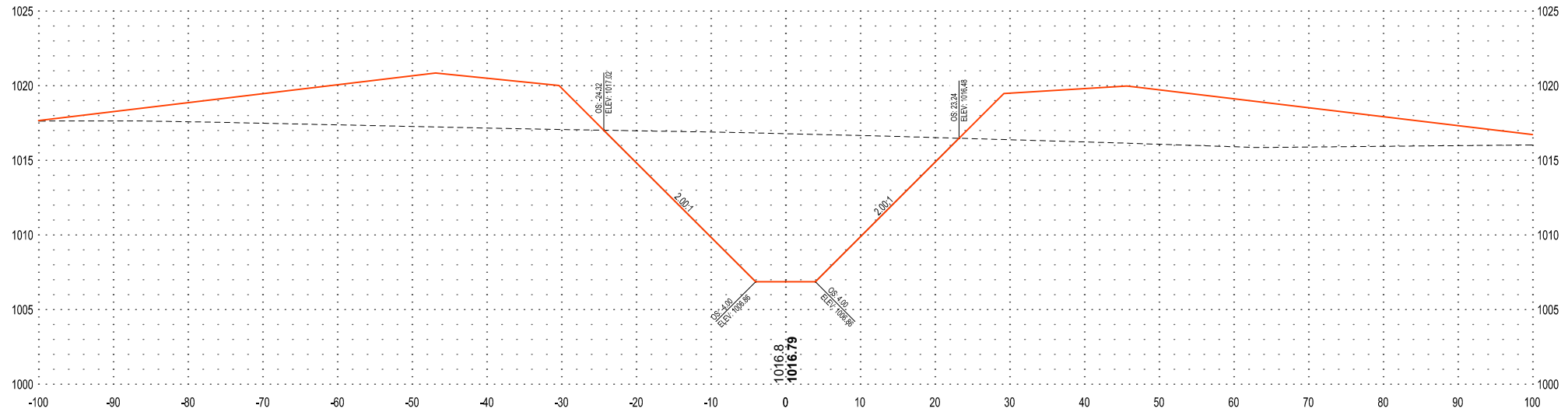
NOTE:
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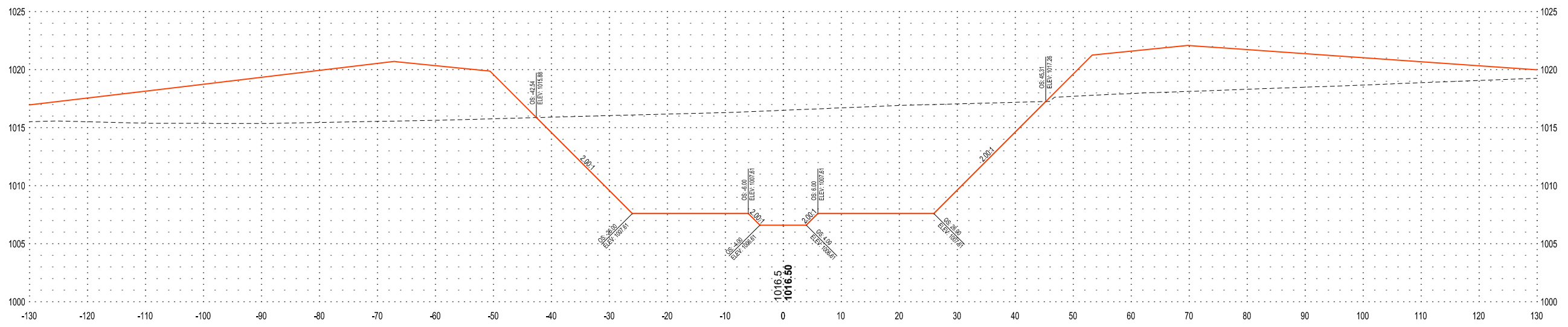
SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



41+00



38+00



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PROJECT
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MAINLINE

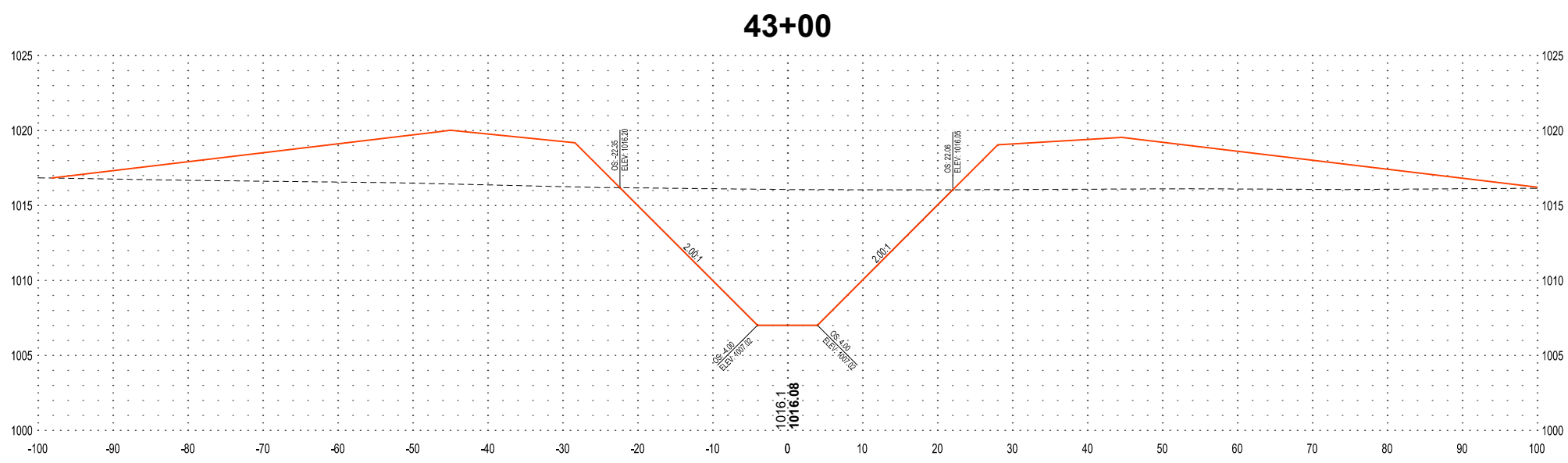
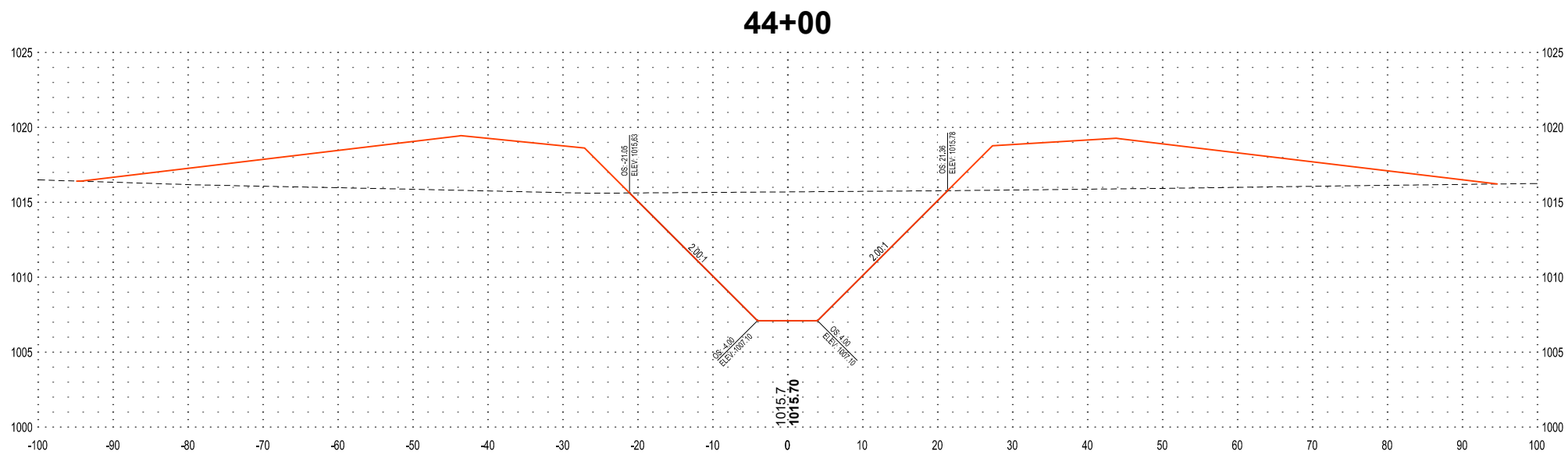
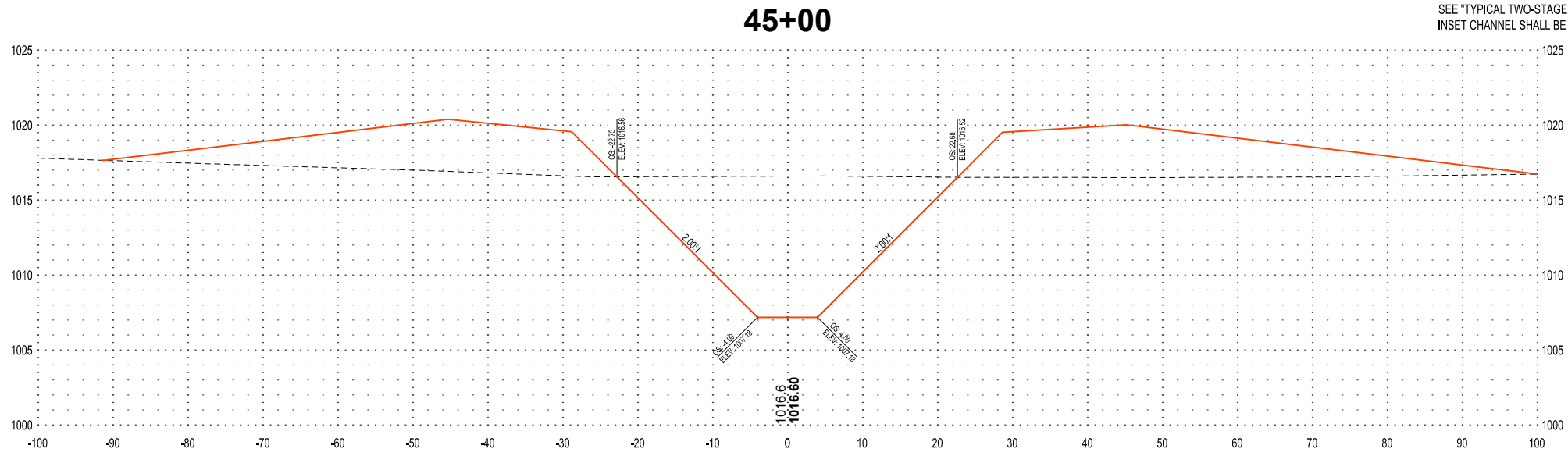
SHEET
33
OF 49

PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
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INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ϵ
1000.00	XXX.XX - PROPOSED GROUND ϵ



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REDWOOD COUNTY MINNESOTA

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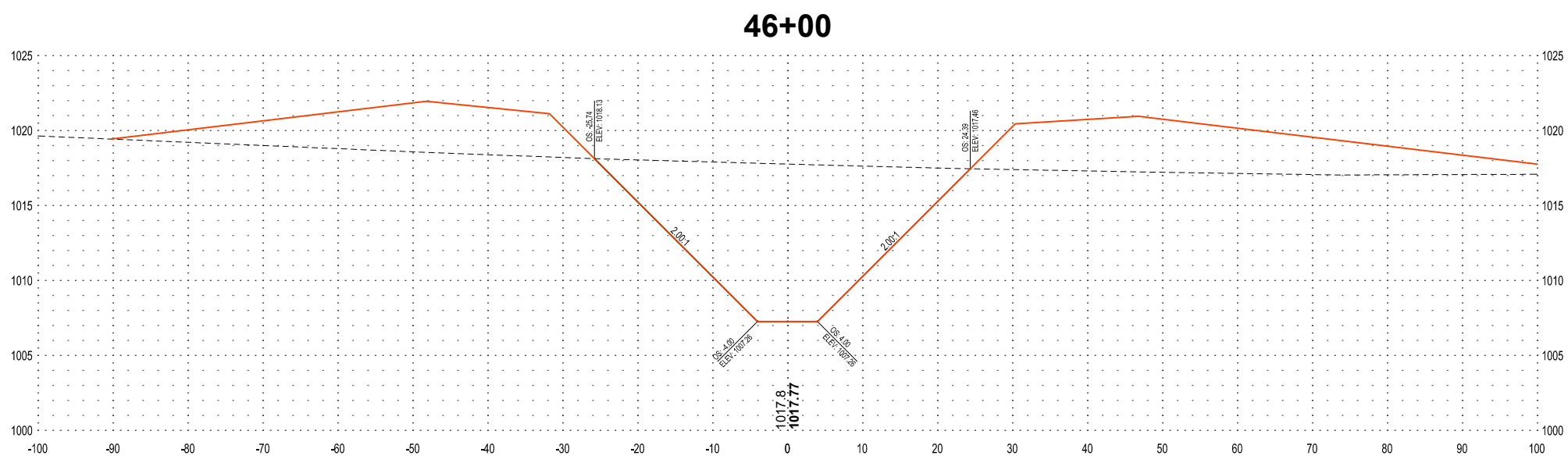
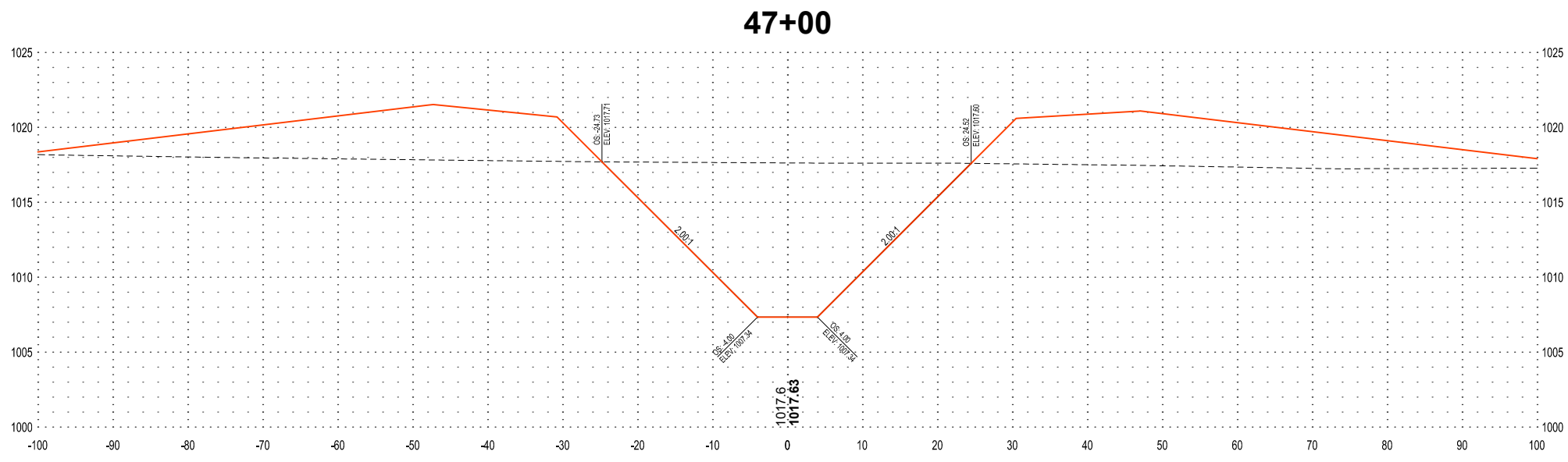
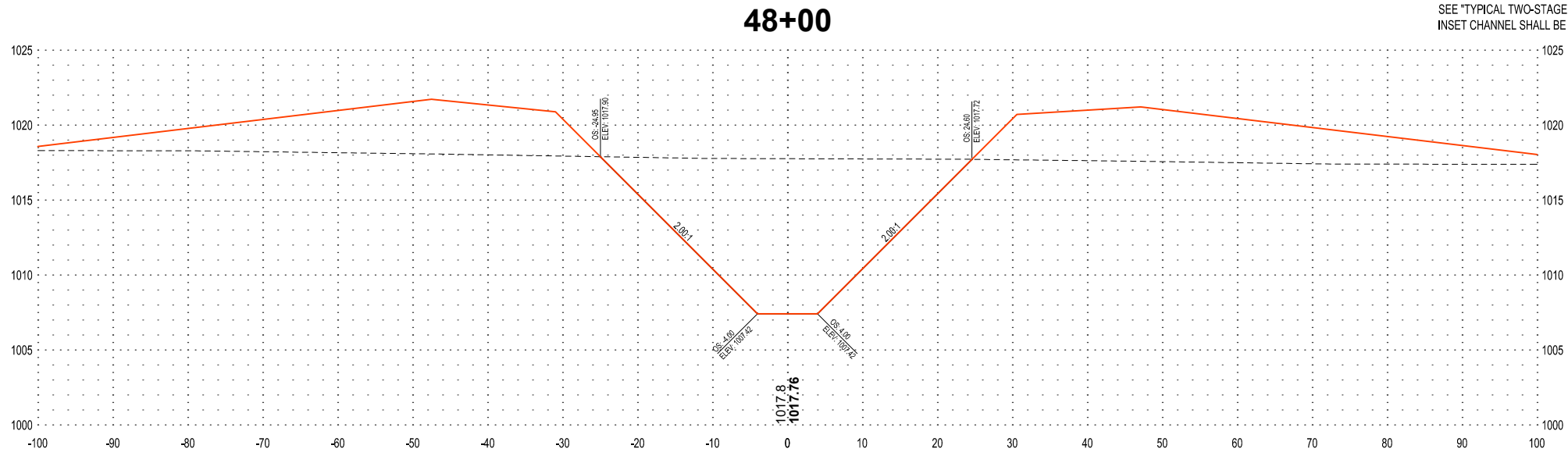
SHEET
34 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
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SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



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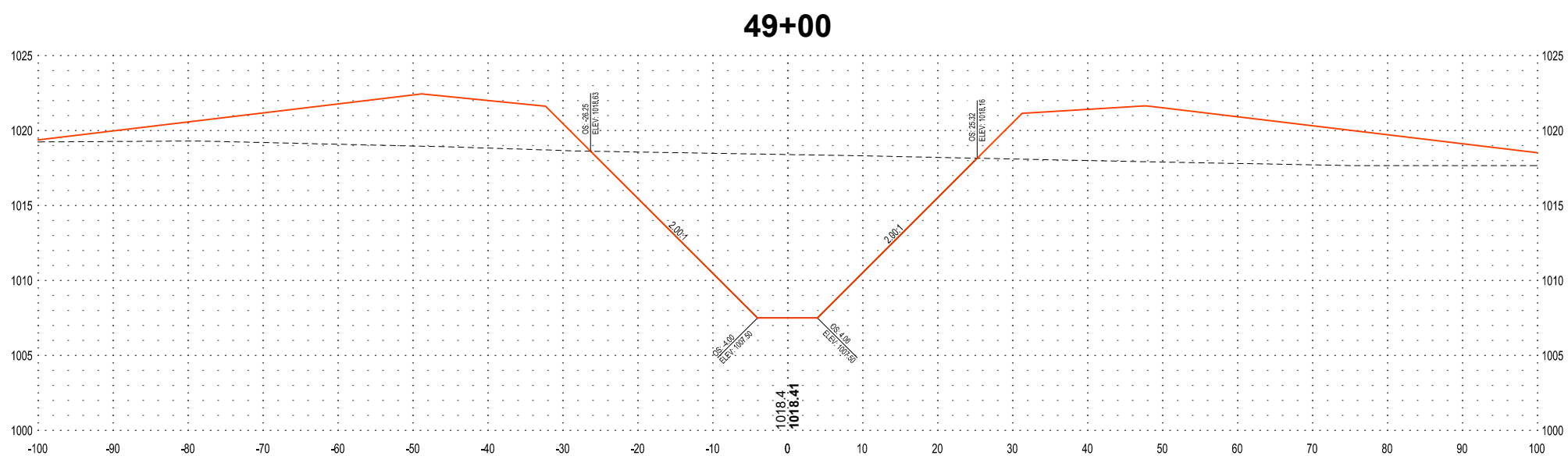
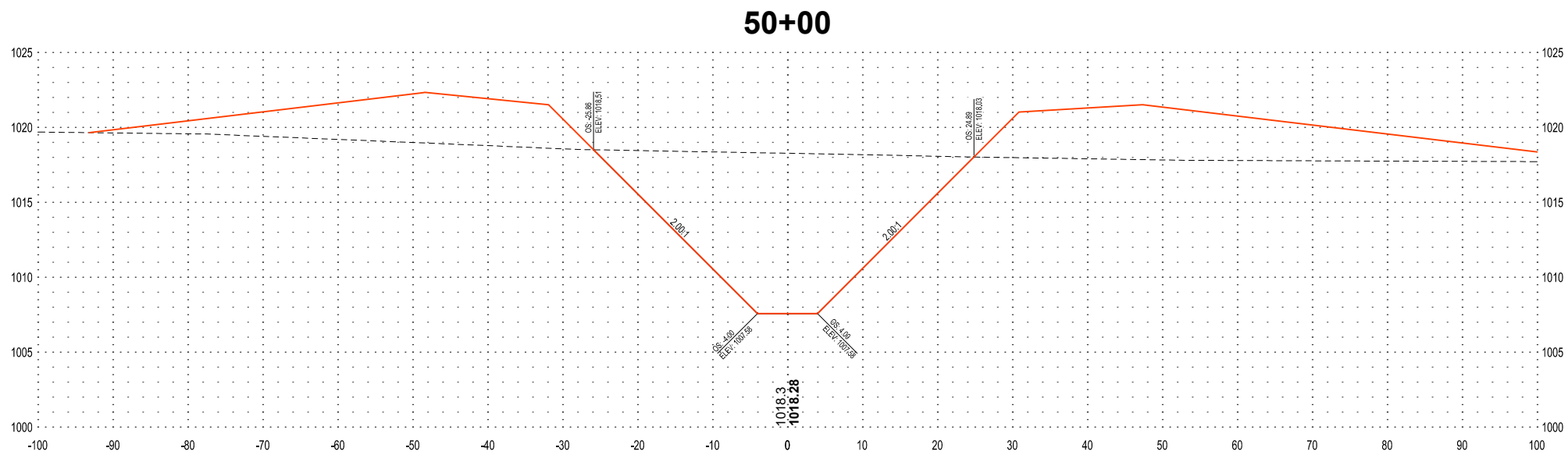
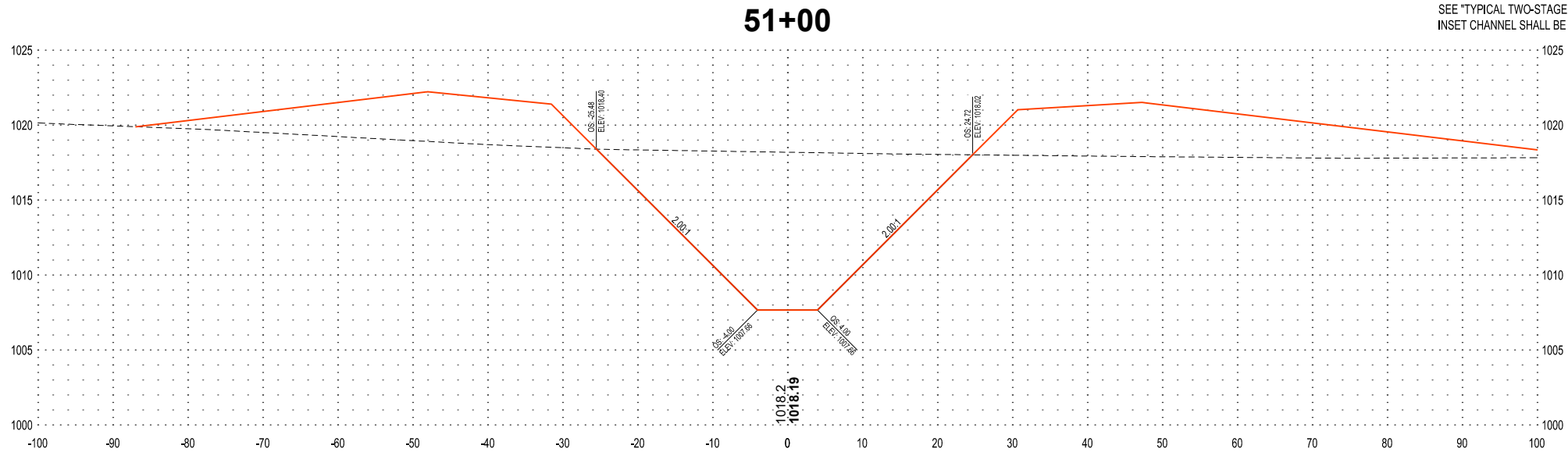
SHEET
35 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



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SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
1000.0 1000.00	XXX.X - EXISTING GROUND ζ XXX.XX - PROPOSED GROUND ζ



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TITLE
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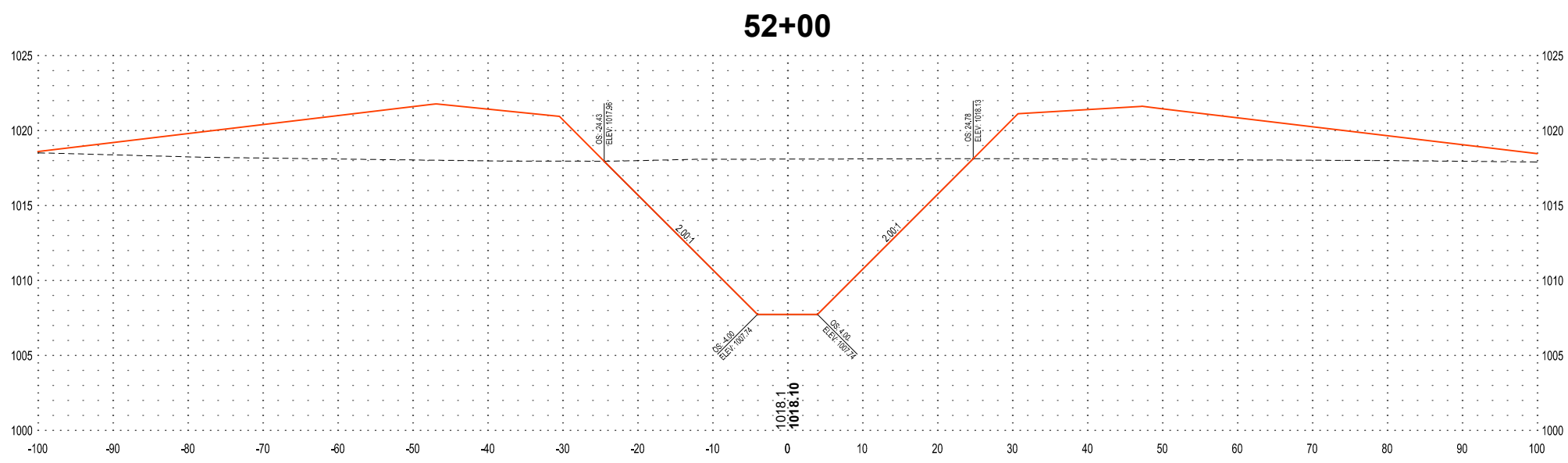
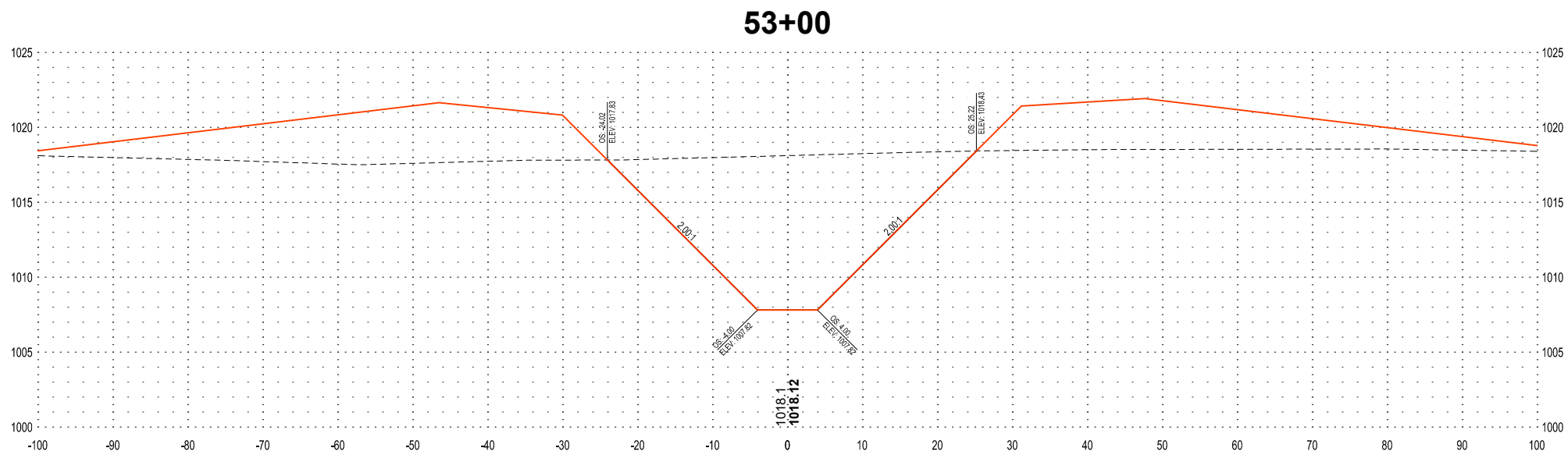
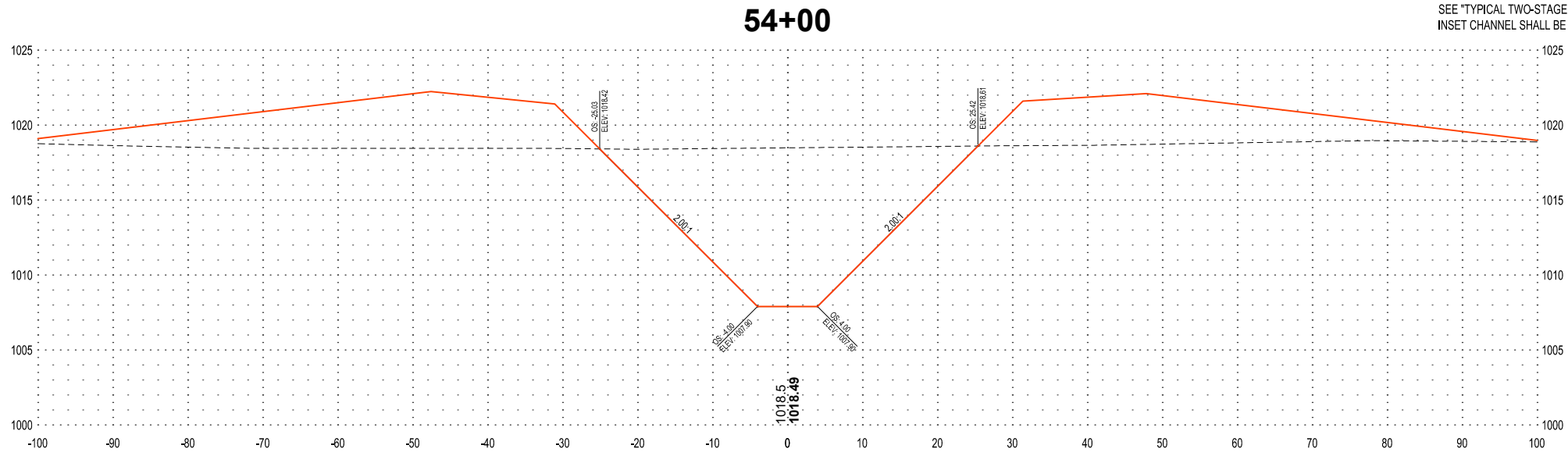
SHEET
36 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



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INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ϕ
1000.00	XXX.XX - PROPOSED GROUND ϕ



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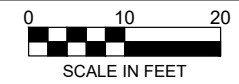
PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE
CROSS SECTIONS MAINLINE

SHEET
37 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



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DATE _____ LIC. NO. _____

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PROJECT
**REDWOOD COUNTY
COUNTY DITCH
No. 20**
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

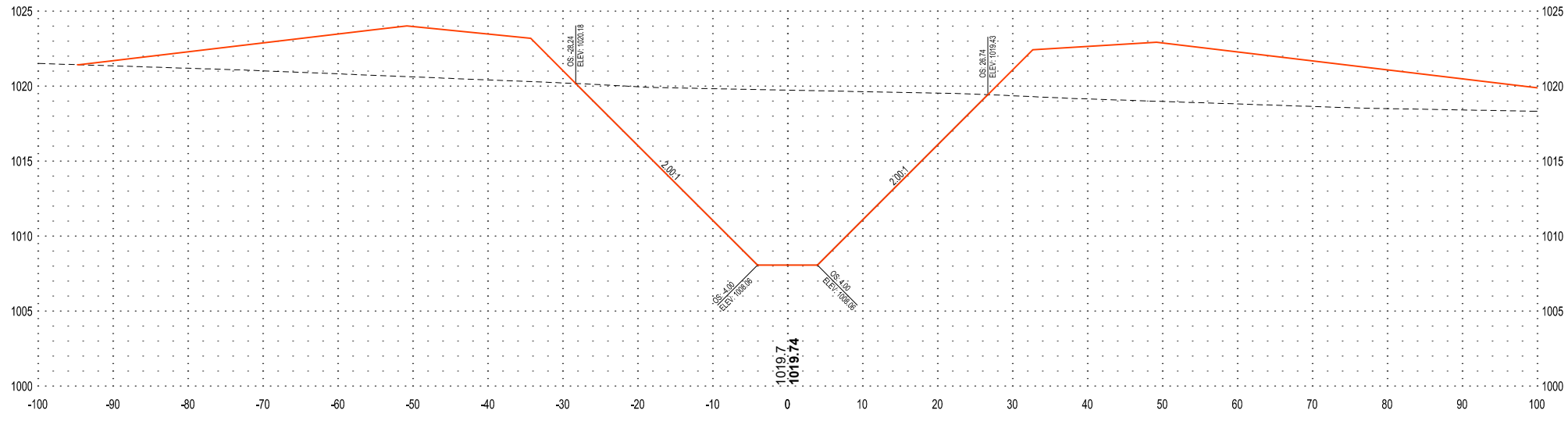
PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

TITLE
**CROSS SECTIONS
MAINLINE**

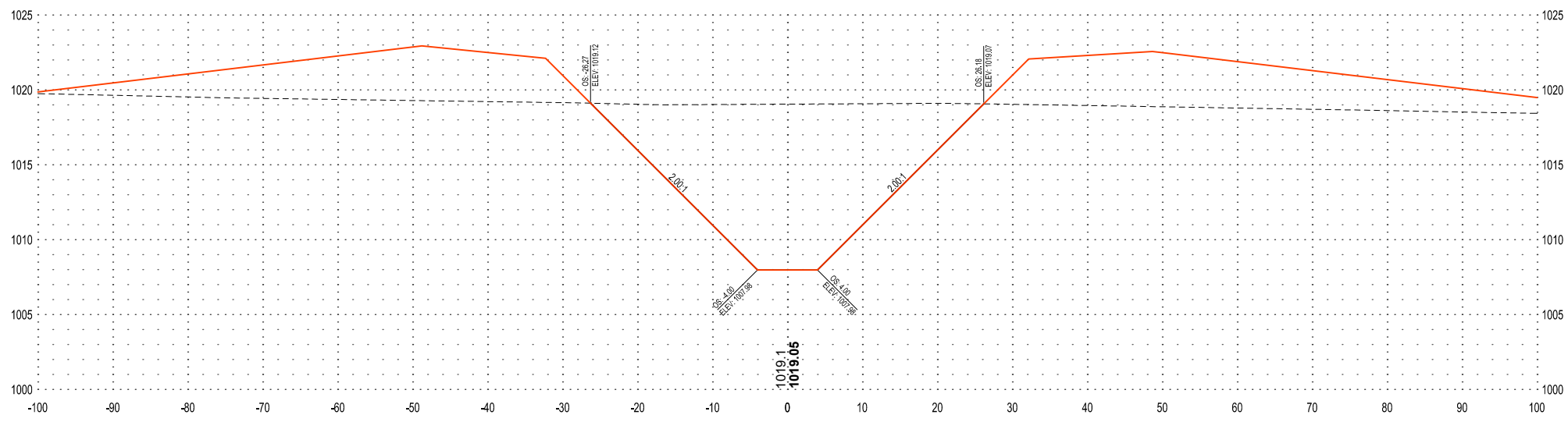
SHEET
38
OF 49

PRELIMINARY NOT FOR CONSTRUCTION

56+00



55+00



NOTE:

SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
REDWOOD COUNTY MINNESOTA

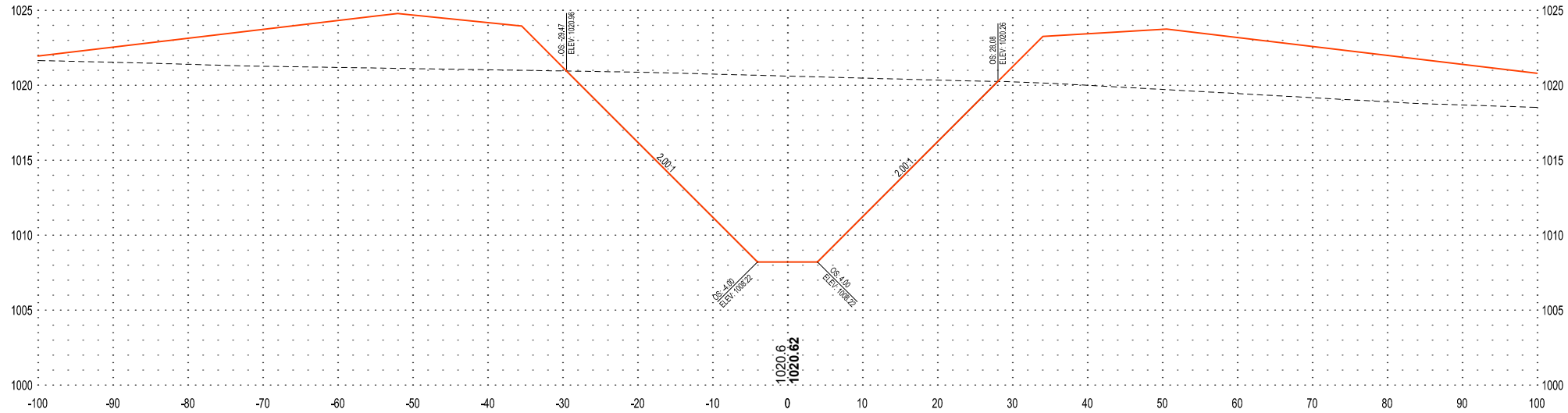
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

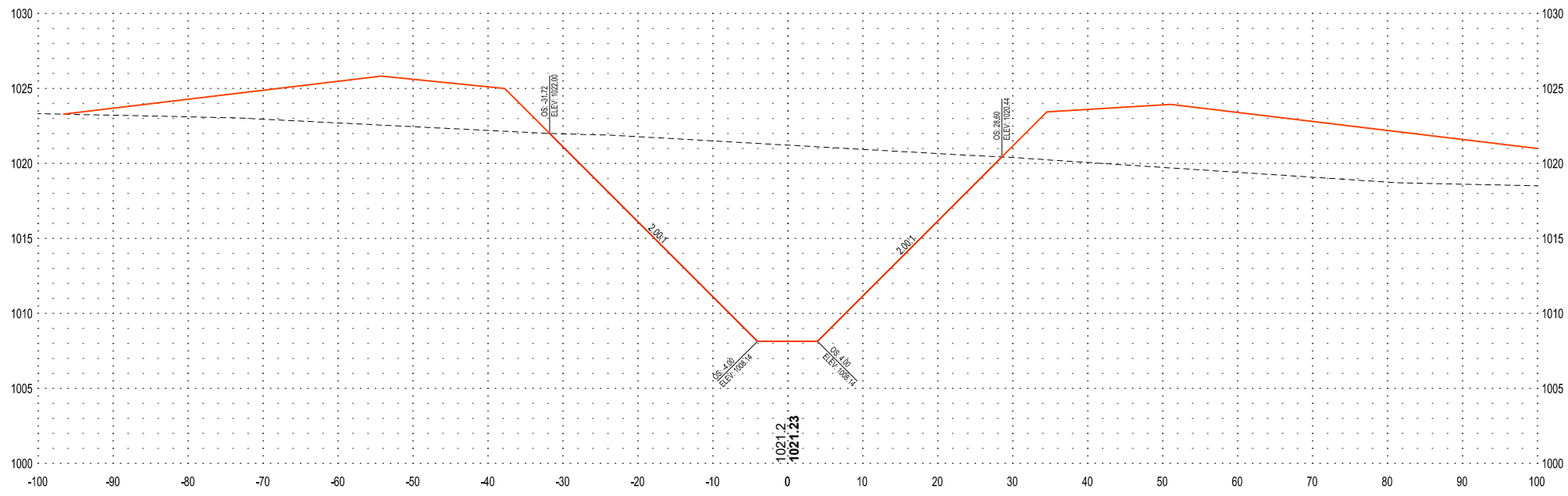
TITLE
CROSS SECTIONS
MAINLINE

SHEET
39 OF 49

58+00



57+00



PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
REDWOOD COUNTY MINNESOTA

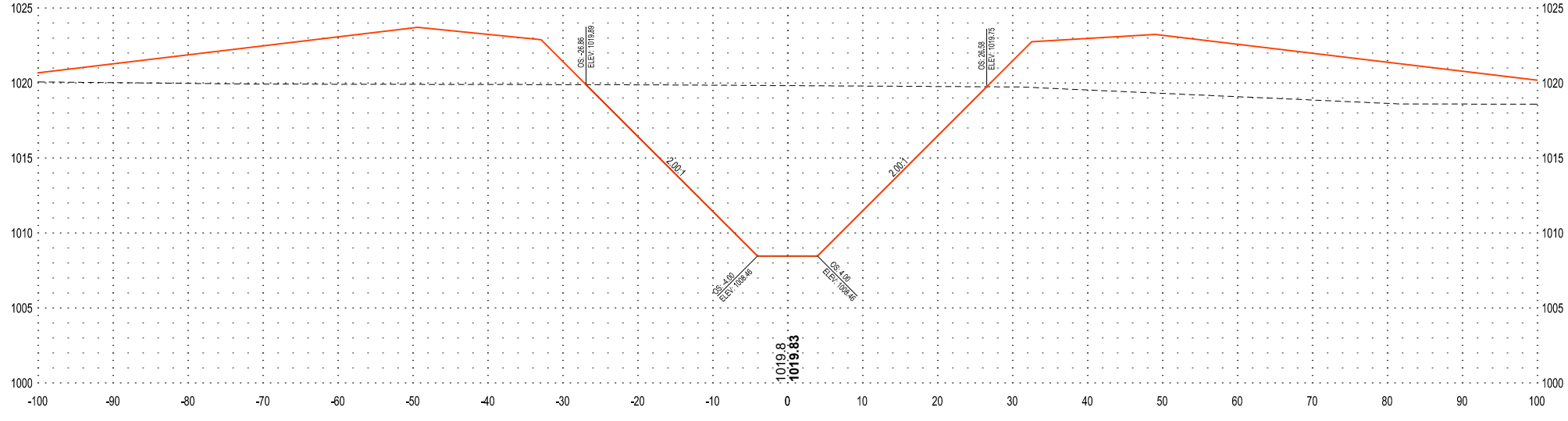
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

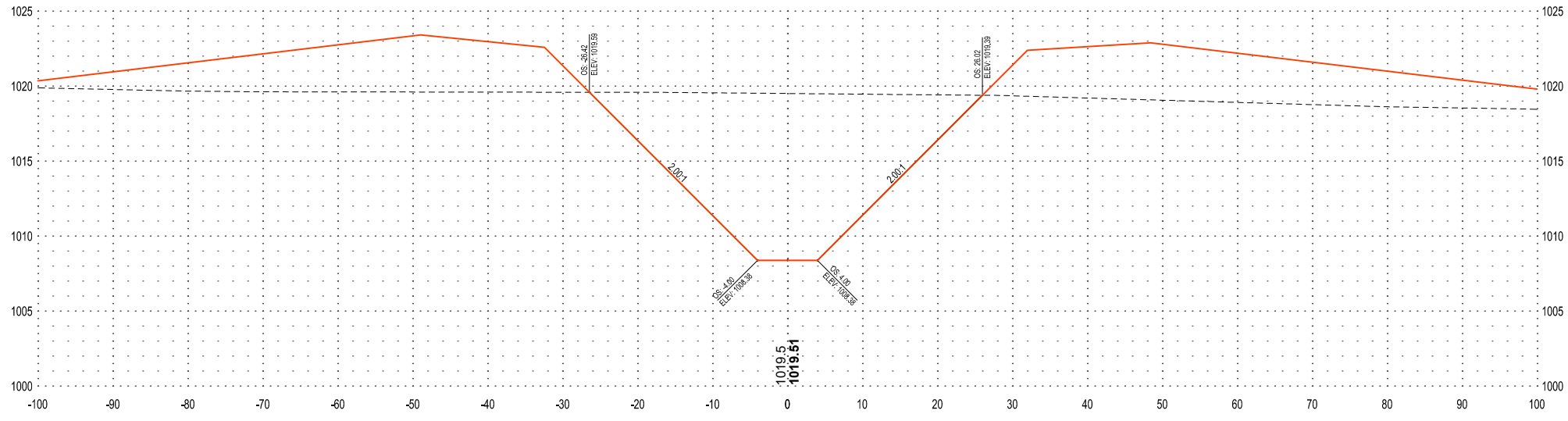
TITLE
CROSS SECTIONS
MAINLINE

SHEET
40 OF 49

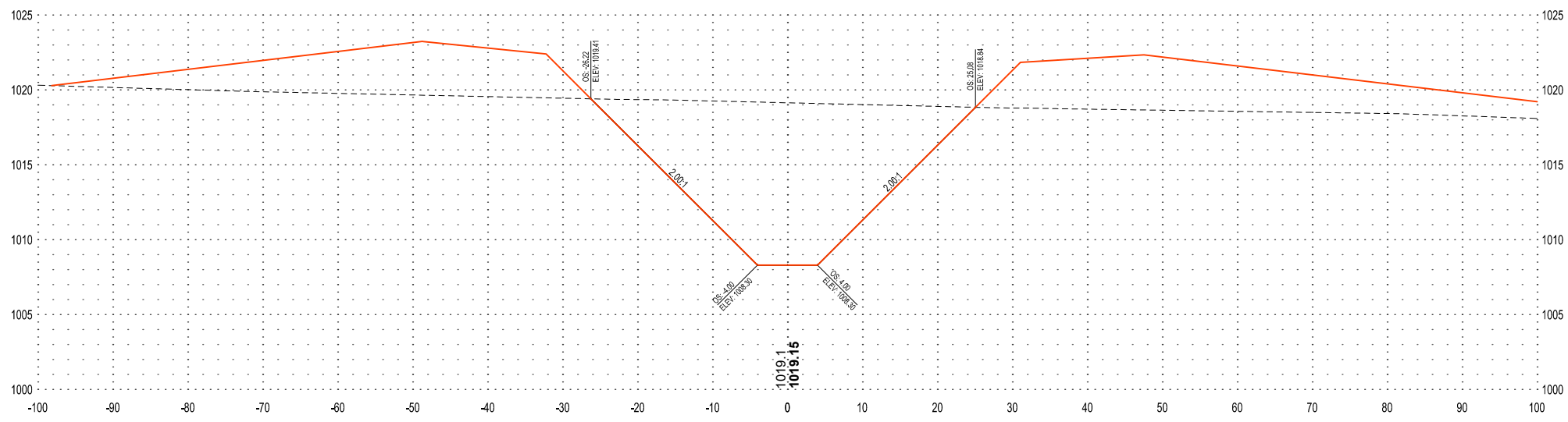
61+00



60+00



59+00

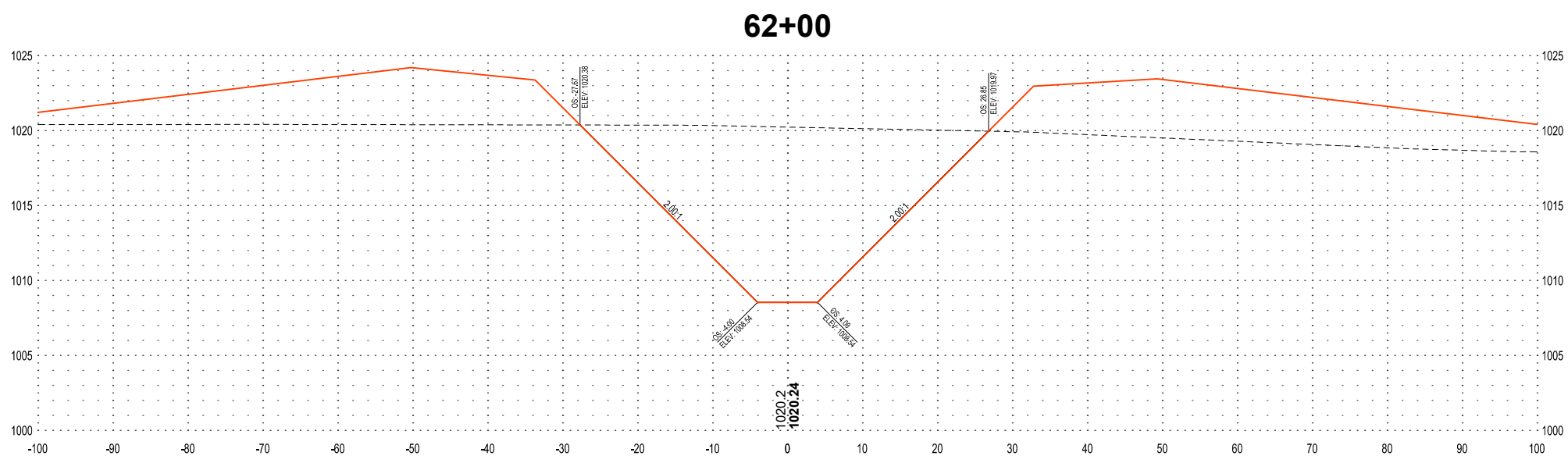
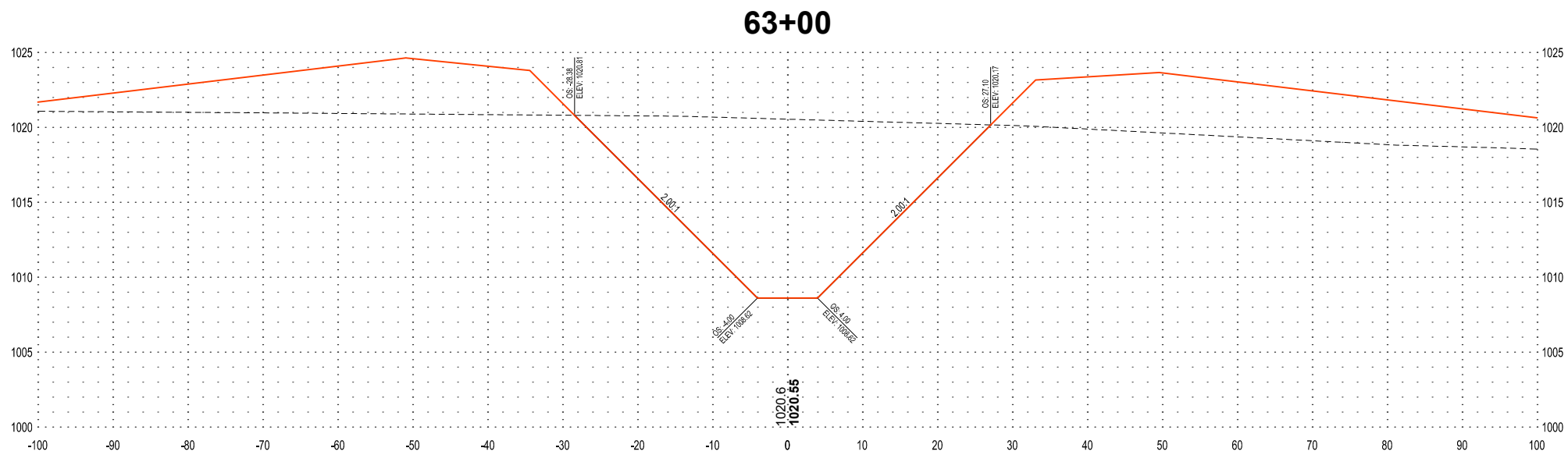
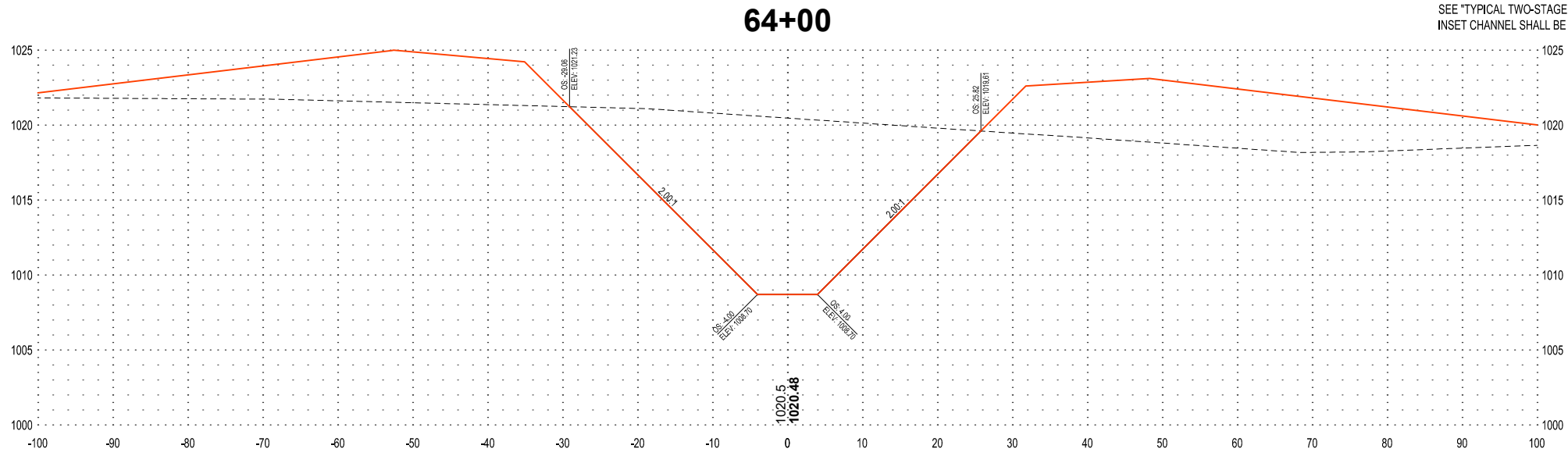


PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
 FILE NAME 28479 SECTIONS
 DRAWN BY KJH
 DESIGNED BY AJS
 REVIEWED BY JMW
 ORIGINAL ISSUE DATE --/--
 CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

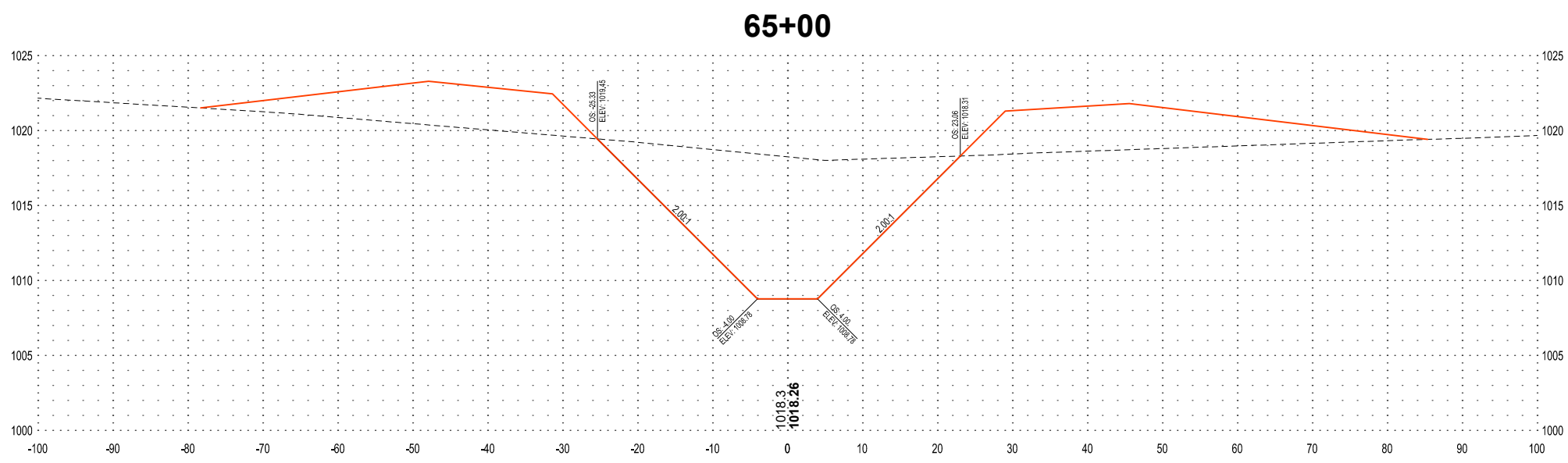
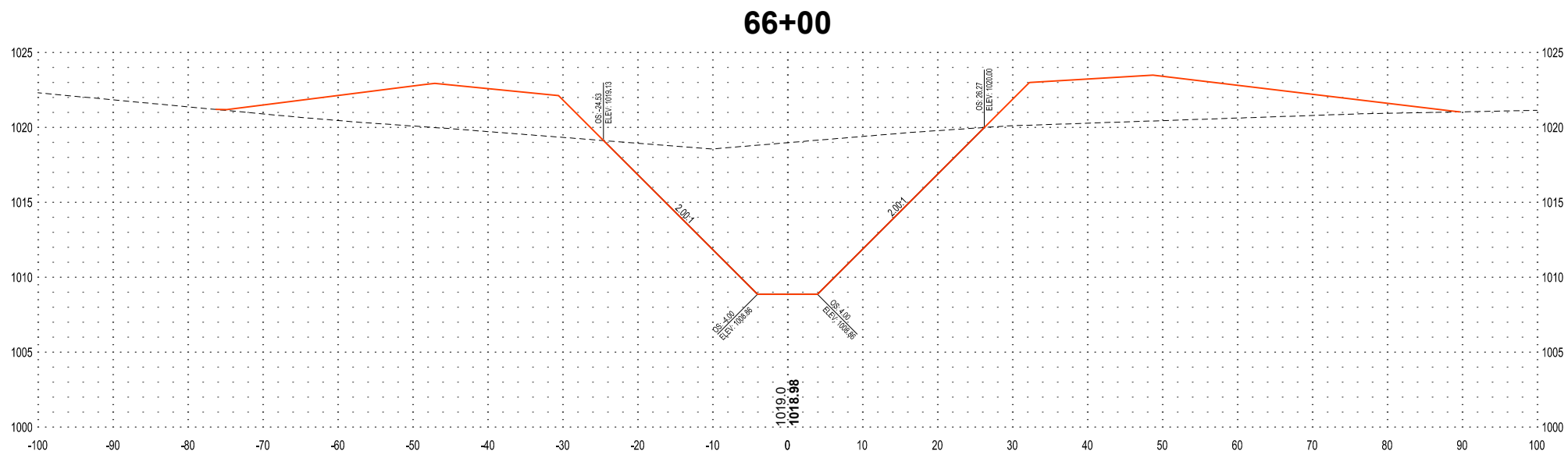
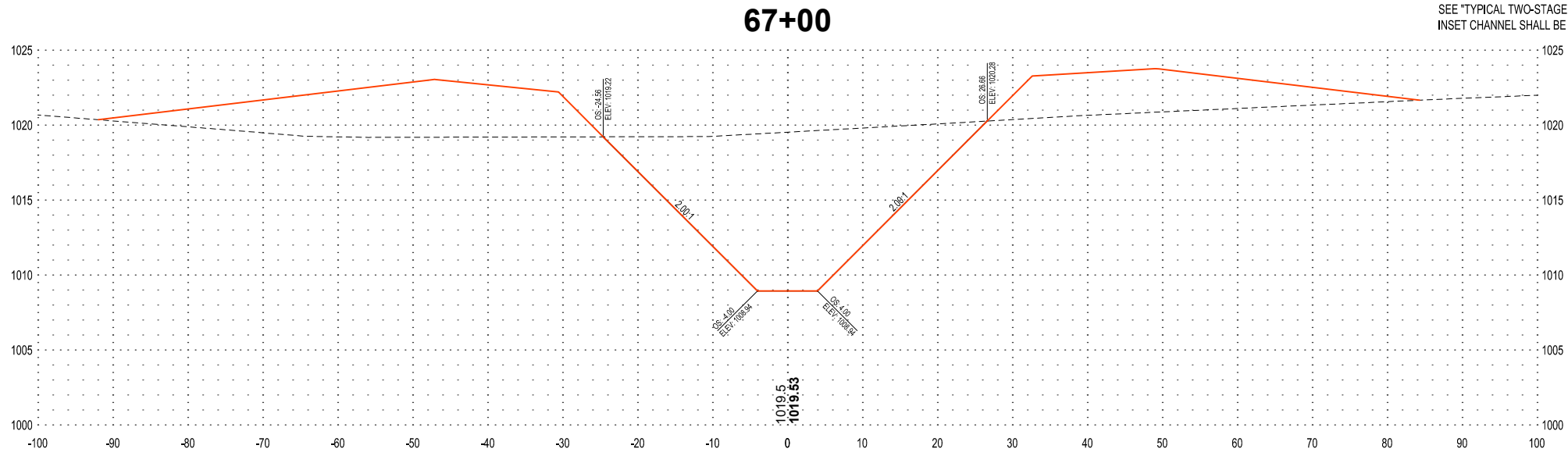
SHEET
41 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ϕ
1000.00	XXX.XX - PROPOSED GROUND ϕ



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 SECTIONS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET
42 OF 49

PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

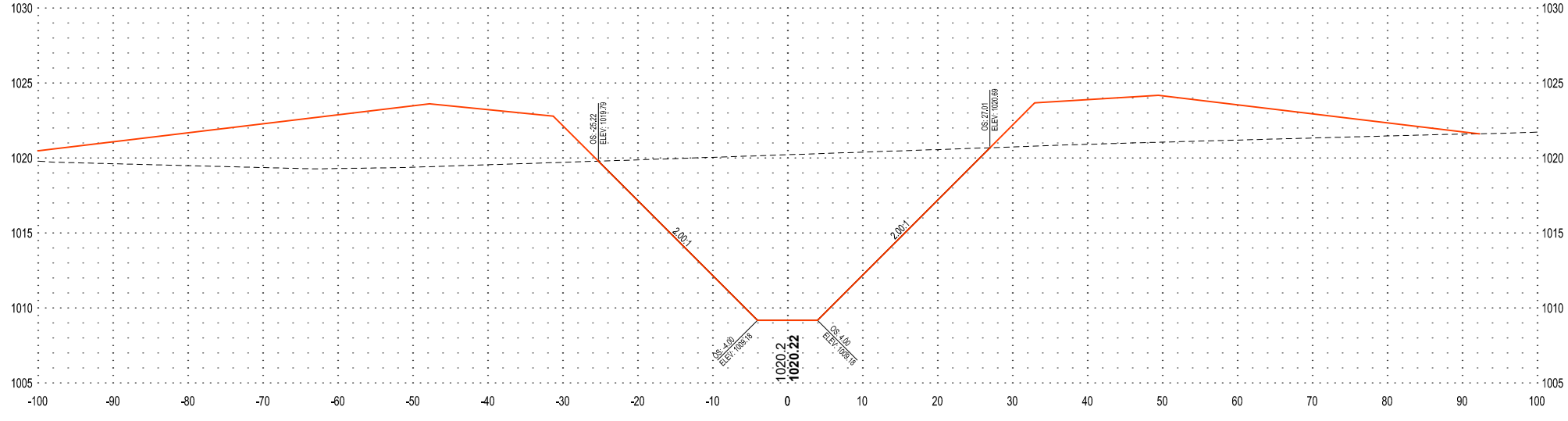
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

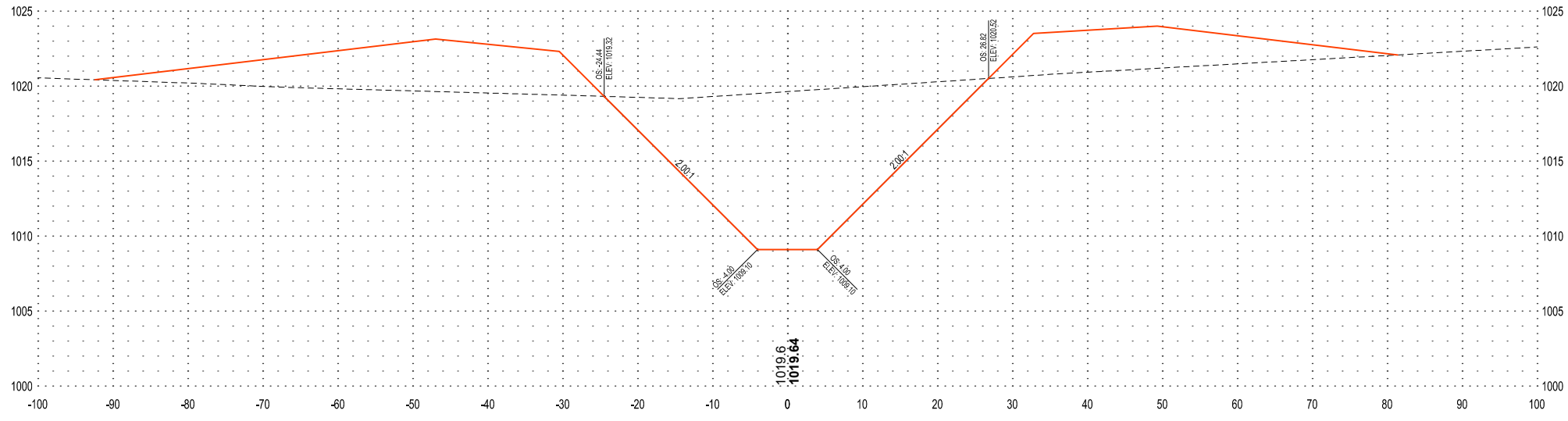
TITLE
CROSS SECTIONS MAINLINE

SHEET
43 OF 49

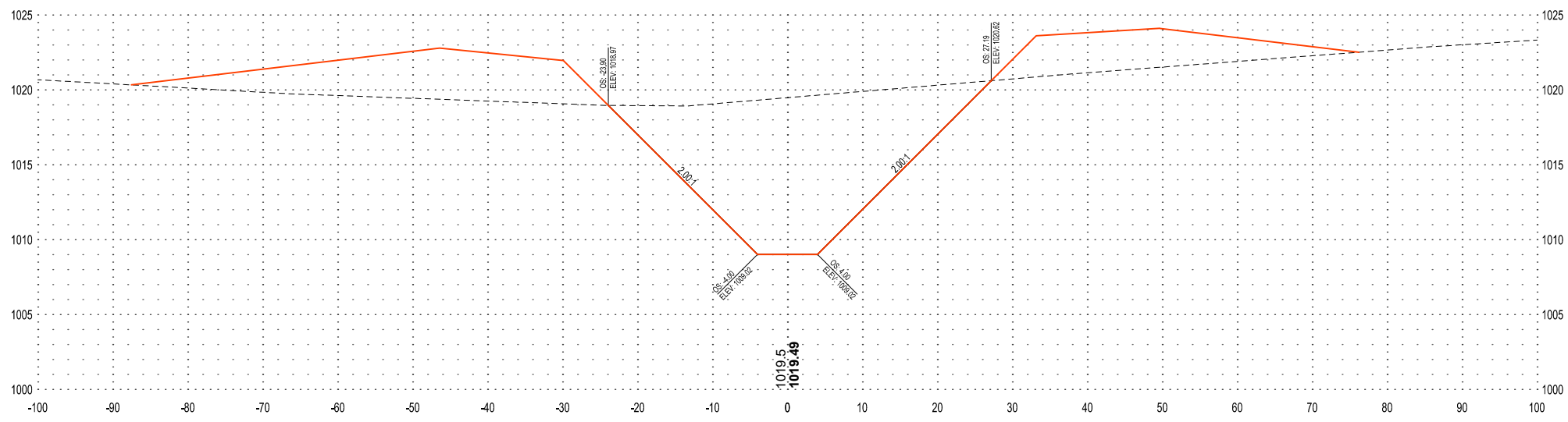
70+00



69+00



68+00



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NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

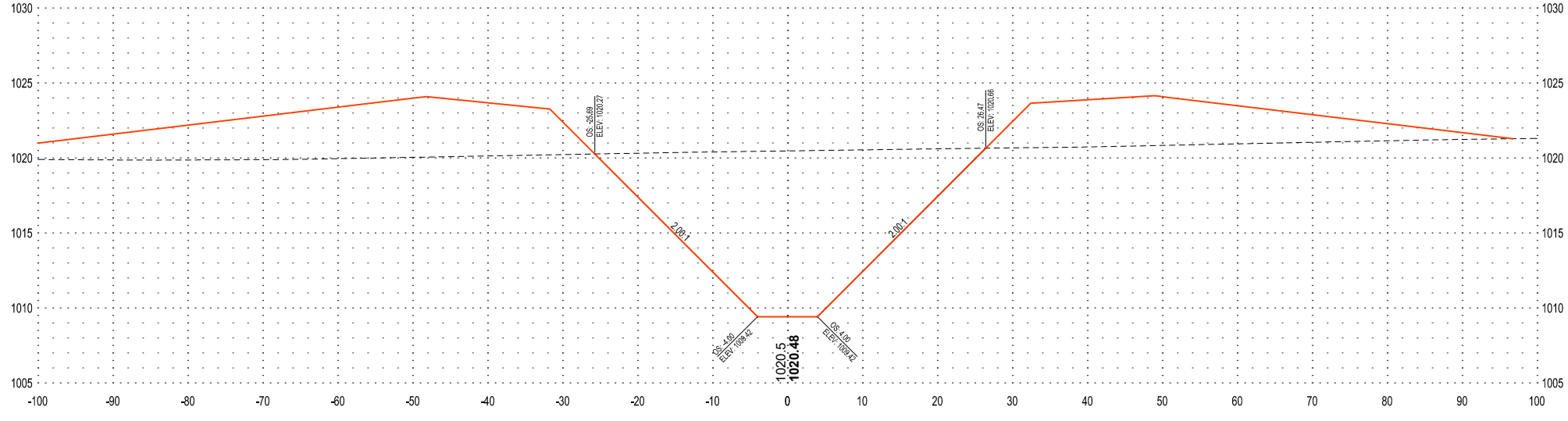
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 SECTIONS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

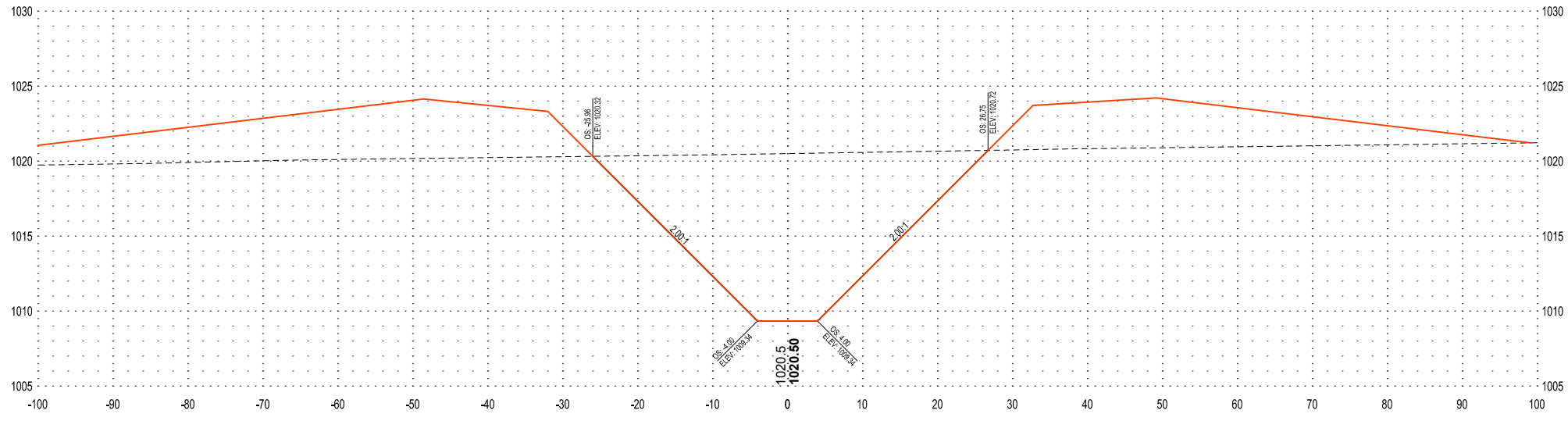
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SHEET
44 OF 49

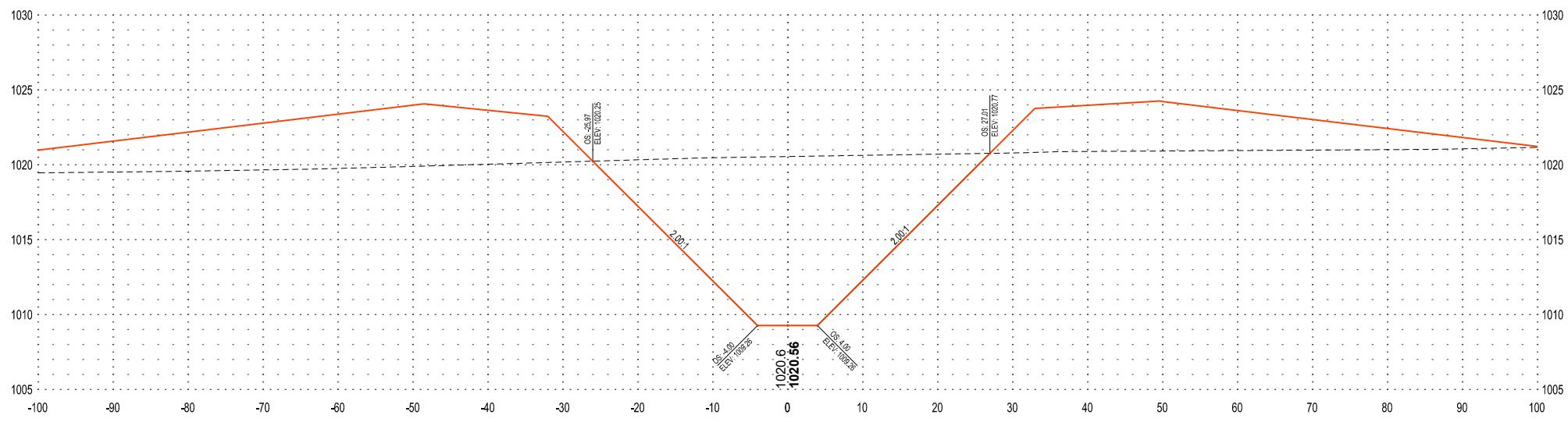
73+00



72+00



71+00



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NOTE:

SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
 INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND

NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION

---	EXISTING GROUND
—	PROPOSED GROUND
1000.0 1000.00	XXX.X - EXISTING GROUND ζ XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
 REDWOOD COUNTY MINNESOTA

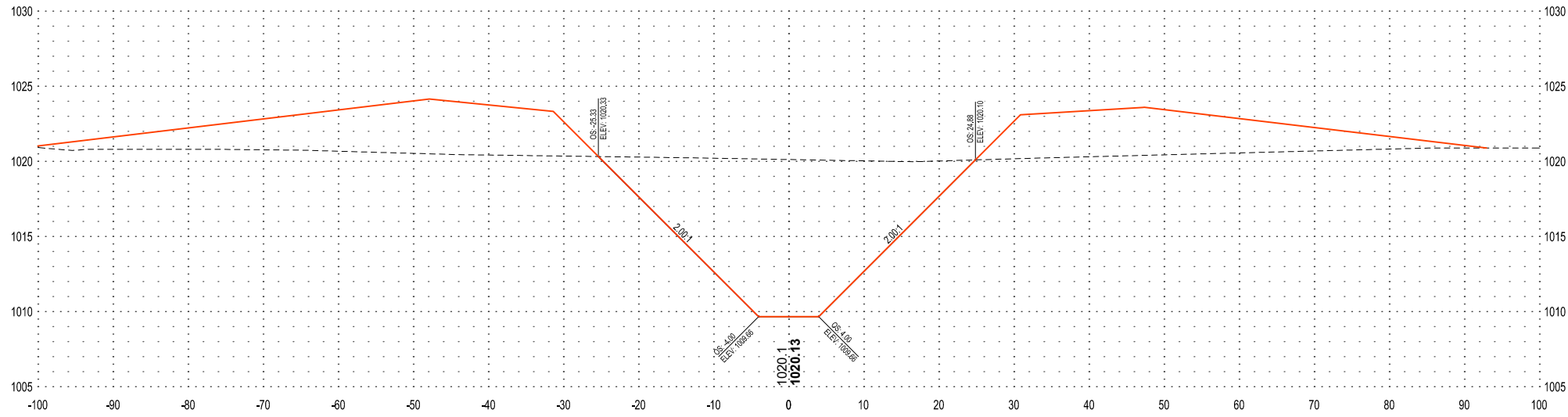
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
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ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

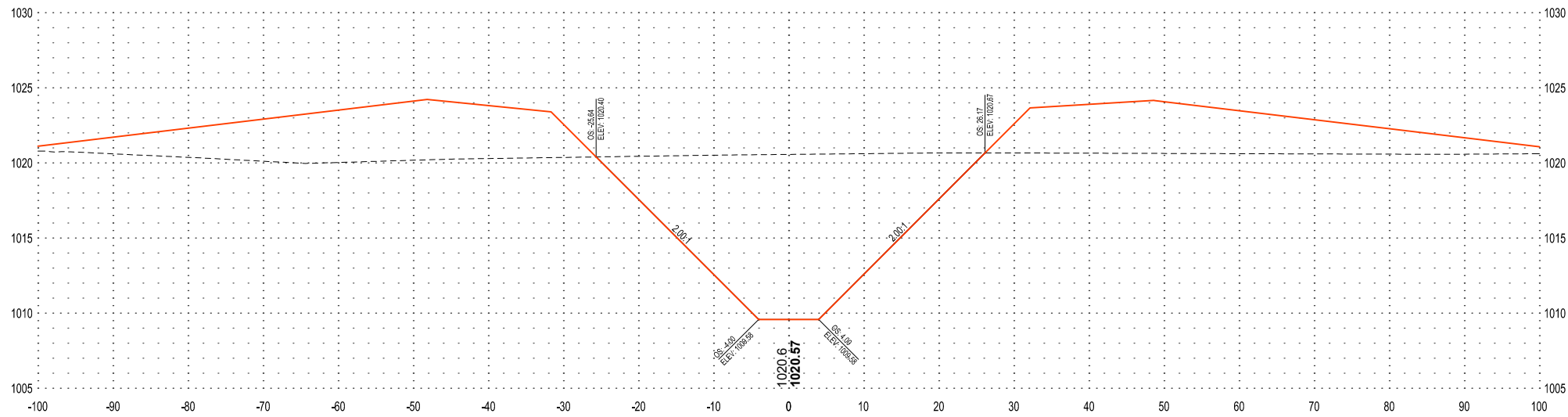
TITLE
CROSS SECTIONS
MAINLINE

SHEET
45
 OF 49

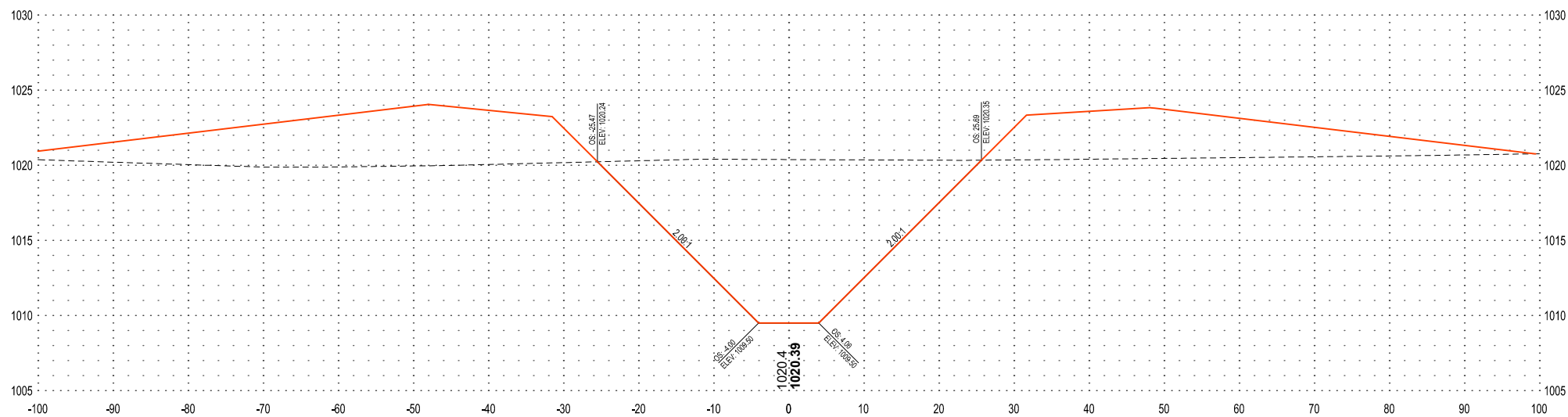
76+00



75+00



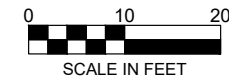
74+00



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NOTE:

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INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND E
1000.00	XXX.XX - PROPOSED GROUND E



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
REDWOOD COUNTY MINNESOTA

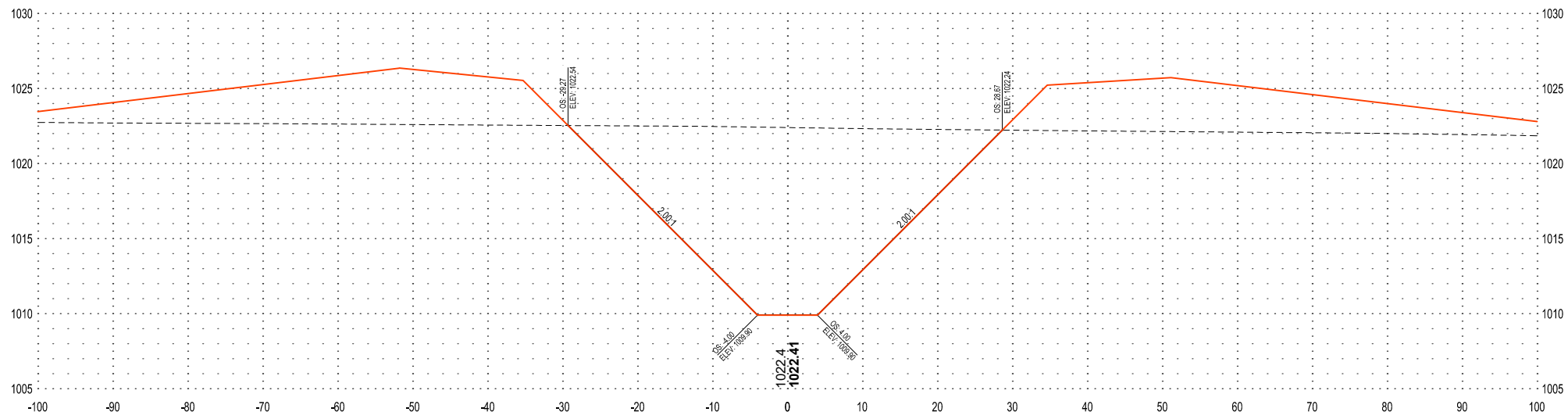
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
DESIGNED BY	AJS
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ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

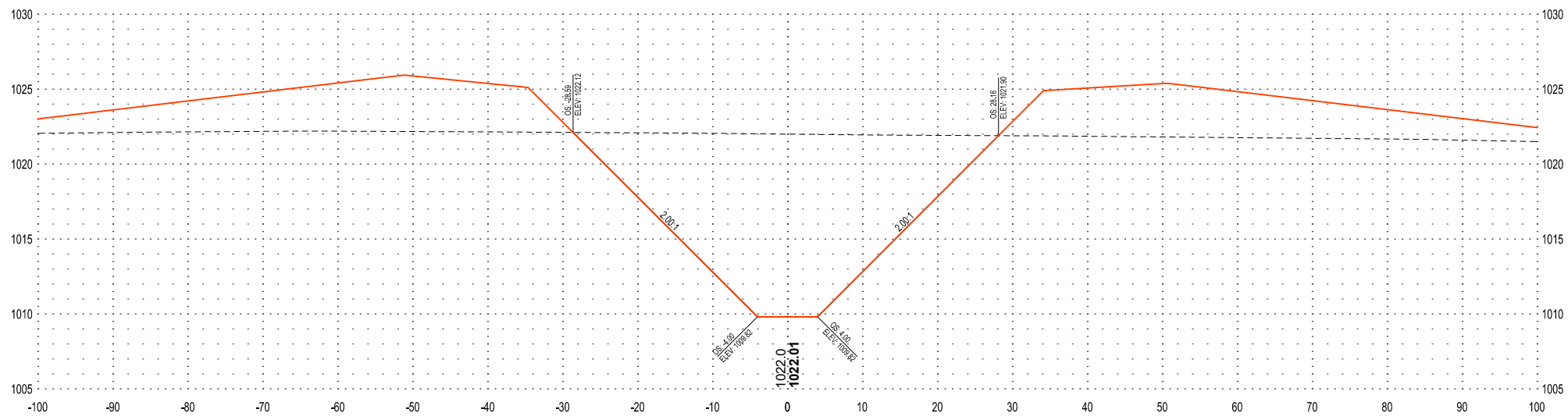
TITLE
CROSS SECTIONS
MAINLINE

SHEET
46 OF 49

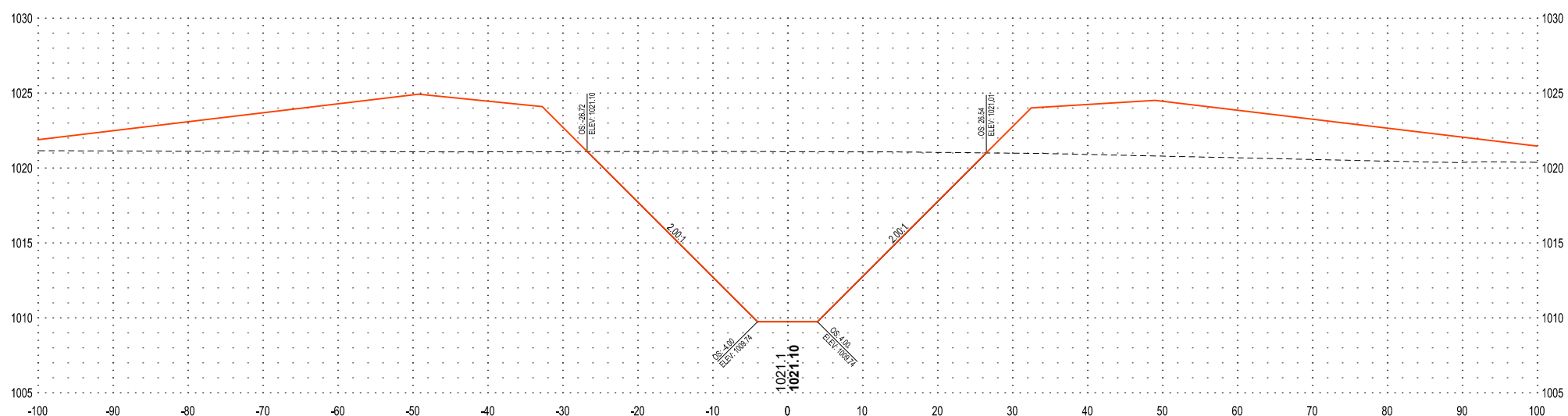
79+00



78+00



77+00



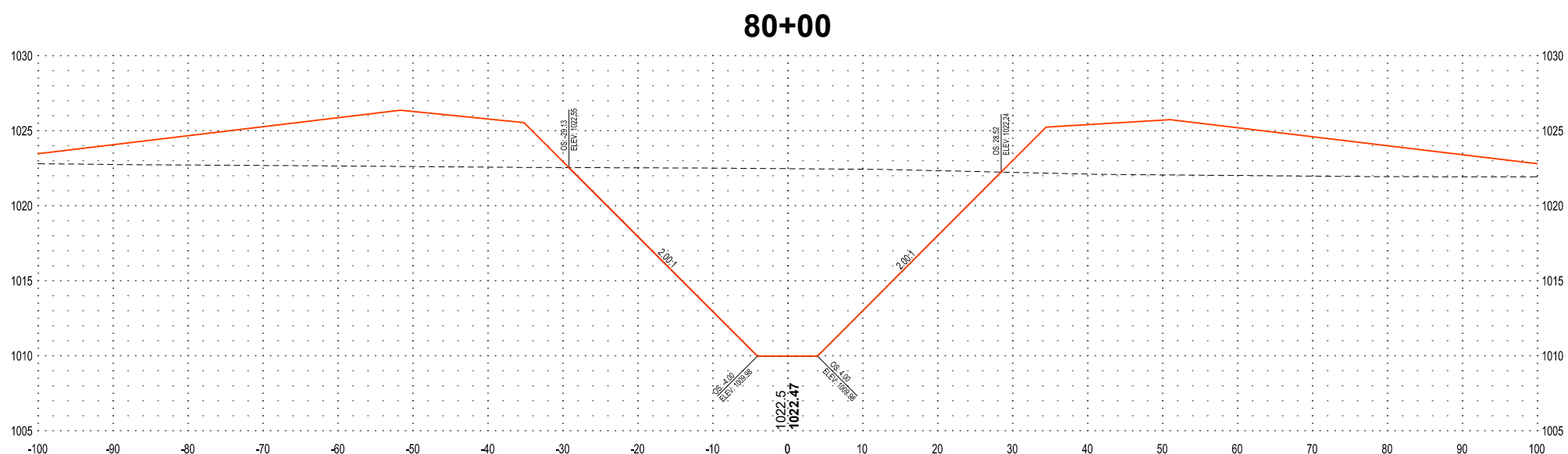
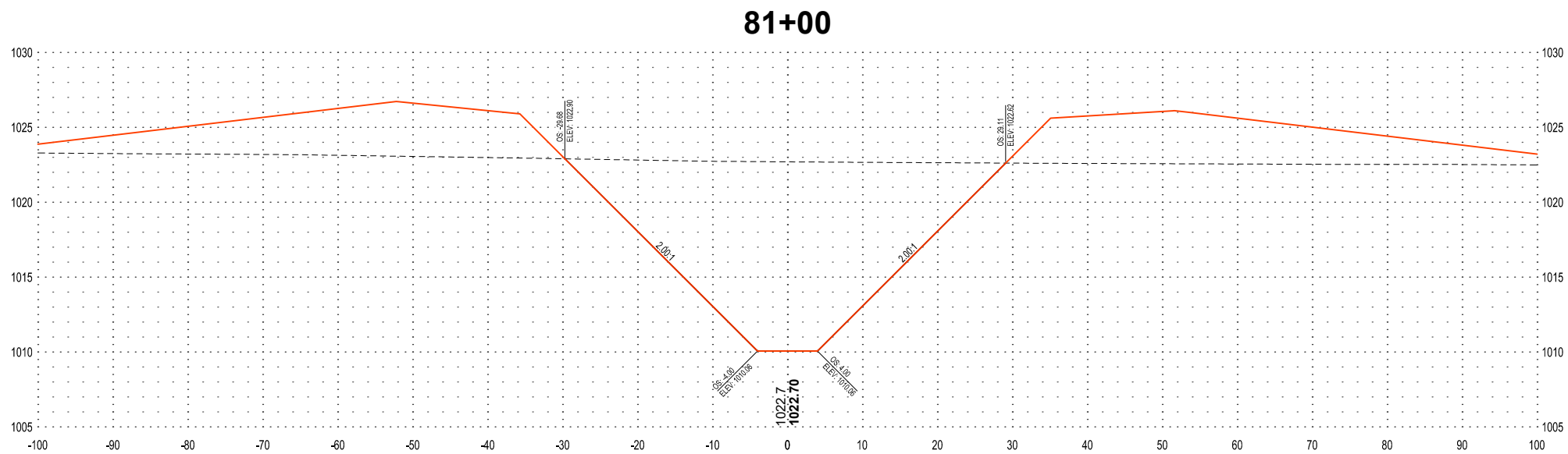
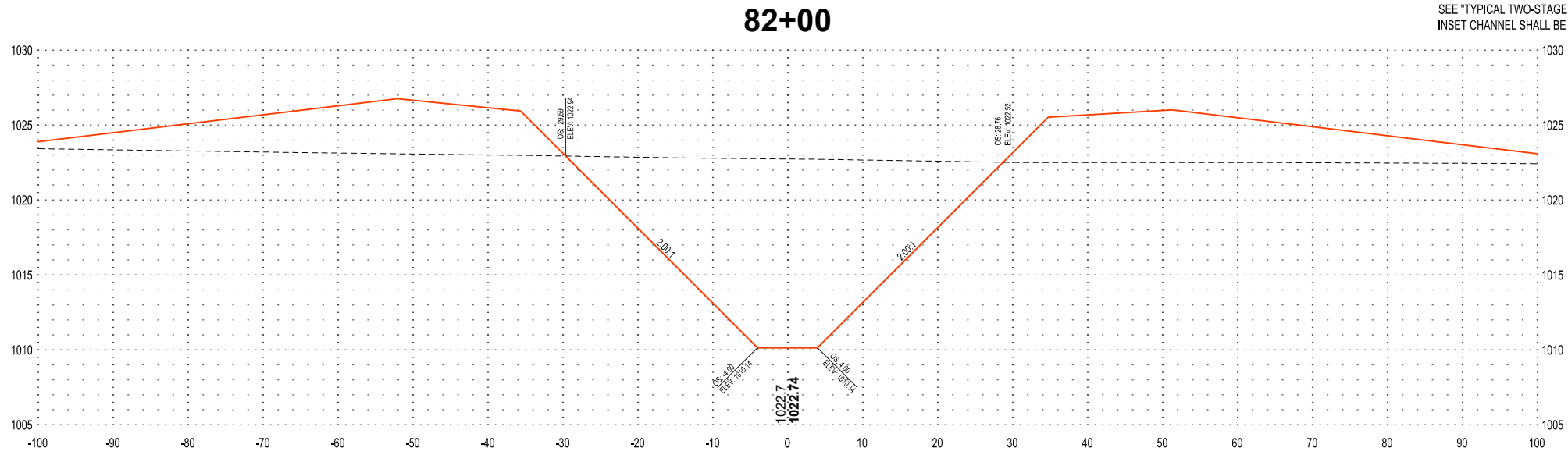
PRELIMINARY NOT FOR CONSTRUCTION

NOTE:

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INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
	EXISTING GROUND
	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 SECTIONS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET
47 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

NOTE:

SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.



SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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PROJECT
REDWOOD COUNTY
COUNTY DITCH
No. 20
REDWOOD COUNTY MINNESOTA

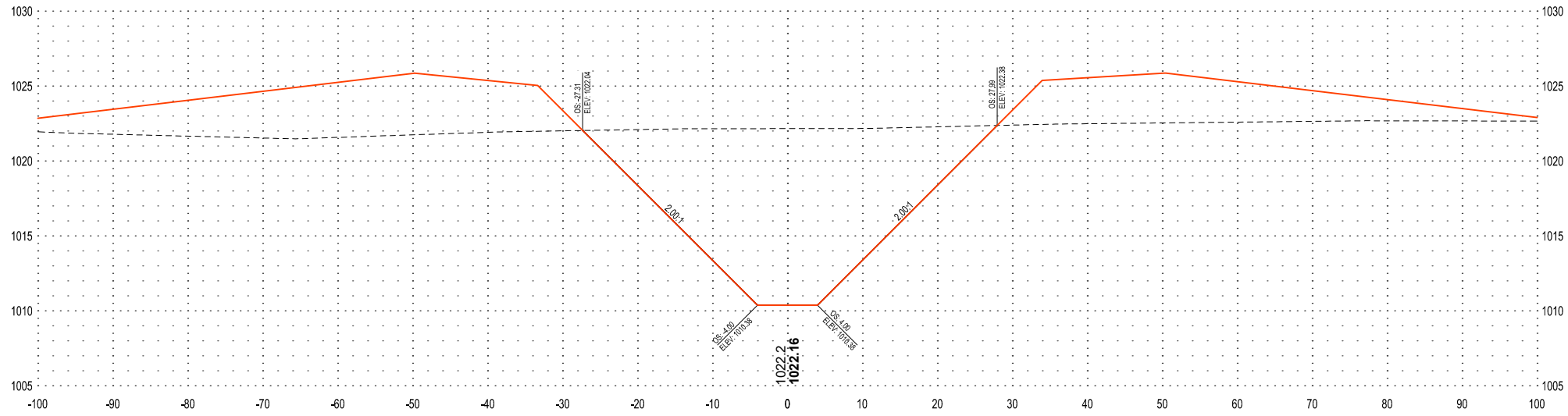
REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO.	23-28479
FILE NAME	28479 SECTIONS
DRAWN BY	KJH
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REVIEWED BY	JMW
ORIGINAL ISSUE DATE	--/--
CLIENT PROJECT NO.	-

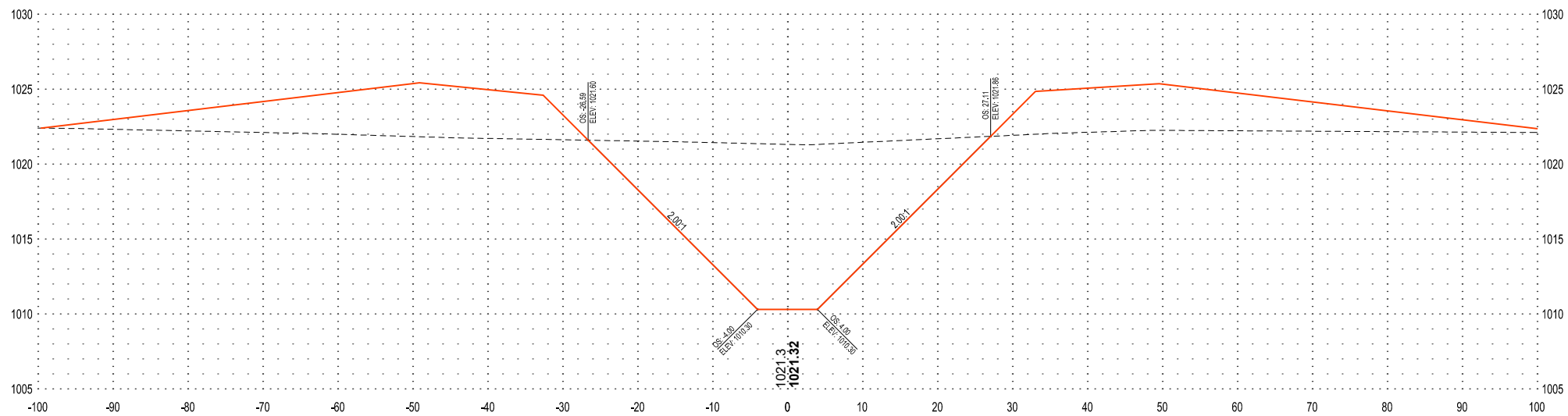
TITLE
CROSS SECTIONS
MAINLINE

SHEET
48 OF 49

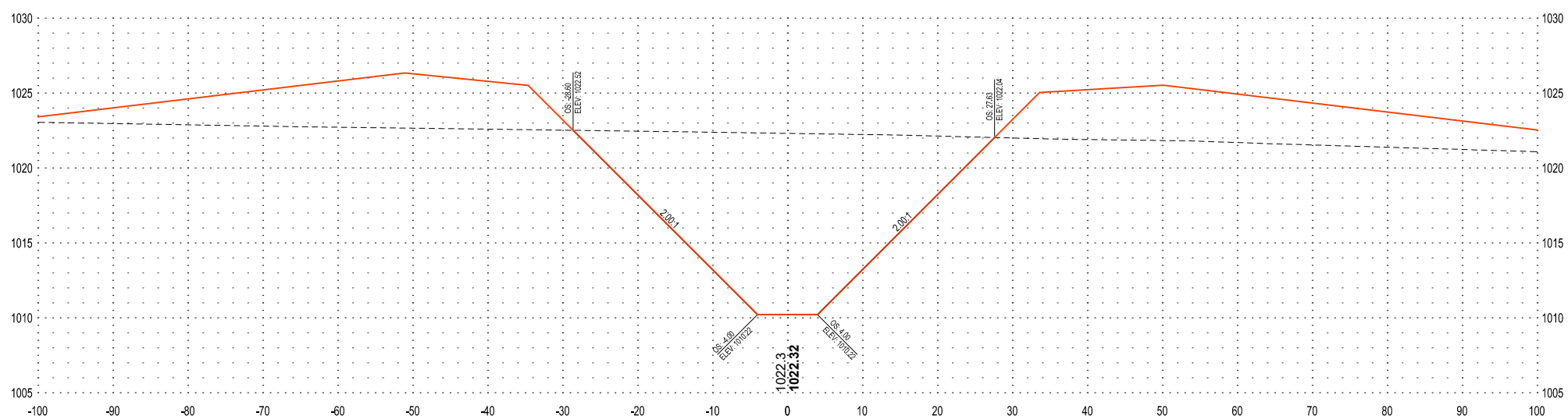
85+00



84+00



83+00

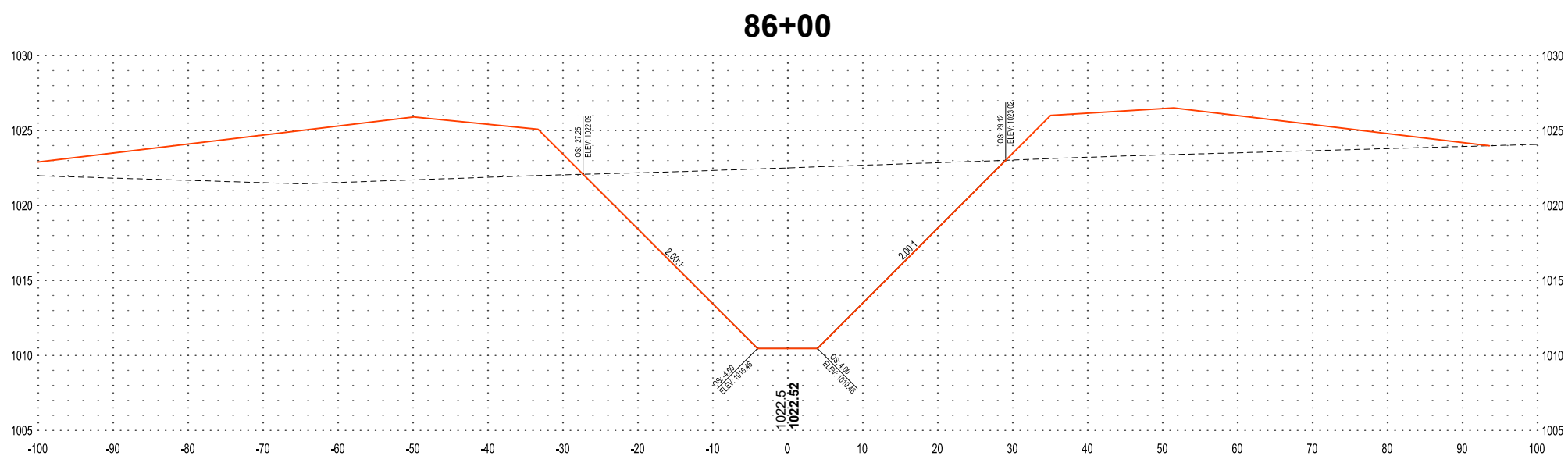
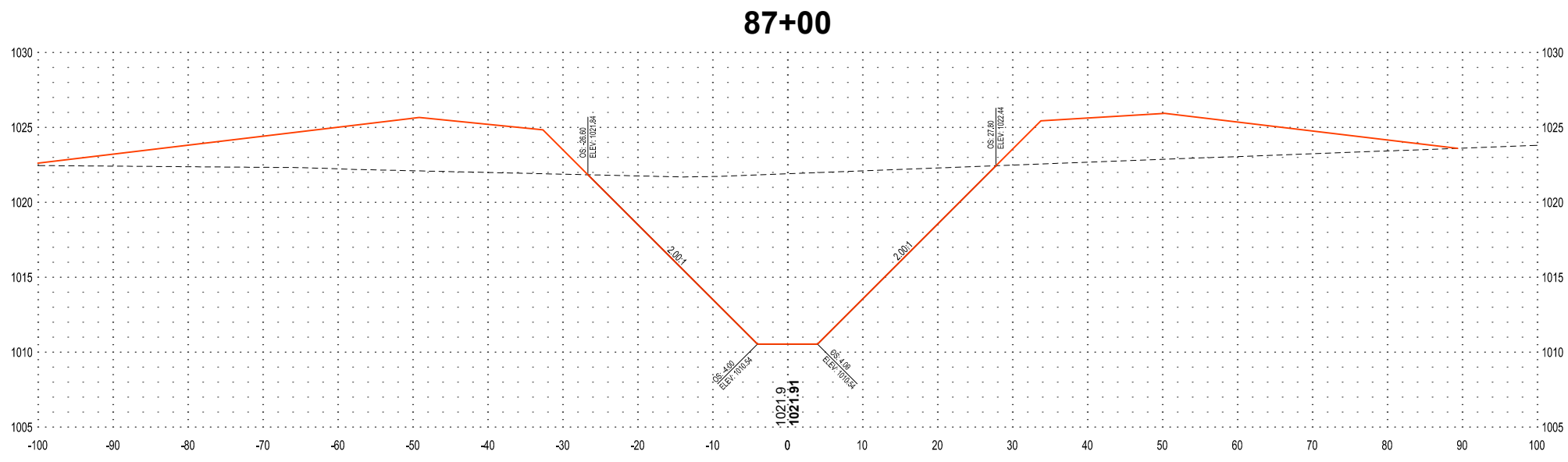
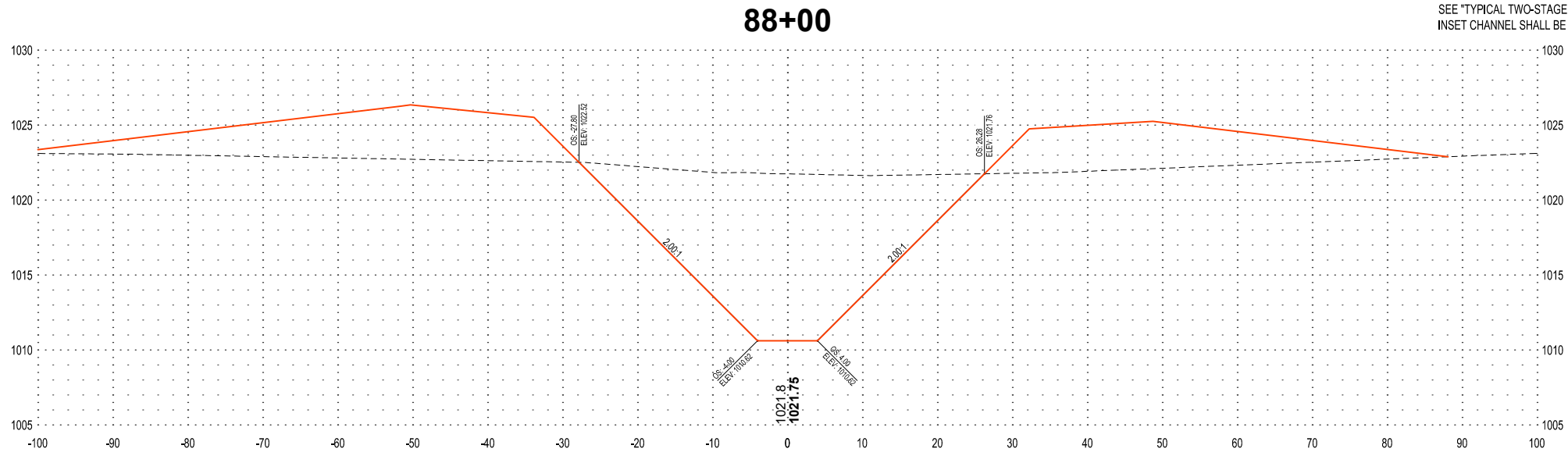


PRELIMINARY NOT FOR CONSTRUCTION



NOTE:
SEE "TYPICAL TWO-STAGE DITCH" DETAIL TYPICAL CROSS SECTION.
INSET CHANNEL SHALL BE CONSTRUCTED WITH ELLIPSE BOTTOM.

SECTION VIEW LEGEND	
NOTE: AS VIEWED IN THE DIRECTION OF INCREASING STATION	
---	EXISTING GROUND
---	PROPOSED GROUND
1000.0	XXX.X - EXISTING GROUND ζ
1000.00	XXX.XX - PROPOSED GROUND ζ



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.

DATE _____ LIC. NO. _____

SHEET NOT VALID UNLESS THIS TEXT IS COLOR.

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PROJECT
REDWOOD COUNTY COUNTY DITCH No. 20
REDWOOD COUNTY MINNESOTA

REVISION SCHEDULE		
DATE	DESCRIPTION	BY

PROJECT NO. 23-28479
FILE NAME 28479 SECTIONS
DRAWN BY KJH
DESIGNED BY AJS
REVIEWED BY JMW
ORIGINAL ISSUE DATE --/--
CLIENT PROJECT NO. -

TITLE
CROSS SECTIONS MAINLINE

SHEET
49 OF 49

PRELIMINARY NOT FOR CONSTRUCTION

Appendix B: Order to Proceed

GISLASON & HUNTER LLP
ATTORNEYS AT LAW

RECEIVED
JUN 17 2024
REDWOOD COUNTY
AUDITOR - TREAS

Dean M. Zimmerli
507-354-3111
dzimmerli@gislason.com

June 12, 2024

Ms. Jean Price
Redwood County Auditor-Treasurer
Redwood County Government Center
P.O. Box 130
Redwood Falls, MN 56283

Re: Redwood County Ditch 20
Our File No. 35494.1

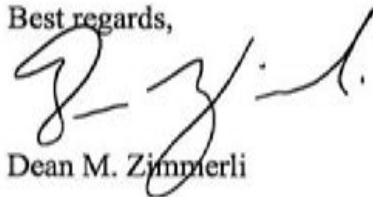
Dear Auditor-Treasurer

Enclosed for filing pursuant to Minn. Stat. § 103E.202, please find a Petition for Improvement of Redwood County Ditch 20. I understand that Michael Anderson will contact the County directly to provide a \$50,000 letter of credit in lieu of a bond.

I request that the matter be presented to the County Attorney to determine if it is adequate pursuant to Minn. Stat. § 103E.238 and refer it to the drainage authority to appoint an engineer to make a preliminary survey within a prescribed time, as specified by Minn. Stat. § 103E.241, subd. 1. Jen Widmer of ISG, Inc. is familiar with the proposed project, and we request that she be appointed engineer on the project.

Please contact me if you have questions or need anything else at this time. Thank you for your consideration.

Best regards,



Dean M. Zimmerli

DMZ:JJB
Enclosure

cc: Mr. Michael Anderson (w/enc.)(via email only)

**PETITION FOR
IMPROVEMENT OF DRAINAGE SYSTEM
REDWOOD COUNTY DITCH NO. 20**

TO: THE REDWOOD COUNTY BOARD OF COMMISSIONERS, ACTING AS THE DRAINAGE AUTHORITY FOR REDWOOD COUNTY DITCH NO. 20

Petitioners respectfully represent, state and request the following:

1. Designation of Drainage System.

This Petition requests the completion of a drainage project consisting of improvements to the drainage system designated as County Ditch No. 20 ("CD 20") located in Redwood County, Minnesota.

2. Necessity for Drainage Project.

The existing drainage system has insufficient capacity or needs enlarging or extending to furnish sufficient capacity or a better outlet. Minn. Stat. § 103E.215, Subd. 4(c)(2). The proposed improvements are necessary to prevent flooding, erosion, and adverse effects on agricultural land.

The drainage system is out of repair and the drainage project petitioned for herein is for a separable portion of the drainage system. Therefore, a portion of the cost may be assessed as a repair. Minn. Stat. § 103E.215, Subd. 6.

3. Description of Proposed Improvement.

The proposed improvement would consist of improving the Mainline and Branch 4 of CD 20. A map showing the proposed improvement is attached hereto as **Exhibit A**.

The Mainline would be improved starting at its outlet in Section 7 of Delhi Township to its connection with Branch 6 in Section 11 of Kintire Township. The proposed improvement would replace the existing 28-inch, 26-inch, 18-inch, and 16-inch buried tile with an open ditch and larger tile as determined by the engineer to provide modern recommended drainage capacity. The proposed open ditch will be approximately 8,800 feet in length, beginning in the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 7 of Delhi Township and ending in the NW $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 12 of Kintire Township. The proposed enlarged buried tile for the mainline would begin at the terminus of the proposed open ditch in the NW $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 12 of Kintire Township and run to its connection with Branch 6 in the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 11 of Kintire Township.

Branch 4 would be improved starting at its connection into the Mainline in Section 12 of Kintire Township up to its connection with Branch 4 Lateral A in the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ Section 11 of Kintire Township. The proposed improvement would consist of replace the existing 20-inch tile with larger tile as determined by the engineer to provide modern recommended drainage capacity.

The project proposes to include water storage within the open ditch to ensure the project has an adequate outlet and complies with multi-purpose drainage management goals described in Minnesota Statute 103E. The exact size and location of the storage is yet to be determined.

4. Jurisdiction.

The undersigned Petitioners constitute: (1) at least 26% of the owners of the property affected by the proposed improvements; (2) at least 26% of the owners of property that the proposed improvements pass over; (3) the owners of at least 26% of the property area affected by the proposed improvements; or (4) the owners of at least 26% of the property area that the proposed improvements pass over. Minn. Stat. § 103E.215, Subd. 4(a).

A complete listing of properties affected by the proposed improvement and their respective owners are set forth on the table attached hereto as **Exhibit B**. Pursuant to Minn. Stat. § 103E.215, Subd. 4(c)(4), set forth below is a list of the 40-acre tracts or government lots that the proposed improvements would pass over, together with the names and addresses of the owners of those tracts; to-wit:

	Owner	Address	PID	Description	Sec	Twp	Rge
1	CHARLOTTE A KNUTSON	328 N OCEAN BLVD, POMPANO BEACH, FL 33062	57-011-1060	SW 1/4 NE 1/4	11	113N	37W
2	JONATHON KNUTSON	986 COWAN TOWN RD, BUTLER, TN 37640-7628	57-011-1040	SE 1/4 NE 1/4	11	113N	37W
3	THOMAS G & ALYSSA B ANDERSON	26202 390 ST REDWOOD FALLS, MN 56283	57-011-4040	NE 1/4 SE 1/4	11	113N	37W
4	GREGORY R & CECILIA M ANDERSON	15943 SE AMELIA RD, GLENWOOD, MN 56334	57-012-2030	NW 1/4 SW 1/4	12	113N	37W
5	GREGORY R & CECILIA M ANDERSON	15943 SE AMELIA RD, GLENWOOD, MN 56334	57-012-2030	NE 1/4 SW 1/4	12	113N	37W
6	OSWALD A JORDAN DISCLAIMER TR	905 POINT PLEASANT RD, MADISON LAKE, MN 56063	57-012-4020	NW 1/4 SE 1/4	12	113N	37W
7	OSWALD A JORDAN DISCLAIMER TR	905 POINT PLEASANT RD, MADISON LAKE, MN 56063	57-012-4020	NE 1/4 SE 1/4	12	113N	37W
8	KENNETH M & CAROL Y ANDERSON	38498 IRONWOOD AVE, REDWOOD FALLS, MN 56283	52-007-3040	NW 1/4 SW 1/4	7	113N	36W
9	KENNETH M & CAROL Y ANDERSON	38498 IRONWOOD AVE, REDWOOD FALLS, MN 56283	52-007-3040	NE 1/4 SW 1/4	7	113N	36W
10	JACQUES FARMS LLC	5005 S BUR OAK PL, SIOUX FALLS, SD 57108	52-007-4020	NW 1/4 SE 1/4	7	113N	36W

	Owner	Address	PID	Description	Sec	Twp	Rge
11	GREGORY R & CECILIA M ANDERSON	15943 SE AMELIA RD, GLENWOOD, MN 56334	57-012-3020	SW 1/4 SW 1/4	11	113N	37W
12	BRUCE A & JAMIE A RIGGE	39462 IMPALA AVE, REDWOOD FALLS, MN 56283-2629	57-011-4060	SE 1/4 SE 1/4	11	113N	37W
13	MN VALLEY REGIONAL RAIL AUTH	200 S MILL ST, REDWOOD FALLS, MN 56283	57-996-0020	NW 1/4 SE 1/4	11	113N	37W

5. Public Utility and Health.

The proposed improvements will be of public benefit and utility because they will (1) protect property and roads from overflow and flooding and (2) render property suitable for cultivation. Minn. Stat. § 103E.215, Subd. 4(c)(5); Minn. Stat. § 103E.005, Subd. 27. Further, the proposed improvements will promote the public health because they will (1) improve the general sanitary condition of property by drainage and (2) prevent overflow that produces or tends to produce unhealthful conditions on agricultural land. Minn. Stat. § 103E.215, Subd. 4(c)(5); Minn. Stat. § 103E.005, Subd. 25.

6. Agreement by Petitioners.

The undersigned Petitioners have been informed and understand that they may not withdraw as a petitioner at any time after this Petition is accepted by the drainage authority, except with the written consent of all other Petitioners on the filed Petition. Also, the undersigned Petitioners acknowledge and agree that they will pay all costs and expenses that may be incurred if the proceedings for this drainage project are dismissed. Minn. Stat. § 103E.215, Subd. 4(c)(6).

7. Cost Bond.

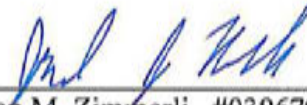
One or more petitioners shall cause a bond to be filed or a check to be delivered in the amount of at least \$10,000.00 payable to the drainage authority. Minn. Stat. § 103E.202, Subd. 5. The bond or payment will be conditioned to pay the costs incurred if the proceedings are dismissed or if a contract is not awarded to construct the proposed improvements described in the petition. *Id.*

WHEREFORE, the Petitioners respectfully request the following:

- a. That the drainage authority accepts this Petition, review it and determine that it is legally adequate;
- b. That the drainage authority appoints an engineer for purposes of evaluating the proposed drainage project and direct the engineer to prepare an engineer's preliminary report for the proposed drainage project, including allowing the engineer to analyze other potential routes for the proposed improvements and whether separable maintenance may be employed. Petitioners request Jen Widmer of ISG, Inc. be appointed as project engineer; and

- c. That the proposed improvements be established and constructed as part of the CD 20 drainage system.

Dated: June 12, 2024



Dean M. Zimmerli #0396791
dzimmerli@gislason.com
Jacob J. Brekke #0504544
jbrekke@gislason.com
GISLASON & HUNTER LLP
Attorneys for Petitioners
2700 South Broadway
P. O. Box 458
New Ulm, MN 56073-0458
Phone: 507-354-3111

[Signature pages to follow]

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

DAVE ANDERSON
KATHRYN ANDERSON

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
<u>SW 1/4</u>	<u>13</u>	<u>113-N</u> 113-N	<u>37-W</u>	<u>Redwood</u>
<u>E 1/3 SE 1/4</u>	<u>15</u>	<u>113-N</u>	<u>37-W</u>	<u>Redwood</u>
<u>NW 1/4</u>	<u>15</u>	<u>113-N</u>	<u>37-W</u>	<u>Redwood</u>

Dated: 4-27-24

David Anderson
 (signature)

Dated: 4-27-24

Kathryn Anderson
 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Eric Anderson
Amanda Anderson

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
Farms Site	15	113N	R237W	Redwood
NE 1/8 of NE 1/4				

Dated: 4/28/24

[Signature]
 (signature)

Dated: 4/28/24

[Signature]
 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Double A Farms Trust
by Glenn Rohlf

Ownership (check one):

- Individual
 Co-Owners (# of co-owners: _____)
 Partner (name of partnership: _____)
 Corporation or limited liability company (name of corporation or LLC: _____)
 Trust (complete name of trust: Double A Farms Trust)
 Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
<u>S 1/2 Sec 5 of R/R 211.48A</u>	<u>10</u>	<u>Kintire</u>	<u>R-37-W</u>	<u>Redwood</u>
<u>NW 1/4 EXTR 8 SW 1/4 N of RR 19132A</u>	<u>10</u>	<u>Kintire</u>	<u>R-37-W</u>	<u>Redwood</u>
<u>N 1/2 NE 1/4 80A</u>	<u>13</u>	<u>Kintire</u>	<u>R-37-W</u>	<u>Redwood</u>
<u>S 1/2 NE 1/4 80A</u>	<u>13</u>	<u>Kintire</u>	<u>R-37-W</u>	<u>Redwood</u>

Dated: 4-29-24 by Glenn Rohlf
 (signature)

Dated: _____
 (signature)

Dated: _____
 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Bruce Rigge
Jamie A Rigge

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: 2)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>SE 1/4 SE 1/4</u>	<u>11</u>	<u>113N</u>	<u>37W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 04-26-2024 Bruce Rigge
 (signature)

Dated: 4/27/24 Jamie Rigge
 (signature)

Dated: _____
 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Andrew Rigge

Ownership (check one):

- Individual
- _____ Co-Owners (# of co-owners: _____)
- _____ Partner (name of partnership: _____)
- _____ Corporation or limited liability company (name of corporation or LLC: _____)
- _____ Trust (complete name of trust: _____)
- _____ Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	149.75A Section	Township	Range	County
<u>SE 1/4 EXTRA</u>	<u>1</u>	<u>113</u>	<u>37</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 4-29-2024

Andrew Rigge
 (signature)

Dated: _____

 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Ardella J. Anderson

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>NE 1/4</u>	<u>9</u>	<u>113-N</u>	<u>37-W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 4-26-24

Ardella J. Anderson
(signature)

Dated: _____

(signature)

Dated: _____

(signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Michael J. Anderson
Jean A. Anderson

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
<u>E 1/2 of SW 1/4</u>	<u>3</u>	<u>113-N</u>	<u>37-W</u>	<u>Redwood</u>
<u>W 1/2 of SE 1/4</u>	<u>3</u>	<u>113-N</u>	<u>37-W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 4-29-24

Michael J. Anderson
 (signature)

Dated: 4-29-24

Jean A. Anderson
 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Tom Ellingson

Ownership (check one):

- Individual
- _____ Co-Owners (# of co-owners: _____)
- _____ Partner (name of partnership: _____)
- _____ Corporation or limited liability company (name of corporation or LLC: _____)
- _____ Trust (complete name of trust: _____)
- _____ Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>East 1/2 of</u> <u>southeast 1/4</u>	<u>3</u>	<u>713-N</u>	<u>37W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 4-30-24

[Signature]
 (signature)

Dated: _____

 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

OSWALD A JORDAN DISCLAIMER TRUST
CARL JORDAN PERS REP

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: OSWALD A JORDAN DISCLAIMER TRUST)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>SE 1/4 EXLRR</u>	<u>12</u>	<u>113</u>	<u>37</u>	<u>REDWOOD</u>
<u>NE 1/4 EXC 4.61 ac Tract</u>	<u>12</u>	<u>113</u>	<u>37</u>	<u>REDWOOD</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 4-28-2024

Carl Jordan Personal Representative
 (signature)

Dated: _____

 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Paul Klause
Gail Klause

Ownership (check one):

Individual
 Co-Owners (# of co-owners: 2)
 Partner (name of partnership: _____)
 Corporation or limited liability company (name of corporation or LLC: _____)
 Trust (complete name of trust: _____)
 Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
<u>S 1/2 NE 1/4 EX TR and</u>	<u>10</u>	<u>113</u>	<u>37</u>	<u>Redwood</u>
<u>N 1/2 SE 1/4 N RR R/W D8.35A</u>	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 5-1-24 Paul Klause
 (signature)

Dated: 5/1/24 Gail Klause
 (signature)

Dated: _____
 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Taylor Klause

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: 5)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: Paul A and Gail E Klause ETAL)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
<u>N 1/2 NE 1/4 EX TR 76.70A</u>	<u>10</u>	<u>113</u>	<u>37</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 5-1-24

Tom Klause
(signature)

Dated: _____

(signature)

Dated: _____

(signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Tom Anderson
Alyssa Anderson

Ownership (check one):

Individual
 Co-Owners (# of co-owners: X)
 Partner (name of partnership: _____)
 Corporation or limited liability company (name of corporation or LLC: _____)
 Trust (complete name of trust: _____)
 Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>SE 1/4 N of RR, 82.84 A</u>	<u>11</u>	<u>113</u>	<u>37</u>	<u>Redwood</u>
<u>Property ID # 57-011-4040</u>	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 5/11/24

Tom Anderson
 (signature)

Dated: 5/11/24

Alyssa Anderson
 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Carol Yvonne Anderson Estate

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: Estate)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>NW 1/4 SW 1/4</u>	<u>7</u>	<u>113N</u>	<u>36W</u>	<u>Redwood</u>
<u>NE 1/4 SW 1/4</u>	<u>7</u>	<u>113N</u>	<u>36W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 05/01/2024

Jim Bengtson
 (signature)

Dated: _____

 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Cole Steven Andersen

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

Tract Description	Section	Township	Range	County
<u>w 1/2 SE 1/4</u>	<u>2</u>	<u>13N</u>	<u>37W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 5-6-24

Cole SA
 (signature)

Dated: _____

 (signature)

Dated: _____

 (signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Don Hagen

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>Kirture Sec 14</u>	<u>14</u>	<u>Kirture</u>	<u>37W</u>	<u>Redwood</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 5-6-24

Donald W Hagen
(signature)

Dated: _____

(signature)

Dated: _____

(signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

VICKIE HUHNERKOLH

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: _____)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)

Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>SE 1/4</u>	<u>9</u>	<u>113</u>	<u>37</u>	<u>RED.</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 5-8-24

Vickie Huhnerkohl
(signature)

Dated: _____

(signature)

Dated: _____

(signature)

SIGNATURE PAGES FOR
 PETITION FOR NEW DRAINAGE PROJECT:
 IMPROVEMENT OF DRAINAGE SYSTEM
 REDWOOD COUNTY DITCH NO. 20

Name of Petitioner(s) (please print or type):

Dean Vroman

Ownership (check one):

- Individual
- Co-Owners (# of co-owners: 3)
- Partner (name of partnership: _____)
- Corporation or limited liability company (name of corporation or LLC: _____)
- Trust (complete name of trust: _____)
- Other (explanation: _____)


Statement of Authority:

The undersigned states and represents that if he or she is executing in a representative capacity, he or she has the authority to execute on behalf of the respective partnership, corporation, limited liability company, trust or other such entity.

The above-named Petitioner(s) owns the following tract(s) which the proposed improvement will pass over or which is affected by the proposed improvement.

<u>Tract Description</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>	<u>County</u>
<u>SW 1/4</u>	<u>14</u>	<u>T-113-N</u>	<u>37W</u>	<u>Redwood</u>
_____	_____	_____	37W	Redwood
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Dated: 6/1/2024


 (signature)

Dated: _____

 (signature)

Dated: _____

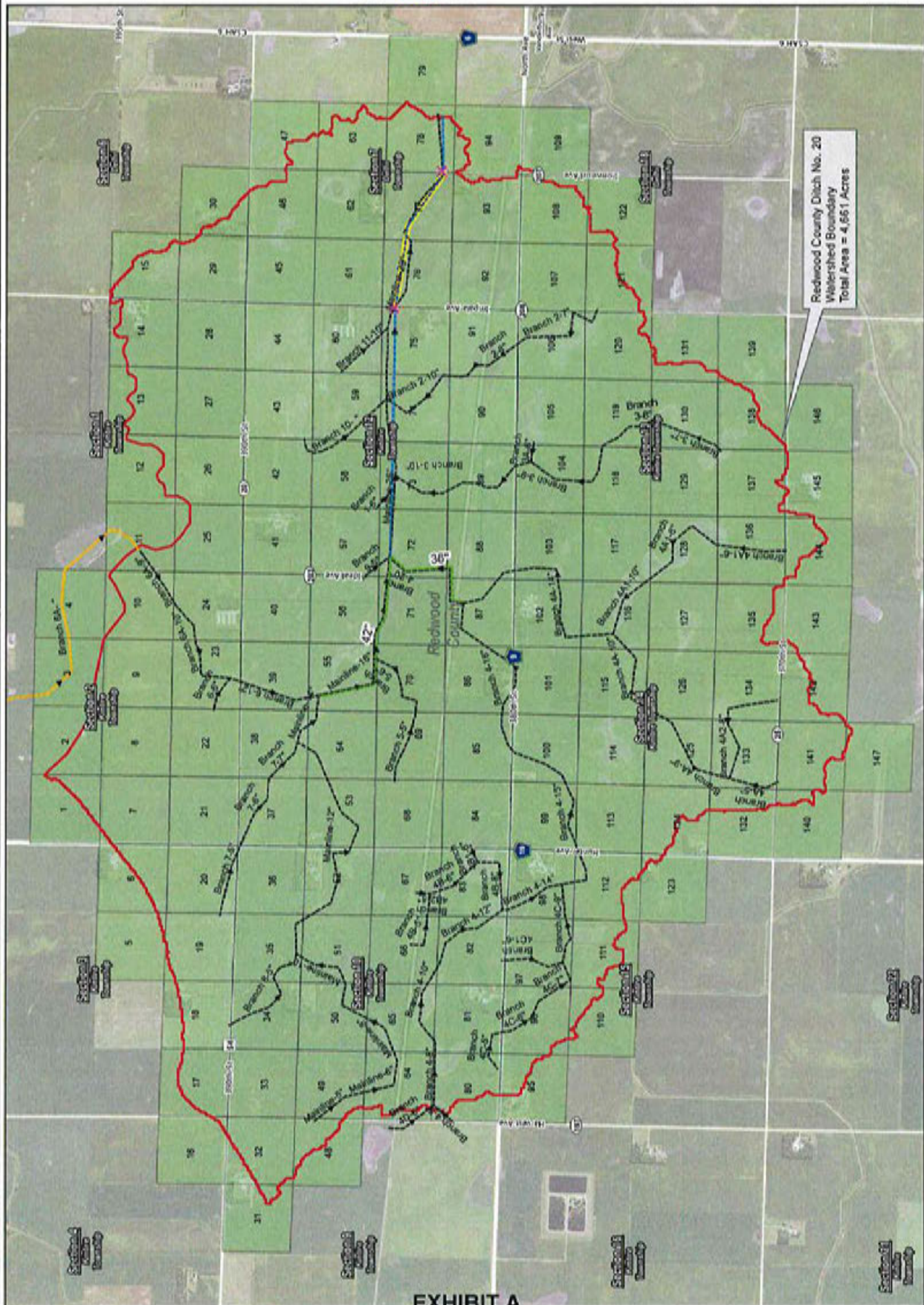
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Exhibit A
 County Ditch No 20
 Redwood County,
 Minnesota

- Legend**
- Culvert Crossing
 - Proposed Tile
 - Proposed Open Ditch
 - Existing Tile
 - Abandoned Tile
 - Potential Ditch Storage
 - Watershed
 - 40%'s
 - Parcels

PN: 23-2043
 DATE: 08/20/2023
 PROJECT: Redwood County Ditch No. 20
 CLIENT: Redwood County, Minnesota
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 SCALE: AS SHOWN



Redwood County Ditch No. 20
 Watershed Boundary
 Total Area = 4,661 Acres

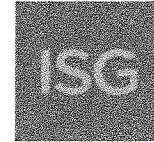
EXHIBIT A

**REDWOOD COUNTY
COUNTY DITCH No. 20**



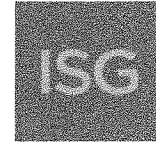
Tract	PIN	Landowner	Deed Acres	Tract Acres
1	570022030	RIGGE/BRUCE A & JAMIE A	75	10.31
2	570022040	GRANNES/CHARLES & JUDY	81	16.78
3	570021040	GRANNES/CLARK A & DENISE R	154	3.80
5	570033080	ANDERSON/MICHAEL J & JEAN A	77	0.99
6	570023020	DONNER/DALE A & CHARLOTTE R	80	0.13
6	570034020	ELLINGSON/TIM & VICKI	6	0.58
6	570034040	ELLINGSON/TIM	74	16.98
7	570023020	DONNER/DALE A & CHARLOTTE R	80	38.82
7	570023040	ANDERSON/THOMAS G/ETAL	80	0.11
7	570022030	RIGGE/BRUCE A & JAMIE A	75	1.22
8	570023040	ANDERSON/THOMAS G/ETAL	80	39.24
8	570022040	GRANNES/CHARLES & JUDY	81	1.65
9	570024020	NEITZEL/CHARLES D	155	39.27
9	570021040	GRANNES/CLARK A & DENISE R	154	1.56
10	570024020	NEITZEL/CHARLES D	155	33.09
10	570013020	LUND/MARILYN J	160	0.67
11	570013020	LUND/MARILYN J	160	10.57
12	570013020	LUND/MARILYN J	160	9.65
12	570014020	RIGGE/ANDREW JAMES	150	0.13
13	570014020	RIGGE/ANDREW JAMES	150	26.90
14	570014020	RIGGE/ANDREW JAMES	150	25.17
14	570014040	RIGGE/BRUCE A & JAMIE A	11	7.91
15	520063020	HULTQUIST/CASEY	157	23.10
16	570044040	WEIDEMANN/BURTON & ORLEEN P	40	0.84
17	570033040	COLE/BARBARA J/ETAL	40	25.42
17	570033080	ANDERSON/MICHAEL J & JEAN A	77	0.20
17	570102040	DOUBLE A FARMS TRUST	191	0.16
18	570033060	ARNDT/APRIL M/ETAL	0	3.02
18	570033080	ANDERSON/MICHAEL J & JEAN A	77	26.38
18	570102040	DOUBLE A FARMS TRUST	191	0.14
19	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	0.13
19	570034040	ELLINGSON/TIM	74	0.24
19	570033080	ANDERSON/MICHAEL J & JEAN A	77	38.52
20	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	0.12
20	570023020	DONNER/DALE A & CHARLOTTE R	80	0.17
20	570034040	ELLINGSON/TIM	74	40.49
21	570023020	DONNER/DALE A & CHARLOTTE R	80	40.76
21	570023040	ANDERSON/THOMAS G/ETAL	80	0.23
22	570023040	ANDERSON/THOMAS G/ETAL	80	40.64
22	570024020	NEITZEL/CHARLES D	155	0.28
23	570024020	NEITZEL/CHARLES D	155	40.79
24	570024040	CHRISTENSEN FARMS MIDWEST LLC	5	4.96
24	570024020	NEITZEL/CHARLES D	155	35.05
24	570013020	LUND/MARILYN J	160	0.64
25	570013020	LUND/MARILYN J	160	36.38
26	570013020	LUND/MARILYN J	160	39.41
26	570014020	RIGGE/ANDREW JAMES	150	0.13
27	570014020	RIGGE/ANDREW JAMES	150	40.11
28	570014020	RIGGE/ANDREW JAMES	150	40.01
29	520063020	HULTQUIST/CASEY	157	37.73
30	520063020	HULTQUIST/CASEY	157	8.33
31	570091040	ANDERSON/ARDELLA J	180	2.32
32	570091020	ANDERSON/MICHAEL J & JEAN A	10	0.80
32	570091040	ANDERSON/ARDELLA J	180	30.75
32	570102040	DOUBLE A FARMS TRUST	191	0.40
33	570102040	DOUBLE A FARMS TRUST	191	39.93
34	570102040	DOUBLE A FARMS TRUST	191	34.11
34	570102020	ROHLIK/GINA	10	5.80
35	570101040	KLAUSE/PAUL A & GAIL E	128	0.14
35	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	39.88
36	570101020	IVERSON/PAUL H & LORI A	10	3.36
36	570112060	ANDERSON/GREGORY R & CECILIA M	127	0.25
36	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	36.37

**REDWOOD COUNTY
COUNTY DITCH No. 20**



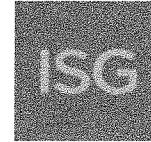
Tract	PIN	Landowner	Deed Acres	Tract Acres
37	570112020	HACKER/ERIC W & SAMANTHA	0	0.87
37	570112060	ANDERSON/GREGORY R & CECILIA M	127	39.42
38	570112060	ANDERSON/GREGORY R & CECILIA M	127	5.43
38	570112040	PETERSON LONG LANE FARM LLC	100	34.44
38	570111060	KNUTSON/CHARLOTTE A	80	0.39
39	570024020	NEITZEL/CHARLES D	155	0.16
39	570111040	KNUTSON/JONATHON	50	0.47
39	570111060	KNUTSON/CHARLOTTE A	80	39.72
40	570122010	ANDERSON/GREGORY R & CECILIA M	68	0.54
40	570024020	NEITZEL/CHARLES D	155	0.17
40	570111020	KNUTSON/JONATHON	30	15.05
40	570111040	KNUTSON/JONATHON	50	24.54
41	570122020	ANDERSON/GREGORY R & CECILIA M	12	12.47
41	570122010	ANDERSON/GREGORY R & CECILIA M	68	27.43
41	570013020	LUND/MARILYN J	160	0.25
42	570122010	ANDERSON/GREGORY R & CECILIA M	68	39.96
42	570013020	LUND/MARILYN J	160	0.18
43	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	39.96
43	570014020	RIGGE/ANDREW JAMES	150	0.16
44	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	39.99
44	570014020	RIGGE/ANDREW JAMES	150	0.20
45	520072040	GREENFIELD LLP	150	39.04
45	520063020	HULTQUIST/CASEY	157	0.23
46	520072040	GREENFIELD LLP	150	35.01
46	520063020	HULTQUIST/CASEY	157	0.17
47	520071020	JACQUES FARMS LLC	160	7.96
48	570091040	ANDERSON/ARDELLA J	180	12.00
48	570102040	DOUBLE A FARMS TRUST	191	0.32
49	570102040	DOUBLE A FARMS TRUST	191	38.61
50	570101040	KLAUSE/PAUL A & GAIL E	128	0.16
50	570102040	DOUBLE A FARMS TRUST	191	35.70
50	570102020	ROHLIK/GINA	10	4.20
51	570101040	KLAUSE/PAUL A & GAIL E	128	40.11
52	570101040	KLAUSE/PAUL A & GAIL E	128	32.99
52	570101020	IVERSON/PAUL H & LORI A	10	6.68
52	570112060	ANDERSON/GREGORY R & CECILIA M	127	0.40
53	570112020	HACKER/ERIC W & SAMANTHA	0	2.10
53	570112060	ANDERSON/GREGORY R & CECILIA M	127	38.08
54	570112060	ANDERSON/GREGORY R & CECILIA M	127	5.29
54	570112040	PETERSON LONG LANE FARM LLC	100	34.50
54	570111060	KNUTSON/CHARLOTTE A	80	0.41
55	570111040	KNUTSON/JONATHON	50	0.44
55	570111060	KNUTSON/CHARLOTTE A	80	39.79
56	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.46
56	570111020	KNUTSON/JONATHON	30	15.14
56	570111040	KNUTSON/JONATHON	50	24.65
57	570122010	ANDERSON/GREGORY R & CECILIA M	68	0.11
57	570122030	ANDERSON/GREGORY R & CECILIA M	200	39.99
58	570122030	ANDERSON/GREGORY R & CECILIA M	200	40.03
59	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	39.80
59	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.31
60	570121040	JORDAN/CARL OSWALD	5	4.36
60	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	35.74
61	520072040	GREENFIELD LLP	150	39.50
62	520072020	ANDERSON/KENNETH M & CAROL Y	12	8.79
62	520072040	GREENFIELD LLP	150	31.56
63	520071020	JACQUES FARMS LLC	160	30.19
63	520072040	GREENFIELD LLP	150	0.22
64	570103020	DOUBLE A FARMS LIVING TRUST	211	14.54
64	570102040	DOUBLE A FARMS TRUST	191	16.85
64	579960020	MN VALLEY REGIONAL RAIL AUTH	0	2.65

**REDWOOD COUNTY
COUNTY DITCH No. 20**



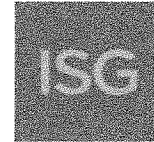
Tract	PIN	Landowner	Deed Acres	Tract Acres
65	570103020	DOUBLE A FARMS LIVING TRUST	211	14.79
65	570101040	KLAUSE/PAUL A & GAIL E	128	0.14
65	570102040	DOUBLE A FARMS TRUST	191	22.18
65	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.04
66	570103020	DOUBLE A FARMS LIVING TRUST	211	11.77
66	570101040	KLAUSE/PAUL A & GAIL E	128	25.39
66	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.05
67	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.10
67	570103020	DOUBLE A FARMS LIVING TRUST	211	8.65
67	570101040	KLAUSE/PAUL A & GAIL E	128	28.01
67	570112060	ANDERSON/GREGORY R & CECILIA M	127	0.44
67	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.05
68	570113020	SUMMIT FARMLAND IV LLP ETAL	88	5.24
68	570112060	ANDERSON/GREGORY R & CECILIA M	127	31.80
68	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.02
69	570113020	SUMMIT FARMLAND IV LLP ETAL	88	1.39
69	570114040	ANDERSON/GREGORY R/&	83	0.15
69	570112060	ANDERSON/GREGORY R & CECILIA M	127	4.60
69	570112040	PETERSON LONG LANE FARM LLC	100	30.97
69	579960020	MN VALLEY REGIONAL RAIL AUTH	0	2.98
70	570114040	ANDERSON/GREGORY R/&	83	39.29
70	579960020	MN VALLEY REGIONAL RAIL AUTH	0	0.75
71	570114040	ANDERSON/GREGORY R/&	83	39.76
71	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.37
72	570122030	ANDERSON/GREGORY R & CECILIA M	200	39.69
72	570123020	ANDERSON/GREGORY R & CECILIA M	34	0.36
73	570122030	ANDERSON/GREGORY R & CECILIA M	200	39.79
73	570123020	ANDERSON/GREGORY R & CECILIA M	34	0.27
74	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	39.49
74	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.59
75	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	40.02
76	520073040	ANDERSON/KENNETH M & CAROL Y	149	39.64
77	520073040	ANDERSON/KENNETH M & CAROL Y	149	39.17
77	520072020	ANDERSON/KENNETH M & CAROL Y	12	1.21
78	520073040	ANDERSON/KENNETH M & CAROL Y	149	0.16
78	520074020	JACQUES FARMS LLC	115	33.67
78	520072020	ANDERSON/KENNETH M & CAROL Y	12	1.01
78	520071020	JACQUES FARMS LLC	160	0.13
80	570103020	DOUBLE A FARMS LIVING TRUST	211	28.72
81	570151040	ANDERSON/DAVID & KATHRYN	204	0.24
81	570103020	DOUBLE A FARMS LIVING TRUST	211	40.01
82	570151020	ANDERSON/LEROY M/TRUST B	97	0.10
82	570151040	ANDERSON/DAVID & KATHRYN	204	0.20
82	570103020	DOUBLE A FARMS LIVING TRUST	211	40.00
83	570151020	ANDERSON/LEROY M/TRUST B	97	0.27
83	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.54
83	570103020	DOUBLE A FARMS LIVING TRUST	211	39.52
84	570113020	SUMMIT FARMLAND IV LLP ETAL	88	39.87
85	570113020	SUMMIT FARMLAND IV LLP ETAL	88	39.92
86	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.47
86	570114040	ANDERSON/GREGORY R/&	83	0.28
86	579960020	MN VALLEY REGIONAL RAIL AUTH	0	2.27
86	570114020	LARSEN/BRADLEY & JENNIFER	7	7.62
86	570114060	RIGGE/BRUCE A & JAMIE A	62	29.35
87	570141020	LARSON/LELAND	159	0.38
87	570114040	ANDERSON/GREGORY R/&	83	3.39
87	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.14
87	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.02
87	570114060	RIGGE/BRUCE A & JAMIE A	62	32.96

**REDWOOD COUNTY
COUNTY DITCH No. 20**



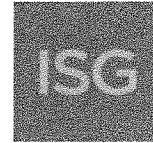
Tract	PIN	Landowner	Deed Acres	Tract Acres
88	570132020	LARSON/LELAND A	160	0.69
88	570123020	ANDERSON/GREGORY R & CECILIA M	34	7.42
88	570122030	ANDERSON/GREGORY R & CECILIA M	200	19.92
88	570123020	ANDERSON/GREGORY R & CECILIA M	34	8.96
88	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
89	570132020	LARSON/LELAND A	160	0.53
89	570123020	ANDERSON/GREGORY R & CECILIA M	34	11.53
89	570122030	ANDERSON/GREGORY R & CECILIA M	200	19.48
89	570123020	ANDERSON/GREGORY R & CECILIA M	34	5.47
89	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
90	570131020	DOUBLE A FARMS LIVING TRUST	80	0.38
90	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	20.46
90	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	15.37
90	570123020	ANDERSON/GREGORY R & CECILIA M	34	0.27
90	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.46
90	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
91	570131020	DOUBLE A FARMS LIVING TRUST	80	0.28
91	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	16.98
91	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	19.71
91	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
92	520182020	JORDAN/DARLENE	159	0.17
92	520073040	ANDERSON/KENNETH M & CAROL Y	149	13.21
92	520073040	ANDERSON/KENNETH M & CAROL Y	149	23.46
92	529960020	MINNESOTA VALLEY REGIONAL	0	3.00
93	520073040	ANDERSON/KENNETH M & CAROL Y	149	9.56
93	520073020	PATNOE/JODI	0	2.70
93	520073040	ANDERSON/KENNETH M & CAROL Y	149	22.65
93	529960020	MINNESOTA VALLEY REGIONAL	0	2.90
94	520074020	JACQUES FARMS LLC	115	0.20
94	520074020	JACQUES FARMS LLC	115	4.43
95	570151040	ANDERSON/DAVID & KATHRYN	204	8.95
95	570152020	NELSON/DONNA & ELDON	0	0.83
95	570152040	NELSON/TROY E & ANGEL B	0	0.68
96	570151040	ANDERSON/DAVID & KATHRYN	204	37.72
97	570151020	ANDERSON/LEROY M/TRUST B	97	13.69
97	570151040	ANDERSON/DAVID & KATHRYN	204	25.80
98	570142060	ANDERSON/LEROY M/TRUST B	80	0.49
98	570151020	ANDERSON/LEROY M/TRUST B	97	28.83
98	570151030	ANDERSON/DAVID M & KATHRYN K	7	6.87
98	570151035	ANDERSON/ERIC M & AMANDA J	0	3.13
99	570142060	ANDERSON/LEROY M/TRUST B	80	38.88
100	570142030	HAGEN/DONALD & NANCY	78	36.13
100	570142020	SOUPIR/BRANDON C & APRIL E	0	2.51
100	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.48
101	570142030	HAGEN/DONALD & NANCY	78	0.57
101	570141020	LARSON/LELAND	159	38.46
101	570114020	LARSEN/BRADLEY & JENNIFER	7	0.16
101	570114060	RIGGE/BRUCE A & JAMIE A	62	0.20
102	570141020	LARSON/LELAND	159	39.26
102	570132020	LARSON/LELAND A	160	0.38
103	570132020	LARSON/LELAND A	160	39.61
104	570132020	LARSON/LELAND A	160	39.50
105	570132020	LARSON/LELAND A	160	0.81
105	570131020	DOUBLE A FARMS LIVING TRUST	80	38.59
106	570131020	DOUBLE A FARMS LIVING TRUST	80	39.22
107	520182020	JORDAN/DARLENE	159	39.32
108	520182020	JORDAN/DARLENE	159	34.88
109	520181020	MILLER/BETTY M/ETAL	80	0.57
110	570151040	ANDERSON/DAVID & KATHRYN	204	7.25
111	570151020	ANDERSON/LEROY M/TRUST B	97	10.10
111	570151040	ANDERSON/DAVID & KATHRYN	204	15.89

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
112	570142060	ANDERSON/LEROY M/TRUST B	80	0.45
112	570151020	ANDERSON/LEROY M/TRUST B	97	32.61
113	570142030	HAGEN/DONALD & NANCY	78	0.13
113	570142060	ANDERSON/LEROY M/TRUST B	80	38.87
114	570142030	HAGEN/DONALD & NANCY	78	39.32
115	570142030	HAGEN/DONALD & NANCY	78	0.19
115	570141020	LARSON/LELAND	159	39.36
116	570141020	LARSON/LELAND	159	39.15
116	570132020	LARSON/LELAND A	160	0.63
117	570132020	LARSON/LELAND A	160	39.59
118	570132020	LARSON/LELAND A	160	39.48
119	570131060	DOUBLE A FARMS TRUST	80	38.47
119	570132020	LARSON/LELAND A	160	0.43
119	570131020	DOUBLE A FARMS LIVING TRUST	80	0.48
120	570131060	DOUBLE A FARMS TRUST	80	36.95
120	570131020	DOUBLE A FARMS LIVING TRUST	80	0.30
121	520182020	JORDAN/DARLENE	159	23.29
122	520182020	JORDAN/DARLENE	159	3.56
123	570143040	VROMAN/DEAN/ETAL	78	0.14
123	570154030	KING/LEON & SHARON	0	1.55
124	570143040	VROMAN/DEAN/ETAL	78	27.55
125	570143040	VROMAN/DEAN/ETAL	78	39.18
125	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	0.21
126	570141020	LARSON/LELAND	159	0.31
126	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	26.01
126	570144040	LARSON/LELAND A	52	13.38
127	570133060	ANDERSON/DAVID M & KATHRYN K	53	0.75
127	570141020	LARSON/LELAND	159	0.57
127	570144040	LARSON/LELAND A	52	12.67
127	570144020	HUHNERKOCH/CAROLYN	52	25.94
128	570133060	ANDERSON/DAVID M & KATHRYN K	53	25.35
128	570133020	ANDERSON/LEROY/TRUST A ETAL	34	13.30
128	570132020	LARSON/LELAND A	160	0.92
129	570133020	ANDERSON/LEROY/TRUST A ETAL	34	12.54
129	570133040	ANDERSON/DAVID M & KATHRYN K	53	25.52
129	570132020	LARSON/LELAND A	160	1.38
130	570134020	HUHNERKOCH/HERBERT C	80	37.93
130	570131060	DOUBLE A FARMS TRUST	80	1.36
131	570134020	HUHNERKOCH/HERBERT C	80	9.64
131	570131060	DOUBLE A FARMS TRUST	80	0.50
132	570143040	VROMAN/DEAN/ETAL	78	12.04
133	570232020	GRANNES/DENISE R	80	0.29
133	570143040	VROMAN/DEAN/ETAL	78	38.72
133	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	0.60
134	570231020	ANDERSON/LEROY M/TRUST B	153	0.16
134	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	25.87
134	570144040	LARSON/LELAND A	52	13.80
135	570133060	ANDERSON/DAVID M & KATHRYN K	53	0.73
135	570144040	LARSON/LELAND A	52	10.72
135	570144020	HUHNERKOCH/CAROLYN	52	21.86
136	570133060	ANDERSON/DAVID M & KATHRYN K	53	25.73
136	570133020	ANDERSON/LEROY/TRUST A ETAL	34	13.79
137	570134040	HUHNERKOCH/HERBERT C	80	0.33
137	570133020	ANDERSON/LEROY/TRUST A ETAL	34	12.26
137	570133040	ANDERSON/DAVID M & KATHRYN K	53	25.93
138	570134040	HUHNERKOCH/HERBERT C	80	24.98
138	570134020	HUHNERKOCH/HERBERT C	80	1.22
139	570134040	HUHNERKOCH/HERBERT C	80	0.38
139	570134020	HUHNERKOCH/HERBERT C	80	0.13
140	570232020	GRANNES/DENISE R	80	4.42

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
141	570232040	DOUBLE A FARMS TRUST	80	0.10
141	570231020	ANDERSON/LEROY M/TRUST B	153	0.83
141	570232020	GRANNES/DENISE R	80	33.93
142	570231040	PRAHL/BRADLEY & NANCY	0	5.20
142	570231020	ANDERSON/LEROY M/TRUST B	153	14.40
143	570231040	PRAHL/BRADLEY & NANCY	0	0.18
143	570231020	ANDERSON/LEROY M/TRUST B	153	1.15
144	570242040	SIEGFRIED/RICK D	150	13.29
144	570133060	ANDERSON/DAVID M & KATHRYN K	53	0.26
144	570133020	ANDERSON/LEROY/TRUST A ETAL	34	0.21
145	570242040	SIEGFRIED/RICK D	150	1.21
145	570133040	ANDERSON/DAVID M & KATHRYN K	53	0.35
147	570232040	DOUBLE A FARMS TRUST	80	0.70

STATE OF MINNESOTA
REDWOOD COUNTY BOARD OF COMMISSIONERS
PUBLIC DRAINAGE AUTHORITY FOR THE IMPROVEMENT OF REDWOOD COUNTY DITCH 20

The matter of the Petition for the improvement of Redwood County Ditch 20

Preliminary Findings and Order

The Drainage Authority of Redwood County Ditch 20, at a meeting held on September 3, 2024, considered the petition for the improvement of County Ditch 20. Upon review of the petition for improvement and the accompanying bond, Commissioner Van Hee moved, seconded by Commissioner Wakefield, for adoption of the following:

Findings:

1. The petition for the improvement of Redwood County Ditch 20 (CD 20) has been filed with the Redwood County Auditor-Treasurer pursuant to statutes section 103E.2120.
2. The Drainage Authority, by its attorney, verified the signatures and ownership interests of the petitioners and finds that the petitioners are at least 26 percent of the owners of the property area affected by the proposed improvement.
3. The petition properly designated the drainage system proposed to be improved by number or another description that identifies the drainage system.
4. The petition alleges that the drainage system has insufficient capacity or needs enlarging to furnish sufficient capacity.
5. The petition describes the improvement, including the names and addresses of owners of the 40-acre tracts or government lots and property that the improvement passes over.
6. The petition alleges that the proposed improvement is necessary and will be of public utility and promote the public health.
7. The petition contains an agreement by the petitioners that they will pay all costs and expenses that may be incurred if the improvement proceedings are dismissed.
8. The petition alleges that the existing drainage system needs repair and further petitions the Board to consider separable maintenance when determining the allocation of costs of the improvement. Should the portion of the petition seeking improvement be withdrawn by the petitioners, the Board may still consider the petition as one for repair pursuant to statutes section 103E.7120.

