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ENGINEER'S REPORT

DRAINAGE DISTRICT NO. 5 MAIN TILE REPAIR OR IMPROVEMENT BREMER COUNTY, IOWA

PROJECT NO: E22159



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Collin Klingbeil

Date 1/29/24

Collin J. Klingbeil, P.E.

License number 24741

My license renewal date is December 31, 2025

Pages or sheets covered by this seal:

ALL

I. INTRODUCTION/HISTORY

A. Scope

A work order request for repairs to the Main Tile of Drainage District No. 5 (DD5) of Bremer County, Iowa was filed with the Board of Supervisors on November 21, 2022, and is enclosed. The request for repair describes “several sinkholes” over the 36” diameter Main Tile in Section 16 of Maxfield Township (T-91-N, R-12-W). The Bremer County Board of Supervisors, acting as trustees for DD5, appointed Jacobson-Westergard & Associates, Inc. on December 12, 2022, to develop an engineer’s report regarding the most feasible means of repairing the tile, and to evaluate the adequacy of the design of the existing tile system. This report addresses the request.

Drainage District No. 5 is located in Sections 2, 10, 11, 14, 15, 16, & 23 of Maxfield Township (T-91-N, R-12-W) of Bremer County, Iowa. A little less than ½ of the town of Readlyn (western portion) is included in the district.

B. History

We note that the records available for this district are unfortunately somewhat sparse, the history includes only records available at the courthouse.

- 1919 – Presumably a petition was filed for establishment of a drainage district but is not part of the drainage district records.
- December 31, 1919 – Engineer’s Report Filed by Bremer County Engineer C.A. Cool recommending construction of a major tile system with tile ranging in size from 36” to 8” in diameter and including a Main Tile as well as Sub-Mains 1, 2, 3, 4, & 5, and Laterals to the Main Tile, Sub-Main #3, and Sub-Main #5.
- March 25, 1920 – Entered into contract with Paul Berg for construction of the district facilities for \$47,262.35. Contract completion date was set as September 1, 1921.
- May 3, 1920 – Appraisers appointed to classify the district.
- July 27, 1920 – Classification hearing held.
- October 1, 1966 – Agreement executed with the City of Readlyn which allowed the City to run an 8” diameter line from the sanitary wastewater treatment plant to Sub-Main 5 for payment of \$210 annually over twenty years. Maximum flow was set at 310 gallons/minute (0.69 cfs) or about ¼ of the tile’s total capacity.
- November 14, 2016 – Agreement executed with the City of Readlyn which allowed the City to replace the existing 8” diameter line from the sanitary wastewater treatment plant to Sub-Main 5 with a new 12” diameter PVC line. No maximum flow was set. Design capacity of the PVC line is equal to 100% of the Sub-Main 5 design capacity, although the design maximum wet weather (MWW) flow from the plant (1.10 MGD) would still only take up about 2/3rd of the pipe capacity.
- November 21, 2022 – Work order request for repairs to the Main Tile in Section 16 filed with the Board of Supervisors.
- December 12, 2022 – Jacobson-Westergard & Associates, Inc. hired to develop an engineer’s report regarding the most feasible means of repairing the tile, and to evaluate the adequacy of the design of the existing tile system.
- March 13, 2023 – Initial/draft report presented at an informational meeting at the Readlyn Elementary school.
- March 2023 – January 2024 – coordination with Northern Natural Gas to get a cost estimate for relocating the gas line, evaluation of alternatives, cost estimates, additional survey to determine feasibility and quantities for potential open ditch and tile re-route options.

II. EXISTING TILE STARTING POINT, ROUTE AND TERMINUS

See enclosed map showing the existing tile systems of DD5, as well as a portion of the original 1919 Engineer’s Report giving a narrative description of the tile systems.

III. INVESTIGATION

Survey data was collected in Section 16 and 15 of Maxfield Township (T-91-N, R-12-W). In addition, Engineer's reports and plats, plans, and profiles of district facilities were reviewed.

A. Tile Blowouts:

We viewed the tile blowouts on two separate days, February 28th and March 13th, 2023.

On the Feb. 28th site visit we observed water standing in the field where the tile blowouts are located. Crane Creek was in flood condition. Backpressure on the tile was causing water to "push" out of the tile at the blowout locations. This is a side-effect of the lack of cover over the tile, as the water can easily push through the shallow layer of soil above the tile to get to the surface. This action can also cause the tile joints to push apart, as can freeze/thaw action near the outlet. The picture below shows a tile blowout underwater. We note that the tile is not necessarily broken at every blowout location; however, it is at a minimum pushing water out onto the farmland, and at other times sucking soil into the tile. This is a problem that needs to be addressed.



On the March 13th site visit the field was no longer flooded, and we were able to identify several additional blowouts/suck holes in the Main Tile. We note that the tile has less than 1 foot of cover (depth of soil over the top of the pipe). The distance between the lowermost and uppermost tile blowouts observed is approximately 900 feet.

Cover issues are not isolated to the portion of the Main Tile experiencing blowouts. In looking at the original Main Tile profiles, the first approximately 6,000 feet of tile (36" – 26" diameter) was installed with an average of about 1.5 feet of cover (from about 8" to 30"). For a district tile we typically recommend no less than 2.5 feet of cover under normal conditions, and at least 3 feet of cover where the ground is likely to subside (peat ground) or erode (surface waterway). At these shallow depths of cover we would expect that approximately 20-30% of the wheel load of passing equipment would be transmitted to the tile. The tile was installed over 100 years ago and has held up quite well. But we do expect the condition of the tile to continue to be a problem into the future. Tile installed in the early 1900's was typically only expected to last for 50 years and has already long outlasted its life expectancy.

B. Readlyn Stormwater Wetland:

As part of our investigation of the capacity of the existing tile system of Drainage District No. 5, we investigated a stormwater wetland that was constructed in 2018 in the area of the Sub-Main 5 tile. See enclosed plan sheets. Sub-Main 5 Lateral 1 tile was removed. At the upper end of the original lateral, a 10" dual-wall HDPE pipe was installed to route the flow to the downstream side of a rock letdown structure upstream of the wetland. The lower portion of the Sub-Main 5 Lateral 1 tile was replaced with

a 6" single-wall HDPE pipe that connects into the Sub-Main 5 tile. As a result of the project, we consider Sub-Main 5 Lateral 1 tile to be abandoned.

There is a water control structure at the downstream side of the wetland, which is the outlet for the wetland. From the control structure the water flows through a 10" diameter dual-wall HDPE pipe to the 12" diameter Sub-Main 5 tile. It was noted as part of the project that site topography limited the ability to provide significant detention for large flood events. As such, the design flows into and out of the wetland are orders of magnitude greater than the design capacity of the existing tile. If the tile is overloaded, the wetland will overflow, and water will go down a rock chute and continue westward via a series of surface waterways to Crane Creek along a similar path as the Main Tile.

