

**HARDIN COUNTY, IOWA**

**2016**



**ENGINEER'S  
REPORT ON  
REPAIR AND  
IMPROVEMENT TO  
MAIN OF  
DRAINAGE  
DISTRICT NO. 143  
HARDIN COUNTY**

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

LEE O. GALLENTINE, P.E.

DATE

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MY LICENSE RENEWAL DATE IS DECEMBER 31, 2016  
PAGES OR SHEETS COVERED BY THIS SEAL:  
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**RYKEN**

**ENGINEERING & LAND SURVEYING, INC.**

**OFFICE LOCATIONS**

739 Park Avenue  
Ackley, IA. 50601  
Phone: 641-847-3273  
Fax: 641-847-2303

103 East State Street, Ste 430  
Mason City, IA 50401  
Phone: 641-423-1451  
Fax: 641-423-1659

511 Bank Street  
Webster City, IA 50595  
Phone: 515-832-1876  
Fax: 515-832-1932

Licensed and Insured for over 50 years

Ryken@RykenEng.com  
www.RykenEng.com

# Engineer's Report on Repair and Improvement to Main of Drainage District No. 143, Hardin County, Iowa

<b>Table of Contents</b>	Pg. 1
<b>Report</b>	
Introduction	Pg. 2
District History	Pgs. 3-5
Investigation	Pg. 6
Discussion and Conclusions	Pg. 7
Repair Methods	Pgs. 8-9
Improvement Methods	Pgs. 10-11
Opinion of Probable Construction Costs	Pg. 12
Ownership and Classifications	Pg. 13
Recommendations	Pg. 13
<b>Appendices</b>	
Repair Summary for Work Order Request #59	App. A
Drainage District No. 143 Map by Reigles Engineering Company	App. B
Plan Sheet Showing Main Relief Tile	App. C
Rerouted Tile Map (Repair)	App. D
Parallel Tile Installation Map (Improvement)	App. E
Tile Replacement - Upsizing Map (Improvement)	App. F
Tile Replacement - Open Ditch Map (Improvement)	App. G
Main Capacities Chart Parallel Tile Installation (Improvement)	App. H
Main Capacities Chart Tile Replacement - Upsizing (Improvement)	App. I
Main Capacities Chart - Open Ditch (Improvement)	App. J
Opinion of Probable Construction Cost (Repair)	App. K
Opinion of Probable Construction Cost Parallel Tile (Improvement)	App. L
Opinion of Probable Construction Cost Tile Replacement - Upsizing (Improvement)	App. M
Opinion of Probable Construction Cost Tile Replacement - Open Ditch (Improvement)	App. N

# **Engineer's Report on Repair and Improvement to Main of Drainage District No. 143, Hardin County, Iowa**

## 1.0 INTRODUCTION

- SCOPE OF WORK – The Hardin County Board of Supervisors, acting as District Trustees, requested Ryken Engineering to investigate and report concerning repair and improvement to the main of Drainage District No. 143. This report will summarize the history of improvements and repairs, investigate the necessity and feasibility of said repair and improvement, and present an opinion of probable construction costs associated with said repair and improvement. At the regular drainage meeting held on August 5, 2015, the recommended actions shown in the Repair Summary for Work Order Request #59 (copy included in Appendix A) were discussed and reviewed by the District Trustees. At this meeting and subsequent meetings, discussions ensued about additional possible repair and improvement methods beyond those listed in the above mentioned Repair Summary. As a result, at the regular drainage meeting held on September 16, 2015 the District Trustees requested Ryken Engineering to move ahead with an investigation and report concerning repair and improvement to said main.
  
- LOCATION – The area of investigation was limited to parts of the main located in Sections 28, 29, and 33, Township 87 North (T87N), Range 22 West (R22W), Hardin County, Iowa. Specifically, the downstream limit was the main tile outlet on the east side of Section 33 (west side of E Avenue) at approximately ¼ mile south of Highway #175. The main tile then goes west and northwest across Section 33 and crosses Highway #175 at approximately ⅜ mile east of County Highway S-27. It then continues northwest across Section 28 and crosses County Highway S-27 at its intersection with Ionia Street at approximately ⅜ mile north of Highway #175. The main continues west under Ionia Street into Section 29 with the upstream limit of investigation being at the intersection of Ionia Street and Park Street. For reference, a copy of a Drainage District No. 143 map by Reigles Engineering Company, showing said limits is included in Appendix B.