9. The petition was accompanied by a bond from the petitioners of \$50,000 in the form of an irrevocable letter of credit with Redwood County Drainage Authority listed as the beneficiary. The bond is adequate surety and has been reviewed and approved by Board's attorney. The bond is conditioned to pay the costs incurred if the proceedings are dismissed or a contract is not awarded to construct the drainage system proposed in the petition.
10. The costs incurred before the proposed drainage project is established may not exceed the amount of the petitioners' bond. A claim for expenses greater than the amount of the bond may not be paid unless an additional bond is filed. If the Drainage Authority determines that the cost of the proceeding will be greater than the petitioners' bond before the proposed drainage project is established, the Drainage Authority shall require an additional bond to cover all costs to be filed within a prescribed time. The proceeding will be stopped until the additional bond prescribed by the Drainage Authority is filed. If the additional bond is not filed within the time prescribed, the proceeding will be dismissed.
11. The Drainage Authority's attorney has reviewed the petition and bond and has determined they meet the requirement of these proceedings.

Based on the foregoing findings, the Drainage Authority Board adopts the following:

Order:

- a. The Board appoints the engineering firm of ISG, Inc., and Jen Widmer, P.E., to make a preliminary survey and file a report.
- b. The engineer shall serve as the engineer for the drainage project throughout the proceedings and construction unless otherwise ordered.
- c. The engineer shall file an oath to faithfully perform the assigned duties in the best manner possible and file a bond with the Board. The Board's attorney is directed to prepare a draft of the bond and oath upon execution of this order and deliver the same, along with a copy of this order, to the engineer for execution.
- d. Upon execution and return of the engineer's bond and oath, the engineer shall proceed promptly with the preparation of a preliminary survey report.
- e. The engineer shall include in the preliminary survey and report an investigation of the scope of improvement to include consideration of alternative improvement configurations and the impact of regulatory permitting requirements related to wetlands or other environmental factors on the possible alternatives.
- f. The engineer shall include in the preliminary survey and report an investigation of the current condition of the portion of the drainage system proposed to be improved and

provide a recommendation on the propriety of a separable maintenance allocation of project costs.

- g. The engineer is directed to initial early coordination with the Department of Natural Resources and other regulatory and funding agencies as contemplated by statutes section 103E.0120.

After discussion, the Chairperson called the question. The question was on the adoption of the foregoing findings and order, and there were, 5 yeas, 0 nays, 0 absent, and 0 abstentions as follows:

	Yea	Nay	Absent	Abstain
Wakefield	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Groebner	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forkrud	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salfer	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Van Hee	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Commissioner Rick Wakefield, Chairperson

Dated: September 3, 2024

* * * * *

I, Nick Brozek, Environmental Director of Redwood County, do hereby certify that I have compared the above resolution with the original thereof as the same appears of record and on file with the County and find the same to be a true and correct transcript thereof.

IN TESTIMONY WHEREOF, I hereunto set my hand this 18th day of September 2024.



Nick Brozek, Environmental Director

STATE OF MINNESOTA
REDWOOD COUNTY DRAINAGE AUTHORITY
PUBLIC DRAINAGE AUTHORITY PETITION FOR IMPROVEMENT OF
REDWOOD COUNTY DITCH 20

The matter of the Petition for the
Improvement of
Redwood County Ditch 20

**Engineer's Oath (Minn. Stat.
§103E.241, subd. 2)**

ISG, Inc., and Jen Widmer, P.E. (Engineer), having been appointed by the Drainage Authority Board of Redwood County, Drainage Authority for Petition for the Improvement of Redwood County Ditch 20, Drainage Engineer for the project pursuant to Minnesota Statutes Chapter 103E, does hereby swear or affirm to faithfully perform the assigned duties in the best manner possible and to diligently and honestly perform the Engineer's duties and set forth in Chapter 103E according the professional standards required of professional engineers.

This 11th day of September 2024.

ISG, Inc.



By Jen Widmer, PE
Reg. No. 61313

STATE OF MINNESOTA
REDWOOD COUNTY DRAINAGE AUTHORITY
PUBLIC DRAINAGE AUTHORITY PETITION FOR IMPROVEMENT OF
REDWOOD COUNTY DITCH 20

The matter of the Petition for the
Improvement of
Redwood County Ditch 20

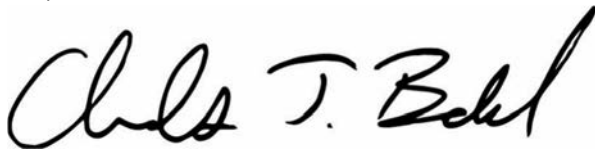
**Engineer's Bond (Minn. Stat.
§103E.241, subd. 2)**

Know All by These Presents, that ISG, Inc. (Chuck Brandel, P.E.), as principal and surety, is held and firmly bound to the Drainage Authority for Redwood County, Drainage Authority for the Petition for the Improvement of Redwood County Ditch 20, in an amount equal to \$100,000 for which the Engineer will maintain commercial general liability and professional liability coverage limits, per occurrence and per claim respectively, of not less than that amount during the entire term of the Engineer's appointment, to pay on any proven claim by any person or the Drainage Authority for damages and injuries resulting from negligence of the Engineer while the Engineer is acting in the proceedings for the Petition for the Improvement of Redwood County Ditch 20.

The condition of the above obligation is such: Engineer was appointed by the Drainage Authority as the Drainage Engineer for the petition for the Improvement of Redwood County Ditch 20. Minnesota Statutes Section 103E.241, subd. 2, requires the Engineer to file a bond of at least \$5,000 with the Drainage Authority upon appointment. The bond must be conditioned to pay any person or the Drainage Authority for damages and injuries resulting from negligence of the Engineer while the Engineer is acting in the proceedings or construction and provide that the Engineer will diligently and honestly perform the Engineer's duties. The aggregate liability of the Engineer for all proven claims shall not exceed the amount of the Engineer's bond, for which the Engineer acknowledges being held and firmly bound in the amount of \$100,000 to be underwritten by the Engineer's obligation to provide commercial general liability and professional liability insurance during the term of the Engineer's appointment.

Signed this 11th day of September 2024.

ISG, Inc.



By Chuck Brandel
Reg. No. 43359

DATE: March 26, 2024

TO: Dean Zimmerli – Gislason & Hunter

FROM: Jen Widmer, PE - ISG

SUBJECT: Redwood County Ditch No. 20 Petition Summary

The Redwood County Ditch No. 20 Improvement Project proposes to improve portions of the Mainline and Branch 4.

The Mainline will be improved starting at its outlet in Section 7 of Delhi Township to its connection with Branch 6 in Section 11 of Kintire Township. The proposed Mainline will replace the existing 28-inch, 26-inch, 18-inch, and 16-inch buried tile with an open ditch and 42-inch tile. The proposed open ditch will be approximately 8,800 feet in length, beginning in the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 7 of Delhi Township and ending in the SW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 12 of Kintire Township. The proposed 42-inch buried tile will begin at the proposed open ditch in the SW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 12 of Kintire Township and run to its connection with Branch 6 in the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 11 of Kintire Township.

Branch 4 will be improved starting at its connection into the Mainline in Section 12 of Kintire Township up to its connection with Branch 4 Lateral A in the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ Section 11 of Kintire Township. Branch 4 will replace the existing 20-inch tile with a 36-inch tile.

The project proposes to include storage within the open ditch to ensure the project has an adequate outlet and complies with Minnesota Statute 103.E. The exact size and location of the storage is yet to be determined.

**REDWOOD COUNTY
COUNTY DITCH No. 20**



IMPROVEMENT COST SUMMARY

Option	Separable Maintenance	Improvement Cost	Net Cost
Mainline Open Ditch	\$ 864,481	\$ 909,307	\$ 44,826
Mainline (Segment)	\$ 206,952	\$ 685,790	\$ 478,838
Branch 4 (Segment)	\$ 223,529	\$ 313,400	\$ 89,871
Total Project Costs	\$ 1,294,962	\$ 1,908,497	\$ 613,535

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
1	570022030	RIGGE/BRUCE A & JAMIE A	75	10.31
2	570022040	GRANNES/CHARLES & JUDY	81	16.78
3	570021040	GRANNES/CLARK A & DENISE R	154	3.80
5	570033080	ANDERSON/MICHAEL J & JEAN A	77	0.99
6	570023020	DONNER/DALE A & CHARLOTTE R	80	0.13
6	570034020	ELLINGSON/TIM & VICKI	6	0.58
6	570034040	ELLINGSON/TIM	74	16.98
7	570023020	DONNER/DALE A & CHARLOTTE R	80	38.82
7	570023040	ANDERSON/THOMAS G/ETAL	80	0.11
7	570022030	RIGGE/BRUCE A & JAMIE A	75	1.22
8	570023040	ANDERSON/THOMAS G/ETAL	80	39.24
8	570022040	GRANNES/CHARLES & JUDY	81	1.65
9	570024020	NEITZEL/CHARLES D	155	39.27
9	570021040	GRANNES/CLARK A & DENISE R	154	1.56
10	570024020	NEITZEL/CHARLES D	155	33.09
10	570013020	LUND/MARILYN J	160	0.67
11	570013020	LUND/MARILYN J	160	10.57
12	570013020	LUND/MARILYN J	160	9.65
12	570014020	RIGGE/ANDREW JAMES	150	0.13
13	570014020	RIGGE/ANDREW JAMES	150	26.90
14	570014020	RIGGE/ANDREW JAMES	150	25.17
14	570014040	RIGGE/BRUCE A & JAMIE A	11	7.91
15	520063020	HULTQUIST/CASEY	157	23.10
16	570044040	WEIDEMANN/BURTON & ORLEEN P	40	0.84
17	570033040	COLE/BARBARA J/ETAL	40	25.42
17	570033080	ANDERSON/MICHAEL J & JEAN A	77	0.20
17	570102040	DOUBLE A FARMS TRUST	191	0.16
18	570033060	ARNDT/APRIL M/&	0	3.02
18	570033080	ANDERSON/MICHAEL J & JEAN A	77	26.38
18	570102040	DOUBLE A FARMS TRUST	191	0.14
19	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	0.13
19	570034040	ELLINGSON/TIM	74	0.24
19	570033080	ANDERSON/MICHAEL J & JEAN A	77	38.52
20	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	0.12
20	570023020	DONNER/DALE A & CHARLOTTE R	80	0.17
20	570034040	ELLINGSON/TIM	74	40.49
21	570023020	DONNER/DALE A & CHARLOTTE R	80	40.76
21	570023040	ANDERSON/THOMAS G/ETAL	80	0.23
22	570023040	ANDERSON/THOMAS G/ETAL	80	40.64
22	570024020	NEITZEL/CHARLES D	155	0.28
23	570024020	NEITZEL/CHARLES D	155	40.79
24	570024040	CHRISTENSEN FARMS MIDWEST LLC	5	4.96
24	570024020	NEITZEL/CHARLES D	155	35.05
24	570013020	LUND/MARILYN J	160	0.64
25	570013020	LUND/MARILYN J	160	36.38
26	570013020	LUND/MARILYN J	160	39.41
26	570014020	RIGGE/ANDREW JAMES	150	0.13
27	570014020	RIGGE/ANDREW JAMES	150	40.11
28	570014020	RIGGE/ANDREW JAMES	150	40.01
29	520063020	HULTQUIST/CASEY	157	37.73
30	520063020	HULTQUIST/CASEY	157	8.33
31	570091040	ANDERSON/ARDELLA J	180	2.32
32	570091020	ANDERSON/MICHAEL J & JEAN A	10	0.80
32	570091040	ANDERSON/ARDELLA J	180	30.75
32	570102040	DOUBLE A FARMS TRUST	191	0.40
33	570102040	DOUBLE A FARMS TRUST	191	39.93
34	570102040	DOUBLE A FARMS TRUST	191	34.11
34	570102020	ROHLIK/GINA	10	5.80
35	570101040	KLAUSE/PAUL A & GAIL E	128	0.14
35	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	39.88
36	570101020	IVERSON/PAUL H & LORI A	10	3.36
36	570112060	ANDERSON/GREGORY R & CECILIA M	127	0.25
36	570101030	KLAUSE/PAUL A & GAIL E/ETAL	54	36.37

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
37	570112020	HACKER/ERIC W & SAMANTHA	0	0.87
37	570112060	ANDERSON/GREGORY R & CECILIA M	127	39.42
38	570112060	ANDERSON/GREGORY R & CECILIA M	127	5.43
38	570112040	PETERSON LONG LANE FARM LLC	100	34.44
38	570111060	KNUTSON/CHARLOTTE A	80	0.39
39	570024020	NEITZEL/CHARLES D	155	0.16
39	570111040	KNUTSON/JONATHON	50	0.47
39	570111060	KNUTSON/CHARLOTTE A	80	39.72
40	570122010	ANDERSON/GREGORY R & CECILIA M	68	0.54
40	570024020	NEITZEL/CHARLES D	155	0.17
40	570111020	KNUTSON/JONATHON	30	15.05
40	570111040	KNUTSON/JONATHON	50	24.54
41	570122020	ANDERSON/GREGORY R & CECILIA M	12	12.47
41	570122010	ANDERSON/GREGORY R & CECILIA M	68	27.43
41	570013020	LUND/MARILYN J	160	0.25
42	570122010	ANDERSON/GREGORY R & CECILIA M	68	39.96
42	570013020	LUND/MARILYN J	160	0.18
43	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	39.96
43	570014020	RIGGE/ANDREW JAMES	150	0.16
44	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	39.99
44	570014020	RIGGE/ANDREW JAMES	150	0.20
45	520072040	GREENFIELD LLP	150	39.04
45	520063020	HULTQUIST/CASEY	157	0.23
46	520072040	GREENFIELD LLP	150	35.01
46	520063020	HULTQUIST/CASEY	157	0.17
47	520071020	JACQUES FARMS LLC	160	7.96
48	570091040	ANDERSON/ARDELLA J	180	12.00
48	570102040	DOUBLE A FARMS TRUST	191	0.32
49	570102040	DOUBLE A FARMS TRUST	191	38.61
50	570101040	KLAUSE/PAUL A & GAIL E	128	0.16
50	570102040	DOUBLE A FARMS TRUST	191	35.70
50	570102020	ROHLIK/GINA	10	4.20
51	570101040	KLAUSE/PAUL A & GAIL E	128	40.11
52	570101040	KLAUSE/PAUL A & GAIL E	128	32.99
52	570101020	IVERSON/PAUL H & LORI A	10	6.68
52	570112060	ANDERSON/GREGORY R & CECILIA M	127	0.40
53	570112020	HACKER/ERIC W & SAMANTHA	0	2.10
53	570112060	ANDERSON/GREGORY R & CECILIA M	127	38.08
54	570112060	ANDERSON/GREGORY R & CECILIA M	127	5.29
54	570112040	PETERSON LONG LANE FARM LLC	100	34.50
54	570111060	KNUTSON/CHARLOTTE A	80	0.41
55	570111040	KNUTSON/JONATHON	50	0.44
55	570111060	KNUTSON/CHARLOTTE A	80	39.79
56	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.46
56	570111020	KNUTSON/JONATHON	30	15.14
56	570111040	KNUTSON/JONATHON	50	24.65
57	570122010	ANDERSON/GREGORY R & CECILIA M	68	0.11
57	570122030	ANDERSON/GREGORY R & CECILIA M	200	39.99
58	570122030	ANDERSON/GREGORY R & CECILIA M	200	40.03
59	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	39.80
59	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.31
60	570121040	JORDAN/CARL OSWALD	5	4.36
60	570121020	JORDAN/OSWALD A/DISCLAIMER TR	155	35.74
61	520072040	GREENFIELD LLP	150	39.50
62	520072020	ANDERSON/KENNETH M & CAROL Y	12	8.79
62	520072040	GREENFIELD LLP	150	31.56
63	520071020	JACQUES FARMS LLC	160	30.19
63	520072040	GREENFIELD LLP	150	0.22
64	570103020	DOUBLE A FARMS LIVING TRUST	211	14.54
64	570102040	DOUBLE A FARMS TRUST	191	16.85
64	579960020	MN VALLEY REGIONAL RAIL AUTH	0	2.65

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
65	570103020	DOUBLE A FARMS LIVING TRUST	211	14.79
65	570101040	KLAUSE/PAUL A & GAIL E	128	0.14
65	570102040	DOUBLE A FARMS TRUST	191	22.18
65	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.04
66	570103020	DOUBLE A FARMS LIVING TRUST	211	11.77
66	570101040	KLAUSE/PAUL A & GAIL E	128	25.39
66	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.05
67	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.10
67	570103020	DOUBLE A FARMS LIVING TRUST	211	8.65
67	570101040	KLAUSE/PAUL A & GAIL E	128	28.01
67	570112060	ANDERSON/GREGORY R & CECILIA M	127	0.44
67	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.05
68	570113020	SUMMIT FARMLAND IV LLP ETAL	88	5.24
68	570112060	ANDERSON/GREGORY R & CECILIA M	127	31.80
68	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.02
69	570113020	SUMMIT FARMLAND IV LLP ETAL	88	1.39
69	570114040	ANDERSON/GREGORY R/&	83	0.15
69	570112060	ANDERSON/GREGORY R & CECILIA M	127	4.60
69	570112040	PETERSON LONG LANE FARM LLC	100	30.97
69	579960020	MN VALLEY REGIONAL RAIL AUTH	0	2.98
70	570114040	ANDERSON/GREGORY R/&	83	39.29
70	579960020	MN VALLEY REGIONAL RAIL AUTH	0	0.75
71	570114040	ANDERSON/GREGORY R/&	83	39.76
71	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.37
72	570122030	ANDERSON/GREGORY R & CECILIA M	200	39.69
72	570123020	ANDERSON/GREGORY R & CECILIA M	34	0.36
73	570122030	ANDERSON/GREGORY R & CECILIA M	200	39.79
73	570123020	ANDERSON/GREGORY R & CECILIA M	34	0.27
74	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	39.49
74	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.59
75	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	40.02
76	520073040	ANDERSON/KENNETH M & CAROL Y	149	39.64
77	520073040	ANDERSON/KENNETH M & CAROL Y	149	39.17
77	520072020	ANDERSON/KENNETH M & CAROL Y	12	1.21
78	520073040	ANDERSON/KENNETH M & CAROL Y	149	0.16
78	520074020	JACQUES FARMS LLC	115	33.67
78	520072020	ANDERSON/KENNETH M & CAROL Y	12	1.01
78	520071020	JACQUES FARMS LLC	160	0.13
80	570103020	DOUBLE A FARMS LIVING TRUST	211	28.72
81	570151040	ANDERSON/DAVID & KATHRYN	204	0.24
81	570103020	DOUBLE A FARMS LIVING TRUST	211	40.01
82	570151020	ANDERSON/LEROY M/TRUST B	97	0.10
82	570151040	ANDERSON/DAVID & KATHRYN	204	0.20
82	570103020	DOUBLE A FARMS LIVING TRUST	211	40.00
83	570151020	ANDERSON/LEROY M/TRUST B	97	0.27
83	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.54
83	570103020	DOUBLE A FARMS LIVING TRUST	211	39.52
84	570113020	SUMMIT FARMLAND IV LLP ETAL	88	39.87
85	570113020	SUMMIT FARMLAND IV LLP ETAL	88	39.92
86	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.47
86	570114040	ANDERSON/GREGORY R/&	83	0.28
86	579960020	MN VALLEY REGIONAL RAIL AUTH	0	2.27
86	570114020	LARSEN/BRADLEY & JENNIFER	7	7.62
86	570114060	RIGGE/BRUCE A & JAMIE A	62	29.35
87	570141020	LARSON/LELAND	159	0.38
87	570114040	ANDERSON/GREGORY R/&	83	3.39
87	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.14
87	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.02
87	570114060	RIGGE/BRUCE A & JAMIE A	62	32.96

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
88	570132020	LARSON/LELAND A	160	0.69
88	570123020	ANDERSON/GREGORY R & CECILIA M	34	7.42
88	570122030	ANDERSON/GREGORY R & CECILIA M	200	19.92
88	570123020	ANDERSON/GREGORY R & CECILIA M	34	8.96
88	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
89	570132020	LARSON/LELAND A	160	0.53
89	570123020	ANDERSON/GREGORY R & CECILIA M	34	11.53
89	570122030	ANDERSON/GREGORY R & CECILIA M	200	19.48
89	570123020	ANDERSON/GREGORY R & CECILIA M	34	5.47
89	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
90	570131020	DOUBLE A FARMS LIVING TRUST	80	0.38
90	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	20.46
90	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	15.37
90	570123020	ANDERSON/GREGORY R & CECILIA M	34	0.27
90	570122030	ANDERSON/GREGORY R & CECILIA M	200	0.46
90	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
91	570131020	DOUBLE A FARMS LIVING TRUST	80	0.28
91	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	16.98
91	570124020	JORDAN/OSWALD A/DISCLAIMER TR	153	19.71
91	579960020	MN VALLEY REGIONAL RAIL AUTH	0	3.01
92	520182020	JORDAN/DARLENE	159	0.17
92	520073040	ANDERSON/KENNETH M & CAROL Y	149	13.21
92	520073040	ANDERSON/KENNETH M & CAROL Y	149	23.46
92	529960020	MINNESOTA VALLEY REGIONAL	0	3.00
93	520073040	ANDERSON/KENNETH M & CAROL Y	149	9.56
93	520073020	PATNOE/JODI	0	2.70
93	520073040	ANDERSON/KENNETH M & CAROL Y	149	22.65
93	529960020	MINNESOTA VALLEY REGIONAL	0	2.90
94	520074020	JACQUES FARMS LLC	115	0.20
94	520074020	JACQUES FARMS LLC	115	4.43
95	570151040	ANDERSON/DAVID & KATHRYN	204	8.95
95	570152020	NELSON/DONNA & ELDON	0	0.83
95	570152040	NELSON/TROY E & ANGEL B	0	0.68
96	570151040	ANDERSON/DAVID & KATHRYN	204	37.72
97	570151020	ANDERSON/LEROY M/TRUST B	97	13.69
97	570151040	ANDERSON/DAVID & KATHRYN	204	25.80
98	570142060	ANDERSON/LEROY M/TRUST B	80	0.49
98	570151020	ANDERSON/LEROY M/TRUST B	97	28.83
98	570151030	ANDERSON/DAVID M & KATHRYN K	7	6.87
98	570151035	ANDERSON/ERIC M & AMANDA J	0	3.13
99	570142060	ANDERSON/LEROY M/TRUST B	80	38.88
100	570142030	HAGEN/DONALD & NANCY	78	36.13
100	570142020	SOUPIR/BRANDON C & APRIL E	0	2.51
100	570113020	SUMMIT FARMLAND IV LLP ETAL	88	0.48
101	570142030	HAGEN/DONALD & NANCY	78	0.57
101	570141020	LARSON/LELAND	159	38.46
101	570114020	LARSEN/BRADLEY & JENNIFER	7	0.16
101	570114060	RIGGE/BRUCE A & JAMIE A	62	0.20
102	570141020	LARSON/LELAND	159	39.26
102	570132020	LARSON/LELAND A	160	0.38
103	570132020	LARSON/LELAND A	160	39.61
104	570132020	LARSON/LELAND A	160	39.50
105	570132020	LARSON/LELAND A	160	0.81
105	570131020	DOUBLE A FARMS LIVING TRUST	80	38.59
106	570131020	DOUBLE A FARMS LIVING TRUST	80	39.22
107	520182020	JORDAN/DARLENE	159	39.32
108	520182020	JORDAN/DARLENE	159	34.88
109	520181020	MILLER/BETTY M/ETAL	80	0.57
110	570151040	ANDERSON/DAVID & KATHRYN	204	7.25
111	570151020	ANDERSON/LEROY M/TRUST B	97	10.10
111	570151040	ANDERSON/DAVID & KATHRYN	204	15.89

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
112	570142060	ANDERSON/LEROY M/TRUST B	80	0.45
112	570151020	ANDERSON/LEROY M/TRUST B	97	32.61
113	570142030	HAGEN/DONALD & NANCY	78	0.13
113	570142060	ANDERSON/LEROY M/TRUST B	80	38.87
114	570142030	HAGEN/DONALD & NANCY	78	39.32
115	570142030	HAGEN/DONALD & NANCY	78	0.19
115	570141020	LARSON/LELAND	159	39.36
116	570141020	LARSON/LELAND	159	39.15
116	570132020	LARSON/LELAND A	160	0.63
117	570132020	LARSON/LELAND A	160	39.59
118	570132020	LARSON/LELAND A	160	39.48
119	570131060	DOUBLE A FARMS TRUST	80	38.47
119	570132020	LARSON/LELAND A	160	0.43
119	570131020	DOUBLE A FARMS LIVING TRUST	80	0.48
120	570131060	DOUBLE A FARMS TRUST	80	36.95
120	570131020	DOUBLE A FARMS LIVING TRUST	80	0.30
121	520182020	JORDAN/DARLENE	159	23.29
122	520182020	JORDAN/DARLENE	159	3.56
123	570143040	VROMAN/DEAN/ETAL	78	0.14
123	570154030	KING/LEON & SHARON	0	1.55
124	570143040	VROMAN/DEAN/ETAL	78	27.55
125	570143040	VROMAN/DEAN/ETAL	78	39.18
125	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	0.21
126	570141020	LARSON/LELAND	159	0.31
126	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	26.01
126	570144040	LARSON/LELAND A	52	13.38
127	570133060	ANDERSON/DAVID M & KATHRYN K	53	0.75
127	570141020	LARSON/LELAND	159	0.57
127	570144040	LARSON/LELAND A	52	12.67
127	570144020	HUHNERKOCH/CAROLYN	52	25.94
128	570133060	ANDERSON/DAVID M & KATHRYN K	53	25.35
128	570133020	ANDERSON/LEROY/TRUST A ETAL	34	13.30
128	570132020	LARSON/LELAND A	160	0.92
129	570133020	ANDERSON/LEROY/TRUST A ETAL	34	12.54
129	570133040	ANDERSON/DAVID M & KATHRYN K	53	25.52
129	570132020	LARSON/LELAND A	160	1.38
130	570134020	HUHNERKOCH/HERBERT C	80	37.93
130	570131060	DOUBLE A FARMS TRUST	80	1.36
131	570134020	HUHNERKOCH/HERBERT C	80	9.64
131	570131060	DOUBLE A FARMS TRUST	80	0.50
132	570143040	VROMAN/DEAN/ETAL	78	12.04
133	570232020	GRANNES/DENISE R	80	0.29
133	570143040	VROMAN/DEAN/ETAL	78	38.72
133	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	0.60
134	570231020	ANDERSON/LEROY M/TRUST B	153	0.16
134	570144060	LARSON/PAUL W/REVOCABLE TRUST	52	25.87
134	570144040	LARSON/LELAND A	52	13.80
135	570133060	ANDERSON/DAVID M & KATHRYN K	53	0.73
135	570144040	LARSON/LELAND A	52	10.72
135	570144020	HUHNERKOCH/CAROLYN	52	21.86
136	570133060	ANDERSON/DAVID M & KATHRYN K	53	25.73
136	570133020	ANDERSON/LEROY/TRUST A ETAL	34	13.79
137	570134040	HUHNERKOCH/HERBERT C	80	0.33
137	570133020	ANDERSON/LEROY/TRUST A ETAL	34	12.26
137	570133040	ANDERSON/DAVID M & KATHRYN K	53	25.93
138	570134040	HUHNERKOCH/HERBERT C	80	24.98
138	570134020	HUHNERKOCH/HERBERT C	80	1.22
139	570134040	HUHNERKOCH/HERBERT C	80	0.38
139	570134020	HUHNERKOCH/HERBERT C	80	0.13
140	570232020	GRANNES/DENISE R	80	4.42

**REDWOOD COUNTY
COUNTY DITCH No. 20**



Tract	PIN	Landowner	Deed Acres	Tract Acres
141	570232040	DOUBLE A FARMS TRUST	80	0.10
141	570231020	ANDERSON/LEROY M/TRUST B	153	0.83
141	570232020	GRANNES/DENISE R	80	33.93
142	570231040	PRAHL/BRADLEY & NANCY	0	5.20
142	570231020	ANDERSON/LEROY M/TRUST B	153	14.40
143	570231040	PRAHL/BRADLEY & NANCY	0	0.18
143	570231020	ANDERSON/LEROY M/TRUST B	153	1.15
144	570242040	SIEGFRIED/RICK D	150	13.29
144	570133060	ANDERSON/DAVID M & KATHRYN K	53	0.26
144	570133020	ANDERSON/LEROY/TRUST A ETAL	34	0.21
145	570242040	SIEGFRIED/RICK D	150	1.21
145	570133040	ANDERSON/DAVID M & KATHRYN K	53	0.35
147	570232040	DOUBLE A FARMS TRUST	80	0.70



Exhibit A

County Ditch No 20

Redwood County, Minnesota

- Legend**
- Culvert Crossing
 - Proposed Tile
 - Proposed Open Ditch
 - Existing Tile
 - Abandoned Tile
 - Potential Ditch Storage
 - Watershed
 - 40's
 - Parcels

PN: 23-28479

Source:

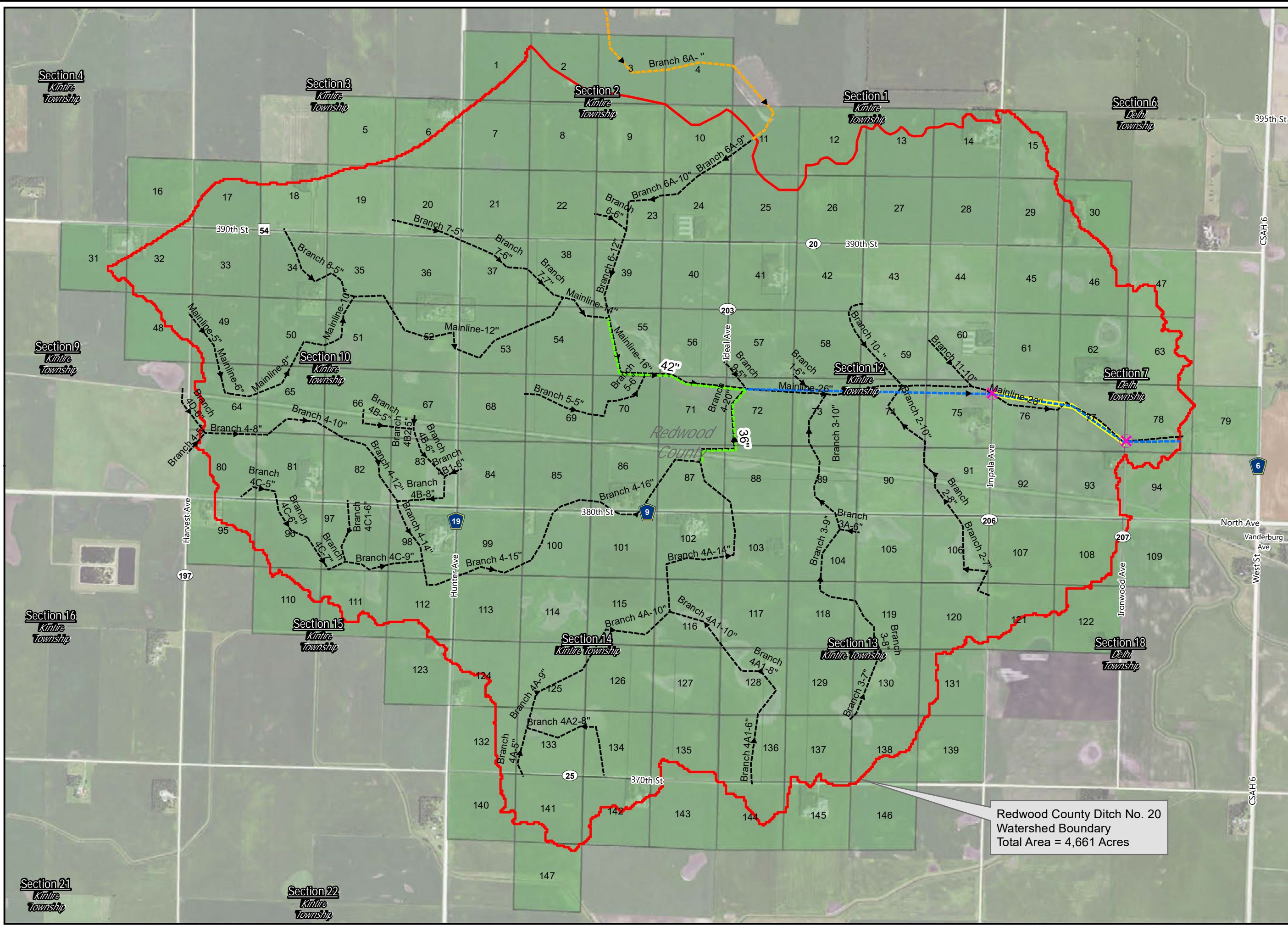
Orthophotograph (MnGeo WMS, 2015)
 Tile/Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July 2008)
 Counties (MN DNR, July 2013)
 PLS (MnGeo/USGS)



0 430 860 1,720 Feet



Redwood County Ditch No. 20
 Watershed Boundary
 Total Area = 4,661 Acres



Section 4
Kintire Township

Section 3
Kintire Township

Section 2
Kintire Township

Section 1
Kintire Township

Section 6
Delhi Township

Section 9
Kintire Township

Section 10
Kintire Township

Section 12
Kintire Township

Section 7
Delhi Township

Section 16
Kintire Township

Section 15
Kintire Township

Section 14
Kintire Township

Section 13
Kintire Township

Section 18
Delhi Township

Section 21
Kintire Township

Section 22
Kintire Township

June 23, 2025



TO: Landowners of County Ditch No. 20

RE: Notice of Preliminary Hearing

Hearing:

The Redwood County Commissioners, acting as the drainage authority of County Ditch No. 20, will hold a public hearing on Tuesday, July 15, 2025, at 10:00 A.M. in the Board Room of the Redwood County Government Center, 403 South Mill Street, in Redwood Falls, Minnesota. The purpose of this hearing is to review and consider the preliminary engineer's report on the petition for improvement to the ditch system with the installation of larger and deeper tile and open ditch. All members of the County Ditch No. 20 drainage system and the general public who are interested or have concerns regarding the aforementioned proposal are encouraged to attend.

Informational Meeting:

Prior to the hearing, an informational meeting will be held at the request of ISG, the Engineer, to discuss the Preliminary Engineers Report (PER) for the project. The informational meeting will be held on Tuesday, July 8, 2025, at 10:00 A.M. in the Board Room of the Redwood County Government Center, 403 South Mill Street, in Redwood Falls, Minnesota. ISG has completed the necessary reports and would like to receive feedback from landowners. Informational meeting allows for informal discussion and questions prior to the hearing. If you have any private tile maps that may be affected by the proposed project, ISG would appreciate a copy of them to minimize the disturbance of the tile. If you are unable to make a copy, ISG can scan your original at the meeting for our records.

The preliminary engineers report is available under the "Drainage Proceedings" tab on the Environmental Department page on the Redwood County website. <https://redwoodcounty-mn.us/departments/environmental-office/>

If you need further information regarding this hearing, please contact Redwood County Environmental Director Nick Brozek at 507-637-4023.

Respectfully,

A handwritten signature in blue ink, appearing to read "N. Brozek", is positioned above the typed name.

Nick Brozek
Redwood County Environmental Director

Redwood County Government Center - Environmental Department
P.O Box 130 Redwood Falls, MN 56283
(507) 637-4023 redwoodcounty-mn.us Environmental@co.redwood.mn.us

STATE OF MINNESOTA
Before the
REDWOOD COUNTY COMMISSIONERS
SITTING AS THE DRAINAGE
AUTHORITY FOR
COUNTY DITCH 20

In the Matter of:

**Preliminary Hearing – CD 20
Improvement**

**FINDINGS AND ORDER FOR A
FINAL ENGINEER REPORT AND
THE APPOINTMENT OF VIEWERS**

The Redwood County Board of Commissioners, sitting as the Drainage Authority for County Ditch 20, pursuant to Minn. State § 103E.261, having answered in the affirmative the findings in Minn. State § 103E.261 subd. 5, and having followed proper notice requirements in Minn. Stat. § 103E.261; and having held a public hearing and followed all requirements of chapter 103E, based on the record and proceedings, Commissioner Groebner moved, seconded by Commissioner Van Hee to adopt the following Findings and Order:

Findings:

1. Redwood County Board of Commissioners is the drainage authority for County Ditch 20.
2. On September 3, 2024, the drainage authority found the petition as presented for an improvement to County Ditch 20 was complete, and that a cash security of \$50,000 had been submitted to the Redwood County Auditor and moved to accept the petition.
3. On September 3, 2024, the drainage authority ordered ISG, Inc. to complete a preliminary engineers report.
4. On May 9, 2025, the Preliminary Engineers report was received by the Redwood County Environmental Office.
5. On June 3, 2025, the drainage authority met and set a time and date for a Preliminary Hearing for the CD 20 Improvement petition.
6. Proper notice was sent to benefited landowners in the CD 20 watershed as well as posted on the doors of the Redwood County government center.
7. On July 15, 2025, a Preliminary Hearing was held and open to the public.

8. During the Preliminary Hearing, the Engineer presented the preliminary engineers report and answered questions from the Drainage Authority.
9. The advisory report submitted by the Minnesota Department of Natural Resources (DNR) was read aloud in its entirety.
10. The meeting was opened up to public comment, and the following comments were received:

[insert summary of comments here]

11. Based on the proceedings herein, the evidence presented during the pendency of these proceedings, and the public comments received, the Board finds:
 - a. The private and public benefits will exceed the costs of the proposed drainage project and the proposed drainage project outlined in the petition and recommended by the engineer is feasible;
 - b. The proposed drainage project will provide improved drainage capacity which will help increase crop yields and prevent crops from drowning out in depressional areas of the watershed and prevent channelized overland flow from developing across agricultural lands, and add depth to the drainage system in areas where there is inadequate cover for today's farming practices, and accordingly there is necessity for the proposed drainage project;
 - c. There are no alternative measures, including measures identified in applicable state-approved and locally adopted water management plans, to conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses; reduce downstream peak flows and flooding; provide adequate drainage system capacity; reduce erosion and sedimentation; and protect or improve water quality beyond those identified by the engineer in the preliminary engineers report;
 - d. Anticipated land use within the drainage project or system will be unchanged from the present use of the land, and compatible with local land use plans;
 - e. The flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50-year flood events will be improved;
 - f. There is an insignificant effect on wetlands from constructing the proposed drainage project;
 - g. There is an insignificant effect on water quality from constructing the proposed drainage project, and potential positive impacts on water quality through implementation of the multi-purpose drainage management plan;

- h. There is an insignificant effect upon fish and wildlife resources affected by the proposed drainage project;
 - i. The shallow groundwater availability, distribution, and use in the drainage project or system will be unaffected;
 - j. The proposed drainage project will be of public benefit and promote the public health, after considering the environmental, land use, and multi-purpose water management criteria in Section 103E.015, subd. 1, and;
 - k. The proposed outlet is adequate to sustain the flow of water that is anticipated by the improvement.
12. The Drainage Authority accepted the Engineers Preliminary Engineering Report and ordered the Redwood County Environmental Director to draft findings and order and the Engineer to prepare a Final Engineers Report.
13. The Drainage Authority appointed the Behrends group (Mark Behrends, Robert Hansen, Kendall Langseth, Bruce Ness, and Wesley Dahl) to view the proposed improvement.

Order:


Based on the foregoing Findings and the entire record of proceedings before the Board, the Board, acting as the drainage authority for County Ditch 20, hereby orders as follows:

- A. The preliminary engineers report is accepted.
- B. The Engineer shall prepare a final engineering report.
- C. The Behrends group shall be appointed to view the improved area.

After discussion, the Board Chair called the question. The question was on the adoption of the foregoing findings and order, and there were 5 yeas, 0 nays, 0 absent, and 0 abstentions as follows:

	Yea	Nay	Absent	Abstain
SALFER	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GROEBNER	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VAN HEE	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
THEIS	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WAKEFIELD	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Upon vote, the Chair declared the motion passed and the Findings and Order adopted.



 Rick Wakefield, Chairperson

Dated: 7-15-25

* * * * *

I, Nick Brozek, Redwood County Environmental Director, do hereby certify that I have compared the above motion; findings and order with the original thereof as the same appears of record and on file with the Redwood County Drainage Authority and find the same to be a true and correct transcript thereof. The above order was filed with me, Nick Brozek, Redwood County Environmental Director, on July 15, 2025.

IN TESTIMONY WHEREOF, I hereunto set my hand this
15th day of July 2025.



Nick Brozek, Environmental Director

STATE OF MINNESOTA
REDWOOD COUNTY DRAINAGE AUTHORITY
PUBLIC DRAINAGE AUTHORITY PETITION FOR IMPROVEMENT OF
REDWOOD COUNTY DITCH 20

The matter of the Petition for the
Improvement of
Redwood County Ditch 20

**Engineer's Oath (Minn. Stat.
§103E.241, subd. 2)**

ISG, Inc., and Bailey Bocchino, P.E. (Engineer), having been appointed by the Drainage Authority Board of Redwood County, Drainage Authority for Petition for the Improvement of Redwood County Ditch 20, Drainage Engineer for the project pursuant to Minnesota Statutes Chapter 103E, does hereby swear or affirm to faithfully perform the assigned duties in the best manner possible and to diligently and honestly perform the Engineer's duties and set forth in Chapter 103E according the professional standards required of professional engineers.

This 23rd day of October 2025.

ISG, Inc.