C. Quail Avenue:

A surface waterway from the Readlyn Stormwater Wetland runs eastward to Quail Avenue. In the east road ditch, there is an intake over the 12" diameter Sub-Main 5 tile. The culvert under the road is approximately 150 feet south of the intake and waterway, out of the natural course of drainage. Water has to build up in the road ditches and backs up onto the lands east of Quail Avenue before it can continue westward (the 72" diameter culvert has to be about half-full before water will exit the west road ditch). There is no defined waterway west from the road to the acreage access lane. For both the benefit of the tile system and the lands on both sides of Quail Ave, we recommend a waterway be installed. This issue could be addressed separately or as part of this project.

D. Design Capacity of Existing Tile System:

The adequacy of the existing tile system has been analyzed and is shown in the tables below, and in the enclosed maps. Note that the capacities shown assume the tile is in good condition. The design parameter commonly used for drainage tile is known as the *drainage coefficient (DC)*. According to the Iowa Drainage Guide, the drainage coefficient is the rate at which water can be removed from the land, and is expressed as the equivalent depth of water covering the surface of the drained area that can be removed in 24 hours. For field crops with good surface drainage, a drainage coefficient of 3/8" to 1/2" per day is recommended. However, in the early 1900's tile systems were commonly designed with a drainage coefficient of 1/4" to 1/8" per day or less.

Most drainage districts include only agricultural land. This district is somewhat unique in that it includes the western portion of the City of Readlyn. The impervious paved streets, sidewalks, driveways, roofs, etc. generate more storm runoff than agricultural lands, necessitating either a larger tile to carry the extra water away during and following rainfall events, or surface drainage of some sort (waterway, ditch, etc.).

Main Tile & Main Lateral 1							
<u>Lateral</u>	<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Capac. (cfs)</u>	<u>Approx. Length</u>	<u>Acres Drained</u>	<u>DC (in/day)</u>
Main	0+00	36	0.096%	24.42	2,500	1,937.4	0.30
Main	25+00	36	0.240%	38.62	2,000	1,879.5	0.49
Main	45+00	32	0.145%	21.93	650	1,633.4	0.32
Main	51+50	32	0.145%	21.93	450	1485	0.35
Main	56+00	26	0.364%	19.97	1,300	902.7	0.53
Main	69+00	20	0.364%	9.92	800	696.3	0.34
Main	77+00	18	0.364%	7.49	1,300	390.9	0.46
Main	90+00	18	0.666%	10.13	600	278.9	0.86
Main	96+00	12	0.500%	2.98	1,200	127.2	0.56
Main	108+00	12	0.857%	3.90	400	113.4	0.82
Main	112+00	8	0.857%	1.32	650	89.7	0.35
Main	118+50	8	0.333%	0.82	300	49.5	0.40
Main Lat 1	0+00	8	0.900%*	1.35	740	57.7	0.56

*: No profile for this reach. Estimated based on ground elevations.

Sub-Main 1							
<u>Lateral</u>	<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Capac. (cfs)</u>	<u>Approx. Length</u>	<u>Acres Drained</u>	<u>DC (in/day)</u>
Sub-Main 1	0+00	12	0.200%	1.88	100	142.7	0.31
Sub-Main 1	1+00	12	0.600%	3.26	900	142.7	0.54
Sub-Main 1	10+00	10	0.658%	2.10	1,000	124.5	0.40
Sub-Main 1	20+00	8	0.658%	1.16	700	62.9	0.44
Sub-Main 1	27+00	8	1.309%	1.63	1,100	34.5	1.13

Sub-Main 2							
<u>Lateral</u>	<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Capac. (cfs)</u>	<u>Approx. Length</u>	<u>Acres Drained</u>	<u>DC (in/day)</u>
Sub-Main 2	0+00	12	0.200%	1.88	200	136.4	0.33
Sub-Main 2	2+00	12	0.750%	3.65	1,200	136.4	0.64
Sub-Main 2	14+00	10	1.050%	2.65	1,000	90.2	0.70
Sub-Main 2	24+00	8	1.050%	1.46	600	52.4	0.66
Sub-Main 2	30+00	8	1.600%	1.81	500	43.5	0.99
Sub-Main 2	35+00	8	0.750%	1.24	400	25.8	1.14

Sub-Main 3 and Sub-Main 3 Lateral 1							
<u>Lateral</u>	<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Capac. (cfs)</u>	<u>Approx. Length</u>	<u>Acres Drained</u>	<u>DC (in/day)</u>
Sub-Main 3	0+00	18	0.600%	9.62	500	555.7	0.41
Sub-Main 3	5+00	18	0.300%	6.80	2,000	551.3	0.29
Sub-Main 3	25+00	18	0.500%	8.78	400	472.3	0.44
Sub-Main 3	29+00	18	0.700%	10.39	300	407.7	0.61
Sub-Main 3	32+00	15	0.540%	5.61	1,300	354	0.38
Sub-Main 3	45+00	15	0.566%	5.74	600	328.7	0.42
Sub-Main 3	51+00	15	0.450%	5.12	900	253.3	0.48
Sub-Main 3	60+00	12	0.450%	2.82	1,000	211.4	0.32
Sub-Main 3	70+00	10	0.450%	1.74	100	69.1	0.60
Sub-Main 3	71+00	10	0.700%	2.17	1,000	69.1	0.75
Sub 3 Lat 1	0+00	8	0.800%	1.28	500	33.3	0.91
Sub 3 Lat 1	5+00	8	0.500%	1.01	1,000	33.3	0.72
Sub 3 Lat 1	15+00	8	0.330%	0.82	300	17.9	1.09

Sub-Main 4							
<u>Lateral</u>	<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Capac. (cfs)</u>	<u>Approx. Length</u>	<u>Acres Drained</u>	<u>DC (in/day)</u>
Sub-Main 4	0+00	12	0.300%	2.31	900	171.4	0.32
Sub-Main 4	9+00	10	0.300%	1.42	1,100	155.8	0.22
Sub-Main 4	20+00	10	0.830%	2.36	100	118.9	0.47
Sub-Main 4	21+00	8	0.830%	1.30	500	118.9	0.26
Sub-Main 4	26+00	8	1.600%	1.81	720	23.1	1.86

Sub-Main 5 and Sub-Main 5 Lateral 1							
Lateral	Starting Station	Dia. (in)	Grade (%)	Ex Capac. (cfs)	Approx. Length	Acres Drained	DC (in/day)
Sub-Main 5	0+00	12	0.413%	2.71	1,500	294.3	0.22
Sub-Main 5	15+00	12	0.583%	3.21	1,100	255.7	0.30
Sub-Main 5	26+00	8	0.583%	1.09	100	70.8	0.37
Sub-Main 5	27+00	8	0.846%	1.31	1,300	70.8	0.44
Sub-Main 5	40+00	8	0.400%	0.90	500	39.4	0.55
Sub 5 Lat 1	0+00	10	0.633%	2.06	1,197	115.8	0.42

The original tile system appears to have generally been designed for a minimum drainage coefficient between 1/4" and 1/3" per day. The grades generally follow the ground, which at times has quite a bit of slope resulting in higher drainage coefficients for several reaches of the tile system.

Overall, for the agricultural lands in the district we would recommend a minimum of a 3/8" per day drainage coefficient. For the tile system to carry the stormwater from the town of Readlyn a much larger drainage coefficient would be needed. As an illustration, the storm sewer system serving the portion of Readlyn that is in DD5 has pipes as large as 42" in diameter and drains roughly 90 acres. The DD5 Main Tile is 36" in diameter at its largest and drains nearly 2,000 acres. We acknowledge that water from the stormwater wetland may not all enter the tile system, but a large portion of it does.

The focus of this project is on the first approximately 2,500 feet of the Main Tile, west of Piedmont Avenue. In our opinion the flow capacity for this reach of tile is inadequate, and an improvement should be considered.

Many of the laterals draining agricultural lands are at or near what we would consider to be adequate and likely improvements are not warranted at this time. However, several reaches of the Main Tile and Sub-Main #5 tile that drains Readlyn (and carries effluent from the wastewater treatment plant) are undersized. Improvement of these tile should be considered at some point in the future.

E. Natural Gas Line

In the process of our investigation, we found that a 3-inch diameter natural gas line is located in the area of and crosses the existing Main Tile west of Piedmont Avenue. The presence of the gas line limits flexibility in how to go about making repairs or improvements. Any re-route that would require the relocation of the line would result in an expense to the district of roughly \$1 million dollars, according to the gas line company (Northern Natural Gas).

F. Repair vs. Improvement:

Based on the Iowa Drainage Code, repairs are required whereas improvements are permissive. A repair is whatever is necessary to restore or maintain a district tile to its original capacity or efficiency. An improvement is anything that is intended to expand, enlarge or otherwise increase the capacity of the tile.

IV. OPTIONS

Several options were considered in evaluating this issue. Repairing the tile in place (not re-routing) sounds appealing but does not address the issue of the lack of cover. We would need to add a significant amount of fill material to gain adequate cover over the pipe, and the land over the pipe should no longer be farmed (otherwise the fill added would be spread out over time and lack of cover would again become an issue). This would include right-of-way acquisition, and significant cost. It would also be much more difficult to do an improvement with this option, as a larger pipe would exacerbate the cover issue. We also looked at potentially constructing an open ditch, and other tile routes, but all were deemed either cost prohibitive and/or undesirable. We now see two feasible options for addressing the tile blowouts at the lower end of the Main Tile.

Option #1: Re-route Tile as an Improvement

The Main Tile in Section 16 would be re-routed out of the low ground and into a side-hill in order to gain additional cover over the tile. The tile re-route would avoid the natural gas line in order to avoid the exorbitant expense of its re-location. This would solve the problem of the deteriorating condition of the Main Tile, and its lack of cover. The new tile would also be larger in size (new 42" vs. existing 36" diameter), increasing the capacity of the lower portion of the Main Tile. The existing Main Tile in Section 16 would be removed and replaced with a smaller diameter tile. Soil would be needed to fill in the void left by removing the existing Main Tile. We anticipate that some of the excess material from the new tile installation could be used for this purpose. In our opinion the new smaller tile should be constructed by the district, but thereafter should be a private tile. Future maintenance would not be the responsibility of the drainage district. It should be noted that an improvement to the Main Tile in Section 16 will not result in the entire Main Tile system becoming adequate. Further improvements would be required.

Based on Iowa Code, improvements are permissive (optional). This option would be subject to remonstrance, and vote of the Board of Supervisors acting as trustees for the district.

Option #2: Re-route Tile as a Repair

This option would be the same as Option #1 except that it would be done as a repair, meaning the new tile would be limited to the same drainage capacity as the existing Main Tile. By Iowa Code a repair is required. This means that if Option #1 (which is optional) is not pursued this Option (#2) would be required.

Tile Material:

We would consider either reinforced concrete pipe (RCP) or dual-wall plastic tile and would recommend including bid alternates for each material. In areas with minimal cover we would recommend RCP be used. Dual-wall high-density polyethylene (HDPE) pipe is much more susceptible to deflection than RCP, and relies heavily on the strength of the backfill material around it. Public installation standards require installation in a water-free trench and that the pipe either be encased in a crushed rock envelope, or placed in a shaped trench to the spring-line with crushed rock placed to the pipe crown or above. Video testing is required 30 days after final backfill. Excessively deflected pipe is required to be replaced. The cost estimates provided assume the use of RCP. Historically, we have recommended RCP but the cost has increased significantly in recent years making it more competitive with plastic pipe, despite its other drawbacks.

V. COST ESTIMATES**OPTION 1: RE-ROUTE TILE AS AN IMPROVEMENT**

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	42" DIA. Flap Gate	1	EA	\$4,000.00	\$4,000.00
2	42" DIA. RCP, 2000D	2,841	LF	\$120.00	\$340,920.00
3	Riprap, Class D	20	TN	\$60.00	\$1,200.00
4	Dig Outlet Channel	1	LS	\$2,000.00	\$2,000.00
5	Remove & Dispose, 36" Dia. Tile	2,593	LF	\$7.00	\$18,151.00
6	12" Dia. Dual-Wall HDPE	850	LF	\$25.00	\$21,250.00
7	10" Dia. Dual-Wall HDPE	350	LF	\$22.00	\$7,700.00
8	8" Dia. Dual-Wall HDPE	1,393	LF	\$18.00	\$25,074.00
9	Topsoil Fill & Grading	602	CY	\$20.00	\$12,040.00
10	Exploratory Excavation	5	HR	\$250.00	\$1,250.00
11	Trench Stabilization and Bedding Stone	60	TN	\$35.00	\$2,100.00
12	Mobilization	1	LS	\$22,000.00	\$22,000.00
ESTIMATED OPTION 1 CONSTRUCTION COST:					\$458,000
ESTIMATED SUBTOTAL CONSTRUCTION COST:					\$458,000
CONSTRUCTION CONTINGENCIES					\$46,000
ESTIMATED TOTAL CONSTRUCTION COST					\$504,000
<u>NON-CONSTRUCTION COSTS</u>					

ENGINEERING - (REPORT, HEARINGS, PLANS & SPECS, BID LETTING, CONSTRUCTION, COMPLETION)	\$85,000
LEGAL, PUBLICATIONS, MAILINGS, ETC.	\$3,000
RE-CLASSIFICATION	\$8,000
TEMPORARY EASEMENT (12.5 ACRES @ \$1,000 / ACRE)	\$12,500
OTHER DAMAGES	\$3,000
INTEREST	\$37,000

ESTIMATED TOTAL DISTRICT COST \$653,000

AVG COST PER ACRE FOR (BASED ON 1,934.7 ACRES):	\$337
AVERAGE COST PER ACRE PER YEAR AT 6% INTEREST FOR 10 YEARS:	\$46
AVERAGE COST PER ACRE PER YEAR AT 6% INTEREST FOR 20 YEARS:	\$29