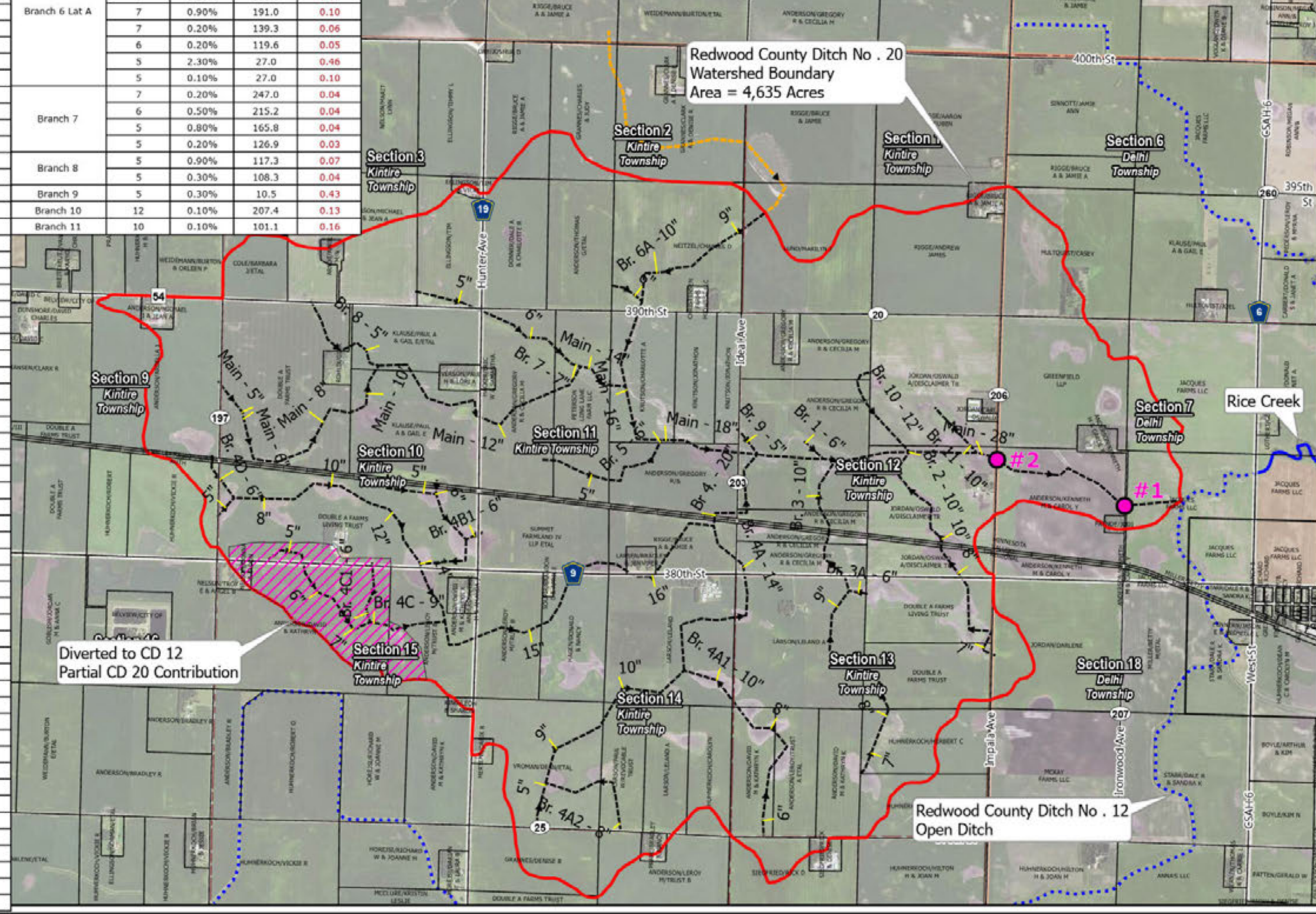


By Bailey Bocchino, PE
Reg. No. 59968

Appendix C: Maps

Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	28	0.10%	4869.6	0.05
	28	0.10%	4647.1	0.06
	28	0.10%	4304.5	0.06
	28	0.10%	4252.8	0.06
	28	0.10%	4104.2	0.06
	26	0.10%	3688.5	0.06
	26	0.10%	3177.3	0.07
	18	0.20%	1576.8	0.07
	16	0.20%	1371.3	0.06
	14	0.20%	794.0	0.07
	12	0.40%	531.6	0.10
	12	0.20%	473.5	0.08
	10	0.20%	232.2	0.10
	8	0.20%	218.4	0.06
	6	0.50%	95.9	0.10
5	0.40%	80.3	0.06	
5	0.40%	57.1	0.09	
Branch 1	6	0.30%	123.5	0.06
Branch 2	10	0.50%	205.9	0.18
	10	0.10%	148.3	0.11
Branch 3	8	0.20%	137.0	0.09
	7	0.20%	108.0	0.08
	7	0.10%	50.6	0.13
Branch 4	7	0.10%	6.6	0.97
	10	0.30%	365.3	0.08
Branch 5	9	0.30%	290.7	0.07
	9	0.15%	233.2	0.07
Branch 6	8	0.35%	155.1	0.11
	7	0.10%	100.2	0.06
Branch 7	20	0.32%	1565.8	0.12
	16	0.32%	875.3	0.12
	16	0.32%	843.3	0.12
	16	0.20%	795.1	0.10
	15	0.43%	705.9	0.14
Branch 8	15	0.10%	695.9	0.07
	15	0.10%	519.6	0.09
	14	0.10%	339.0	0.12
	12	0.15%	217.2	0.15
	12	0.10%	214.9	0.13
Branch 9	10	0.10%	193.5	0.09
	8	0.10%	141.6	0.06
	5	0.10%	26.0	0.10
	14	0.20%	627.0	0.09
	14	0.20%	607.5	0.09
Branch 10	14	0.10%	539.4	0.08
	10	0.40%	263.1	0.13
	10	0.10%	261.1	0.06
	9	0.10%	205.8	0.06
	5	0.25%	53.2	0.08
Branch 11	5	0.25%	33.1	0.12
	10	0.10%	236.8	0.07
	8	0.10%	189.6	0.05
	6	0.10%	66.0	0.06
	6	0.30%	55.2	0.13
Branch 12	6	0.30%	21.2	0.35
	8	0.10%	116.0	0.08
	6	0.10%	83.0	0.05
	8	0.10%	85.2	0.11
	6	0.10%	59.5	0.07
Branch 13	6	0.25%	59.5	0.11
	5	0.25%	20.5	0.20
	6	0.10%	20.6	0.21
	5	0.50%	6.6	0.88
	9	0.10%	146.2	0.09
Branch 14	7	0.24%	74.7	0.13
	6	0.24%	40.4	0.16
	5	0.24%	17.0	0.24

Crossing # on Map	Roadway	Existing Type	Existing Material	Existing Size (in)	Existing Width (ft)	Existing Height (ft)	Existing Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)	Combined Existing Drainage Coefficient (in/day)
1	Ironwood Ave	ROUND CULVERT	RCP	48	-	-	2.63%	4722	1.18	1.32
	Ironwood Ave	ROUND CULVERT	RCP	36	-	-	0.18%	4722	0.14	
2	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	6.08
	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	

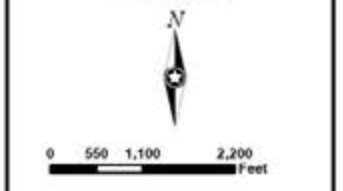


Existing System

County Ditch No. 20
Redwood County,
Minnesota
Friday, February 27, 2026

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Culverts
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads
 - Approximate Partial CD 20 Contribution

PN: 23-28479
Source:
 Orthophotograph (MnGeo WMS, 2015)
 Tile Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July 2008)
 Counties (MN DNR, July 2013)
 PLS (MnGeo/USGS)





**Existing System
(Zoomed)**
County Ditch No. 20
Redwood County,
Minnesota
Friday, February 27, 2026

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Culverts
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads
 - Approximate Partial CD 20 Contribution

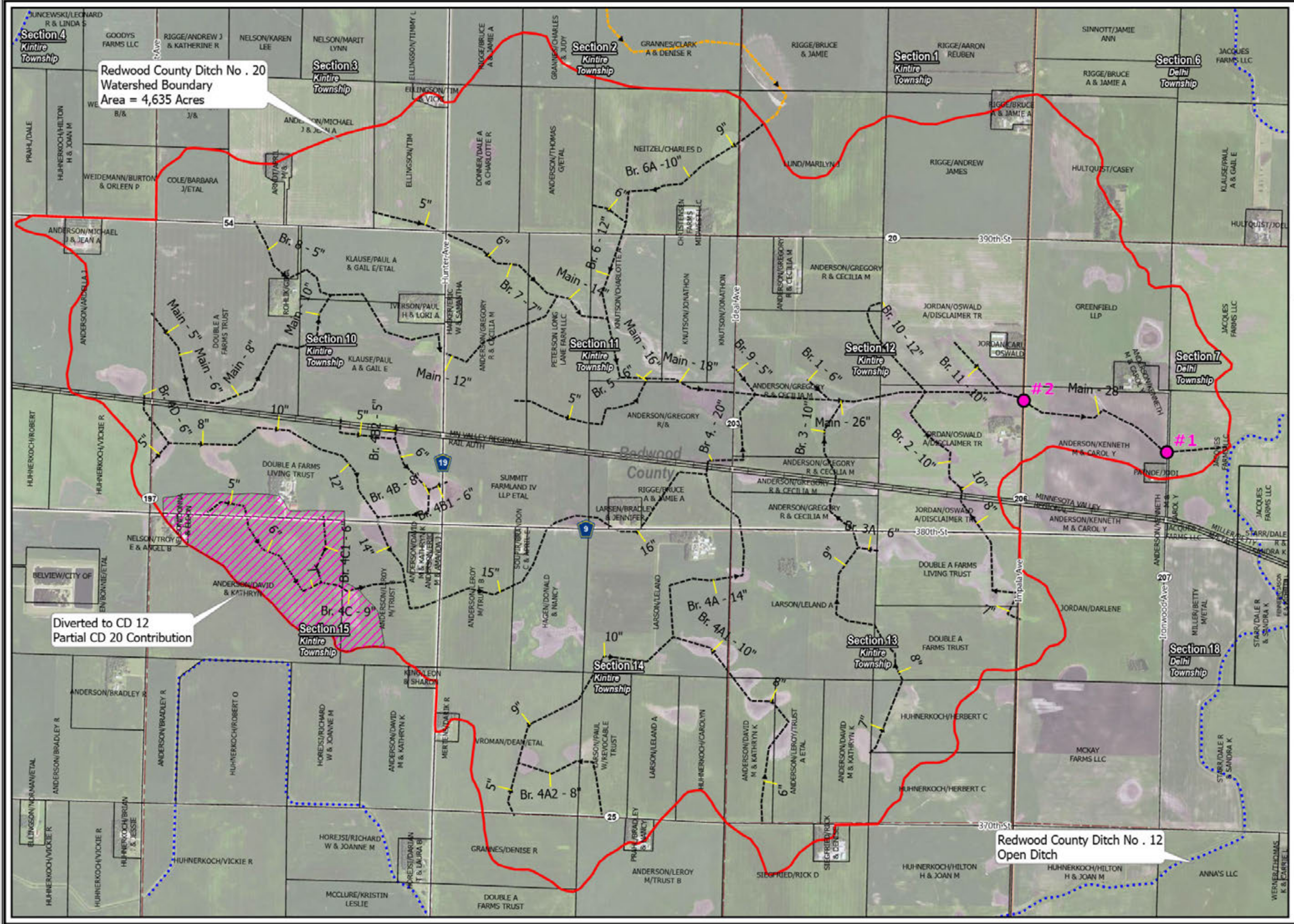
PN: 23-28479

Source:

Orthophotograph (MnGeo WMS, 2015)
Tile Ditch (Redwood County, 12/16/2016)
Parcels (Redwood County, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)



0 390 780 1,560 Feet



Redwood County Ditch No. 20
Watershed Boundary
Area = 4,635 Acres

Diverted to CD 12
Partial CD 20 Contribution

Redwood County Ditch No. 12
Open Ditch



Elevation Map
 County Ditch No. 20
 Redwood County,
 Minnesota
 Friday, February 27, 2026

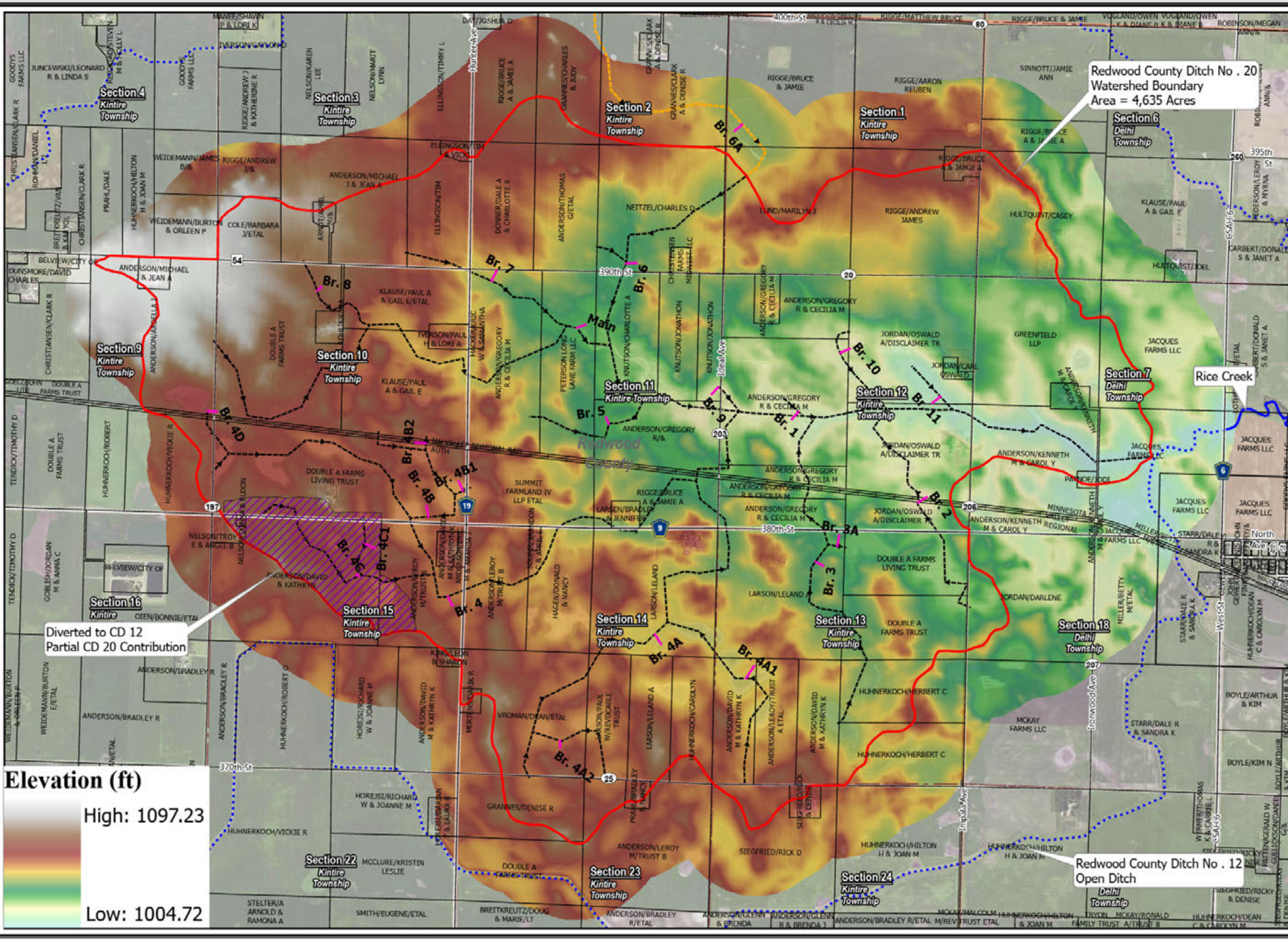
- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads
 - Approximate Partial CD 20 Contribution

PN: 23-28479

Source:
 Orthophotograph (MnGeo WMS, 2015)
 Tile/Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July, 2008)
 Counties (MN DNR, July 2013)
 PLS (MnGeo/USGS)



0 450 900 1,800
 Feet



Redwood County Ditch No. 20
 Watershed Boundary
 Area = 4,635 Acres

Rice Creek

Redwood County Ditch No. 12
 Open Ditch

Diverted to CD 12
 Partial CD 20 Contribution

Elevation (ft)
 High: 1097.23
 Low: 1004.72

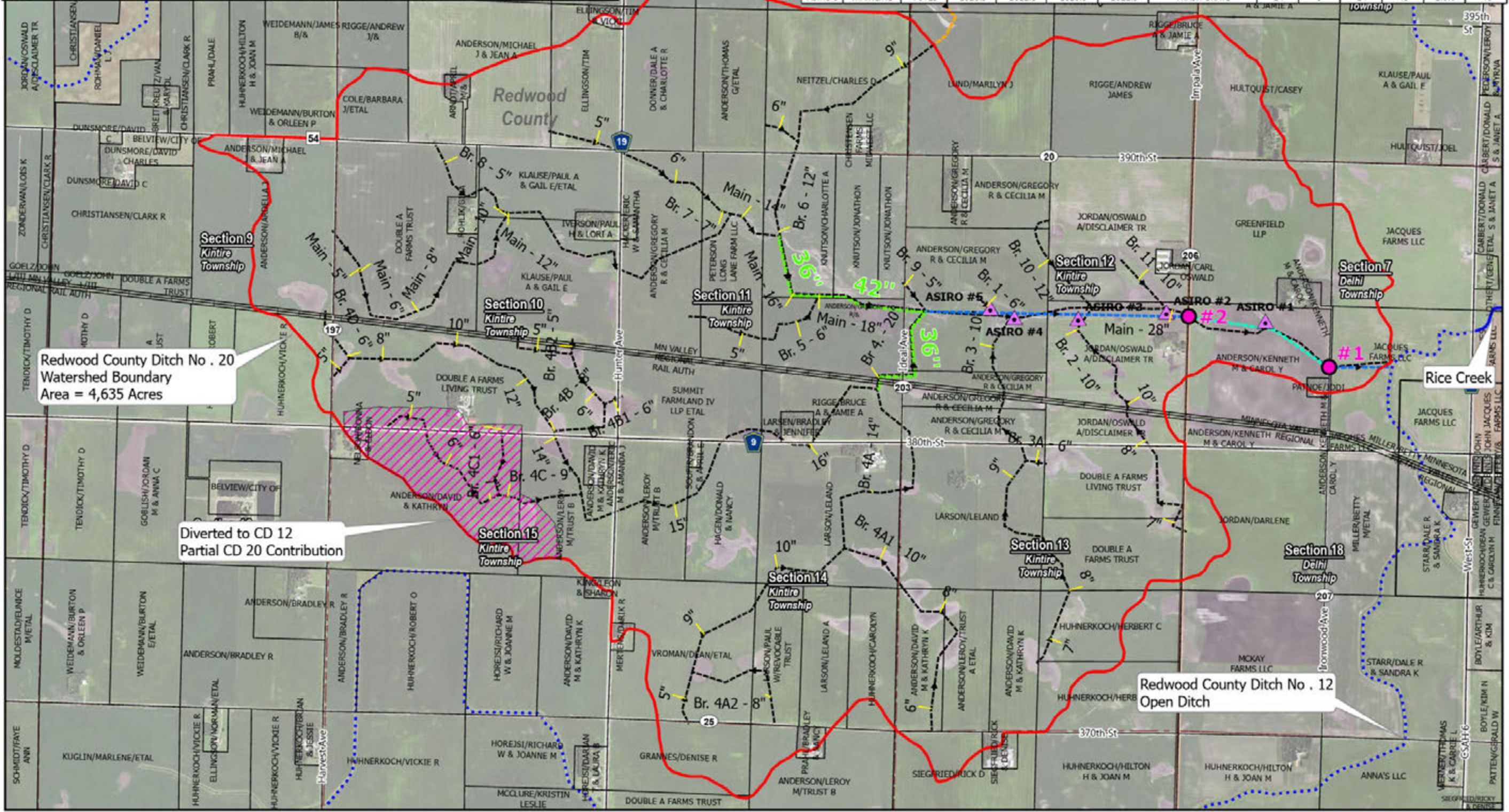


Proposed Improvement County Ditch No. 20 Redwood County, Minnesota Friday, February 27, 2026

Area	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	28	Open Ditch	0.10%	0.09%	4869.6	0.05	Open Ditch
	28		0.10%	0.08%	4647.1	0.06	
	28		0.10%	0.07%	4304.5	0.06	
	28		0.10%	0.07%	4252.8	0.06	
	28		0.10%	0.07%	4104.2	0.06	
	26		0.10%	0.17%	3688.5	0.06	
	26		0.10%	0.13%	3177.3	0.07	
Branch 4	18	42	0.20%	0.12%	1576.8	0.07	0.53
	16	36	0.20%	0.20%	1371.3	0.06	0.52
Branch 4	20	36	0.32%	0.25%	1565.8	0.12	0.51

Crossing # on Map	Ditch Description	Station	Roadway	Proposed Type	Proposed Material	Proposed Width (ft)	Proposed Height (ft)	Proposed Slope (%)	Drainage Area (Acres)	Proposed Drainage Coefficient (in/day)
1	Mainline Open Ditch	10+90	Ironwood Ave	BOX CULVERT	RCP	8	4	0.10%	4722	0.93
2	Mainline Open Ditch	39+49	Impala Ave	BOX CULVERT	RCP	8	7	0.10%	4145	2.17

ALTERNATIVE SIDE INLET W/RIPRAP (ASIRO)														
Description				Elevations				Bid Item						
ID	BRANCH (LOCATION)	STATION		RIM ELEVATION	INVERT ELEVATION	EXISTING BERM ELEVATION	PROPOSED BERM ELEVATION	INTAKE TYPE	RISER SIZE (in)	RISER DEPTH (LF)	OUTLET SIZE (in)	OUTLET LENGTH (LF)	OUTLET GRADE (%)	RIPRAP (CY)
ASIRO 1	MAINLINE	26+03		1014.8	1007.8	1014.8	1016.8	TRASH GRATE	24	7	24	40	2.0%	35
ASIRO 2	MAINLINE	43+72		1016.3	1009.4	1016.3	1018.3	TRASH GRATE	24	7	24	40	2.0%	35
ASIRO 3	MAINLINE	60+28		1020.1	1010.6	1020.1	1022.1	TRASH GRATE	18	9	18	45	2.0%	40
ASIRO 4	MAINLINE	72+06		1020.7	1011.3	1020.7	1022.7	TRASH GRATE	18	9	18	45	2.0%	40
ASIRO 5	MAINLINE	76+19		1020.5	1011.8	1020.5	1022.5	TRASH GRATE	24	9	24	45	2.0%	40



- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Proposed Tile
 - Proposed Culvert Crossings
 - ASIRO
 - Proposed Open Ditch
 - Proposed Two-Stage Ditch
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads
 - Approximate Partial CD 20 Contribution

PN: 23-28479
 Source:
 Orthophotograph (MrGeo WMS, 2015)
 Tile/Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July, 2008)
 Counties (MN DNR, July 2013)
 PLS (MrGeo/USGS)



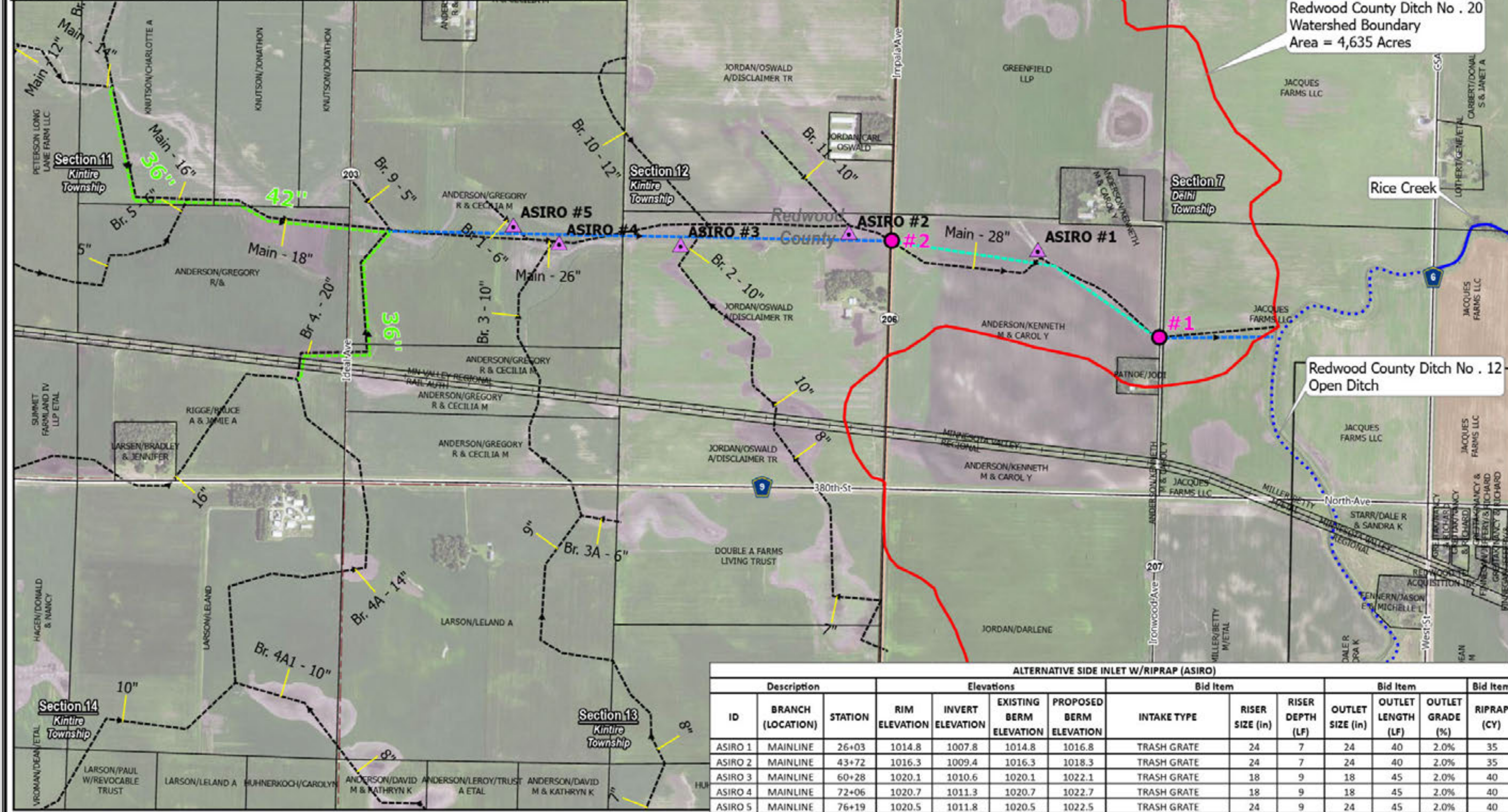
Redwood County Ditch No. 20
 Watershed Boundary
 Area = 4,635 Acres

Diverted to CD 12
 Partial CD 20 Contribution

Redwood County Ditch No. 12
 Open Ditch

Area	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	28	Open Ditch	0.10%	0.09%	4869.6	0.05	Open Ditch
	28		0.10%	0.08%	4647.1	0.06	
	28		0.10%	0.07%	4304.5	0.06	
	28		0.10%	0.07%	4252.8	0.06	
	28		0.10%	0.07%	4104.2	0.06	
	26		0.10%	0.17%	3688.5	0.06	
	26		0.10%	0.13%	3177.3	0.07	
Main	18	42	0.20%	0.12%	1576.8	0.07	0.53
	16	36	0.20%	0.20%	1371.3	0.06	0.52
Branch 4	20	36	0.32%	0.25%	1565.8	0.12	0.51

Crossing # on Map	Ditch Description	Station	Roadway	Proposed Type	Proposed Material	Proposed Width (ft)	Proposed Height (ft)	Proposed Slope (%)	Drainage Area (Acres)	Proposed Drainage Coefficient (in/day)
1	Mainline Open Ditch	10+90	Ironwood Ave	BOX CULVERT	RCP	8	4	0.10%	4722	0.93
2	Mainline Open Ditch	39+49	Impala Ave	BOX CULVERT	RCP	8	7	0.10%	4145	2.17





Proposed Improvement Project Area

County Ditch No. 20


Redwood County, Minnesota

Tuesday, December 9, 2025

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Proposed Tile
 - Proposed Culvert Crossings
 - ▲ ASIRO
 - Proposed Open Ditch
 - Proposed Two-Stage Ditch
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads

PN: 23-28479

Source:
 Orthophotograph (MnGeo WMS, 2015)
 Tile Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July, 2008)
 Counties (MN DNR, July, 2013)
 PLSS (MnGeo/USGS)



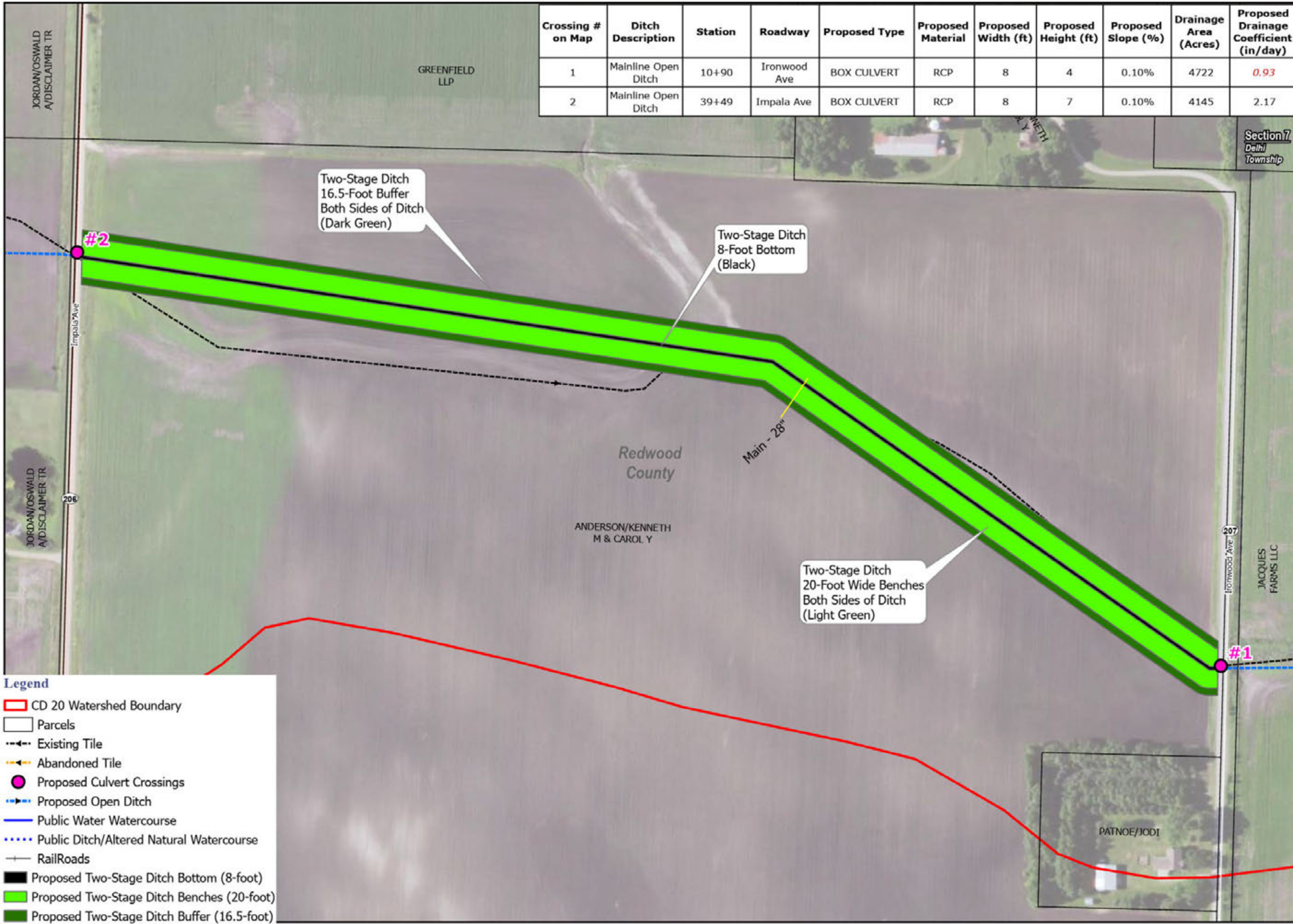



ALTERNATIVE SIDE INLET W/RIPRAP (ASIRO)													
Description			Elevations				Bid Item			Bid Item			
ID	BRANCH (LOCATION)	STATION	RIM ELEVATION	INVERT ELEVATION	EXISTING BERM ELEVATION	PROPOSED BERM ELEVATION	INTAKE TYPE	RISER SIZE (in)	RISER DEPTH (LF)	OUTLET SIZE (in)	OUTLET LENGTH (LF)	OUTLET GRADE (%)	RIPRAP (CY)
ASIRO 1	MAINLINE	26+03	1014.8	1007.8	1014.8	1016.8	TRASH GRATE	24	7	24	40	2.0%	35
ASIRO 2	MAINLINE	43+72	1016.3	1009.4	1016.3	1018.3	TRASH GRATE	24	7	24	40	2.0%	35
ASIRO 3	MAINLINE	60+28	1020.1	1010.6	1020.1	1022.1	TRASH GRATE	18	9	18	45	2.0%	40
ASIRO 4	MAINLINE	72+06	1020.7	1011.3	1020.7	1022.7	TRASH GRATE	18	9	18	45	2.0%	40
ASIRO 5	MAINLINE	76+19	1020.5	1011.8	1020.5	1022.5	TRASH GRATE	24	9	24	45	2.0%	40

Crossing # on Map	Ditch Description	Station	Roadway	Proposed Type	Proposed Material	Proposed Width (ft)	Proposed Height (ft)	Proposed Slope (%)	Drainage Area (Acres)	Proposed Drainage Coefficient (in/day)
1	Mainline Open Ditch	10+90	Ironwood Ave	BOX CULVERT	RCP	8	4	0.10%	4722	0.93
2	Mainline Open Ditch	39+49	Impala Ave	BOX CULVERT	RCP	8	7	0.10%	4145	2.17



Proposed Two-Stage Ditch Extents
 County Ditch No. 20
 Redwood County, Minnesota
 Friday, November 21, 2025



PN: 23-28479
 Source:
 Orthophotograph (MinGeo WMS, 2015)
 Tile Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July 2008)
 Counties (MN DNR, July 2013)
 PLS (MinGeo/USGS)

N

0 45 90 180 Feet



- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Proposed Culvert Crossings
 - Proposed Open Ditch
 - Public Water Watercourse
 - ⋯ Public Ditch/Altered Natural Watercourse
 - Railroads
 - Proposed Two-Stage Ditch Bottom (8-foot)
 - Proposed Two-Stage Ditch Benches (20-foot)
 - Proposed Two-Stage Ditch Buffer (16.5-foot)



Soil Type Map
 County Ditch No. 20
 Redwood County,
 Minnesota
 Friday, November 21, 2025

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads

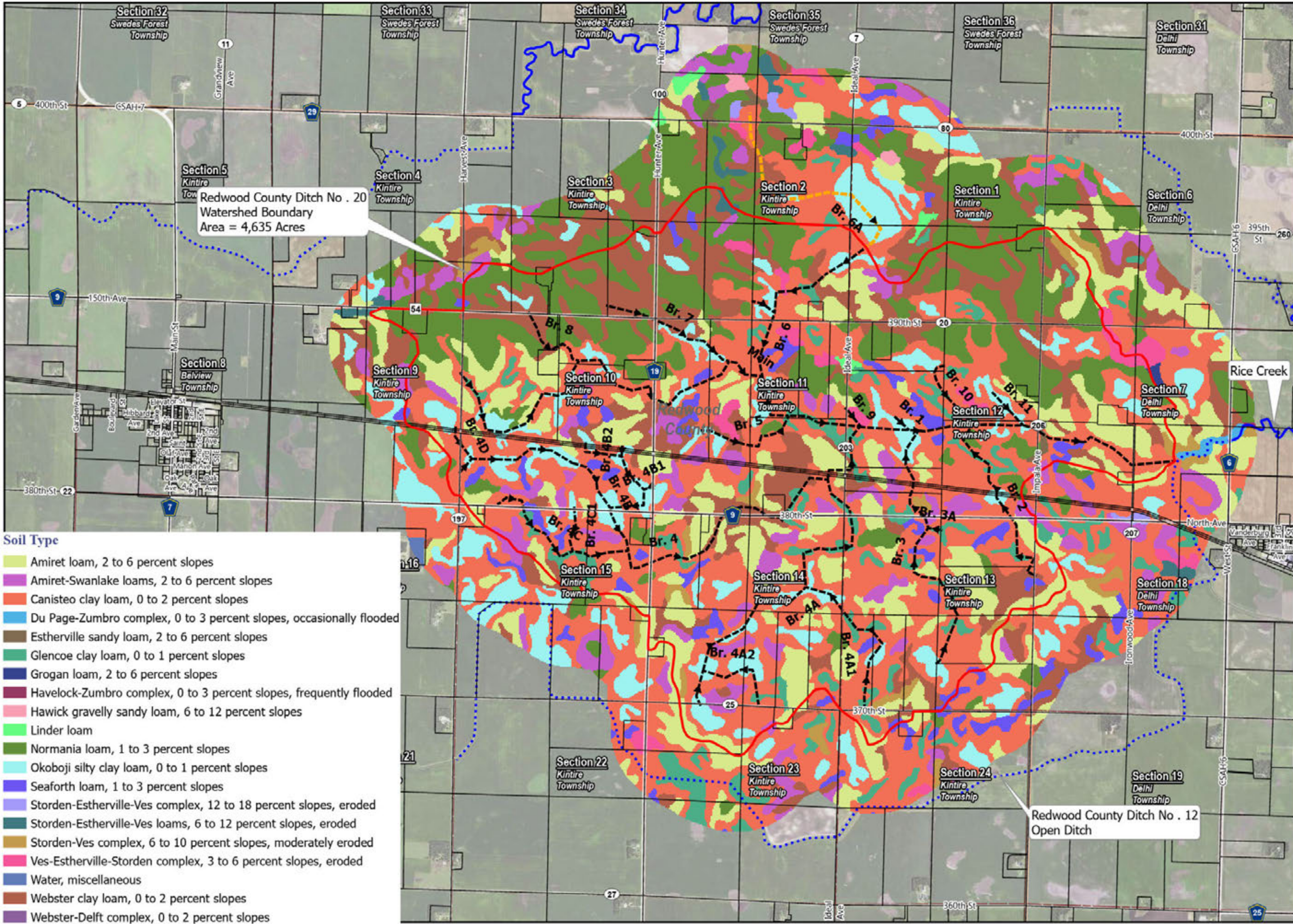
PN: 23-28479

Source:

- Orthophotograph (MnGeo/WMS, 2015)
- Tile/Ditch (Redwood County, 12/16/2016)
- Parcels (Redwood County, 12/16/2016)
- Lakes (MN DNR, July, 2008)
- Major Stream (MN DNR, July 2008)
- Counties (MN DNR, July 2013)
- PLSS (MnGeo/USGS)



0 550 1,100 2,200
 Feet



- Soil Type**
- Amiret loam, 2 to 6 percent slopes
 - Amiret-Swanlake loams, 2 to 6 percent slopes
 - Canisteo clay loam, 0 to 2 percent slopes
 - Du Page-Zumbro complex, 0 to 3 percent slopes, occasionally flooded
 - Estherville sandy loam, 2 to 6 percent slopes
 - Glencoe clay loam, 0 to 1 percent slopes
 - Grogan loam, 2 to 6 percent slopes
 - Havelock-Zumbro complex, 0 to 3 percent slopes, frequently flooded
 - Hawick gravelly sandy loam, 6 to 12 percent slopes
 - Linder loam
 - Normania loam, 1 to 3 percent slopes
 - Okoboji silty clay loam, 0 to 1 percent slopes
 - Seaforth loam, 1 to 3 percent slopes
 - Storden-Estherville-Ves complex, 12 to 18 percent slopes, eroded
 - Storden-Estherville-Ves loams, 6 to 12 percent slopes, eroded
 - Storden-Ves complex, 6 to 10 percent slopes, moderately eroded
 - Ves-Estherville-Storden complex, 3 to 6 percent slopes, eroded
 - Water, miscellaneous
 - Webster clay loam, 0 to 2 percent slopes
 - Webster-Delft complex, 0 to 2 percent slopes

Redwood County Ditch No. 20
 Watershed Boundary
 Area = 4,635 Acres

Redwood County Ditch No. 12
 Open Ditch



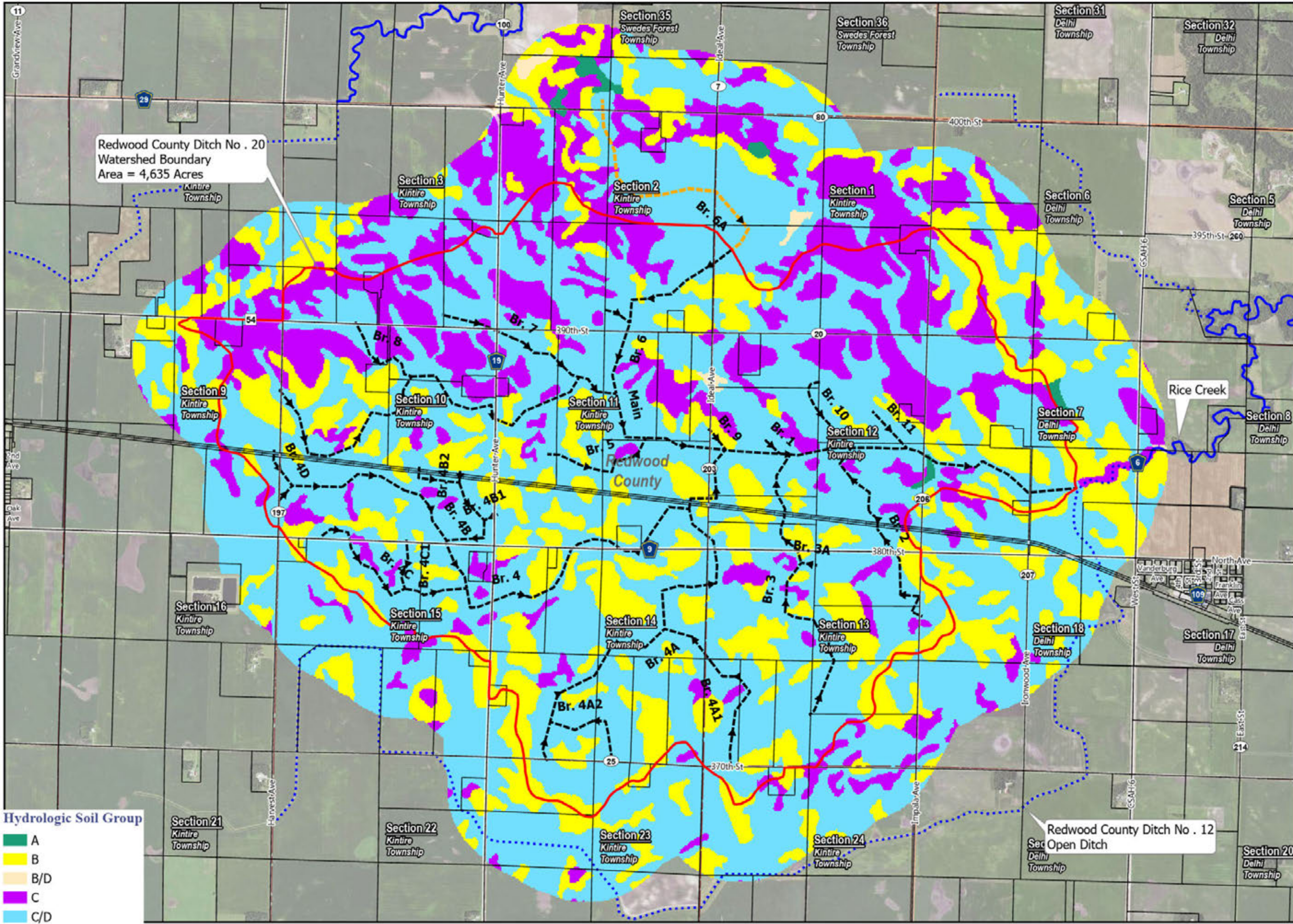
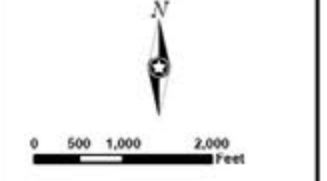
Hydrologic Soil Group Map

County Ditch No. 20

Redwood County, Minnesota
Friday, November 21, 2025

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads

PN: 23-28479
Source:
 Orthophotograph (MnGeo WMS, 2015)
 Tile/Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July 2008)
 Counties (MN DNR, July 2013)
 PLSS (MnGeo/USGS)



Redwood County Ditch No. 20
 Watershed Boundary
 Area = 4,635 Acres

Redwood County Ditch No. 12
 Open Ditch

- Hydrologic Soil Group**
- A
 - B
 - B/D
 - C
 - C/D



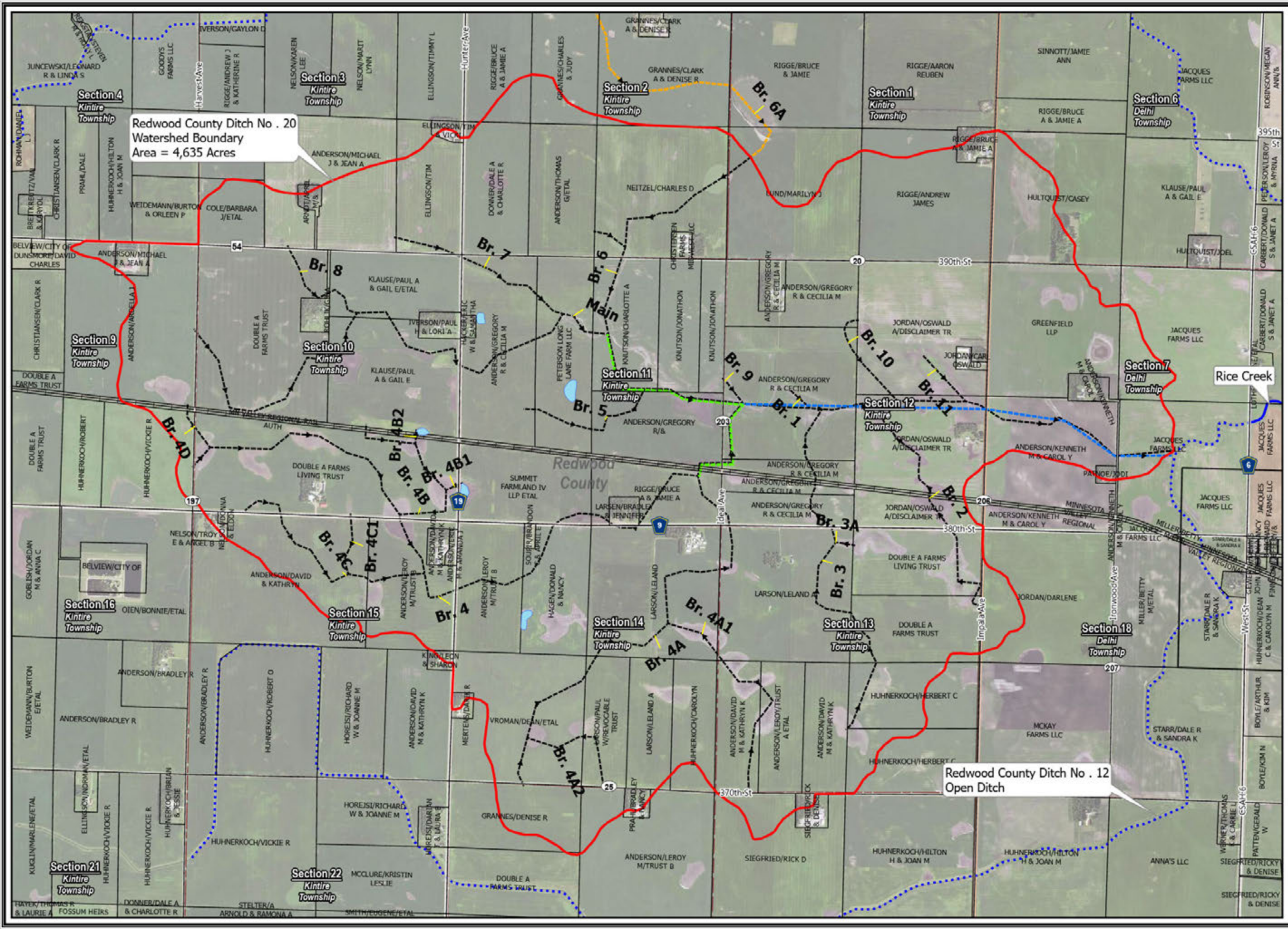
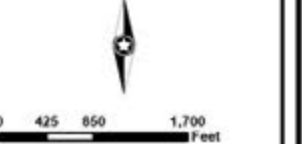
Level 1 Wetland Delineation Map
County Ditch No. 20
 Redwood County,
 Minnesota
 Friday, November 21, 2025

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Proposed Tile
 - Proposed Open Ditch
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads
 - Potential Wetlands

PN: 23-28479

Source:

Orthophotograph (MinGeo WMS, 2015)
 Tile Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July, 2008)
 Counties (MN DNR, July 2013)
 PLSS (MinGeo/USGS)



Redwood County Ditch No. 20
 Watershed Boundary
 Area = 4,635 Acres

Redwood County Ditch No. 12
 Open Ditch

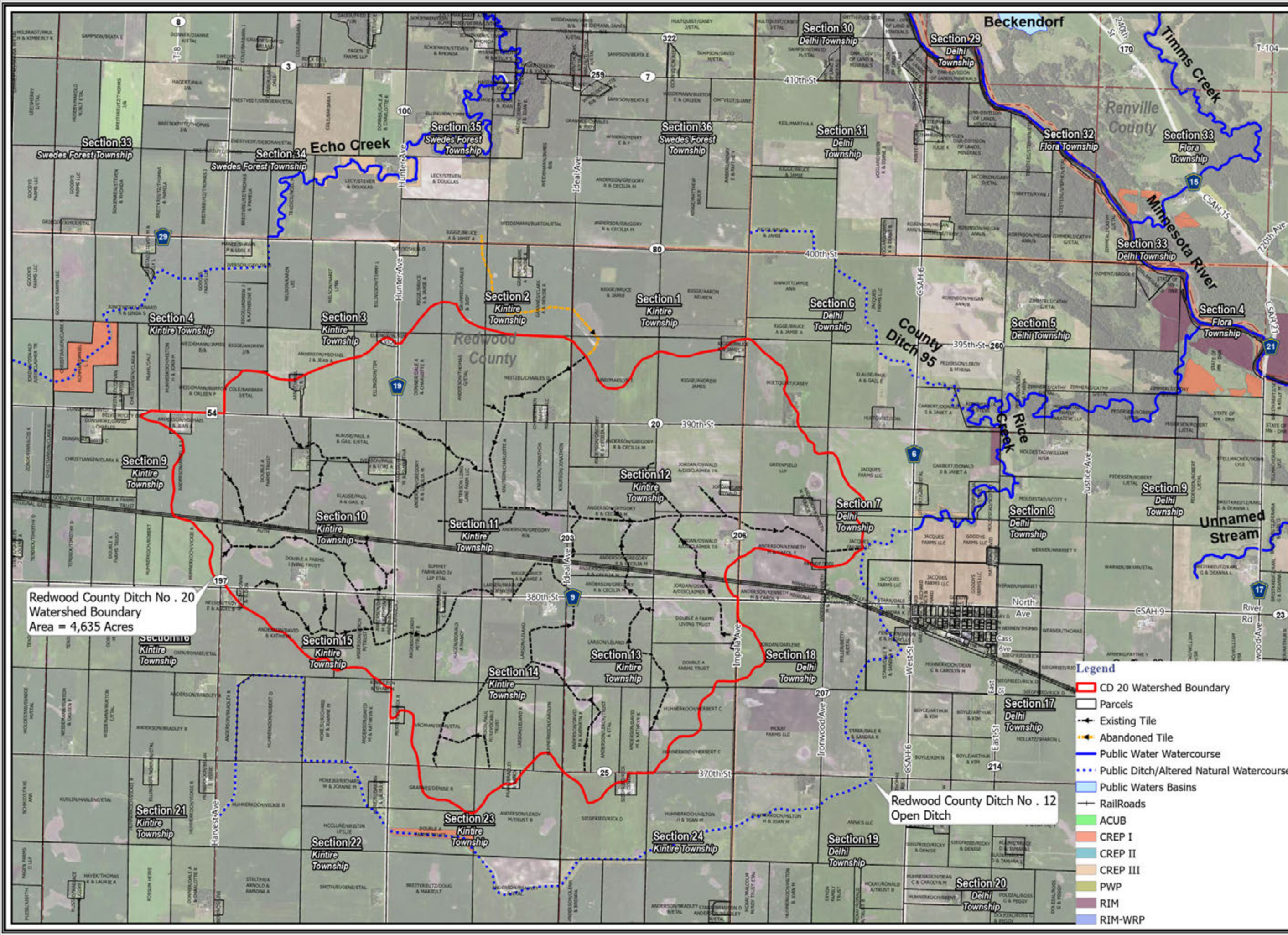
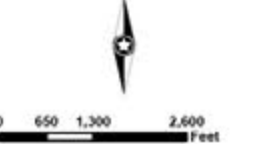


Public Waters and Lands Map
County Ditch No. 20
 Redwood County,
 Minnesota
 Friday, November 21, 2025

PN: 23-28479

Source:

Orthophotograph (MinGeo WMS, 2015)
 Tile/Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July, 2008)
 Counties (MN DNR, July, 2013)
 PLS (MinGeo/USGS)



Redwood County Ditch No. 20
 Watershed Boundary
 Area = 4,635 Acres

Redwood County Ditch No. 12
 Open Ditch

- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Public Waters Basins
 - Railroads
 - ACUB
 - CREP I
 - CREP II
 - CREP III
 - PWP
 - RIM
 - RIM-WRP



Appendix D: Multipurpose Drainage Management

Multi-Purpose Drainage Management Plan

Prior to this report, the Agricultural Conservation Planning Framework (ACPF) GIS tools were used along with aerial drone videos to site and prioritize BMPs within the watershed. The data sets developed were the starting point for identifying practical and feasible practices to prioritize for implementation. Additional practices were added that may be outside the scope of siting through the GIS tools but would be feasible based upon on-site conditions such as topography, field boundaries, and aerial review. It is important to note that this study was completed through desktop analysis and on-site investigation is needed to verify project feasibility.

Multi-purpose drainage management incorporates Best Management Practices (BMPs) which utilize effective measures aimed at reducing sediment and nutrient loading and improving water quality. These BMPs are divided into Preventive, Control, and Treatment measures.

Preventative Measures

Preventative measures that can be applied throughout the watershed include crop rotation, cover crops, residue management, and nutrient management. These measures are aimed at controlling sediment, minimizing erosion and nutrient loss, and sustaining the soil's health, all without dramatically changing the current land use of the landscape. ISG performed a runoff risk assessment throughout the CD 20 watershed. From this assessment, ISG was able to identify areas of high potential for sediment and nutrient loaded runoff. These areas give a good idea of where to implement the preventative measures discussed previously.

Control Measures

Control measures are practices aimed at improving water quality directly associated with the flow of water by reducing peak flow and providing in-stream storage, sedimentation, and nutrient uptake. Examples of control measures include alternative tile intakes, grassed waterways, two stage ditches, water control structures, and controlled subsurface drainage. These practices are directly linked to the conveyance of subsurface tile water or open channel ditch flow. ISG identified several areas in which contour buffer strips, grassed waterways, and woodchip bioreactors have a high potential for sediment reduction.

Grassed Waterways

Control Waterways are installed to reduce the risk of concentrated flow (gully) erosion. This practice is effective in preventing gully erosion as the growing grasses can reduce mean velocity of runoff, which discourages soil detachment. Grass vegetation also provides a physical barrier to prevent gully formation and the fibrous root systems of grasses lead to increased soil strength which can limit detachment of soil particles. The grassed waterways in this watershed were placed in steep sloped areas with concentrated flows subject to erosion.

Contour Buffer Strips

Contour Buffer Strips are strips of perennial vegetation planted along topographic contours, which may be alternated with wider cultivated strips that are farmed on the contour. Contour buffer strips are in-field runoff control practices that use permanent vegetation to decrease the length of slopes along which runoff accumulates, and thereby reduce sheet and rill erosion. Additionally, contour buffer strips reduce water quality degradation from the transport of sediment and other water-borne contaminants down slope. Contour buffer strips are placed along topographic contours to intercept flows.

Controlled Drainage

Controlled Drainage is the process of managing the drainage volume and water table elevation by regulating the flow from a surface or subsurface agricultural drainage system. This practice is used to reduce nutrient, pathogen, and pesticide loading from drainage systems into downstream receiving waters. Additionally, controlled drainage improves productivity, health, and vigor of plants along with reducing the oxidation of organic matter in soils. This practice is applicable to agricultural lands with surface or subsurface drainage systems that can be adapted, or partially adapted to allow management of drainage volume and the water table by changing the water level elevation at the outlets. This practice applies where a high natural water table exists or has existed, and the topography is relatively smooth, uniform, and flat to very gently sloping.

Treatment Measures

The function of treatment measures is to improve water quality by directly removing sediment and nutrients from the subsurface or surface water flow throughout a watershed. Examples of treatment measures include surge basins (storage ponds), filter/buffer strips, wetland restorations, woodchip bioreactors, and water and sediment control basins (WASCOBs). These practices may be incorporated into either the public or private drainage systems.

Water and Sediment Control Basins (WASCOBs)

Water and Sediment Control Basins (WASCOBs) are an earthen embankment placed perpendicular to the water flow direction on a moderate to steep hillside of an agricultural area. The primary goal of WASCOBs is to improve the ability to farm steep sloped areas of farmland by reducing gully erosion. They are placed in areas that experience gully erosion with steep side slopes or can be placed adjacent to ditch banks that experience gully erosion. They are designed to temporarily pool water on the hillside behind the embankment, thus reducing peak surface flow, reducing erosion, and providing an area for sedimentation.

Denitrifying Bioreactors

Bioreactors typically comprise a buried bed of woodchips that receive a portion of tile drainage flows from an adjoining field. The wood chips provide a carbon source, which combined with the reducing (oxygen limiting) conditions in the saturated subsurface environment, encourage naturally occurring bacteria to reduce nitrate to di-nitrogen gas in a stepwise process (denitrification). This practice applies to sites where there is a need to reduce the concentration of nitrate nitrogen in the flow from subsurface drainage systems.

Constructed Treatment Wetlands

Constructed treatment wetlands are generally located in low-lying areas that would otherwise be saturated during rain events. Constructed wetlands use embankments such as berms or overflow weirs to hold agricultural drainage water to be treated. Constructed wetlands benefits include reduced peak flow rates, sedimentation, nutrient reductions, wildlife enhancement, and overall improved water quality. There are many programs available for constructed treatment wetlands and include wetland banking, RIM-WRP, CREP, and various NRCS programs.

Wetland Enhancements

Wetland Enhancements are implemented to enhance existing wetland areas. Wetland enhancements include but are not limited to increasing wetland storage by adding additional hydrology to the site, expanding the wetland footprint, or allowing agricultural drainage water treatment. By enhancing the wetland, it can add additional water quality benefits including increased sedimentation, nutrient reduction, and reduced peak flows.

Several potential wetland areas were located throughout the CD 20 watershed. These potential wetlands are generally located in areas that have a large upstream drainage area to maximize sediment and nutrient capture.

Funding

There are several outside funding sources available to assist in financing practices that help to improve water quality and natural resources in the watershed. Water quality measures identified in the Multi-purpose Management Plan are applicable for some source of outside funding. Below outlines options for pursuing funding to improve water quality, reduce erosion and sedimentation, reduce downstream flooding, and protect and enhance aquatic and terrestrial habitat. These grants can be applied for if there is support from the Drainage Authority, soil and water conservation district, and/or interest from individual landowners. While this list outlines many options available for this region, it is not all inclusive and other funding sources may be options for pursuing cost-share for implementation.

TABLE 1. GRANT PROGRAMS

Grant / Program	Grant / Program Goals*
BWSR CWF Watershed Based Implementation Fund (WBIF)	Implement projects and programs to advance goals outline in the watershed's Comprehensive Watershed Management Plan developed under the One Watershed, One Plan program
BWSR Clean Water Fund (CWF) Multi-purpose drainage management (MDM)	Target critical pollution source areas to reduce erosion and sedimentation, reduce peak flows and flooding, and improve water quality while protecting drainage system efficiency and reducing drainage system maintenance on 103E drainage systems
BWSR CWF Project and Practices	On-the-ground projects and practices that will protect or restore water quality in lakes, rivers or streams, or will protect groundwater or drinking water
BWSR Water Quantity and Storage Program	Establish storage practices in the Minnesota River basin and Lower Mississippi River basin to control water rates and/or volumes to protect infrastructure, improve water quality and related public benefits, and mitigate climate change impacts.
DNR Outdoor Heritage Fund	Provides permanent protection on private lands through conservation easements
BWSR CWF Soil Health Grants	Provides funding for farmers to adopt cover crops or other soil health practices that benefit public water supplies
MDA Ag BMP Loan Program	Low interest loans to farmers, rural landowners, and agricultural supply business to encourage BMPs that prevent or reduce runoff from feedlots, farm fields, and other pollution problems identified by the county in local water plan.
NRCS Environmental Quality Incentives Program (EQIP)	Address natural resources concerns and deliver environmental benefits such as improved water, air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or create wildlife habitat and mitigation against drought and increasing weather volatility.

*Grant / program goals outlined above are a summary. Please reference the grant request for submission for the grant/program goals as well as eligible practices along with other program requirements or guidelines.

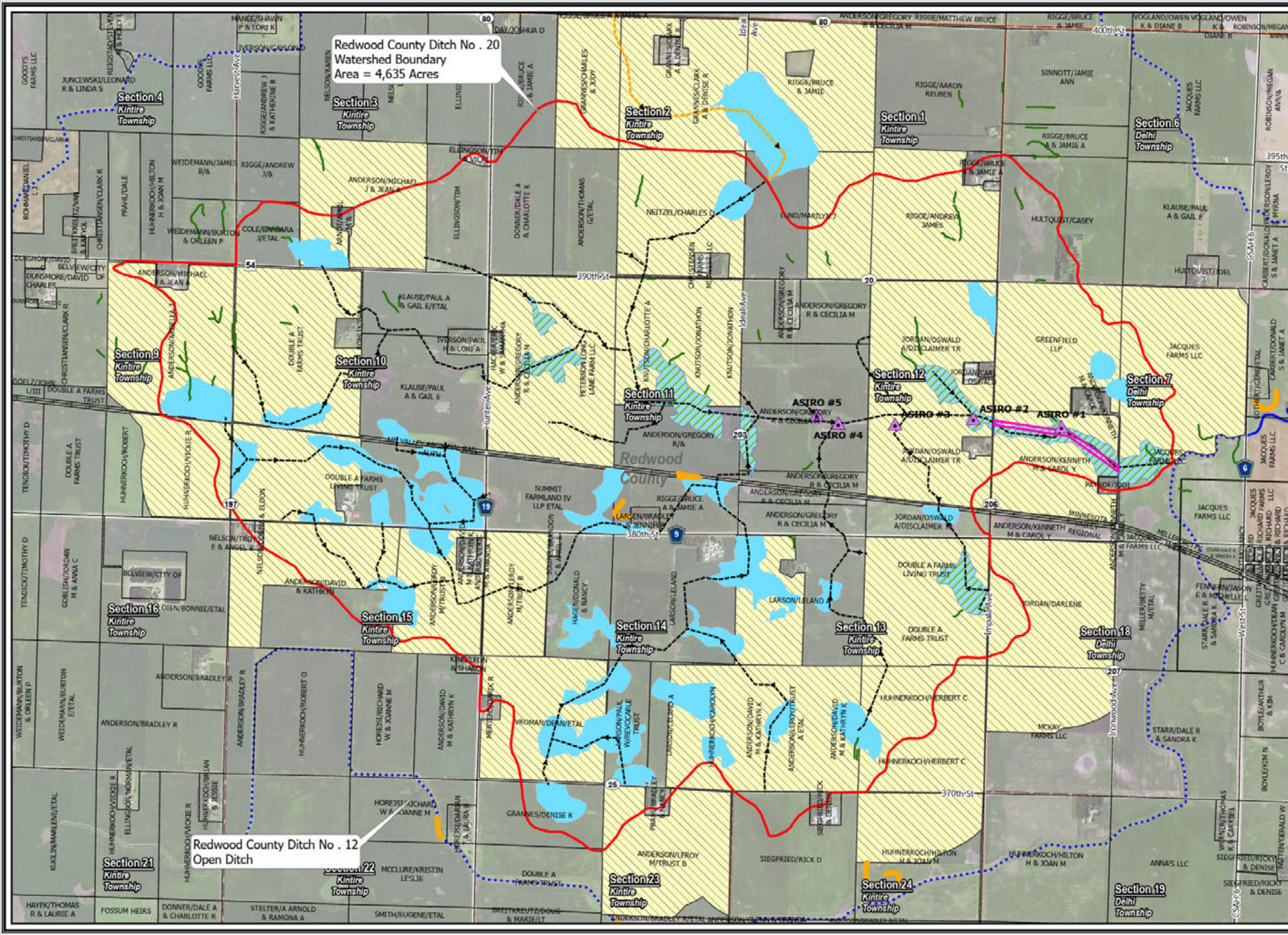
Currently, this project includes ASIs and ASIROS as BMPs. Locations siting potential BMPs are shown on the *Multi-Purpose Drainage Management (MDM) Map* in Appendix D and will be proposed to landowners. Several areas throughout CD 20 are sited for potential storage and/or wetland opportunities. Furthermore, additional water quality measures can be implemented with this project if requested.

Another option for individual landowners that are interested in pursuing additional practices is the Environmental Quality Incentives Program (EQIP). This is a voluntary program through the NRCS that provides financial assistance to individual landowners for various conservative practices as identified above.

In addition, the BWSR Community Partners Grant may be an option. The grant leverages the interest of non-governmental partners such as lake and river associations, boy/girl scout troops and other civic groups to install on the ground projects that reduce runoff and keep water on the land. It allows multiple local government units to work together on a project that involves the Community Partners Grant. Projects installed with the Community Partners Grant are intended to be structural or vegetative practices designed to reduce runoff and/or keep water on the land.



MDM Map
County Ditch No. 20
 Redwood County,
 Minnesota
 Thursday, December 11, 2025



- Legend**
- CD 20 Watershed Boundary
 - Parcels
 - Existing Tile
 - Abandoned Tile
 - Public Water Watercourse
 - Public Ditch/Altered Natural Watercourse
 - Railroads
 - ▲ ASIRO
 - Grassed Waterway
 - Contour Buffer Strips
 - Two-Stage Ditch
 - Nutrient Removal Wetland
 - Potential Storage
 - Controlled Drainage

PN: 23-28479

Source:

Orthophotograph (MnGeo WMS, 2015)
 Tile/Ditch (Redwood County, 12/16/2016)
 Parcels (Redwood County, 12/16/2016)
 Lakes (MN DNR, July, 2008)
 Major Stream (MN DNR, July 2008)
 Counties (MN DNR, July 2013)
 PLSS (MnGeo/USGS)



Appendix E: Drainage Calculations



ACSIC TILE SUMMARY

Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	28	0.10%	4869.6	0.05
	28	0.10%	4647.1	0.06
	28	0.10%	4304.5	0.06
	28	0.10%	4252.8	0.06
	28	0.10%	4104.2	0.06
	26	0.10%	3688.5	0.06
	26	0.10%	3177.3	0.07
	18	0.20%	1576.8	0.07
	16	0.20%	1371.3	0.06
	14	0.20%	794.0	0.07
	12	0.40%	531.6	0.10
	12	0.20%	473.5	0.08
	10	0.20%	232.2	0.10
	8	0.20%	218.4	0.06
	6	0.50%	95.9	0.10
	5	0.40%	80.3	0.06
5	0.40%	57.1	0.09	
Branch 1	6	0.30%	123.5	0.06
Branch 2	10	0.50%	205.9	0.18
	10	0.10%	148.3	0.11
	8	0.20%	137.0	0.09
	7	0.20%	108.0	0.08
	7	0.10%	50.6	0.13
	7	0.10%	6.6	0.97
Branch 3	10	0.30%	365.3	0.08
	9	0.30%	335.5	0.06
	9	0.30%	290.7	0.07
	9	0.15%	233.2	0.07
	8	0.35%	155.1	0.11
	7	0.10%	100.2	0.06
Branch 3A	6	0.10%	43.1	0.10
Branch 4	20	0.32%	1565.8	0.12
	16	0.32%	875.3	0.12
	16	0.32%	843.3	0.12
	16	0.20%	795.1	0.10
	15	0.43%	705.9	0.14
	15	0.10%	695.9	0.07
	15	0.10%	519.6	0.09
	14	0.10%	339.0	0.12
	12	0.15%	217.2	0.15
	12	0.10%	214.9	0.13
	10	0.10%	193.5	0.09
	8	0.10%	141.6	0.06
5	0.10%	26.0	0.10	

**Redwood County
County Ditch No. 20**



Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Branch 4 Lat A	14	0.20%	627.0	0.09
	14	0.20%	607.5	0.09
	14	0.10%	539.4	0.08
	10	0.40%	263.1	0.13
	10	0.10%	261.1	0.06
	9	0.10%	205.8	0.06
	5	0.25%	53.2	0.08
Branch 4 Lat A1	5	0.25%	33.1	0.12
	10	0.10%	236.8	0.07
	8	0.10%	189.6	0.05
	6	0.10%	66.0	0.06
	6	0.30%	55.2	0.13
Branch 4 Lat A2	6	0.30%	21.2	0.35
	8	0.10%	116.0	0.08
Branch 4 Lat B	6	0.10%	83.0	0.05
	8	0.10%	85.2	0.11
	6	0.10%	59.5	0.07
	6	0.25%	59.5	0.11
Branch 4 Lat B1	5	0.25%	20.5	0.20
Branch 4 Lat B2	6	0.10%	20.6	0.21
Branch 4 Lat C	5	0.50%	6.6	0.88
	9	0.10%	146.2	0.09
	7	0.24%	74.7	0.13
	6	0.24%	40.4	0.16
Branch 4 Lat C1	5	0.24%	17.0	0.24
	6	0.10%	32.4	0.13
	6	0.10%	15.1	0.28
Branch 5	6	0.20%	78.7	0.08
	6	0.20%	102.5	0.06
	5	0.60%	70.2	0.09
Branch 6	5	0.20%	58.2	0.06
	12	0.13%	551.5	0.05
	12	0.13%	494.6	0.06
	6	0.13%	17.2	0.28
	6	0.40%	13.2	0.64

**Redwood County
County Ditch No. 20**



Area	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Branch 6 Lat A	10	0.25%	346.9	0.08
	10	0.10%	232.9	0.07
	9	0.10%	190.9	0.07
	8	0.10%	131.8	0.07
	7	0.90%	191.0	0.10
	7	0.20%	139.3	0.06
	6	0.20%	119.6	0.05
	5	2.30%	27.0	0.46
Branch 7	5	0.10%	27.0	0.10
	7	0.20%	247.0	0.04
	6	0.50%	215.2	0.04
	5	0.80%	165.8	0.04
Branch 8	5	0.20%	126.9	0.03
	5	0.90%	117.3	0.07
Branch 8	5	0.30%	108.3	0.04
	5	0.30%	10.5	0.43
Branch 9	5	0.30%	10.5	0.43
Branch 10	12	0.10%	207.4	0.13
Branch 11	10	0.10%	101.1	0.16

**Redwood County
County Ditch No. 20**



PROPOSED IMPROVEMENT TILE SUMMARY

Area	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	28	Open Ditch	0.10%	0.09%	4869.6	0.05	Open Ditch
	28		0.10%	0.08%	4647.1	0.06	
	28		0.10%	0.07%	4304.5	0.06	
	28		0.10%	0.07%	4252.8	0.06	
	28		0.10%	0.07%	4104.2	0.06	
	26		0.10%	0.17%	3688.5	0.06	
	26		0.10%	0.13%	3177.3	0.07	
	18	42	0.20%	0.12%	1576.8	0.07	0.53
	16	36	0.20%	0.20%	1371.3	0.06	0.52
Branch 4	20	36	0.32%	0.25%	1565.8	0.12	0.51



EXISTING DITCH CULVERT SUMMARY

Crossing # on Map	Roadway	Existing Type	Existing Material	Existing Size (in)	Existing Width (ft)	Existing Height (ft)	Existing Slope (%)	Drainage Area (Acres)	Existing Drainage Coefficient (in/day)	Combined Existing Drainage Coefficient (in/day)
1	Ironwood Ave	ROUND CULVERT	RCP	48	-	-	2.63%	4722	1.18	1.32
	Ironwood Ave	ROUND CULVERT	RCP	36	-	-	0.18%	4722	<i>0.14</i>	
2	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	6.08
	Impala Ave	BOX CULVERT	RCP	-	10	4	0.46%	4145	3.04	



PROPOSED DITCH CULVERT SUMMARY

Crossing # on Map	Ditch Description	Station	Roadway	Proposed Type	Proposed Material	Proposed Width (ft)	Proposed Height (ft)	Proposed Slope (%)	Drainage Area (Acres)	Proposed Drainage Coefficient (in/day)
1	Mainline Open Ditch	10+90	Ironwood Ave	BOX CULVERT	RCP	8	4	0.10%	4722	0.93
2	Mainline Open Ditch	39+49	Impala Ave	BOX CULVERT	RCP	8	7	0.10%	4145	2.17

Appendix F: Hydraulic Modeling

Redwood County Ditch No. 20 Hydrology Report

PROJECT OVERVIEW

The Redwood County Ditch No. 20 (CD 20) public drainage improvement proposes to deepen and increase the capacity of a portion of Mainline and Branch 4 public tile and replace a portion of Mainline tile with a Mainline open ditch. Additionally, the proposed improvement includes the implementation of a two-stage ditch as a portion of the proposed Mainline open ditch. The “Proposed” condition as referenced throughout this appendix, is the Proposed Improvement as detailed in the Final Engineer’s Report (FER).

MODEL PARAMETERS

Runoff Parameters

The routing method for the models used the SCS Hydrology method. Two parameters were calculated in GIS: the runoff sub-catchment area and the time of concentration. Time of Concentration (T_c), calculations were calculated utilizing the TR-55 methodology. The tool referenced is a proprietary ArcGIS tool developed by ISG to calculate the time of concentration for a given subwatershed. This tool calculates the longest flowpath and average land slope for each catchment. This data is calculated from county Digital Elevation Model (DEM) data. User input parameters include land use type, surface roughness (based on land use type), and the P2 variable (the depth of rainfall, in inches, of a 2-year 24-hour storm - gathered from NOAA Atlas 14). This tool essentially automates the TOC calculations given land use and elevation data. This information was calculated for points located strategically along the CD 20 drainage tile. The values used for this tool conservatively assume that the entire watershed is tile drained. The curve number for agricultural land was found to be relatively uniform, but weighted curve numbers were attributed to each individual subcatchment through review of the land use and soil parameters within the watershed, this resulted in a range between roughly 80.3 and 87.9.

The SCS depth, or storage depth, was calculated based on the curve number using the equation: $SCS\ Depth = \frac{1000 - CN}{12}$. The storage depth is the maximum potential depth of water in feet that could be infiltrated or stored on the surface, or “lost”, before runoff occurs (i.e. through initial infiltration, evaporation, and surface depression storage). The initial abstraction factor was calculated from the curve number using the equation: $Ia = 0.2 \times (\frac{1000}{CN} - 10)$.

Hydraulic Parameters

One assumption made to model the current drainage system in the As Constructed or Subsequently Improved Condition (ACSIC) so that the tile is functioning as it was originally constructed. This means it does not take into consideration the blockages and restrictions that are likely throughout the existing tile or open ditch. Both the ACSIC and proposed tile systems are modeled using a Manning’s n value of 0.013.

Another factor within the model is that the subcatchment runoff is routed directly into the pipes, which assumes 100% privately tiled ground. The landowners may or may not have their land completely privately tiled at this time, but the Engineer finds it to be a necessary conservative assumption. Many small depressional basins exist throughout the watershed some of the subcatchments can be routed to additional private tiles or routed directly to the landscape. Routing subcatchments directly to the landscape or additional private tile allows flooding in these small depressional areas as well as greater levels of infiltration to be represented within the model, which more closely represents what is occurring on the landscape.

Storm Events

The design storm events were chosen to comply with Minnesota drainage statute (103E.015(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.”

Modeled rainfall depths were determined using NOAA Atlas 14 Point Precipitation Frequency Estimates: MN as provided for near Dehli, MN and the obtained values can be seen in Table 1 below. The 24-hour duration was used as it is the standard design storm duration and is the necessary duration to use the NRCS MSE3 rainfall distribution.

TABLE 1. MODELED 24-HR PRECIPITATION VALUES

Rainfall Event	Rainfall Depth (inches)
5-yr	3.30
10-yr	3.89
25-yr	4.84
50-yr	5.66

Infiltration

2D hydraulic infiltration was used in the model to allow surface water to infiltrate into the soil. Soil data was imported from GIS to apply infiltration parameters based on the USDA Hydrologic Soil Types as delineated by the USDA Web Soil Survey. Infiltration is applied using the Green-Ampt methodology. When combining this 2D infiltration method with the SCS storage depth, some considerations must be taken so as to not duplicate the initial rapid infiltration volumes. To remedy this, initial Green-Ampt Soil Moisture Deficit is set to 0.01 (as near “0”) as the model will allow, what this achieves is modeling an initially saturated soil profile, which would have been achieved through the infiltration accounted for in the SCS storage depth. The majority of the hydrologic soil classification is representative of C/D soils, which contain large percentages of clay and display relatively slow infiltration rates.

FER Modeling Updates & DNR Advisory Comments

The Minnesota Department of Natural Resources (DNR) submitted their Preliminary Advisory Report on July 14th, 2025, which was read into the record at the preliminary hearing. Comments and discussion points relating to modeling are compiled and addressed below, along with notable model revisions. A complete tabulated response to the DNR Preliminary Advisory Report is located in the “Response to DNR’s PER Advisory Review and Model Review” section in the Final Engineer’s Report.

DNR Modeling Comment #1 – The existing Mainline tile and other branch tile sizes in the plan and profile sheets, specifically the Mainline tile outlet (28-inch), does not match the modeled existing Mainline tile outlet size (30-inch).

ISG’s Response: According to historical plan and profiles, the As Constructed or Subsequently Improved Condition (ACSIC) Mainline tile outlet size is 28-inches. The model represented the condition that would be installed if repair were to be constructed which is represented as the size under separable maintenance estimate. Under 103E.701, the repaired condition means to restore all or part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved condition (ACSIC). This includes the replacement of tiles with the next larger size that is readily available, if the original size is not readily available. This process was followed for the Mainline and branch tiles, so that modeling is performed following the most realistic as-repaired condition.

DNR Modeling Comment #2 – The existing Mesh Level Zone for Ironwood Avenue does not match the proposed Mesh Level Zone elevations, in addition to an elevation discrepancy in the proposed model, preventing overland flow from overtopping Ironwood Avenue in the proposed conditions.

ISG’s Response: Mesh level zone elevation updates have been completed for Ironwood Avenue in the ACSIC and proposed FER models. These updates eliminated elevation discrepancies between ACSIC and proposed model simulations.

Ironwood Avenue has been a discussion point amongst landowners and ISG as preliminary modeling depicted overtopping for larger storm events in the preliminary model. A meeting was held with landowners to discuss the validity of this observation in an effort to calibrate the ACSIC model. Landowners owning property at and around Ironwood Avenue provided feedback and testimony stating that they have never witnessed Ironwood Avenue overtop, even with rain events as large as 7 or more inches. Additionally, a site investigation by ISG staff found no damage or evidence that Ironwood Avenue has been overtopping. Ironwood Avenue consists of a 48-inch RCP culvert and a 36-inch RCP culvert to by-pass overland flow. The mesh level zones in both the ACSIC and proposed FER models were adjusted to better reflect the

ground surface and prevent overtopping of Ironwood Avenue. This elevation adjustment was maintained in both the ACSIC and proposed model simulations for consistency.

DNR Modeling Comment #3 – The existing results and narrative report emphasizes that a majority of the flow through the drainage system is passing as channelized flow over the Mainline draintile, especially between Impala Avenue and the CD 20 outlet. The 2D mesh does the hydraulic computations on the channelized overland flow. Mesh Zones are used in the proposed scenario to refine the mesh size for the open channel ditch, and it is recommended that a similar approach taken for the existing conditions, where there is significant overland flow happening.

It is understood that the mesh cannot be equal for the scenarios due to the changes required for the improvements, but having a similar level of detail for similar hydraulic cases can better support the comparison between the two scenarios.

ISG's Response: In the ACSIC and proposed FER models, Mesh Zones were added to refine the mesh size through the Mainline tile and Mainline open ditch region to support hydraulic computations and provide consistency across scenarios. Mesh zones in both the ACSIC and proposed FER models are set to the same parameters.

Validation

One method for fact-checking the model is to calculate the runoff coefficient for the ACSIC conditions at the system outlet for each rainfall event and compare it to the runoff coefficient calculated from USGS StreamStats peak flow data. This was done for both the CD 20 outlet and the CD 12 open ditch. Flows displayed at the CD 20 outlet and CD 12 open ditch fit within the StreamStats Lower 90% Prediction Interval and the Upper 90% prediction interval. Following the calibration of CD 20 and CD 12, County State Aid Highway 6 (CSAH 6) hydraulic bridge report was utilized to verify design flow to compare to ACSIC and proposed modeled flow. In the hydraulic report, CSAH 6 50-year design flood is approximately 825 cfs, which closely matches the modeled ACSIC and proposed 50-year flow at this location which is illustrated in the tables below. Other notable changes were the expansion and refinement of subcatchments throughout CD 20. In the preliminary model, subcatchments were larger sized and less refined to be divided by roadways. Subcatchment refinement and expansion provided more detail in subcatchment routing to tile and the landscape if no tile was present and could more accurately represent the numerous isolated basins in which water would inundate and infiltrate, therefore further calibrating and lowering the higher flows that were observed in the preliminary model. Additional modeling calibration was done through site visits, the collaborative stream survey, drone flights, and landowner testimony as described throughout this appendix.

MODEL REVIEW

The following results and discussion comprise the detailed analysis of the ACSIC and proposed models. Results compiled in the tables below illustrate the comparison of peak flow, peak velocity, peak water elevation, and total volume at various locations near and around the outlet of the CD 20 public drainage system.

A hydraulic/hydrologic (H/H) model was created for both the ACSIC and proposed conditions to model the 5-, 10-, 25-, and 50-year storm events in ICM. The CD 20 public drainage system outlets into CD 12 which is another public drainage system. CD 12 subsequently flows east, before crossing County State Aid Highway 6 (CSAH 6) and outletting into Rice Creek. Rice Creek is a public water. The proposed improvement project ends at the outlet of the CD 20 system. The improvement ends at the terminus of the CD 20 system. Modeling results presented herein reference the CD 20 system outlet, downstream of the CD 20 and CD 12 public ditch confluence, and CSAH 6. Figure 1 below illustrates the locations at which model results are presented from.

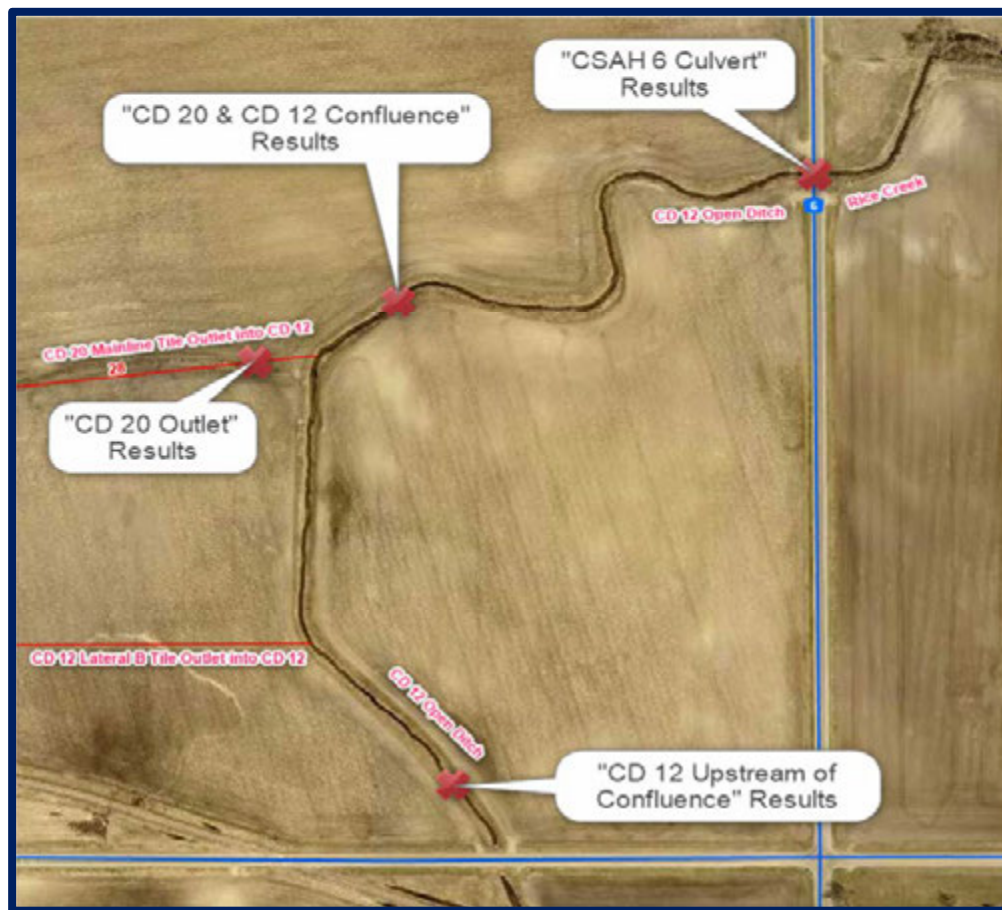


Figure 1. Reported Result Location Map

As defined in the subcommittee's report, the terminus for the improvement is defined as the downstream end of the project. For the CD 20 improvement, the project's terminus is defined as the CD 20 Mainline tile outlet into the CD 12 open ditch. The CD 12 open ditch is an engineered channel with primary purpose of supporting agricultural drainage. The CD 12 open ditch was visually inspected and assessed through a stream survey in collaboration with the DNR and was deemed a stable channel with dense vegetation and no visual areas of sloughing or bank instability. CD 12 contributes approximately 10,925-acres at its confluence with the CD 20 outlet. The CD 12 open ditch subsequently flows east to CSAH 6 and becomes Rice Creek. The west side of CSAH 6 is considered the CD 12 open ditch and the east side of CSAH 6 is considered Rice Creek, a public water.



Figure 2. CD 20 Mainline Tile Outlet into CD 12



Figure 3. CD 12 Open Ditch Downstream of CD 20 Mainline tile outlet

Tables 2-5 below present the results from the “CD 20 Outlet” location as illustrated in Figure 1 above. The CD 20 outlet is the terminus of the proposed improvement.

TABLE 2. CD 20 OUTLET FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	226.7	204.2	-10%
10-yr	283.1	216.4	-24%
25-yr	327.3	231.0	-29%
50-yr	363.0	244.1	-33%

TABLE 3. CD 20 OUTLET VELOCITY COMPARISON

Rainfall Event	ACSIC (Tile) (ft/s)	ACSIC (Overland) (ft/s)	Proposed (Overland) (ft/s)	Difference in Overland
5-yr	10.0	1.4	1.8	0.40
10-yr	10.1	1.5	1.5	0.00
25-yr	10.0	1.6	1.5	-0.10
50-yr	10.0	1.5	1.4	-0.10

TABLE 4. CD 20 OUTLET ELEVATION COMPARISON

Rainfall Event	ACSIC (MSL)*	Proposed (MSL)**	Difference
5-yr	1012.2	1011.8	-0.40
10-yr	1012.8	1012.8	0.00
25-yr	1014.3	1014.5	0.20
50-yr	1016.2	1016.6	0.40
*Existing Minimum Ground Elevation is 1006.5'			
**Proposed Channel Bottom Elevation is 1003.7'			

TABLE 5. CD 20 OUTLET VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	393.5	422.1	7%
10-yr	522.5	548.5	5%
25-yr	735.3	759.1	3%
50-yr	923.0	929.5	1%

In ICM, 1D flow includes flow through a tile or pipe and 2D flow includes flow overland/in-channel. In the case of the CD 20 outlet location, both 1D tile flow and 2D overland/in-channel flow are present within the ACSIC model at the CD 20 outlet. For the peak flow comparison at the CD 20 system outlet, ACSIC flowrates include the sum of 1D tile flow and 2D overland/in-channel flow. In the proposed model, the CD 20 Mainline tile will no longer exist, therefore flow is represented as just 2D overland/in-channel flow. When comparing the peak flowrates at the CD 20 existing Mainline tile outlet and the CD 20 proposed Mainline open ditch outlet, the comparison of ACSIC and proposed peak flowrates are decreasing by 10% to 33% across all modeled storm events. The reduction in peak flowrates presented at the CD 20 outlet can be attributed to the implementation of the two-stage ditch. The two-stage ditch design includes a 20-foot bench located on both sides of the proposed Mainline open ditch between Ironwood Avenue and Impala Avenue. The Ironwood Avenue proposed culvert acts as a control structure, which forces water to utilize the two-stage ditch benches like a floodplain, therefore reducing peak flowrates.

Peak velocities are represented at the same location. In ICM, 1D flow includes flow through a tile or pipe and 2D flow includes flow overland/in-channel. In the case of the CD 20 outlet, both 1D tile flow and 2D overland/in-channel flow are present within the ACSIC model at the CD 20 outlet. Table 3 above shows the ACSIC tile velocity and ACSIC overland flow velocity in the ACSIC model. In the proposed model, the CD 20 Mainline tile does not exist, as it is being replaced by the Mainline open ditch, therefore only contributing 2D overland/in-channel flow. For the purpose of providing an “apples to apples” comparison, 1D and 2D flows are presented separately and compared. Peak velocities for 2D overland flow are increasing by 0.40 ft/s for the 5-year event and are decreasing or showing no change for the 10 through 50-year events when comparing the ACSIC and proposed models. 1D tile flow velocity at this same location only exists within the ACSIC model and is generally 10 ft/s. Even though there is a slight increase in velocity for the 5-year event in the proposed model, it will be concentrated within the CD 20 Mainline open ditch channel and will not contribute to overland gully erosion which is present within the ACSIC model. Additionally, peak velocity through the CD 20 Mainline tile is approximately 10 ft/s in the ACSIC model, which is significantly higher than peak overland/in-channel flow

velocity in both the ACSIC and proposed model. Because the CD 20 Mainline tile will be replaced with the Mainline open ditch, CD 12 will no longer be experiencing the high velocities produce by the CD 20 Mainline tile, therefore preventing scour and erosion within the CD 12 open ditch.

A comparison of peak water elevations from the location indicated above are depicted in Table 4. The proposed model suggests a decrease or negligible change in peak water elevations for the 5- and 10-year events and increases of 0.20-feet and 0.40-feet for the 25- and 50-year events respectively. The slight increase in peak water level elevation is due to the fact that in the proposed model, water is more channelized and contained within the CD 20 Mainline open ditch, whereas in the ACSIC model, flooding is able to disperse across the landscape. Containing the same volume of water in a smaller area, such as within the proposed open ditch, will result in a slight increase in peak water elevation, but will reduce the overall flooding impact to adjacent lands and resultant overland erosion. It is important to note that minimum ground elevations differ between the ACSIC and proposed models. Minimum ground elevations are denoted in the table above and can be attributed to the difference in existing ground elevation and proposed ditch bottom elevation. Additionally, for the 5-year event, reduced flow due to a expanded duration, in addition to a decrease in water level elevation, indicates low velocities will not contribute additional erosion.

Table 5 illustrates the CD 20 outlet volume comparison at the CD 20 Mainline open ditch location described above. For the outlet volume comparison at the CD 20 system outlet, ACSIC volume includes the sum of 1D tile flow and 2D overland/in-channel flow. In the proposed model, the CD 20 Mainline tile will no longer exist, therefore outlet volume only represented as just 2D overland/in-channel flow. Outlet volumes at the CD 20 outlet are increasing by 7%, 5%, 3% and 1% for the 5-, 10-, 25-, and 50-year events, respectively. The increase in volume is the result of increased capacity within the CD 20 system which reduces inundation on the landscape as well as total infiltration. Investigation of increased volume at the CD 20 outlet was further investigated as there is a confluence with a larger area (CD 12) where the timing of peak flows do not align. An evaluation further downstream is necessary and provided herein, to illustrate evidence of no change in hydraulic performance downstream.

Figures 4, 5, and 6 below compare the ACSIC and proposed flow hydrographs at the CD 20 Mainline tile outlet and proposed Mainline open ditch outlet, as described in Figure 1, for the 5-year, 10-year, and 50-year events. It is important to note that peak flowrates illustrated with the ACSIC curve are the sum of CD 20 Mainline tile flow and overland/in-channel flow, whereas the proposed curve only represents overland/in-channel flow, as there is no tile flow in the proposed model at this location.



Figure 4. CD 20 Outlet 5-Year Peak Flow Hydrograph Comparison

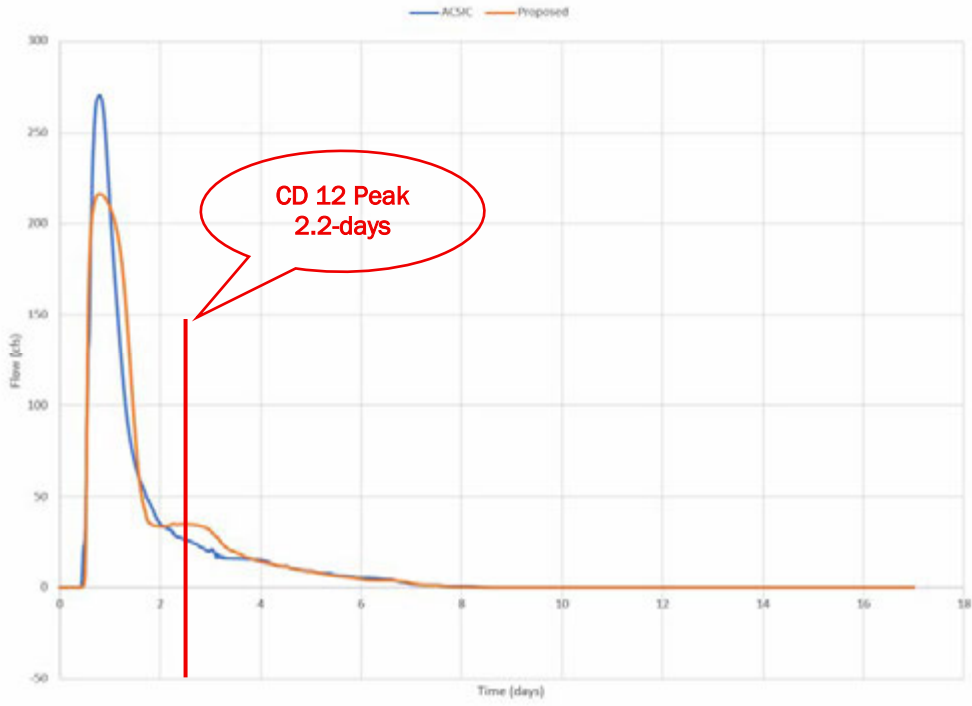


Figure 5. CD 20 Outlet 10-Year Peak Flow Hydrograph Comparison

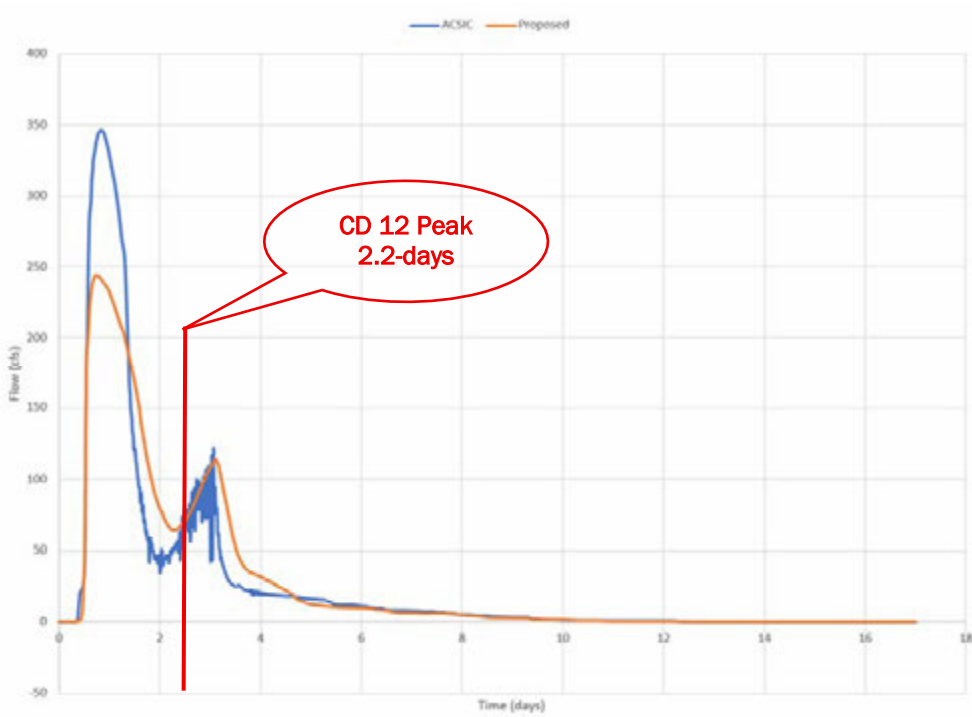


Figure 6. CD 20 Outlet 50-Year Peak Flow Hydrograph Comparison

Tables 5-8 below present the results from the “CD 20 & CD 12 Confluence” location as illustrated in Figure 1 above. No work is proposed within CD 12 for the proposed improvement. For analysis at this location, an important factor is the contribution of CD 12. ACSIC and proposed model results for CD 12 upstream of the CD 20 and CD 12 confluence were compiled to verify consistency between both models. Tables 9 and 10 below illustrate the peak flow and outlet volume of CD 12 upstream of the CD 20 and CD 12 confluence. As expected, no change in peak flows or outlet volume were observed at this location when comparing the ACSIC and proposed model.