OPTION 2: RE-ROUTE TILE AS A REPAIR

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	36" DIA. Flap Gate	1	EA	\$3,000.00	\$3,000.00
2	36" DIA. RCP, 2000D	2,841	LF	\$100.00	\$284,100.00
3	Riprap, Class D	20	TN	\$60.00	\$1,200.00
4	Dig Outlet Channel	1	LS	\$2,000.00	\$2,000.00
5	Remove & Dispose, 36" Dia. Tile	2,593	LF	\$7.00	\$18,151.00
6	12" Dia. Dual-Wall HDPE	850	LF	\$25.00	\$21,250.00
7	10" Dia. Dual-Wall HDPE	350	LF	\$22.00	\$7,700.00
8	8" Dia. Dual-Wall HDPE	1,393	LF	\$18.00	\$25,074.00
9	Topsoil Fill & Grading	602	CY	\$20.00	\$12,040.00
10	Exploratory Excavation	5	HR	\$250.00	\$1,250.00
11	Trench Stabilization and Bedding Stone	60	TN	\$35.00	\$2,100.00
12	Mobilization	1	LS	\$20,000.00	\$20,000.00

ESTIMATED OPTION 1 CONSTRUCTION COST: \$397,000

ESTIMATED SUBTOTAL CONSTRUCTION COST: \$397,000

CONSTRUCTION CONTINGENCIES \$40,000

ESTIMATED TOTAL CONSTRUCTION COST \$437,000

NON-CONSTRUCTION COSTS

ENGINEERING - (REPORT, HEARINGS, PLANS & SPECS, BID LETTING, CONSTRUCTION, COMPLETION)	\$85,000
LEGAL, PUBLICATIONS, MAILINGS, ETC.	\$3,000
RE-CLASSIFICATION	\$8,000
TEMPORARY EASEMENT (12.5 ACRES @ \$1,000 / ACRE)	\$12,500
OTHER DAMAGES	\$3,000
INTEREST	\$33,000

ESTIMATED TOTAL DISTRICT COST \$582,000

AVG COST PER ACRE FOR (BASED ON 1,934.7 ACRES):	\$300
AVERAGE COST PER ACRE PER YEAR AT 6% INTEREST FOR 10 YEARS:	\$41
AVERAGE COST PER ACRE PER YEAR AT 6% INTEREST FOR 20 YEARS:	\$26

VI. PROPOSAL

We recommend re-routing the Main Tile in Section 16 as an improvement (Option #1). It solves the issues with the existing tile (condition and cover) and increases the capacity of the currently undersized system at limited additional cost as compared to a repair (Option #2).

VII. RIGHT-OF-WAY

Iowa Code grants drainage district a permanent right of egress and ingress, and right of access for maintenance, repair, improvement, and inspection of drainage district facilities. Unless right-of-way is acquired, which we are not recommending, landowners will be reimbursed for any damages caused in the process of maintenance, repair, improvement, or inspection.

The district will need an area to perform the proposed work. Compensation for damages within the work limits is normally determined at a completion hearing and is subject to approval by the Board of Supervisors.

VIII. ASSESSMENT SCHEDULE REVIEW

This district is currently under its original assessment schedule from when it was established in 1920. All district tile facilities are included in this single assessment schedule. Under this schedule all lands are assessed for work done on any tile in the district, regardless of whether the lands benefit from it. For example, parcels that drain into Sub-Main 3 tile would help pay for repairs to Sub-Main 5 Tile, which they do not use nor benefit from. This is not fair or equitable. The remedy for this is to develop separate assessment schedules for each district facility, to make the cost of improvements and future repairs more equitable. This process is called re-classification. Re-classification is done by a classification commission which includes an engineer and two Bremer County landowners who neither own nor have any interest in the lands being re-classified.

On December 12, 2022, the Bremer County Board of Supervisors, acting as trustees for Drainage District No. 5 directed us to proceed with reclassification. Once filed, the reclassification report will be available both on the county website and at the auditor's office. Once approved, the new assessment schedules will be used as the basis for future levies to pay for maintenance, improvements, engineering, etc.

We have made significant progress on re-classification, however, have decided that it is best to delay re-classification until a decision is made on how to proceed. The re-classification will likely be affected by what is decided regarding the Main Tile.

For landowner use, we have enclosed dollars maps for both Option #1 and Option #2 presented in this report. We note that if an improvement is pursued (Option #1) we would recommend a one-time use schedule to pay for the project. If a repair (Option #2) is pursued, we would recommend the Lower Main Tile schedule be used to pay for the project. We emphasize that the numbers are estimates and are to be used for informational purposes only. The final values would be based on actual project costs, and parcel-by-parcel relative benefits determined by an appointed classification commission and as such almost certainly would differ from the values shown.

By Iowa Code, drainage district classification is required to be spread equitably, based on benefit received. Several factors were considered in assigning benefits including soil types, land area, facility use, distance to the facility, and runoff generation. The factors are combined for each individual parcel to determine relative benefit, which in turn is used to determine the parcel specific cost.

IX. FARM PROGRAM WETLAND COMPLIANCE

If Option #1 is pursued, and any farmed wetlands exist on property within Drainage District No. 5, the construction of drainage improvements may be considered by the NRCS to be a conversion and place landowners and tenants in jeopardy of being in violation of farm program rules.

If improvements are constructed and you have farmed wetlands that are converted, your options are to either cease farming the wetland acres or purchase mitigation credits through a wetland mitigation

bank. The current fee is approximately \$20,000 per acre. If you believe the wetland determination to be in error, you may request a review by the NRCS.

We mailed letters to landowners on March 22nd and May 16th, 2023 requesting wetland determinations for agricultural lands. No farmed wetlands have been identified at the time of writing this report. Enclosed is a map showing wetland determinations received. We have been informed that wetland determinations have been requested for the remaining lands, as of January 26th, 2024.

It is solely the responsibility of the landowner to keep themselves in farm program compliance.

X. CONCLUSION/RECOMMENDATIONS

This report confirms the need for drainage repairs or improvements within Drainage District No. 5. We recommend re-routing the existing Main Tile in Section 16 of Maxfield Township (T-91-N, R-12-W) with a larger 42" diameter pipe (Option #1). We also recommend removing the existing Main Tile in Section 16 and replacing it with smaller diameter tile. This would include placing soil fill to replace the void left in removing the existing 36" diameter Main Tile. The improvements proposed will provide increased drainage capacity and address the cover issues over the lower reaches of the Main Tile. Yield increases for agricultural lands and increased market value of property are all potential benefits of the project.

The estimated project cost for the improvement is \$653,000 or an average of \$337/acre in the district. By Iowa Code the improvement is permissive. If the proposed improvement is not pursued, a repair (Option #2) is required.

The Board of Supervisors, as trustees for Drainage District No. 5, should tentatively approve this report and set a date for a public hearing. At the hearing, the trustees should seek input from landowners. Once modifications to the report are made, if any, the project should be approved, construction plans and specifications be developed, and the project be advertised for public bid.

Sincerely,

JACOBSON-WESTERGARD & ASSOCIATES INC.



Collin J. Klingbeil, P.E.

Encl. Work Order
 Map of Existing DD5 Tile Systems
 Clip of 1919 Engineer's Report
 Readlyn Stormwater Wetland Plan Sheets C101 & C203
 Dollars Maps for Option #1 & Option #2
 Wetland Determination Map

Mail to: Bremer Co. Auditor
415 E Bremer Ave
Waverly, IA 50677

REQUEST FOR REPAIR BREMER COUNTY, IOWA

To the Board of Supervisors, Bremer County, Iowa:

I, the undersigned, hereby state that repairs are necessary to tile lines and/or open ditches of the organized Drainage District No: 5, Lateral No. Main and I hereby request that the matter be investigated and repairs be made at the earliest possible date.

Signed: _____

Date: 11/21/2022

DRAINAGE WORK ORDER

Repair requested by: Landon Moore

☐ Owner

☐ Tenant

☒ Other

Telephone: 319-352-4302

Address: Piedmont/240th

Site available for repair now? ☒ Yes ☐ No

Landowner name, phone & address (if not provided above): Dawn Lau

Does this also involve private tile? Yes ☒ No ☐

Preference for Contractor to do the repair? _____

Please give description of the problem: Several sinkholes over 36" main

On the grid below, please indicate where the damage is located. Draw in the tile to the best of your ability. The box in the center represents the middle of the section.

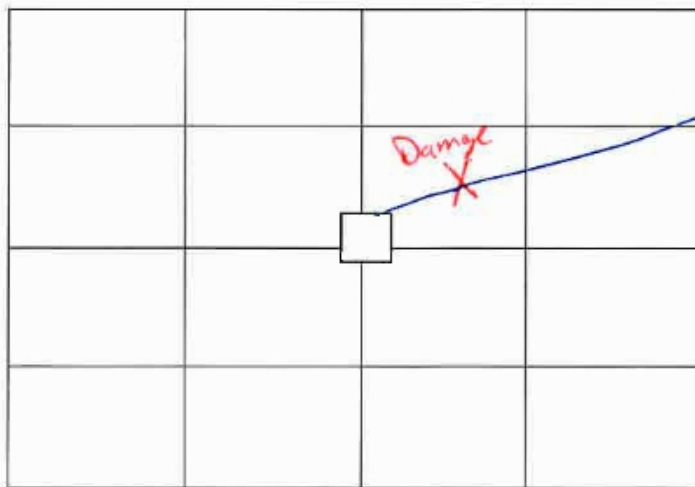
NW ¼

NE ¼

Section: 16
Township: 9N
Range: 12W

SW ¼

SE ¼



REPAIRS (for County use ONLY):

☐ Approved for Work

☐ Investigation Necessary

☐ Not Approved for Work

Supervisor's Signature: _____

Date: _____

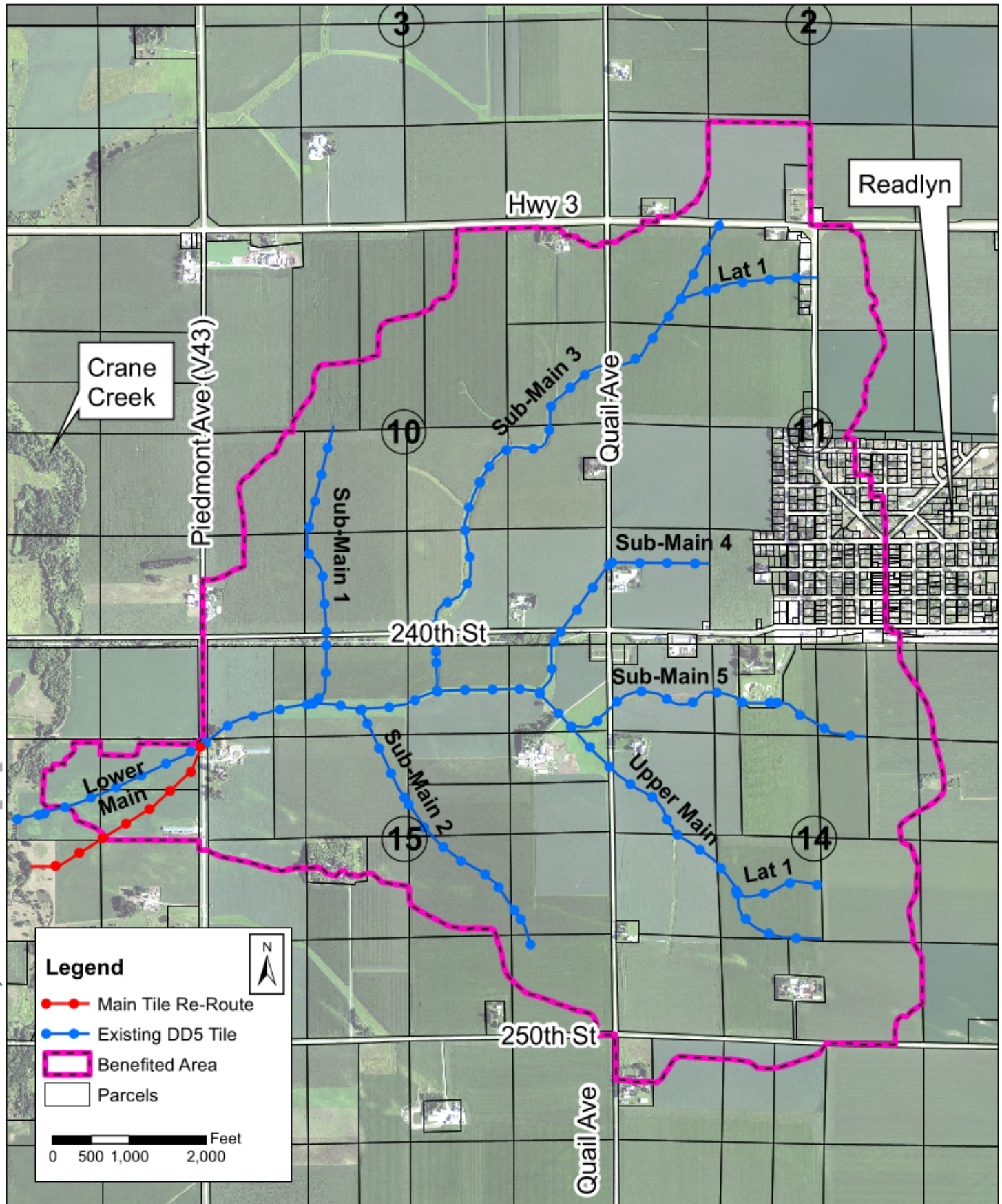
Work Order #: _____

Contractor Assigned: _____

White: return to Auditor's Office for payment
(Invoices submitted without a work order will not be paid)

Yellow: retain for your records

Drainage District No. 5
Map of Existing and Proposed Tile
Bremer County, Iowa



REPORT ON DRAINAGE DISTRICT (Highway) # 5.