TABLE 5. CD 20 & CD 12 CONFLUENCE FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	367.1	369.6	1%
10-yr	484.4	485.8	0%
25-yr	674.5	677.3	0%
50-yr	810.2	834.1	3%

TABLE 6. CD 20 & CD 12 CONFLUENCE VELOCITY COMPARISON

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	2.8	2.8	0%
10-yr	3.0	3.0	0%
25-yr	3.1	3.1	0%
50-yr	3.1	3.1	0%

TABLE 7. CD 20 & CD 12 CONFLUENCE ELEVATION COMPARISON

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	1011.6	1011.6	0.00
10-yr	1012.5	1012.5	0.00
25-yr	1014.2	1014.3	0.10
50-yr	1016.2	1016.5	0.30
*Channel Bottom Elevation is 1003.9'			

TABLE 8. CD 20 & CD 12 CONFLUENCE VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	1817.1	1845.6	2%
10-yr	2402.2	2428.3	1%
25-yr	3367.5	3391.6	1%
50-yr	4230.7	4236.2	0%

TABLE 9. CD 12 FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	340.4	340.4	0%
10-yr	451.2	451.1	0%
25-yr	632.7	632.7	0%
50-yr	795.0	795.2	0%

TABLE 10. CD 12 VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	1405.3	1405.3	0%
10-yr	1862.1	1862.1	0%
25-yr	2611.8	2611.8	0%
50-yr	3288.4	3288.4	0%

At the CD 20 and CD 12 confluence location, results are presented for the ACSIC and proposed models for 2D overland/in-channel flow within the CD 12 open ditch as referenced in Figure 1 above. When comparing the peak flowrates for the ACSIC and proposed modeled, flowrates are increasing for the 5-year and 50-year events by 1% and 3%, respectively, but show no change for the 10-year and 25-year events. These increases in flow can be attributed to the change in duration and timing at the approximate 2.2-day time step for both ACSIC and proposed models. The increase is present in the lagging limb of the hydrograph where flows are less than the channel forming flows, therefore, are not a concern. Peak flows are decreasing at CD 20 and flows at CD 12 show negligible change. CD 20 peak flows are decreasing across all events, but an increase in flow when comparing ACSIC and proposed models, is occurring around the 2.2-day timestep in the proposed model, which is illustrated in the lagging limb of the hydrographs above. Due to this slight increase at that timestep, the CD 20 and CD 12 confluence is depicting an increase in flow. The Engineer believes that this slight increase will not impact the downstream extents of CD 12 and Rice Creek as a direct result of the CD 20 improvement project, because there is significant flow reduction in the CD 20 proposed model and the slight increase in flow at the CD 20 and CD 12 confluence is a direct result of timing. The outlet channel has been determined to be adequate for the proposed conditions of the project.

Peak velocities are represented at the same location. Table 6 above shows the ACSIC and proposed velocity of the CD 12 open ditch downstream of the CD 20 and CD 12 confluence. Peak velocities have no change across all ACSIC and proposed model storm events. No significant increase in velocity at this location indicates that CD 12 will not experience any additional erosion or instability as a result of the upstream CD 20 improvement project.

A comparison of peak water elevations from the location indicated above are depicted in Table 7. The proposed model suggests negligible change in peak water elevations for the 5-year and 10-year events and increases of 0.10-feet and 0.30-feet for the 25- and 50-year events, respectively. The slight increase in peak water level elevation is a result of the small increase in flows detailed above.

Table 8 illustrates the CD 20 & CD 12 confluence volume comparison at the downstream of the CD 20 and CD 12 confluence as described above. Outlet volumes at this location are increasing by 2%, 1%, and 1% for the 5-, 10-, and 25-year events, respectively. Negligible change in outlet volume was observed for the 50-year event. The increase in volume is the result of increased capacity with the CD 20 improvement project, which is reducing inundation on the landscape as well as total infiltration. The increases in volumes from the ACSIC to proposed condition are not expected to have any significant adverse effects downstream.

Figures 7, 8, and 9 below compare the ACSIC and proposed flow hydrographs at the CD 20 and CD 12 confluence, as described in Figure 1 above, for the 5-year, 10-year, and 50-year events. These hydrographs provide additional information supporting the narrative above.

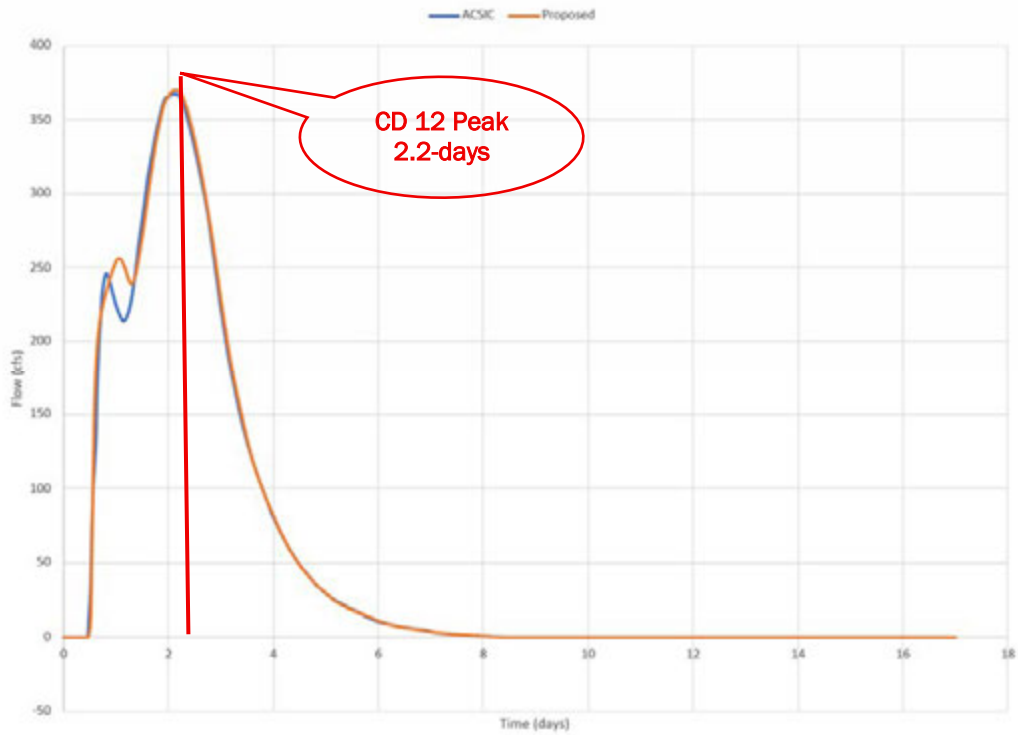


Figure 7. CD 20 & CD 12 Confluence 5-Year Peak Flow Hydrograph Comparison

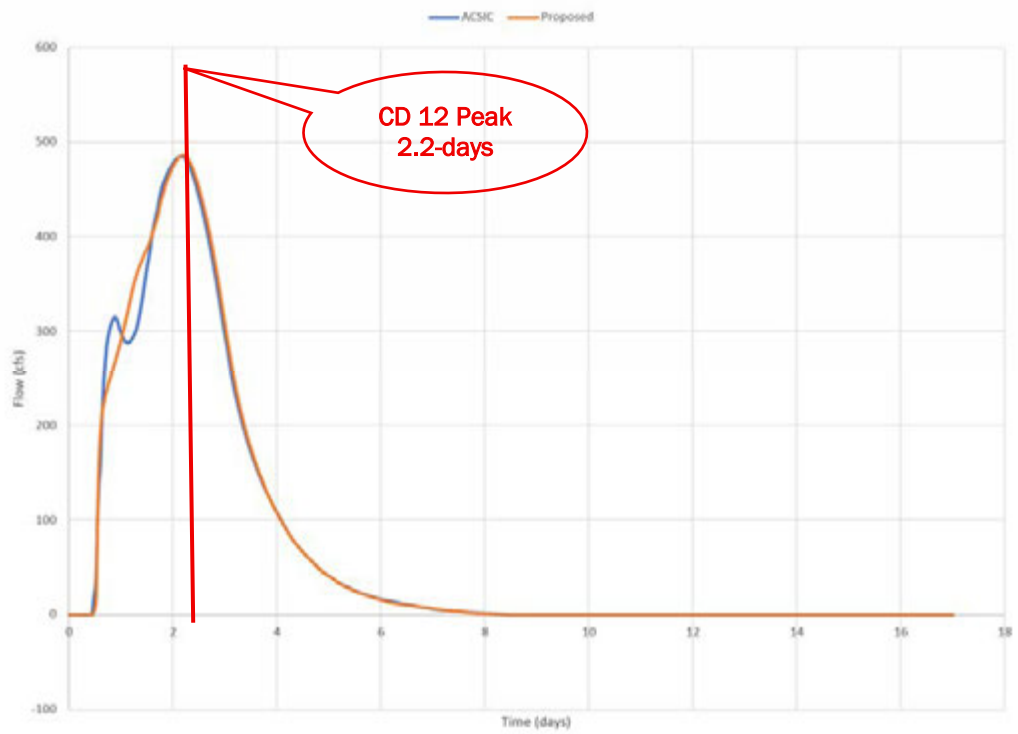


Figure 8. CD 20 & CD 12 Confluence 10-Year Peak Flow Hydrograph Comparison

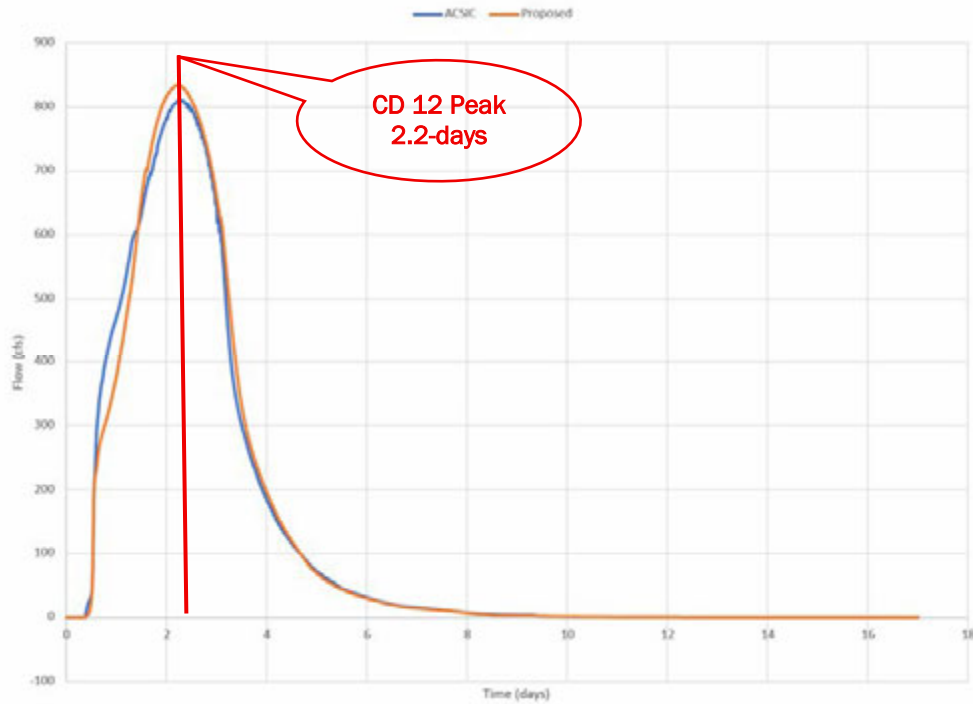


Figure 9. CD 20 & CD 12 Confluence 50-Year Peak Flow Hydrograph Comparison

Tables 11-14 below present the results from the “CSAH 6” location as illustrated in Figure 1 above. CSAH 6 results are presented in this analysis, as it is the next downstream crossing in relation to the proposed improvement. No work is proposed within the CD 12 open ditch or downstream of the CD 20 terminus.

TABLE 11. CSAH 6 CULVERT FLOW COMPARISON

Rainfall Event	ACSIC (cfs)	Proposed (cfs)	% Change
5-yr	366.7	369.3	1%
10-yr	483.7	485.0	0%
25-yr	668.5	669.5	0%
50-yr	802.3	825.8	3%

TABLE 12. CSAH 6 CULVERT VELOCITY COMPARISON

Rainfall Event	ACSIC (ft/s)	Proposed (ft/s)	% Change
5-yr	3.6	3.6	0%
10-yr	3.9	3.8	-3%
25-yr	4.4	4.3	-2%
50-yr	4.8	4.8	0%

TABLE 13. CSAH 6 CULVERT ELEVATION COMPARISON

Rainfall Event	ACSIC (MSL)	Proposed (MSL)	Difference
5-yr	1007.6	1007.7	0.10
10-yr	1008.4	1008.4	0.00
25-yr	1009.3	1009.3	0.00
50-yr	1009.8	1009.9	0.10
*Channel Bottom Elevation is 1003.1'			

TABLE 14. CSAH 6 CULVERT VOLUME COMPARISON

Rainfall Event	ACSIC (AC-ft)	Proposed (AC-ft)	% Change
5-yr	1827.2	1855.7	2%
10-yr	2415.1	2441.2	1%
25-yr	3383.2	3406.9	1%
50-yr	4245.4	4250.1	0%

At the CSAH 6 results location, results are presented for the ACSIC and proposed models for 1D flow through the CSAH 6 culvert as referenced in Figure 1 above. When comparing peak flowrates for the ACSIC and proposed models, flowrates are increasing for the 5-year and 50-year events by 1% and 3%, respectively, but show no change for the 10-year and 25-year events. These increases in flow can be attributed to the change in duration for the proposed improvement project. Peak flows are decreasing at CD 20 and flows at CD 12 show negligible change. The increases in peak flows at CSAH 6 can be attributed to the peak flow timing. CD 12 peak flows occur at the approximate 2.2-day timestep for both the ACSIC and proposed models. CD 20 peak flows are decreasing across all events, but an increase in flow when comparing ACSIC and proposed models, is occurring around the 2.2-day timestep in the proposed model, which is illustrated in the lagging limb of the hydrographs above. Due to this slight increase at that timestep, the CSAH 6 culvert is depicting an increase in flow. The Engineer believes that this slight increase will not impact the downstream extents of CD 12 and Rice Creek as a direct result of the CD 20 improvement project, because there is significant flow reduction in the CD 20 proposed model and the slight increase in flow at the CSAH 6 culvert is a direct result of timing.

Peak velocities are represented at the same location. Table 12 above shows the ACSIC and proposed velocities of the CSAH 6 culvert. Peak velocities are slightly decreasing or show no change across all ACSIC and proposed modeled storm events. No significant increase in velocity at this location indicates that Rice Creek will not experience any additional erosion or instability as a result of the upstream CD 20 improvement project.

A comparison of peak water elevations from the location indicated above are depicted in Table 13. The proposed model suggests that negligible change in peak water elevation for the 10-year and 25-year events and increases of 0.10-feet for both the 5-year and 50-year events. The slight increase in peak water level elevation is a result of the small increase in flows detailed above.

Table 14 illustrates the CSAH 6 volume comparison at the CSAH 6 culvert crossing downstream of the CD 20 and CD 12 confluence as described above. Outlet volumes at this location are increasing by 2%, 1%, and 1% for the 5-, 10-, and 25-year events, respectively. Negligible change in outlet volume was observed for the 50-year event. The increase in volume is a result of increased capacity with the CD 20 improvement project, which is reducing inundation on the landscape as well as total infiltration. The increases in volumes from the ACSIC to proposed condition are not expected to have any significant adverse effects downstream. The increases in volumes from the ACSIC to proposed condition are not expected to have any significant adverse effects downstream.

Figures 10, 11, and 12 below compare the ACSIC and proposed flow hydrographs at the CSAH 6 culvert crossing, as described in Figure 1 above, for the 5-year, 10-year, and 50-year events. These hydrographs provide additional information supporting the narrative above.

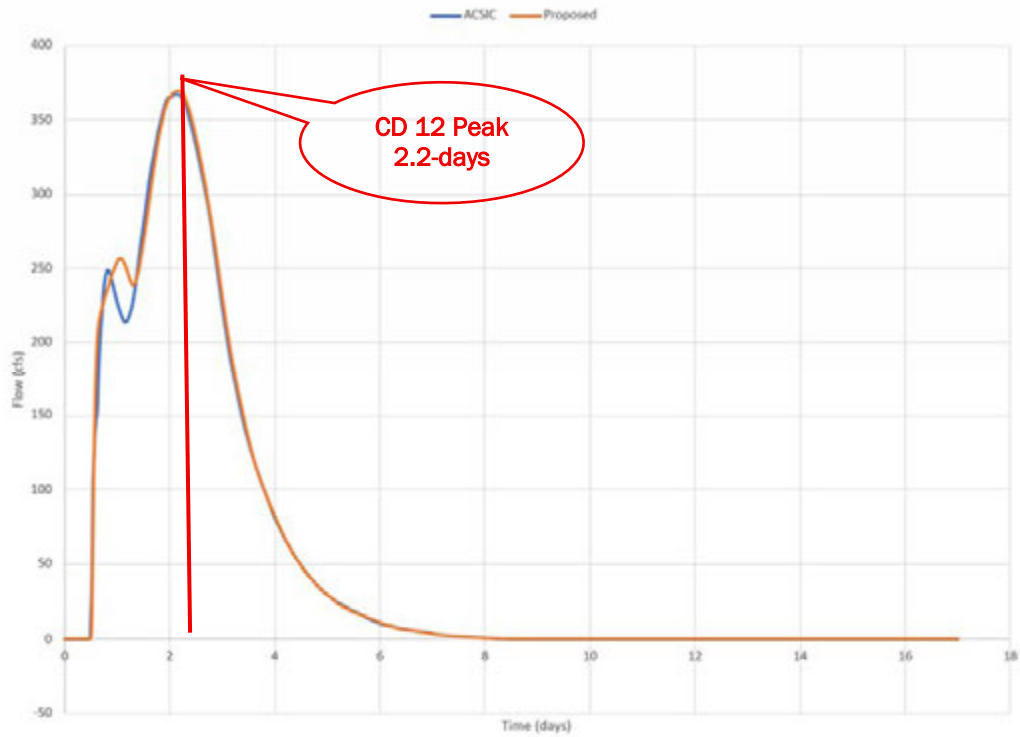


Figure 10. CSAH 6 Culvert 5-Year Peak Flow Hydrograph Comparison

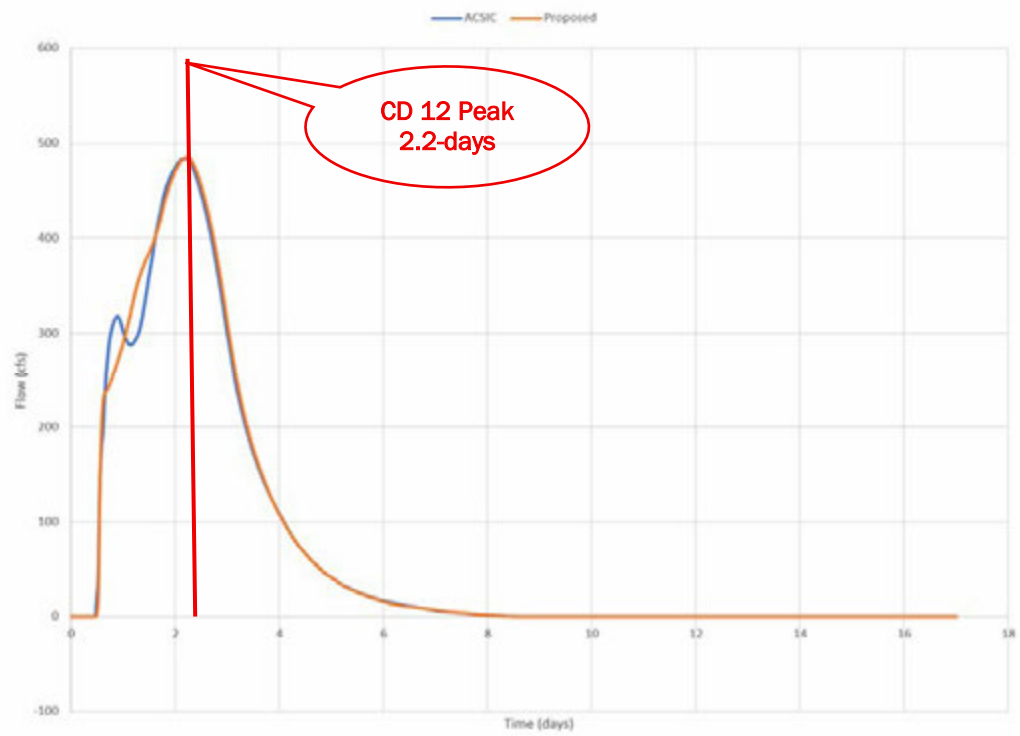


Figure 11. CSAH 6 Culvert 10-Year Peak Flow Hydrograph Comparison

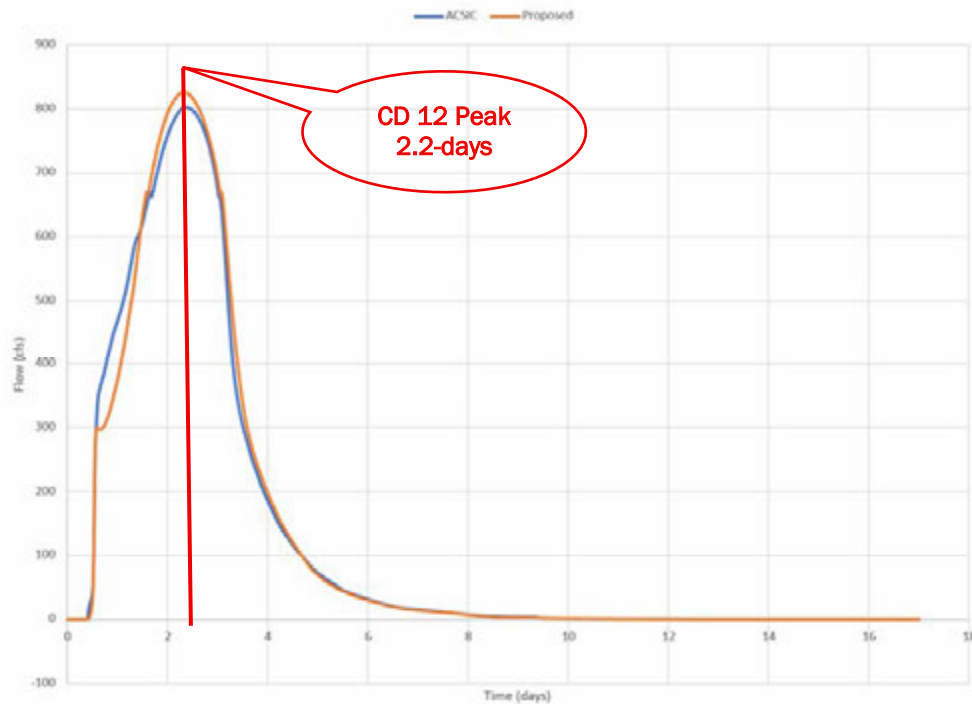


Figure 12. CSAH 6 Culvert 50-Year Peak Flow Hydrograph Comparison

The inundation maps shown in Figures 13-16 below show the time that water deeper than 0.1-foot sits on the landscape. Generally, crop stress from excess water occurs above a 24-hour threshold 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. The illustrations below correspond to the 10-year and 50-year events.

In general, inundation along the proposed improvements is reduced, but upstream portions of the watershed still experience flooding due to the tile being undersized.

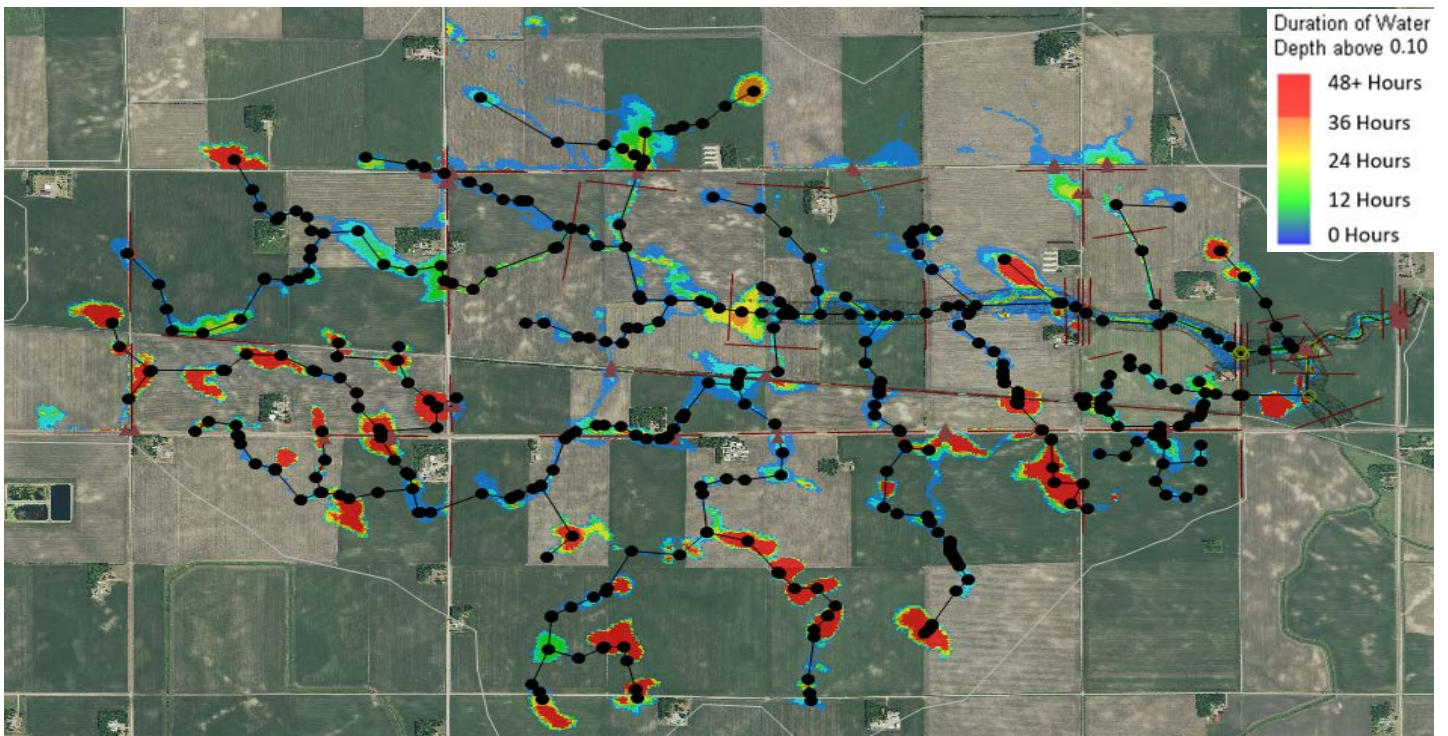


Figure 13. ACSIC 10-Year Inundation Map

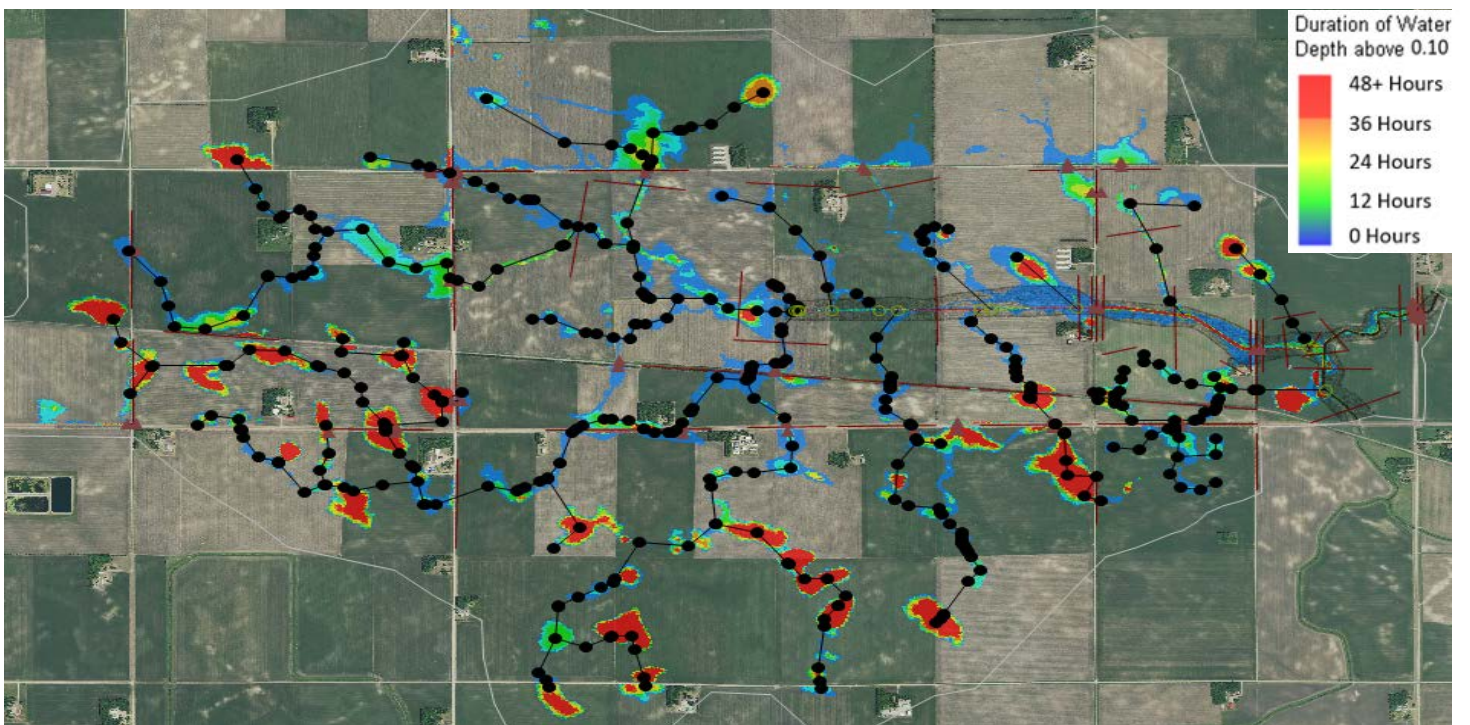


Figure 14. Proposed 10-Year Inundation Map

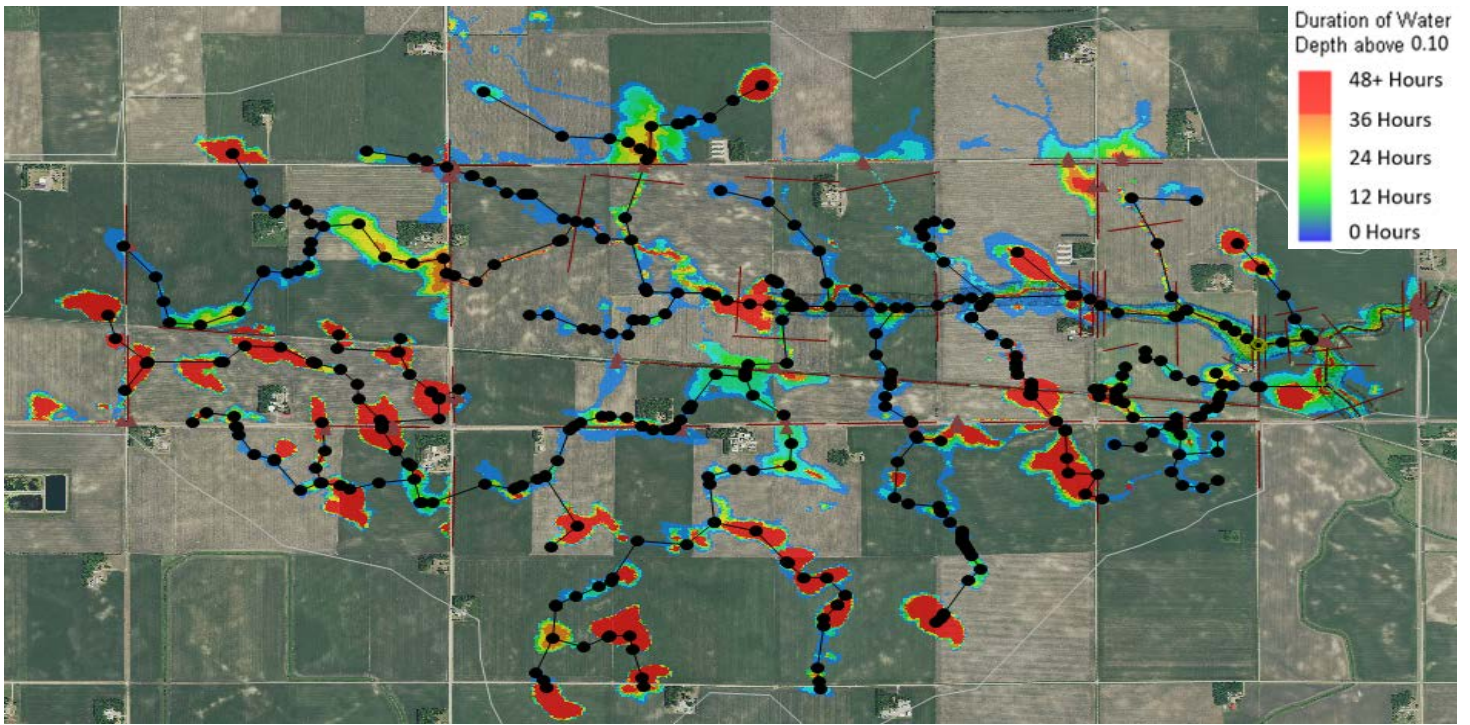


Figure 15. ACSIC 50-Year Inundation Map

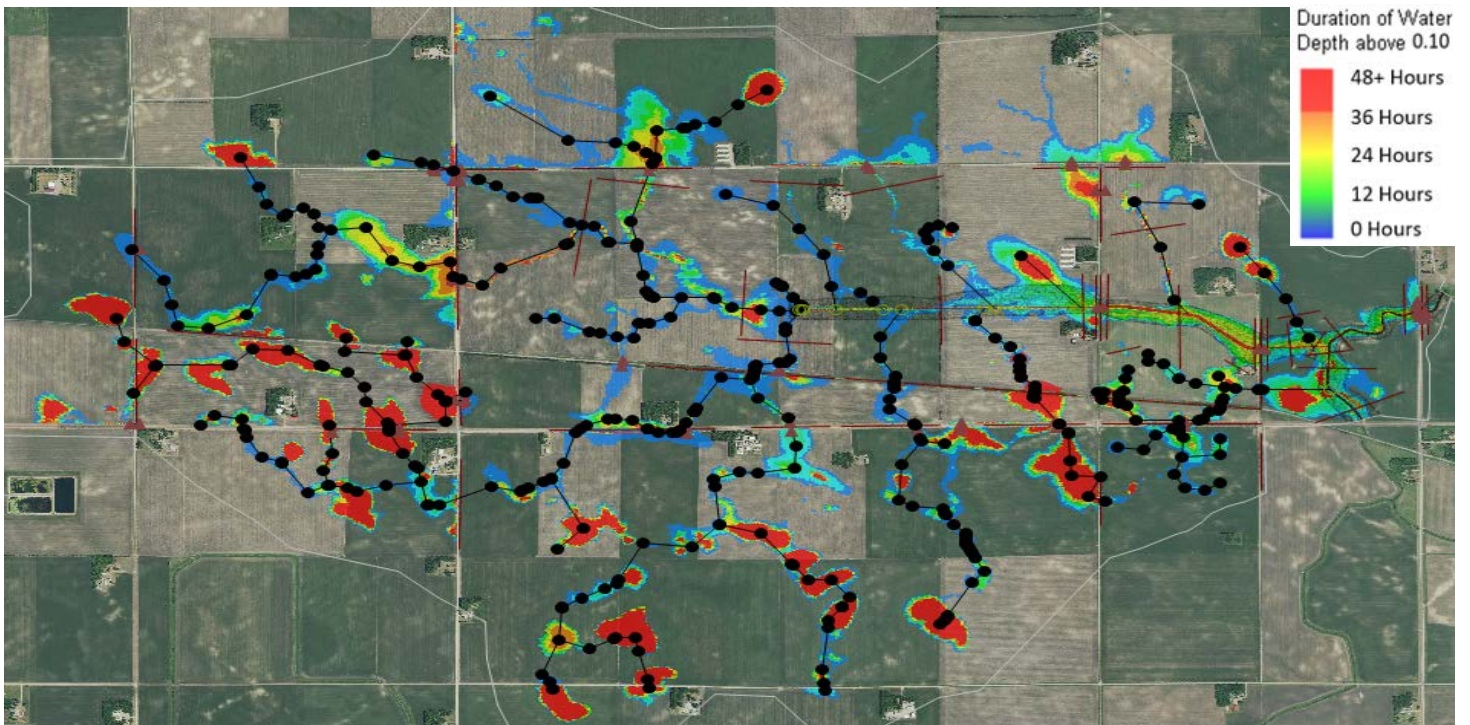


Figure 16. Proposed 50-Year Inundation Map

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 15 shows the volume balance error for each modeled storm event. The maximum absolute volume balance error was -0.78%, which was for the 50-year proposed model. This is below ICM's 5% allowable percent volume balance error.

TABLE 15. MODELING VOLUME BALANCE ERRORS

Rainfall Event	ACSIC (% Error)	Proposed (% Error)
5-yr	-0.08%	0.01%
10-yr	-0.10%	-0.07%
25-yr	0.02%	-0.53%
50-yr	0.13%	-0.78%



ICM FLOWRATE TABLE

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Proposed (cfs)	% Change	ACSIC (cfs)	Proposed (cfs)	% Change	ACSIC (cfs)	Proposed (cfs)	% Change	ACSIC (cfs)	Proposed (cfs)	% Change
CSAH 6	Culvert	366.70	369.30	1%	483.70	485.00	0%	668.50	669.60	0%	802.30	825.80	3%
	Overland Flow	0.00	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A
	Total	366.70	369.30	1%	483.70	485.00	0%	668.50	669.60	0%	802.30	825.80	3%
CD 20 & CD 12 Confluence	Overland Flow	367.10	369.60	1%	484.40	485.80	0%	674.50	677.30	0%	810.20	834.10	3%
CD 20 Outlet	Tile	53.10	N/A	N/A	53.80	N/A	N/A	53.10	N/A	N/A	53.50	N/A	N/A
	Overland Flow	173.60	204.20	18%	229.30	216.40	-6%	274.20	231.00	-16%	309.50	244.10	-21%
	Total	226.70	204.20	-10%	283.10	216.40	-24%	327.30	231.00	-29%	363.00	244.10	-33%
Ironwood Avenue	Tile	22.20	N/A	N/A	26.00	N/A	N/A	33.60	N/A	N/A	36.90	N/A	N/A
	Culvert	113.40	N/A	N/A	141.10	N/A	N/A	172.80	N/A	N/A	194.00	N/A	N/A
	Culvert	81.40	N/A	N/A	101.80	N/A	N/A	102.80	N/A	N/A	109.40	N/A	N/A
	Culvert	N/A	202.60	N/A	N/A	215.10	N/A	N/A	228.50	N/A	N/A	236.00	N/A
	Overland Flow	0.00	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A
	Total	217.00	202.60	-7%	268.90	215.10	-20%	309.20	228.50	-26%	340.30	236.00	-31%
Impala Avenue	Tile	29.80	N/A	N/A	33.30	N/A	N/A	37.40	N/A	N/A	39.70	N/A	N/A
	Culvert	177.40	259.10	46%	234.20	294.10	26%	324.50	311.90	-4%	392.80	306.90	-22%
	Overland Flow	0.00	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A
Proposed Mainline Tile Outlet	Total	207.20	259.10	25%	267.50	294.10	10%	361.90	311.90	-14%	432.50	306.90	-29%
	Tile	5.20	70.90	1263%	5.00	72.10	1342%	4.90	72.20	1373%	4.80	71.80	1396%
	Overland Flow	183.80	168.30	-8%	269.00	239.10	-11%	410.30	360.90	-12%	534.40	498.40	-7%
Proposed Branch 4 Tile Outlet	Total	189.00	239.20	27%	274.00	311.20	14%	415.20	433.10	4%	539.20	570.20	6%
	Tile	15.60	50.70	225%	15.70	49.80	217%	16.00	49.30	208%	16.20	49.00	202%
	Overland Flow	17.00	4.20	-75%	23.60	8.90	-62%	34.10	17.20	-50%	43.30	22.30	-48%
Existing Branch 1 Tile Outlet	Total	32.60	54.90	68%	39.30	58.70	49%	50.10	66.50	33%	59.50	71.30	20%
	Tile	0.90	0.80	-11%	1.00	0.80	-20%	1.00	0.80	-20%	1.00	0.80	-20%
	Tile	1.80	3.20	78%	1.70	3.30	94%	1.70	3.30	94%	1.70	3.30	94%
Existing Branch 2 Tile Outlet	Tile	1.60	2.30	44%	1.60	2.20	38%	1.60	2.20	38%	1.50	2.20	47%
Existing Branch 3 Tile Outlet	Tile	0.10	0.70	600%	0.10	0.80	700%	0.10	0.80	700%	0.10	0.80	700%
Existing Branch 9 Tile Outlet	Tile	3.30	5.60	70%	3.40	5.30	56%	4.20	5.20	24%	4.10	4.70	15%
Existing Branch 10 Tile Outlet	Tile	2.10	4.60	119%	2.10	3.10	48%	2.20	3.30	50%	2.30	3.10	35%
Existing Branch 11 Tile Outlet	Tile	2.10	4.60	119%	2.10	3.10	48%	2.20	3.30	50%	2.30	3.10	35%
CD 12 Open Ditch (Upstream of CD 20 Outlet)	Overland Flow	340.40	340.40	0%	451.20	451.10	0%	632.70	632.70	0%	795.00	795.20	0%

Denotes peak flows less than or equal to existing



ICM ELEVATION TABLE

Location	5-yr			10-yr			25-yr			50-yr		
	ACSIC (MSL)	Proposed (MSL)	Difference	ACSIC (MSL)	Proposed (MSL)	Difference	ACSIC (MSL)	Proposed (MSL)	Difference	ACSIC (MSL)	Proposed (MSL)	Difference
Downstream of CSAH 6	1007.60	1007.70	0.10	1008.40	1008.40	0.00	1009.30	1009.30	0.00	1009.80	1009.90	0.10
Top of Road (CSAH 6)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Downstream of CD 20 & CD 12 Confluence	1011.60	1011.60	0.00	1012.50	1012.50	0.00	1014.20	1014.30	0.10	1016.20	1016.50	0.30
Existing Mainline Outlet (Overland Flow Only)	1012.20	1011.80	-0.40	1012.80	1012.80	0.00	1014.30	1014.50	0.20	1016.20	1016.60	0.40
Downstream of Ironwood Avenue	1013.10	1011.90	-1.20	1013.30	1012.80	-0.50	1014.30	1014.50	0.20	1016.20	1016.60	0.40
Top of Road (Ironwood Avenue)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upstream of Ironwood Avenue	1015.30	1015.50	0.20	1016.00	1016.30	0.30	1017.50	1017.20	-0.30	1018.20	1017.90	-0.30
Downstream of Impala Avenue	1016.90	1015.50	-1.40	1017.20	1016.30	-0.90	1017.70	1017.20	-0.50	1018.40	1017.90	-0.50
Top of Road (Impala Avenue)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upstream of Impala Avenue	1018.30	1017.40	-0.90	1018.90	1018.30	-0.60	1019.70	1019.60	-0.10	1020.30	1020.50	0.20
Proposed Mainline (Overland Flow)	1025.40	1025.00	-0.40	1025.50	1025.30	-0.20	1025.60	1025.50	-0.10	1025.70	1025.60	-0.10
Proposed Branch 4 (Overland Flow)	1025.40	1025.50	0.10	1025.50	1025.70	0.20	1025.70	1025.70	0.00	1025.80	1025.70	-0.10
Proposed Two-Stage Ditch (Middle)	1016.50	1016.40	-0.10	1016.60	1016.40	-0.20	1017.50	1017.20	-0.30	1018.30	1017.90	-0.40
CD 12 Open Ditch (Upstream of CD 20)	1012.70	1012.70	0.00	1013.70	1013.80	0.10	1015.00	1015.00	0.00	1016.40	1016.60	0.20
Denotes peak elevation less than or equal to existing												

Appendix G: Construction Cost Estimates

**REDWOOD COUNTY
COUNTY DITCH No. 20**



PROPOSED IMPROVEMENT COST SUMMARY

Area	Separable Maintenance	Improvement Cost	Net Cost
Mainline (Standard Ditch Segments)	\$ 625,870	\$ 901,169	\$ 275,298
Mainline (Two-Stage Ditch Segment)	\$ 260,590	\$ 547,958	\$ 287,368
Mainline (Tile Segment)	\$ 238,484	\$ 568,578	\$ 330,094
Branch 4 (Segment)	\$ 332,305	\$ 503,136	\$ 170,831
ASIs & ASIROs	\$ -	\$ 56,369	\$ 56,369
Road Crossing Costs	\$ -	\$ 317,154	\$ 317,154
Subtotal	\$ 1,457,249	\$ 2,894,363	\$ 1,437,114
Road Authority Repair Costs	\$ 31,725	\$ 31,725	\$ -
Total Project Costs	\$ 1,488,974	\$ 2,926,088	\$ 1,437,114
Subtotal Separable Maintenance Costs			\$ 1,457,249
Net Costs			\$ 1,437,114
Total Project Costs for Landowners			\$ 2,894,363
Benefits (Per Ditch Viewer Report)			\$ 1,753,027
Net Benefit			\$ 315,913



SEPARABLE MAINTENANCE (REPAIR)

Mainline (Standard Ditch Segments)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 20,120.00	\$ 20,120
102	TILE INVESTIGATION	HR	14	\$ 209.03	\$ 2,926
103	30-INCH AGRICULTURAL TILE	LF	6585	\$ 50.00	\$ 329,250
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	27	\$ 900.00	\$ 24,300
105	CONNECT EXISTING 24-INCH TILE	EA	1	\$ 2,000.00	\$ 2,000
106	CONNECT EXISTING 12-INCH TILE	EA	1	\$ 1,100.00	\$ 1,100
107	CONNECT EXISTING 10-INCH TILE	EA	3	\$ 1,000.00	\$ 3,000
108	CONNECT EXISTING 6-INCH TILE	EA	2	\$ 550.00	\$ 1,100
109	30-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	\$ 5,000.00	\$ 10,000
110	GRANULAR PIPE FOUNDATION	CY	244	\$ 43.00	\$ 10,492
111	INSTALL DROP INTAKE (18-INCH)	EA	7	\$ 1,400.00	\$ 9,800
112	CAP DROP INTAKE (18-INCH)	EA	2	\$ 550.00	\$ 1,100
113	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	5	\$ 375.00	\$ 1,875
114	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 2,400.00	\$ 2,400
SUBTOTAL CONSTRUCTION COST					\$ 419,464
10% UNFORSEEN					\$ 41,946
TOTAL CONSTRUCTION COST					\$ 461,410
TEMPORARY DAMAGES		AC	22.68	\$ 800.00	\$ 18,140
TELEVISIONING (POST CONSTRUCTION)		LF	6585	\$ 1.00	\$ 6,585
COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)					\$ 23,071
TOPOGRAPHIC SURVEY					\$ 8,232
REPORTS, PLANS AND SPECIFICATIONS					\$ 46,141
CONSTRUCTION STAKING & ADMINISTRATION					\$ 62,291
TOTAL MAINLINE (STANDARD DITCH SEGMENTS) REPAIR COST					\$ 625,870



SEPARABLE MAINTENANCE (REPAIR)

Mainline (Two-Stage Ditch Segment)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 8,370.00	\$ 8,370
102	TILE INVESTIGATION	HR	6	\$ 209.03	\$ 1,254
103	30-INCH AGRICULTURAL TILE	LF	2783	\$ 50.00	\$ 139,150
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	12	\$ 900.00	\$ 10,800
105	30-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 5,000.00	\$ 5,000
106	GRANULAR PIPE FOUNDATION	CY	103	\$ 43.00	\$ 4,429
107	INSTALL DROP INTAKE (18-INCH)	EA	3	\$ 1,400.00	\$ 4,200
108	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
109	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	\$ 375.00	\$ 750
SUBTOTAL CONSTRUCTION COST					\$ 174,503
10% UNFORSEEN					\$ 17,450
TOTAL CONSTRUCTION COST					\$ 191,954
TEMPORARY DAMAGES		AC	9.58	\$ 800.00	\$ 7,667
TELEVISIONING (POST CONSTRUCTION)		LF	2783	\$ 1.00	\$ 2,783
COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)					\$ 9,598
TOPOGRAPHIC SURVEY					\$ 3,479
REPORTS, PLANS AND SPECIFICATIONS					\$ 19,196
CONSTRUCTION STAKING & ADMINISTRATION					\$ 25,914
TOTAL MAINLINE (TWO-STAGE DITCH SEGMENT) REPAIR COST					\$ 260,590



**SEPARABLE MAINTENANCE (REPAIR)
 Mainline (Tile Segment)**

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 7,590.00	\$ 7,590
102	TILE INVESTIGATION	HR	8	\$ 209.03	\$ 1,672
103	18-INCH AGRICULTURAL TILE	LF	3617	\$ 32.00	\$ 115,744
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	15	\$ 900.00	\$ 13,500
105	CONNECT EXISTING 15-INCH TILE	EA	1	\$ 1,200.00	\$ 1,200
106	CONNECT EXISTING 12-INCH TILE	EA	1	\$ 1,100.00	\$ 1,100
107	CONNECT EXISTING 6-INCH TILE	EA	1	\$ 550.00	\$ 550
108	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	\$ 2,600.00	\$ 5,200
109	GRANULAR PIPE FOUNDATION	CY	103	\$ 43.00	\$ 4,429
110	INSTALL DROP INTAKE (18-INCH)	EA	4	\$ 1,400.00	\$ 5,600
111	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
112	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	3	\$ 375.00	\$ 1,125
SUBTOTAL CONSTRUCTION COST					\$ 158,260
10% UNFORSEEN					\$ 15,826
TOTAL CONSTRUCTION COST					\$ 174,086
TEMPORARY DAMAGES		AC	8.30	\$ 800.00	\$ 6,643
TELEVISIONING (POST CONSTRUCTION)		LF	3617	\$ 1.00	\$ 3,617
COUNTY ADMINISTRATION COSTS					\$ 8,705
TOPOGRAPHIC SURVEY					\$ 4,522
REPORTS, PLANS AND SPECIFICATIONS					\$ 17,409
CONSTRUCTION STAKING & ADMINISTRATION					\$ 23,502
TOTAL MAINLINE (TILE SEGMENT) REPAIR COST					\$ 238,484