To the Honorable Board of Supervisors of Bremer County.

Gentlemen:

Your Engineer, in accordance with the resolution passed by you, has surveyed and planned a drainage system for the lands mentioned in your resolution and begs to make the following report.

I went over the watershed covered by your resolution and find that the most practical way of draining the watershed is as shown by the attached map.

The outlet for this watershed is in a small gully that discharges into Crane Creek, on the land of August Wittenberg in Sec. 16-91-12, and the outlet is about 200' south of the point where the gully empties into Crane Creek at a point 700' north of the center line of the section and 2280' west of the east line. The Main line runs in a general north-westerly direction across the lands of August Wittenberg, Herman Oltrogge and August Wittenberg and thence in a south-easterly direction across the lands of Louis Meyerhoff and Ed Huebner and terminates on the land of Herman Thies.

The size of tile in the main is as follows - from sta. 0-00 at the outlet to sta. 43-00, a point in Herman Oltrogge's field where sub-main #1 commences, will be 36"; from sta. 43-00 to sta. 56-00 where sub-main #3 commences, will be 32"; from sta. 56-00 to sta. 69-00, the point where sub-main #4 commences, will be 26"; from sta. 69-00 to sta. 77-00, the point where sub-main #5 commences will be 20"; from sta. 77-00 to sta. 96-00 will be 18"; from sta. 96-00 to sta. 112-00 will be 12" and from sta. 112-00 to sta. 121-90 will be 8".

Sub-main #1 consists of 1000' of 12" tile, 1000' of 10" tile and 1770' of 8" tile.

Sub-main #2 consists of 1400' of 12" tile, 1000' of 10" tile and 1510' of 8" tile.

Sub-main #3 consists of 3200' of 18" tile: 2800' of 15" tile; 1000' of 12" tile and 1400' of 10" tile.

Sub-main #4 consists of 900' of 12" tile; 1200' of 10" and 1220' of 8" tile.

Sub-main #5 consists of 2600' of 12" tile and 1818' of 8" Tile.

Lateral #1, Sub-main #5 consists of 1197' of 10" tile.

Lateral #1, Main line, consists of 740' of 8" tile.

Lateral #1, Sub-Main #3 consists of 1760' of 8" tile.

The total area of this watershed is 1900 acres and about 60% of the area requires drainage in order that the land can be placed under plow.

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WATERSHED DATA:

FIELD	9 ACRES
GRASS	56 ACRES
IMPERVIOUS	30 ACRES
TOTAL	95 ACRES

HYDROLOGIC AND HYDRAULIC DATA:

WETLAND INFLOWS:

1	89.83 CFS
5	152.33 CFS
100	352.48 CFS

WETLAND OUTFLOWS:

1	82.58 CFS
5	144.24 CFS
100	340.11 CFS

WETLAND DATA:

WATER ELEVATIONS:

FOREBAY POOL	1018.30
PERMANENT POOL	1013.50
W ₁ V HWE	1014.14
CPV HWE (1 YR)	1014.57
100 YR HWE	1015.46

W₁V:

REQUIRED	144,066 CF
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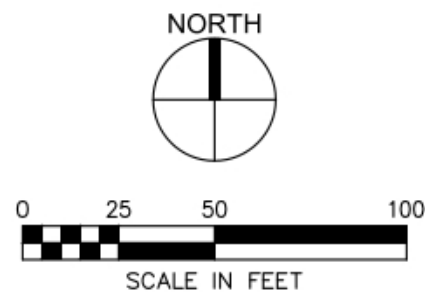
FOREBAY PERMANENT POOL