**SEPARABLE MAINTENANCE (REPAIR)
Branch 4 (Segment)**

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 10,960.00	\$ 10,960
102	TILE INVESTIGATION	HR	4	\$ 209.03	\$ 836
103	24-INCH AGRICULTURAL TILE	LF	1905	\$ 41.00	\$ 78,105
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	8	\$ 900.00	\$ 7,200
105	CONNECT EXISTING 18-INCH TILE	EA	1	\$ 1,725.00	\$ 1,725
106	CONNECT EXISTING 15-INCH TILE	EA	1	\$ 1,200.00	\$ 1,200
107	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	\$ 3,500.00	\$ 7,000
108	SAND OR CLSM FILL PIPE UNDER ROAD (18-INCH)	LF	103	\$ 24.00	\$ 2,472
109	GRANULAR PIPE FOUNDATION	CY	61	\$ 43.00	\$ 2,623
110	INSTALL DROP INTAKE (18-INCH)	EA	2	\$ 1,400.00	\$ 2,800
111	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
112	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	1	\$ 375.00	\$ 375
113	BORING 24-INCH TILE FOR RAILROAD	LF	110	\$ 850.00	\$ 93,500
114	RAILROAD CROSSING	LS	1	\$ 18,500.00	\$ 18,500
115	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	200	\$ 2.50	\$ 500
SUBTOTAL CONSTRUCTION COST					\$ 228,346
10% UNFORSEEN					\$ 22,835
TOTAL CONSTRUCTION COST					\$ 251,181
TEMPORARY DAMAGES		AC	6.56	\$ 800.00	\$ 5,248
TELEVISIONING (POST CONSTRUCTION)		LF	1905	\$ 1.00	\$ 1,905
COUNTY ADMINISTRATION COSTS					\$ 12,560
TOPOGRAPHIC SURVEY					\$ 2,382
REPORTS, PLANS AND SPECIFICATIONS					\$ 25,119
CONSTRUCTION STAKING & ADMINISTRATION					\$ 33,910
TOTAL BRANCH 4 (SEGMENT) REPAIR COST					\$ 332,305

TOTAL REPAIR COST

Mainline (Standard Ditch Segments)				\$ 625,870
Mainline (Two-Stage Ditch Segment)				\$ 260,590
Mainline (Tile Segment)				\$ 238,484
Branch 4 (Segment)				\$ 332,305
COMPLETE REPAIR COST				\$ 1,457,249



PROPOSED IMPROVEMENT

Mainline (Standard Ditch Segments)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 26,010.00	\$ 26,010
102	TILE INVESTIGATION	HR	1	\$ 209.03	\$ 209
103	30-INCH AGRICULTURAL TILE	LF	134	\$ 50.00	\$ 6,700
104	10" PRIVATE TILE HEADER (PERFORATED SINGLE WALL	LF	4605	\$ 25.00	\$ 115,125
105	30-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	\$ 5,000.00	\$ 10,000
106	GRANULAR PIPE FOUNDATION	CY	5	\$ 43.00	\$ 215
107	BULKHEAD EXISTING TILE	EA	3	\$ 450.00	\$ 1,350
108	CONSTRUCT STANDARD DITCH (P) (EV)	CY	68560	\$ 3.00	\$ 205,680
109	TOP SOIL STRIP & PLACE SPOILS	AC	28.0	\$ 4,000.00	\$ 111,880
110	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 2,400.00	\$ 2,400
111	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2	\$ 2,100.00	\$ 4,200
112	10-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2	\$ 1,050.00	\$ 2,100
113	8-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2	\$ 1,000.00	\$ 2,000
114	ARMOR TILE OUTET (RIPRAP & GEOTEXTILE FABRIC)	EA	2	\$ 1,200.00	\$ 2,400
115	16.5' BUFFER STRIP SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 3 MULCH)	AC	2.2613636	\$ 1,900.00	\$ 4,297
116	SIDESLOPE SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 8 MULCH)	AC	2.8	\$ 4,600.00	\$ 12,650
117	MOWING	AC	4.5	\$ 130.00	\$ 588
118	WEED SPRAYING	AC	7.3	\$ 250.00	\$ 1,818
119	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	34.0	\$ 93.00	\$ 3,162
120	REMOVE EXISTING DROP INTAKE	EA	2	\$ 350.00	\$ 700
121	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	1879.0	\$ 7.60	\$ 14,280
122	REMOVE EXISTING HDPE CULVERT	EA	2	\$ 1,000.00	\$ 2,000
123	CONNECT EXISTING PRIVATE TILE	EA	25	\$ 500.00	\$ 12,500
SUBTOTAL CONSTRUCTION COST					\$ 542,264
10% UNFORSEEN					\$ 54,226
TOTAL CONSTRUCTION COST					\$ 596,491
TEMPORARY DAMAGES		AC	16.4	\$ 800.00	\$ 13,144
LAND ACQUISTION/ PERMANENT DAMAGES		AC	11.5	\$ 10,000.00	\$ 115,400
COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)					\$ 29,825
TOPOGRAPHIC SURVEY					\$ 168
REPORTS, PLANS AND SPECIFICATIONS					\$ 65,614
CONSTRUCTION STAKING & ADMINISTRATION					\$ 80,527
TOTAL MAINLINE (STANDARD DITCH SEGMENTS) IMPROVEMENT COST					\$ 901,169



PROPOSED IMPROVEMENT

Mainline (Two-Stage Ditch Segment)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 15,450.00	\$ 15,450
102	BULKHEAD EXISTING TILE	EA	2	\$ 450.00	\$ 900
103	CONSTRUCT TWO-STAGE DITCH (P) (EV)	CY	63814	\$ 3.00	\$ 191,442
104	TOP SOIL STRIP & PLACE SPOILS	AC	20.6	\$ 4,000.00	\$ 82,560
105	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	2	\$ 2,400.00	\$ 4,800
106	ARMOR TILE OUTLET (RIPRAP & GEOTEXTILE FABRIC)	EA	1	\$ 1,200.00	\$ 1,200
107	16.5' BUFFER STRIP SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 3 MULCH)	AC	1.1	\$ 1,900.00	\$ 2,003
108	TWO-STAGE DITCH SIDESLOPE SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 8 MULCH)	AC	1.3	\$ 4,500.00	\$ 5,760
109	TWO-STAGE DITCH BENCH SEEDING (SEED MIX: MnDOT 25-141 WITH TYPE 8 MULCH)	AC	2.6	\$ 4,500.00	\$ 11,500
110	MOWING	AC	2.1	\$ 130.00	\$ 274
111	WEED SPRAYING	AC	5.9	\$ 250.00	\$ 1,486
112	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	624	\$ 7.60	\$ 4,742
SUBTOTAL CONSTRUCTION COST					\$ 322,117
10% UNFORSEEN					\$ 32,212
TOTAL CONSTRUCTION COST					\$ 354,329
TEMPORARY DAMAGES		AC	12.75	\$ 800.00	\$ 10,200
LAND ACQUISITION/ PERMANENT DAMAGES		AC	7.89	\$ 10,000.00	\$ 78,900
COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)					\$ 17,717
TOPOGRAPHIC SURVEY					\$ -
REPORTS, PLANS AND SPECIFICATIONS					\$ 38,977
CONSTRUCTION STAKING & ADMINISTRATION					\$ 47,835
TOTAL MAINLINE (TWO-STAGE DITCH SEGMENT) IMPROVEMENT COST					\$ 547,958



PROPOSED IMPROVEMENT

Mainline (Tile Segment)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 18,540.00	\$ 18,540
102	TILE INVESTIGATION	HR	8	\$ 209.03	\$ 1,672
103	42-INCH AGRICULTURAL TILE	LF	2000	\$ 100.00	\$ 200,000
104	36-INCH AGRICULTURAL TILE	LF	1617	\$ 65.00	\$ 105,105
105	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	15	\$ 900.00	\$ 13,500
106	CONNECT EXISTING 15-INCH TILE	EA	1	\$ 1,200.00	\$ 1,200
107	CONNECT EXISTING 12-INCH TILE	EA	1	\$ 1,100.00	\$ 1,100
108	CONNECT EXISTING 6-INCH TILE	EA	1	\$ 550.00	\$ 550
109	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	\$ 3,500.00	\$ 3,500
110	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	\$ 2,600.00	\$ 5,200
111	GRANULAR PIPE FOUNDATION	CY	155	\$ 43.00	\$ 6,665
112	INSTALL DROP INTAKE (18-INCH)	EA	3	\$ 1,400.00	\$ 4,200
113	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
114	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	\$ 375.00	\$ 750
115	42-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	\$ 3,400.00	\$ 3,400
116	CONNECT EXISTING PRIVATE TILE	EA	41	\$ 500.00	\$ 20,500
SUBTOTAL CONSTRUCTION COST					\$ 386,432
10% UNFORSEEN					\$ 38,643
TOTAL CONSTRUCTION COST					\$ 425,076
TEMPORARY DAMAGES		AC	12.46	\$ 800.00	\$ 9,964
TELEVISIONING (POST CONSTRUCTION)		LF	3617	\$ 1.00	\$ 3,617
COUNTY ADMINISTRATION COSTS					\$ 21,254
TOPOGRAPHIC SURVEY					\$ 4,522
REPORTS, PLANS AND SPECIFICATIONS					\$ 46,759
CONSTRUCTION STAKING & ADMINISTRATION					\$ 57,386
TOTAL MAINLINE (TILE SEGMENT) IMPROVEMENT COST					\$ 568,578



PROPOSED IMPROVEMENT

Branch 4 (Segment)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 16,620.00	\$ 16,620
102	TILE INVESTIGATION	HR	4	\$ 209.03	\$ 836
103	36-INCH AGRICULTURAL TILE	LF	1905	\$ 65.00	\$ 123,825
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	8	\$ 900.00	\$ 7,200
105	CONNECT EXISTING 24-INCH TILE	EA	2	\$ 2,000.00	\$ 4,000
106	CONNECT EXISTING 18-INCH TILE	EA	1	\$ 1,725.00	\$ 1,725
107	CONNECT EXISTING 15-INCH TILE	EA	1	\$ 1,200.00	\$ 1,200
108	SAND OR CLSM FILL PIPE UNDER ROAD (18-INCH)	LF	103	\$ 24.00	\$ 2,472
109	GRANULAR PIPE FOUNDATION	CY	78	\$ 43.00	\$ 3,354
110	INSTALL DROP INTAKE (18-INCH)	EA	4	\$ 1,400.00	\$ 5,600
111	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
112	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	3	\$ 375.00	\$ 1,125
113	36-INCH TILE OUTLET	EA	1	\$ 3,000.00	\$ 3,000
114	BORING 36-INCH TILE FOR RAILROAD	LF	110	\$ 1,400.00	\$ 154,000
115	RAILROAD CROSSING	LS	1	\$ 18,500.00	\$ 18,500
116	CONNECT EXISTING PRIVATE TILE	EA	5	\$ 500.00	\$ 2,500
SUBTOTAL CONSTRUCTION COST					\$ 346,507
10% UNFORSEEN					\$ 34,651
TOTAL CONSTRUCTION COST					\$ 381,158
TEMPORARY DAMAGES		AC	6.56	\$ 800.00	\$ 5,248
TELEVISIONING (POST CONSTRUCTION)		LF	1905	\$ 1.00	\$ 1,905
COUNTY ADMINISTRATION COSTS					\$ 19,058
TOPOGRAPHIC SURVEY					\$ 2,382
REPORTS, PLANS AND SPECIFICATIONS					\$ 41,928
CONSTRUCTION STAKING & ADMINISTRATION					\$ 51,457
TOTAL BRANCH 4 (SEGMENT) IMPROVEMENT COST					\$ 503,136



**PROPOSED IMPROVEMENT
ASIs & ASIROS**

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 1,900.00	\$ 1,900
102	INSTALL 24-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	3	\$ 2,200.00	\$ 6,600
103	INSTALL 18-INCH ASI RISER ASSEMBLY W/TRASH GRATE	EA	2	\$ 1,800.00	\$ 3,600
104	INSTALL 24-INCH ASI OUTLET ASSEMBLY	EA	3	\$ 2,100.00	\$ 6,300
105	INSTALL 18-INCH ASI OUTLET ASSEMBLY	EA	2	\$ 1,750.00	\$ 3,500
106	CLASS III RIPRAP WITH GEOTEXTILE FABRIC (FOR ASIRO)	CY	190	\$ 93.00	\$ 17,670
SUBTOTAL CONSTRUCTION COST					\$ 39,570
10% UNFORSEEN					\$ 3,957
TOTAL CONSTRUCTION COST					\$ 43,527
TEMPORARY DAMAGES		AC	0.00	\$ 800.00	\$ -
LAND ACQUISITION/ PERMANENT DAMAGES		AC	0	\$ 10,000.00	\$ -
LAND ACQUISITION/ PERMANENT DAMAGES (MARSH)		AC	0	\$ 1,250.00	\$ -
COUNTY ADMINISTRATION COSTS					\$ 2,177
TOPOGRAPHIC SURVEY					\$ -
REPORTS, PLANS AND SPECIFICATIONS					\$ 4,788
CONSTRUCTION STAKING & ADMINISTRATION					\$ 5,877
TOTAL ASIS & ASIROS IMPROVEMENT COST					\$ 56,369

TOTAL IMPROVEMENT COST

Mainline (Standard Ditch Segments)	\$ 901,169
Mainline (Two-Stage Ditch Segment)	\$ 547,958
Mainline (Tile Segment)	\$ 568,578
Branch 4 (Segment)	\$ 503,136
ASIs & ASIROS	\$ 56,369
COMPLETE IMPROVEMENT COST	\$ 2,577,209

**REDWOOD COUNTY
COUNTY DITCH No. 20**



ROAD CROSSING SUMMARY

Crossing	Road Authority	Road Authority Cost (Repair Cost With Road)	Improvement Cost	Project Cost for Road Crossings (Difference of Improvement Cost and Road Authority Cost)
Mainline (Standard Ditch Segments)				
Ironwood Ave	DEHLI TOWNSHIP	\$ 15,862	\$ 138,514	\$ 122,651
Impala Ave	DEHLI/KINTIRE TOWNSHIP	\$ 15,862	\$ 210,365	\$ 194,502
TOTAL		\$ 31,725	\$ 348,878	\$ 317,154
DEHLI TOWNSHIP ROAD AUTHORITY TOTAL		\$ 15,862	\$ 138,514	\$ 122,651
DEHLI/KINTIRE TOWNSHIP ROAD AUTHORITY TOTAL		\$ 15,862	\$ 210,365	\$ 194,502



ROAD CROSSINGS

MAINLINE (STANDARD DITCH SEGMENTS) REPAIR COST - IRONWOOD AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 600.00	\$ 600
102	TILE INVESTIGATION	HR	1	\$ 209.03	\$ 209
103	30-INCH AGRICULTURAL TILE	LF	66	\$ 50.00	\$ 3,300
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	1	\$ 900.00	\$ 900
105	GRANULAR PIPE FOUNDATION	CY	2	\$ 43.00	\$ 86
106	INSTALL DROP INTAKE (18-INCH)	EA	1	\$ 1,400.00	\$ 1,400
107	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
108	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 3,420.75	\$ 3,421
109	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	200	\$ 2.50	\$ 500
SUBTOTAL CONSTRUCTION COST					\$ 10,966
10% UNFORSEEN					\$ 1,097
TOTAL CONSTRUCTION COST					\$ 12,062
COUNTY ADMINISTRATION COSTS					\$ 700
REPORTS, PLANS AND SPECIFICATIONS					\$ 1,400
CONSTRUCTION STAKING & ADMINISTRATION					\$ 1,700
ESTIMATED MAINLINE (STANDARD DITCH SEGMENTS) REPAIR COST - IRONWOOD AVE					\$ 15,862

MAINLINE (STANDARD DITCH SEGMENTS) IMPROVEMENT COST - IRONWOOD AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
201	MOBILIZATION	LS	1	\$ 4,700.00	\$ 4,700
202	8-FOOT x 4-FOOT RC BOX CULVERT	LF	76	\$ 850.00	\$ 64,600
203	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 3,420.75	\$ 3,421
204	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	217	\$ 93.00	\$ 20,181
205	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	66	\$ 7.60	\$ 502
206	REMOVE RCP CULVERT	EA	2	\$ 1,600.00	\$ 3,200
207	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	200	\$ 2.50	\$ 500
SUBTOTAL CONSTRUCTION COST					\$ 97,103
10% UNFORSEEN					\$ 9,710
TOTAL CONSTRUCTION COST					\$ 106,814
COUNTY ADMINISTRATION COSTS					\$ 5,400
REPORTS, PLANS AND SPECIFICATIONS					\$ 11,800
CONSTRUCTION STAKING & ADMINISTRATION					\$ 14,500
ESTIMATED MAINLINE (STANDARD DITCH SEGMENTS) IMPROVEMENT COST - IRONWOOD AVE					\$ 138,514



ROAD CROSSINGS

MAINLINE (STANDARD DITCH SEGMENTS) REPAIR COST WITH ROAD - IMPALA AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	\$ 600.00	\$ 600
102	TILE INVESTIGATION	HR	1	\$ 209.03	\$ 209
103	30-INCH AGRICULTURAL TILE	LF	66	\$ 50.00	\$ 3,300
104	CONNECT EXISTING TILE (SIZE & MATERIAL MAY VARY)	EA	1	\$ 900.00	\$ 900
105	GRANULAR PIPE FOUNDATION	CY	2	\$ 43.00	\$ 86
106	INSTALL DROP INTAKE (18-INCH)	EA	1	\$ 1,400.00	\$ 1,400
107	CAP DROP INTAKE (18-INCH)	EA	1	\$ 550.00	\$ 550
108	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 3,420.75	\$ 3,421
109	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	200	\$ 2.50	\$ 500
SUBTOTAL CONSTRUCTION COST					\$ 10,966
10% UNFORSEEN					\$ 1,097
TOTAL CONSTRUCTION COST					\$ 12,062
COUNTY ADMINISTRATION COSTS					\$ 700
REPORTS, PLANS AND SPECIFICATIONS					\$ 1,400
CONSTRUCTION STAKING & ADMINISTRATION					\$ 1,700
ESTIMATED MAINLINE (STANDARD DITCH SEGMENTS) REPAIR COST WITH ROAD - IMPALA AVE					\$ 15,862

MAINLINE (STANDARD DITCH SEGMENTS) IMPROVEMENT COST - IMPALA AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
301	MOBILIZATION	LS	1	\$ 7,100.00	\$ 7,100
302	8-FOOT x 7-FOOT RC BOX CULVERT	LF	80	\$ 1,200.00	\$ 96,000
303	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	\$ 3,420.75	\$ 3,421
304	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	287	\$ 93.00	\$ 26,691
305	REMOVE EXISTING TILE (SIZE & MATERIAL MAY VARY)	LF	66	\$ 7.60	\$ 502
306	REMOVE RC BOX CULVERT	EA	2	\$ 6,650.00	\$ 13,300
307	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 20	SY	200	\$ 2.50	\$ 500
SUBTOTAL CONSTRUCTION COST					\$ 147,513
10% UNFORSEEN					\$ 14,751
TOTAL CONSTRUCTION COST					\$ 162,265
COUNTY ADMINISTRATION COSTS					\$ 8,200
REPORTS, PLANS AND SPECIFICATIONS					\$ 17,900
CONSTRUCTION STAKING & ADMINISTRATION					\$ 22,000
ESTIMATED MAINLINE (STANDARD DITCH SEGMENTS) IMPROVEMENT COST - IMPALA AVE					\$ 210,365

Appendix H: Damages Summary

Redwood County Ditch No. 20
 Approximate Damages Summary
 Per Final Engineer's Report
 December 11, 2025



	40 Description	40 Owner	Parcel ID	Approximate Station Range	Improvement Description	Permanent Damages (Acres)	Length	Temporary Damages (Acres)
Mainline Open Ditch	NW 1/4 SE 1/4 Section 7 Delhi Township	JACQUES FARMS LLC	52-007-4020	0+00 to 11+50	New Standard Open Ditch Construction	1.83	N/A	1.96
	NE 1/4 SW 1/4 Section 7 Delhi Township	ANDERSON/KENNETH M & CAROL Y	52-007-3040	11+50 to 26+50	New Two-Stage Open Ditch Construction	4.14	N/A	6.78
	NW 1/4 SW 1/4 Section 7 Delhi Township	ANDERSON/KENNETH M & CAROL Y	52-007-3040	26+50 to 40+00	New Two-Stage Open Ditch Construction	3.75	N/A	5.97
	NE 1/4 SE 1/4 Section 12 Kintire Township	JORDAN/OSWALD A/DISCLAIMER TR	57-012-4020	40+00 to 53+00	New Standard Open Ditch Construction	2.43	N/A	3.71
	NW 1/4 SE 1/4 Section 12 Kintire Township	JORDAN/OSWALD A/DISCLAIMER TR	57-012-4020	53+00 to 66+00	New Standard Open Ditch Construction	2.57	N/A	4.10
	NE 1/4 SW 1/4 Section 12 Kintire Township	ANDERSON/GREGORY R & CECILIA M	57-012-2030	66+00 to 79+00	New Standard Open Ditch Construction	2.60	N/A	3.63
	NW 1/4 SW 1/4 Section 12 Kintire Township	ANDERSON/GREGORY R & CECILIA M	57-012-2030	79+00 to 90+00	New Standard Open Ditch Construction	2.11	N/A	3.04
Mainline Open Ditch Total						19.43	N/A	29.19

	40 Description	40 Owner	Parcel ID	Approximate Station Range	Improvement Description	Permanent Damages (Acres)	Length	Temporary Damages (Acres)
Mainline Tile	NW 1/4 SW 1/4 Section 12 Kintire Township	ANDERSON/GREGORY R & CECILIA M	57-012-2030	0+00 to 3+30	42-Inch Tile	N/A	330	1.14
	NE 1/4 SE 1/4 Section 11 Kintire Township	ANDERSON/GREGORY R/&	57-011-4040	3+30 to 14+50	42-Inch Tile	N/A	1120	3.86
	SE 1/4 NE 1/4 Section 11 Kintire Township	KNUTSON/JONATHON	57-011-1040	14+50 to 17+20	42-Inch Tile	N/A	270	0.93
	SW 1/4 NE 1/4 Section 11 Kintire Township	KNUTSON/CHARLOTTE A	57-011-1060	17+20 to 20+00	42-Inch Tile	N/A	280	0.96
	SW 1/4 NE 1/4 Section 11 Kintire Township	KNUTSON/CHARLOTTE A	57-011-1060	20+00 to 36+17	36-Inch Tile	N/A	1617	5.57
Mainline Tile Total						N/A	3617	12.46

	40 Description	40 Owner	Parcel ID	Approximate Station Range	Improvement Description	Permanent Damages (Acres)	Length	Temporary Damages (Acres)
Branch 4 Tile	NW 1/4 SW 1/4 Section 12 Kintire Township	ANDERSON/GREGORY R & CECILIA M	57-012-2030	0+00 to 12+15	36-Inch Tile	N/A	1215	4.18
	SW 1/4 SW 1/4 Section 12 Kintire Township	ANDERSON/GREGORY R & CECILIA M	57-012-3020	12+15 to 12+80	36-Inch Tile	N/A	65	0.22
	NE 1/4 SE 1/4 Section 11 Kintire Township	ANDERSON/GREGORY R/&	57-011-4040	12+80 to 13+75	36-Inch Tile	N/A	95	0.33
	SE 1/4 SE 1/4 Section 11 Kintire Township	ANDERSON/GREGORY R/&	57-011-4040	13+75 to 17+85	36-Inch Tile	N/A	410	1.41
	SE 1/4 SE 1/4 Section 11 Kintire Township	RIGGE/BRUCE A & JAMIE A	57-011-4060	18+95 to 20+14	36-Inch Tile	N/A	119	0.41
Branch 4 Tile Total						N/A	1904	6.56

Ditch No. 20 Total	19.4	5,521	48.2
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Appendix I: DNR Letter & ISG Response



Ecological and Water Resources
2716 290th Street
Marshall, MN 56258

May 31, 2024

Jen Widmer, PE
Water Resources Engineer
ISG
115 East Hickory Street
Suite 300
Mankato, MN 56001

Nick Brozek
Environmental Director
Redwood County
403 S. Mill Street
P.O. Box 130
Redwood Falls, MN 56283

RE: Early Coordination for the Proposed Redwood County CD #20 Improvement

Greetings,

This letter is in response to recent discussions and communications around the proposed improvement of Redwood County Ditch #20 (CD #20). The overall goal of our early notification communications and efforts is to provide as much insight into potential resource concerns associated with drainage project proposals as early in the process as possible. Along these lines, we hope to facilitate open communication with landowners and local government unit staff and officials with as much information as possible related to these concerns and potential regulatory oversight to aid in decision-making processes. The early coordination for this project was initiated when I received an email from Jen Widmer on March 12, 2024, at the request of the landowners to feel out any major concerns the DNR may have with the proposed improvement of Redwood County CD 20. Thank you for reaching out and providing an opportunity to discuss this project in the early stages, even with limited information. Early coordination is a critical part of this review process to ensure the petitioners/landowners, county and engineers all have the same information regarding potential resource concerns and associated regulatory oversight.

As a part of her initial email, Jen provided information regarding the project proposal, including a watershed map of CD 20, the potential conversion of approximately 8,000 linear feet of subsurface tile to an open ditch, and improving a short portion of the mainline and Branch 4 tile lines. In a recent meeting with Jen (5/14/2024), we discussed the proposed improvement project and detailed potential resource impacts and concerns outlined in attached the Natural Resources Assessment. As a part of this discussion, we outlined a number of concerns as a part of the assessment of this project, and have included several of these concerns below:

- Converting the existing 28-inch tile to an open ditch system will very likely increase the capacity of the CD #20 system. As a part of increased capacity, any increases in discharge (either peak flows or volume)

or changes to flow duration have the potential to negatively impact streambank or bed conditions by increasing scour-related erosion within downstream Rice Creek, which is a DNR-regulated Public Watercourse.

- Potential mitigation (water storage, wetland restorations).
- A DNR Public Waters Work Permit is required for any project that will result in changes to the course, cross-section and current of a Public Water, including Rice Creek. Based on the project information we have received; it is very likely that a Public Waters permit will be required.
- Adequacy of the outlet at the CR 6 crossing, where county ditch system (CD #12) discharges into Rice Creek.
 - We will be setting up a meeting on-site with ISG, County and DNR staff to complete a Geomorphic Assessment to assess stability of the outlet, including the downstream channel area.

Please provide a copy of this letter and attached Natural Resources Assessment to the petitioners/landowners within the Redwood CD# 20 watershed. In addition, please feel free to contact Kyle Jarcho at 507-718-1574 or kyle.jarcho@state.mn.us if you have any comments, questions, or concerns.

Thank you again for this opportunity to provide comments and resource concerns as a part of this early coordination opportunity. We look forward to further discussion on this project, and to more opportunities for early coordination in the future.

Sincerely,



Name: Kyle Jarcho

Title: Area Hydrologist

CC: Ethan Jenzen (North District Manager)

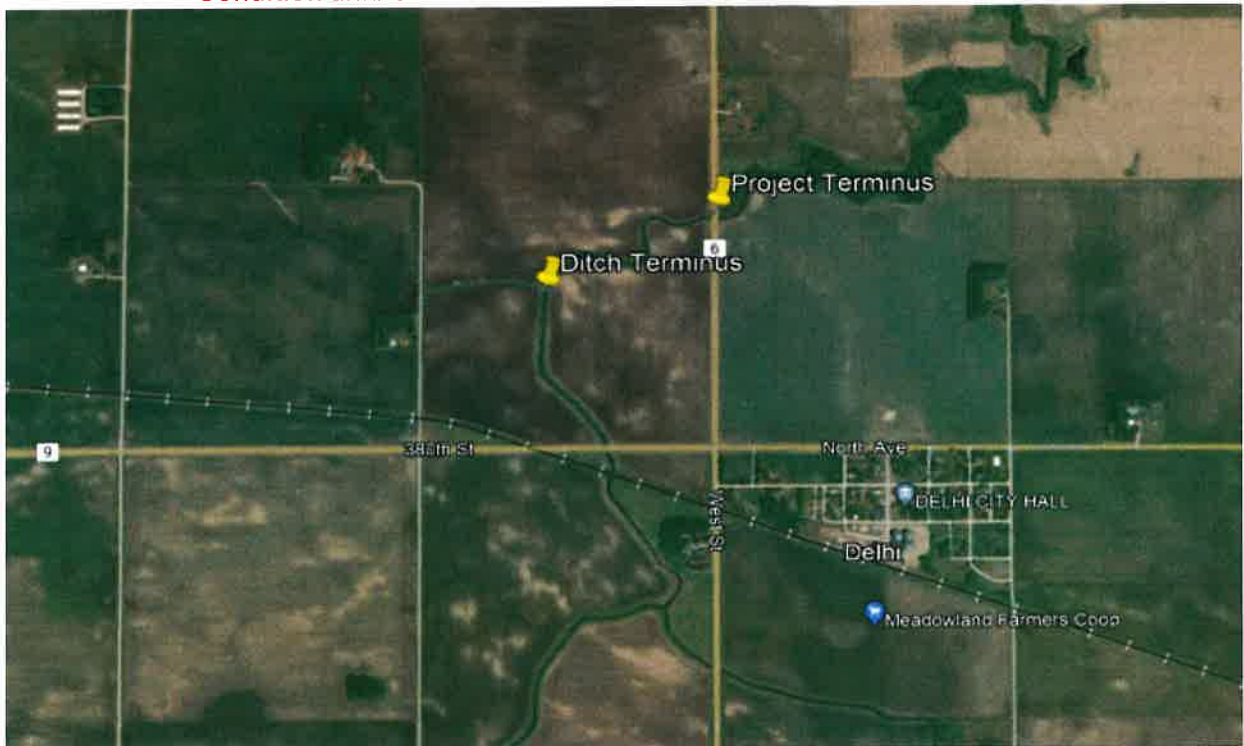
Equal Opportunity Employer

DNR Earlier Coordination: Drainage Projects and Natural Resource Assessments

The purpose of the *Natural Resource Assessment* is to inform drainage shed landowners of potential natural resource issues *prior* to petitioning for a drainage improvement project. The DNR can organize this information in coordination with county staff, the drainage engineer, the drainage authority, or the drainage landowners themselves. If not requested prior to the petition, this information can be compiled at any time after a drainage improvement petition is submitted. It should be noted that the DNR's statutory responsibility is to review and comment on the Preliminary Engineering Report and Final Engineering Report, and so coordinating with the DNR at this earlier phase is voluntary.

The following is a list of issues that may be described by solely identifying the drainage shed of interest. Additional issues may be identifiable as more information is provided (e.g., drainage coefficient of original, existing, and post-project status, etc.).

1. Project Terminus – location and condition of project terminus (i.e., observation and x-section) **Location provided below. Condition is unknown.**
2. Ditch Terminus – location and condition of terminus of the legal drainage system. **Condition unknown.**



3. Project Outlet – location and condition of the project outlet (may not be apparent at this stage) **Rice Creek at CR 6 crossing. Condition of outlet and stream channel yet to be determined.**
4. Public Waters
 - a. Is a public water in the project area or is considered part of the project outlet? **Yes, Rice Creek (M-055-131)**

- b. Is there is potential impact on public water due to changes in course, cross-section, and/or current (may include field observations) **Based on the map provided by ISG, that shows an existing 28-inch tile being replaced with an open ditch. There is a possibility of an increase in discharge that may change the course, cross-section and or current within Rice Creek**
 - c. Are there unique situations or designations of the public water to be considered (impairments, existing conditions, wildlife lake, wild rice waters, etc.)
5. High Priority Sensitive Resources
- a. Aquifers and Shallow Groundwater of Local Use and Concern
 - b. Calcareous Fens – **No fens have been identified within the Rice Creek watershed**
 - c. Trout Streams – **N/A**
 - d. Public Lands – **Cedar Rock WMA**
 - e. Drinking Water Protection Area – **None identified in this area**
 - f. MPCA and EPA Contamination Sites - **Unknown**
 - g. Rare Species – **There are several, including mussels and wetland type species.**
6. Ditch-shed Land Use (% ag, urban, lakes, wetlands, wooded, prairie, etc.)
7. Water Storage Potential
- a. Total restorable wetlands (i.e., in acres and/or %)
 - b. Restorable basins (e.g., > 5 acres, > 10 acres, etc.)
- Green are restorable wetlands, with several larger than 5 acres**



8. Conservation Easements and State-owned Lands
- a. BWSR (RIM, CREP, etc.) – (verify what is publicly available)
- There is a RIM parcel in Section 8**

- b. DNR (WMA, AMA, SNA, NPB)
Upper MN Prairie Conservation Plan area (Rice Creek) and Cedar Rock WMA
- c. Other lands like Waterfowl Production Areas, Pheasant Forever, Ducks Unlimited, Nature Conservancy lands Unknown

9. Environmental Consideration noted in 103E.015.

Review and discuss which items may be applicable, how they may be considered, and which agency/entity may be most appropriate to inform considerations of #1-9.

Subdivision 1. Environmental, land use, and multipurpose water management criteria.

Before establishing a drainage project, the drainage authority must consider each of the following criteria:

- (1) private and public benefits and costs of the proposed drainage project;
- (2) alternative measures, including measures identified in applicable state-approved and locally adopted water management plans, to:
 - (i) conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses;
 - (ii) reduce downstream peak flows and flooding;
 - (iii) provide adequate drainage system capacity;
 - (iv) reduce erosion and sedimentation; and
 - (v) protect or improve water quality;
- (3) the present and anticipated land use within the drainage project or system, including compatibility of the project with local land use plans;
- (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;
- (5) the effects of the proposed drainage project on wetlands;
- (6) the effects of the proposed drainage project on water quality;
- (7) the effects of the proposed drainage project on fish and wildlife resources;
- (8) the effects of the proposed drainage project on shallow groundwater availability, distribution, and use; and
- (9) the overall environmental impact of all the above criteria

10. DNR Early Coordination Team

- a. Kyle Jarcho – Area Hydrologist
- b. Haley Byron - Regional Environmental Assessment Ecologist
- c. Ethan Jenzen - North District Manager
- d. Jon Lore - Regional Watershed Specialist
- e. Tim Gieseke – Assistant Regional Manager

2025-05-28 DNR Meeting Minutes

Redwood County Ditch No. 20 - Improvement



Project Name: Redwood County Ditch No. 20 - Improvement

ISG Project Number: 23-28479

Date: May 28th, 2025

Time: 1:00 PM

These minutes will be held as part of the permanent records for this project unless amended in writing within seven (7) days.

MEETING ATTENDEES

NAME (PLEASE PRINT)	COMPANY NAME	PHONE NUMBER	EMAIL ADDRESS
Bailey Bocchino	ISG	952.426.0699	Bailey.Bocchino@ISGinc.com
Jen Widmer	ISG	612.816.2216	Jen.Widmer@ISGinc.com
Adam Stenzel	ISG	507.387.6651	Adam.Stenzel@ISGinc.com
Nick Brozek	Redwood County	507.637.4023	Nick_b@redwoodcounty-mn.gov
Ethan Jenzen	MnDNR		Ethan.Jenzen@state.mn.us
Nayere Ghazanfarpour	MnDNR		Nayere.Ghazanfarpour@state.mn.us
Jon Lore	MnDNR		Jon.Lore@state.mn.us

2025-05-28 DNR Meeting Minutes

Redwood County Ditch No. 20 - Improvement



MEETING TOPICS

Project Overview

- Provided project extent, existing conditions, outlet clarification, proposed design
 - Discussion around proposed design.
 - Two-Stage Ditch clarification, culvert design discussion, tile sizing discussion
 - Discussion around two-stage ditch sizing and modeling
 - Plan to survey outlet down to CR 6 and subsequently downstream to Rice Creek
 - Meeting was then open to questions

DNR Concerns

- Impacts downstream of the CD 20 outlet and modeling extent.
 - Is the outlet adequate and can the model be extended to Rice Creek?
 - DNR would like CD 12 to be modeled, but CD 12 watershed and stretch of open ditch was included
 - Stream Geomorphic Assessment in June and want to review changes if any to Rice Creek
 - Discussion clarifying that modeling results include tile and ditch flows when applicable
 - Discussion clarifying water level elevations from existing to proposed condition
 - Stream stats and DNR reference regional curves to verify current modeled flows and further calibrate flows
- Proposed Ditch Design
 - Listed concerns related to CD 20 proposed ditch geometry and potential impacts to CD 12.
 - DNR wants to see a ellipse bottom opposed to a flat bottom for the two-stage ditch
 - DNR has interest in if a 8-foot bottom is too wide
 - Concerns about CD 12 having a much larger watershed than just CD 20.
 - 2:1 side slopes are relatively steep, concerns about vegetation establishment
 - DNR fully understands flatter slopes will require more permanent damages
 - Discussion about the sizing and potential for future drainage improvements
 - The two-stage ditch is part of the proposed improvement

2025-05-28 DNR Meeting Minutes

Redwood County Ditch No. 20 - Improvement



ACTION ITEMS + KEY TAKEAWAYS

ISG

- Complete a stream geomorphic assessment with DNR and review profiles and cross sections.
- Send model to the DNR

DNR

- Review Preliminary Engineers Report
- Gain access and permission to accomplish stream assessment
- Review project impacts downstream of the CD 20 outlet



Ecological & Water Resources
Region 4 (South Region)
21371 Highway 15 South
New Ulm, MN 56073

July 14, 2025

Nick Brozek
Environmental Director
403 South Mill Street/P.O. Box 130
Redwood Falls, MN 56283

Re: Preliminary Engineer's Report for Redwood County Ditch No. 20 Improvement (CD #20)

Redwood County Drainage Authority,

The Minnesota DNR appreciates the opportunity to review the Preliminary Engineer's Report (PER) for the proposed improvement of Redwood County Ditch No. 20 Improvement. This Advisory Report, prepared on behalf of the Commissioner, offers expert insights and recommendations in accordance with Minnesota Statutes 103E.255 based on the May 9, 2025, CD 20 Preliminary Engineer's Report.

Overview

Redwood County Ditch No. 20 was originally constructed in 1915 and drains approximately 4,661 acres, located in Sections 1-4, 9-15 and 23-24 of Kintire Township and Sections 6, 7 and 18 of Delhi Township. The mainline tile outlet of CD 20 outlets into CD 12, and then changes designation to Rice Creek (M-055-131) approximately 2050 linear feet downstream at the CSAH 6 crossing.

Redwood County Drainage Authority received a petition to improve a portion of CD 20 Mainline and Branch 4 subsurface tile, including replacing a portion of the Mainline tile with approximately 8,800 linear feet of open ditch on June 17th, 2024. A portion of the proposed open ditch system will be a two-stage ditch, as potential downstream impacts will likely require mitigation. The current drainage system has experienced channelized overland flow. On September 18, 2024, the Redwood County Drainage Authority accepted the petition for Redwood County Ditch No. 20.

Early coordination efforts started on March 12, 2024, when DNR staff received an email from ISG Project Engineer Jen Widmer, to feel out any major concerns the DNR may have with the proposed improvement. During the May 14, 2024 meeting DNR outlined a number of concerns as part of the assessment of the project, and requested the DNR letter and assessment (attached) sent May 31, 2024, be provided to the petitioners/landowners within the CD 20 watershed.

Hydrologic Impacts and adequacy of the outlet

- The project narrative indicates that there is significant overland flow under existing conditions for flows exceeding the 10-yr event. During the review of the ICM hydraulic model for the CD #20 system by DNR Engineer Madison Rogers, several concerns were raised. Most notably, it was noted that the top elevation of Ironwood Avenue changed between the existing and proposed

condition simulations. As this is the last crossing before the system outlet into CD #12, this road elevation has a significant effect on discharge calculations to downstream receiving waters. In order to evaluate the proposed project results, please update the final elevation of the proposed road crossing at Ironwood Avenue.

- Full comments for review of the ICM model are included as an attachment to this report (2025-07-01_Memo_RedwoodCD20_H&HReview.docx)
- Flow duration curves were provided for the system under ACSIC and proposed conditions on Page 4 of Appendix F. Please clarify if the discharge under ACSIC conditions outlined in Figures 1 and 2 includes overland flow as well as discharge from the existing 28-inch mainline. This is assumed from the report narrative; however, it is not explicitly stated in Appendix F.
- On Page 17 of the report, the discussion of peak velocities indicates there will be a slight increase for the 5- and 10-year events, respectively, but a decrease during the 25- and 50-year events (as noted in Table 8 on Page 18). It is then stated that the increase in velocity will not result in additional erosion as it is concentrated in an open channel, but it is then noted that the velocities in Table 8 are for overland flow only. Please clarify if the velocities as noted in Table 8 are for in-channel or overland flow.
- The improvement report includes information on the inclusion of a two-stage channel between Ironwood Avenue and Impala Avenue, which is presented as an alternative on page 14 of the report. All channel hydraulics and flow calculations are presented for the two-stage channel option offered in this alternative. If any other design criteria are to be considered, including a proposed improvement without the two-stage channel, information on flow duration, peak flows, and channel velocity must be presented for consideration. Please clarify if other options are under consideration or if the alternative design is being offered as the primary alternative.
- In the discussion on project alternatives beginning on page 14, it is stated that this improvement will be sized to compensate for a full system improvement in the future. Please note that any future improvements will be subject to the same concerns for increased discharge to receiving waters, and may require a Public Waters permit to proceed if determined to impact downstream receiving waters.
- We appreciate the inclusion of the discussion in Appendix D detailing the possibility of multipurpose drainage management/BMP practices within the CD #20 watershed to facilitate water storage and infiltration. DNR strongly supports the inclusion of practices that increase water storage, as these areas have the potential to effectively mitigate peak flow increases to receiving waters, thereby reducing downstream impacts.
- The proposed two-stage ditch will be constructed in clay soils, which are highly prone to sedimentation and erosion, especially during the first year before vegetation becomes well-established. A proposed plan for immediate stabilization should be included to minimize erosion potential prior to bank and side-slope stabilization.

- The provided design plans indicate that the proposed two-stage channel has a bottom width of 8 feet and would provide approximately 18.9 acre-feet of in-channel storage. Please provide information on how the proposed channel size was determined, as well as any design rationale for the sizing of the two-stage channel.

Public Waters Impacts & Permitting Requirements

The proposed improvement discharges into Redwood CD #12, which is designated as a Public Water (M-055-131 - Rice Creek) at the Redwood CSAH #6 crossing. Proposed changes that result in changes to peak flow/duration and velocities have the potential to negatively impact streambank or bed conditions by increasing scour-related erosion within downstream Rice Creek. A DNR Public Waters Work Permit is required for any project that will result in changes to the course, cross-section, and current of a Public Water, including Rice Creek. Based on the project information we have received, a Public Waters permit may be required.

Please note that a final determination on permit need will depend on responses to the questions and concerns outlined above, as well as the submission of requested data for further evaluation. Please send a response to this letter, the meeting minutes, the Findings of Fact, the Viewers Report, and any Order issued by the Drainage Authority regarding this proposed improvement to the DNR via email at Region4Drainage.dnr@state.mn.us when they become available.

Thank you for consideration of these comments. If you have any further questions regarding the information in this report, please feel free to contact me at ethan.jenzen@state.mn.us or Area Hydrologist Kyle Jarcho at kyle.jarcho@state.mn.us.

Sincerely,

Ethan Jenzen, North District Manager
MN DNR Eco-Waters Region 4

CC:

Nayere Ghazanfarpour, DNR, Drainage Engineer
Haley Byron, DNR Regional Environmental Assessment Ecologist
Kyle Jarcho, DNR Area Hydrologist
Jen Widmer., Project Engineer

Attachments

Hydrology and Hydraulics Model Review Technical Memo

Date: 07/01/2025

To: ISG

From: Madison Rogers, PE, MnDNR

RE: Redwood CD20 Model Review EWR Technical Assistance

Purpose and Scope

The purpose of this model review technical memorandum is to summarize the review findings of the ISG model of the Redwood County Ditch No. 20 (Redwood CD20) Improvement Project. The proposed improvements include replacing existing tile drainage system with larger draintile sizes and converting approximately two miles of the existing mainstem tile to open ditch. Approximately 2,800 feet of the open ditch will be constructed as a two-stage ditch. The outlet, which discharges into Redwood County Ditch No. 12, will be converted from a 28-inch tile to a 6-ft by ft box culvert. Approximately 2,000 feet downstream of the Redwood CD20 outlet, Redwood CD 12 turns into Rice Creek, a DNR public watercourse and direct tributary to the Minnesota River. The preliminary engineers' report, dated May 9th, 2025, was also submitted with the model for review.

The project is under review by the Minnesota Department of Natural Resources (DNR) and the Redwood County Drainage Authority.

This memorandum summarizes the review of the model, '28479_PER_Transportable.icmt' which was modeled in Infoworks ICM version 2026.0 and submitted to the DNR on 06/05/2025. The review consisted of the following:

- Confirming the model's compatibility with the proposed design
- Evaluating the acceptability of modeling parameters and approach
- Evaluating the model's accuracy in evaluating the impacts to the Rice Creek and the Minnesota River

Both hydrology and hydraulic were reviewed for the submitted models. The continuity error in the existing and proposed scenarios is satisfactory, and there are no comments on the model simulation parameters.

Curve number method was used to calculate the runoff of stormwater from each subcatchment. A weighted curve number was calculated for each subcatchment, and the curve numbers range from 79 to 88, which is representative of the agricultural land use within the watershed and majority HSG Type C and D soils. An infiltration surface is also being used across the 2D area in addition to the curve number method, however the Green Ampt deficit is set to 0.01 for all soil types, which will avoid double counting infiltration between the two methods.

The model uses a 2D mesh to represent overland flow, and a network of links and nodes to represent the existing drintile and culverts. The proposed open ditch is represented within the 2D mesh. The minimum triangle element area in both existing and proposed model is set to 200 square feet. Mesh Zones are used to define different mesh resolutions to give specific areas a more detailed mesh resolution.

- The existing model uses a Mesh Zone for the Redwood CD 12/Rice Creek open ditch, using a minimum element area of 15 square feet
- The proposed model uses a Mesh Zone for the proposed open ditch area in addition to the Redwood CD 12/Rice Creek open ditch, using a minimum element area of 15 square feet for all areas.

Refinements are made to the existing and proposed mesh elevations using “Mesh Level Zones”. Mesh Level Zones are used in the existing model to represent roadways. In the proposed model they represent roadways and spoil areas where fill from the proposed open ditch will be placed. They are polygon areas that modify the elevation information within the 2D mesh.

Comments

Comment 1:

The existing mainline drintile outlet size in the plan sheets (28-inch) does not match the modeled existing drintile size (30-inch). There are many differences between the plan and model for the existing drintile sizes for the mainline and branch lines. Drintile sizes should be reviewed and the plan should match the model.

Comment 2:

The existing Mesh Level Zone for Ironwood Ave does not match the proposed Mesh Level Zone elevations. The plan sheets show that Ironwood Ave will be open cut and restored. The mesh level zone shows an increase in elevation of approximately 2.5-ft in the proposed model geometry, preventing overland flow from flowing over Ironwood Ave in the proposed conditions.

The existing overtopping elevation for Ironwood Ave is approximately 1016. Using the Network Results Line upstream (west) of Ironwood Ave, the max water surface elevations results for each of the scenarios and storm events are shown in Table 1. Based on the overtopping elevation, the proposed condition should have “overland flow” for Ironwood Ave in the 10-yr and greater storm events. The Flow Rate table in Appendix F of the PER only shows overland flow in the 50-year event.

Table 1. Comparison of Peak Water Surface Elevations (ft) Upstream of Ironwood Ave.

Scenario	5-yr	10-yr	25-yr	50-yr
Existing	1017.13	1017.37	1017.66	1017.88
Proposed	1015.71	1016.53	1017.78	1019.08

Comment 3:

The existing results and narrative report emphasize that a majority of the flow through the drainage system is passing as channelized flow over the mainline draitile, especially between Impala Ave and the CD 20 outlet. The 2D mesh does the hydraulic computations on the channelized overland flow. Mesh Zones are used in the proposed scenario to refine the mesh size for the open channel ditch, and it is recommended that a similar approach taken for the existing conditions where there is significant overland flow happening.

It is understood that the mesh cannot be equal for the scenarios due to the changes required for the improvements, but having a similar level of detail for similar hydraulic cases can better support the comparison of the two scenarios.

Comment 4:

Once comments are addressed, the Appendix F: Hydraulic Modeling section should be updated accordingly. At that time, the results will be reviewed with the updated modeling.

Appendix J: Drone Report

PROJECT NAME Redwood County Ditch No. 20
PROJECT NO. 23-28479
REVIEWED DATE 2-26-2025
DRONE FLIGHT DATE 9-13-2024



Picture #1: CD 20 Outlet into CD 12 in Section 7 of Delhi Township



Picture #2: Inundation and Channelized Flow in Section 7 of Delhi Township



Picture #3: Channelized Flow in Section 7 of Delhi Township



Picture #4: Channelized Flow in Section 7 of Delhi Township

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Picture #5: Channelized Flow in Section 12 of Kintire Township



Picture #6: Channelized Flow in Section 12 of Kintire Township



Picture #7: Inundation and Channelized Flow in Section 11 of Kintire Township



Picture #8: Channelized Flow in Section 11 of Kintire Township

PROJECT NAME Redwood County Ditch No. 20
PROJECT NO. 23-28479
REVIEWED DATE 2-26-2025
DRONE FLIGHT DATE 9-13-2024



Picture #9: Inundation in Section 10 of Kintire Township



Picture #10: Inundation in Section 11 & 12 of Kintire Township