15,212 CF
129,896 CF

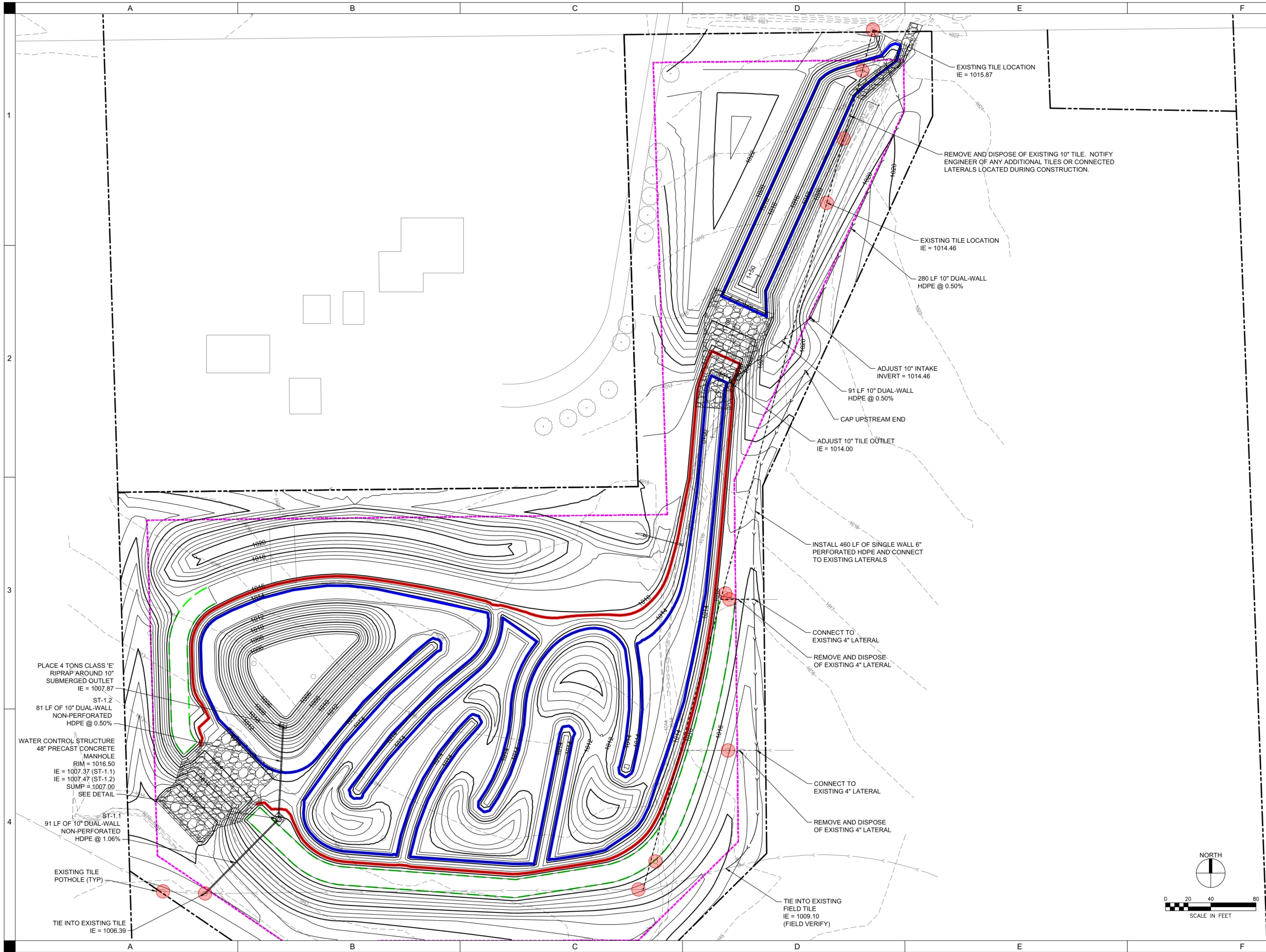
TOTAL PROVIDED 145,108 CF

WETLAND ELEVATIONS

ZONE	MIN ELEVATION	MAX ELEVATION	COLOR
SEMI-WET	1013.50	1015.50	
HIGH MARSH	1013.00	1013.50	
LOW MARSH	1012.00	1013.00	
SHALLOW POOL	1010.50	1012.00	
DEEP POOL	1005.00	1010.50	



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STORMWATER WETLAND

CITY OF READLYN
READLYN, IOWA

TILE ADJUSTMENTS

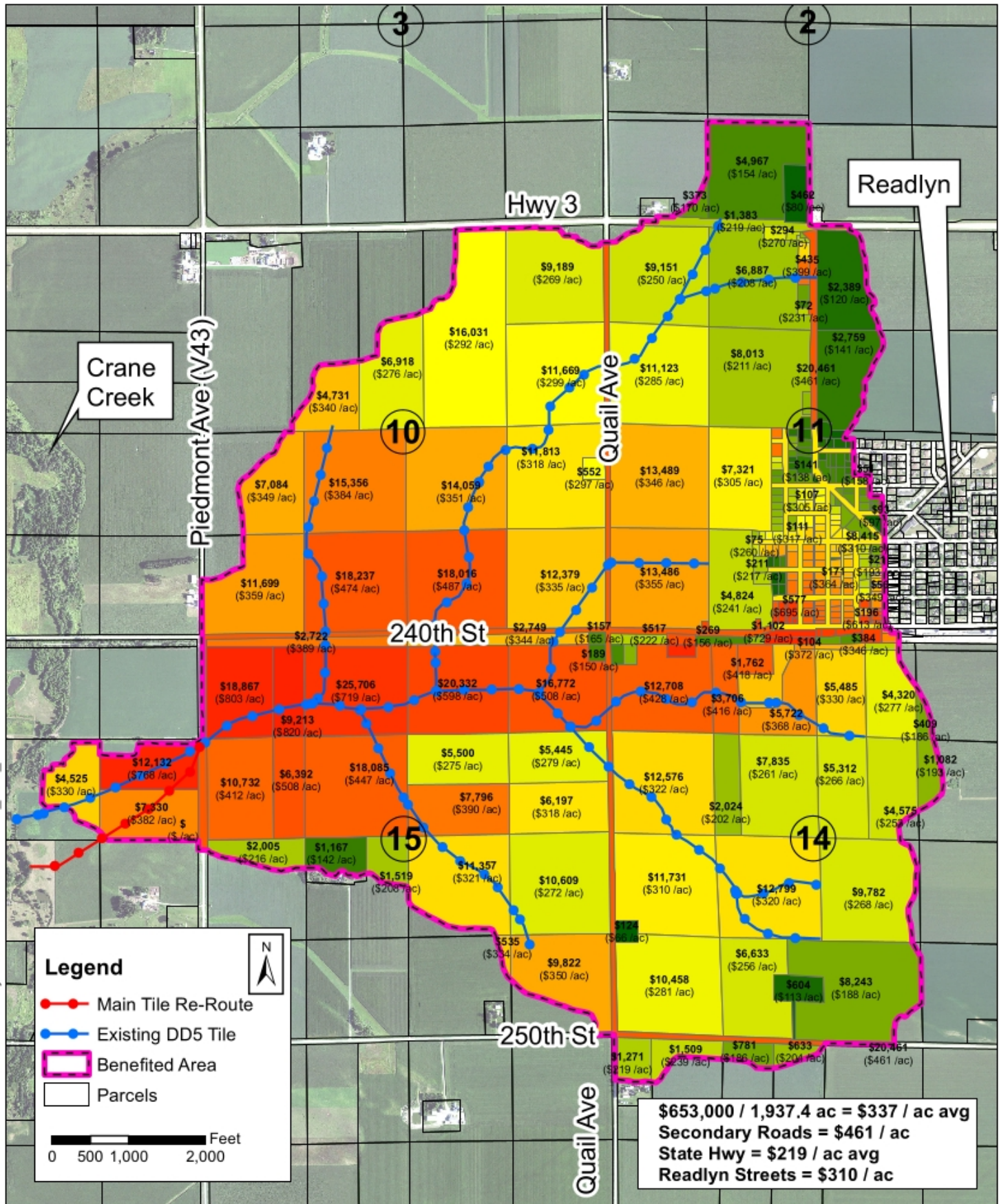
DRAWN: AJH
APPROVED: LTM
ISSUED FOR: BIDDING
DATE: 08/16/2018
PROJECT NO: 2181080
FIELD BOOK: --
CLIENT NO: --

Drainage District No. 5

Option #1: Lower Main Tile Improvement

Dollars Map Based on \$653,000 Levy

Bremer County, Iowa

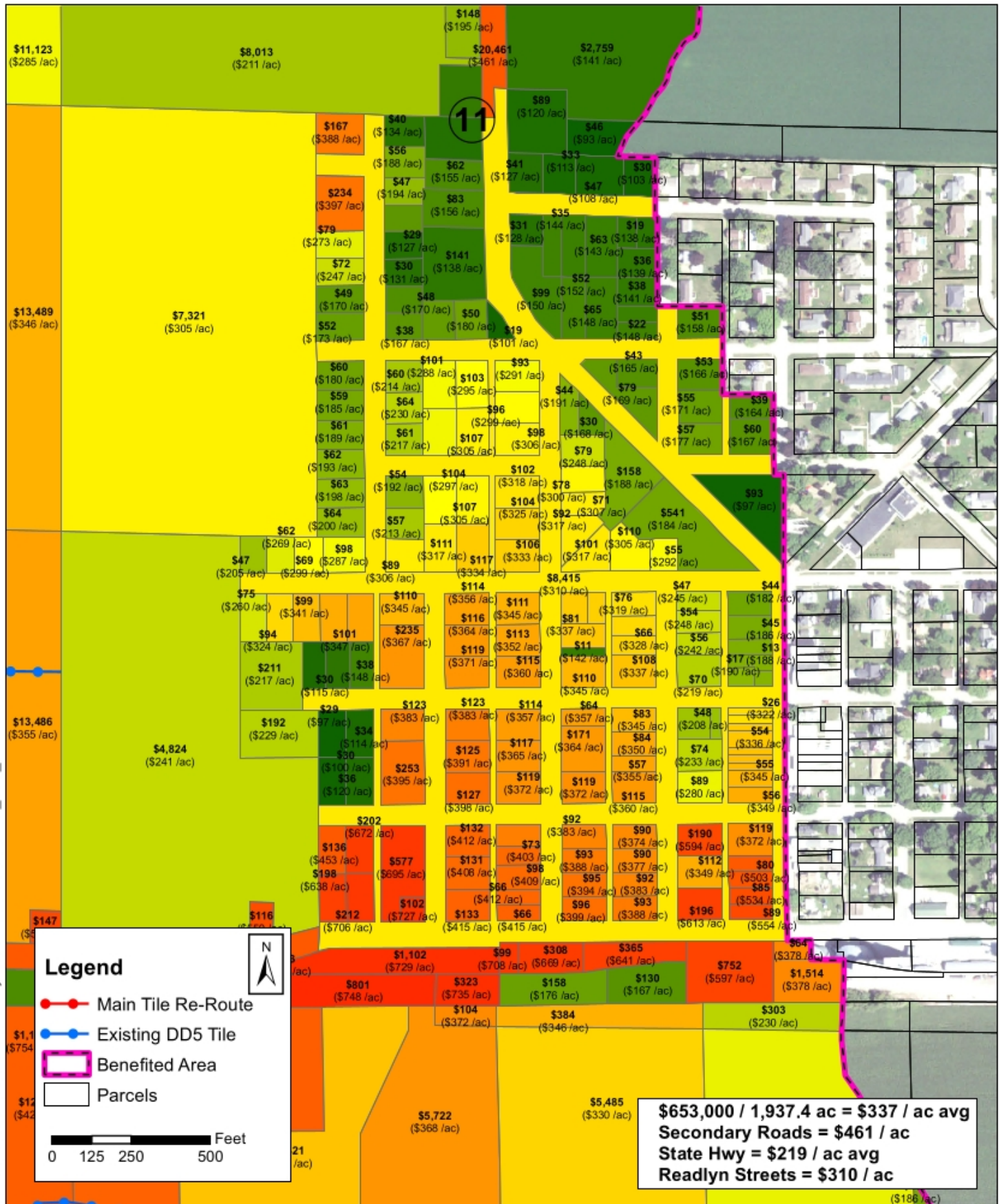


Drainage District No. 5

Option #1: Lower Main Tile Improvement

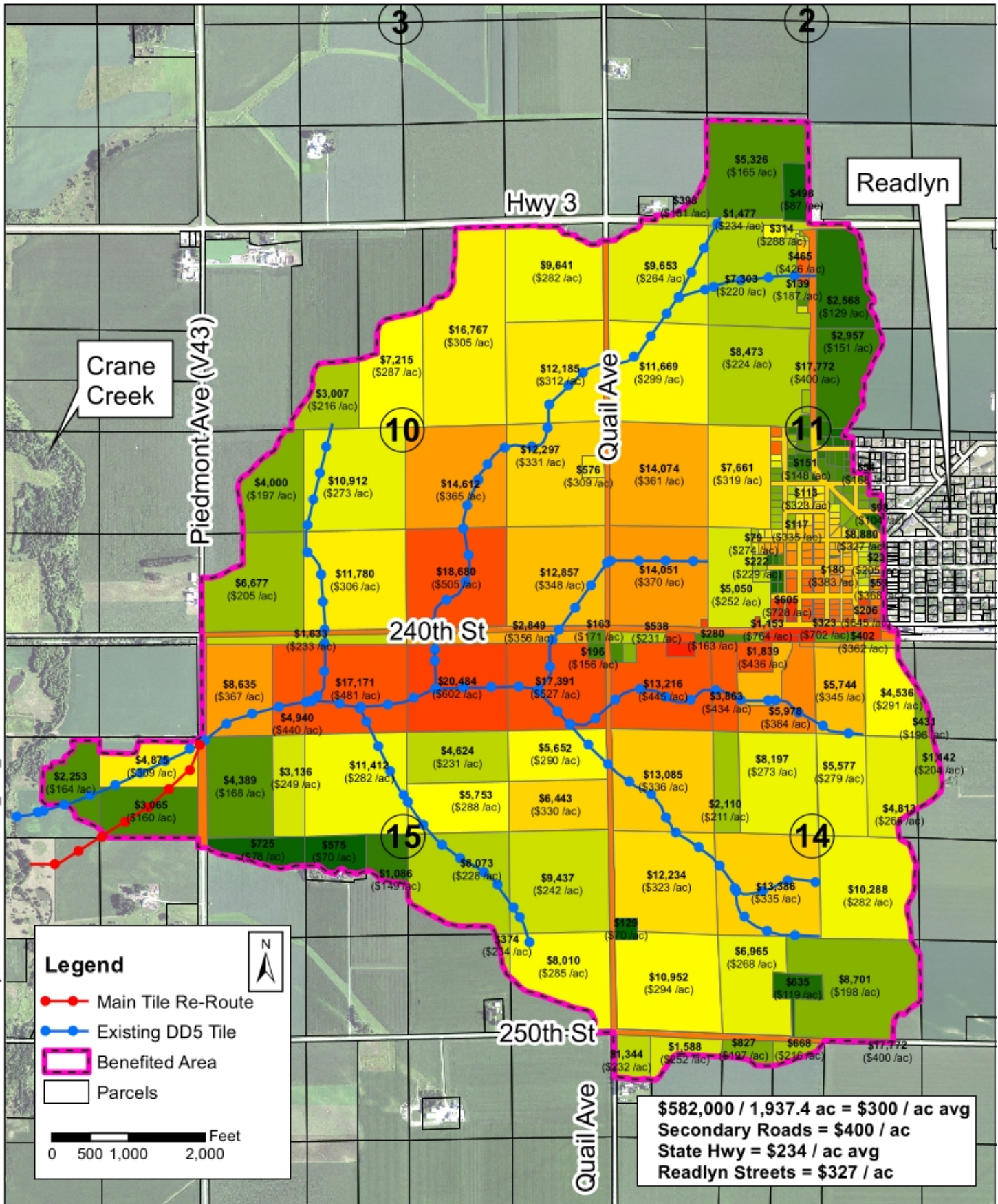
Dollars Map Based on \$653,000 Levy

Bremer County, Iowa



Drainage District No. 5
Option #2: Lower Main Tile Repair
Dollars Map Based on \$582,000 Levy
 Bremer County, Iowa

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Drainage District No. 5

Option #2: Lower Main Tile Repair

Dollars Map Based on \$582,000 Levy

Bremer County, Iowa

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\$582,000 / 1,937.4 ac = \$300 / ac avg
Secondary Roads = \$400 / ac
State Hwy = \$234 / ac avg
Readlyn Streets = \$327 / ac

Drainage District No. 5 Wetland Determinations Requested

Bremer County, Iowa

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