2.0 DISTRICT HISTORY – The following is a summary of the pertinent history of the main of Drainage District No. 2 and 143 as obtained from the Hardin County Auditor's drainage minutes and records and those of Ryken Engineering and Land Surveying.

- 1903, Aug. 15            Petition and Bond for establishment of Drainage District No.2 was filed. Said petition indicated that a main drain, sub-mains, and laterals should be installed. Specifically, it indicated that the main should start on the west side of Section 32, run northeast and east into Section 29 to Ionia Street. There it should run east on Ionia Street to the east side of Section 29 where it would continue southeast and terminate in an open ditch.
- 1903                    E.E. Fox is appointed as the Engineer for the project and an Engineer's Report was filed for this project. Although no copies of said report could be located, it is known to have existed as E.E. Fox revised it through a letter dated Sept. 10, 1903.
- 1903, Aug. 27            Publication of Notice of Drainage District No. 2 establishment.
- 1903, Sept. 29            Notice to Contractors for construction of Drainage District No. 2 facilities with a bid date of Nov. 11, 1903.
- 1906, Mar. 1            Publication of Notice of Drainage District No. 2 establishment.
- 1906, Jul. 7            Publication of Notice to Contractors for construction of Drainage District No. 2 facilities with a bid date of Aug. 6, 1906.
- 1906, Aug. 14            Construction bond with Austin Rorem for construction of Drainage District No. 2 facilities is filed.
- 1907, Mar. 5            Classification Commission to inspect the lands in Drainage District No. 2 is appointed.
- 1908, Jun. 3            Notice of Assessment for Classification for Drainage District No. 2
- 1928, Oct. 13            Engineer's Report by J.R. Maher was filed. It called for a subdistrict to be formed and constructed. Said subdistrict would contain a main tile that connected with the existing main tile outlet of Drainage District 2 (station 503+70) and run southeast and east and discharge near the center of the northeast quarter of Section 33 (station 438+00).
- 1928, Oct. 20            Appointment of Commission to inspect and classify lands per the Oct. 13, 1928 Engineer's Report. It is noted in the appointment that "This is to be known as drainage district #143."
- 1930, Dec. 4            Publication of Notice of Assessment for Classification for Drainage District No. 143. It is noted that Drainage District No. 143 included the upper end of Division 3 of Drainage District No. 55 and Drainage District No. 2.
- 1930, Dec. 29            Memorandum between the Town of Radcliffe and Board of Supervisors for modifying the design in the Engineer's Report with the "main tile (to) be extended to outlet at the road at the East line of the NE quarter of 33-87-22".
- 1930, Dec. 31            Bids were received for construction of Drainage District No. 143 facilities and a construction contract with Lloyd L. Stanley was signed.

- 1931, Jan. 3            Engineer's Report is revised by J.R. Maher to recommend a design that is in accordance with the above memorandum between the Town and Radcliffe and the Board of Supervisors. This became known as the Extension of Drainage District No. 143.
- 1931, Jan. 8            Publication of Notice to Contractors for Extension of Drainage District No. 143.
- 1931, Jan. 23          Bids were received for construction of Extension of Drainage District No. 143 and construction contract with John Chetland of Radcliffe and tile contract with Lehigh Sewer Pipe and Tile Company were signed.
- 1931, May 18          Engineer's Report on completion of construction of Drainage District No. 143 was filed.
- 1931, May 21          Publication of Notice for Completion Hearing for construction of Drainage District No. 143 facilities.
- 1931, Jul. 9            Publication of Notice for Completion Hearing for Extension of Drainage District No. 143.
- 1954, Sep. 7            Petition to repair or replace the main tile of Drainage District No. 143 in order to eliminate overflow from it.
- 1955, Apr. 9            Approval by Board of Supervisors to investigate the condition of the main Drainage District No. 143 tile in the town of Radcliffe.
- 1955, Apr. 19          Informal Engineer's Report from Neil A. Carpenter regarding the above mentioned investigation. It indicated that the main Drainage District No. 143 tile on the east side of Radcliffe had 50% or more reduction in capacity due to silt, tree roots, and a flat grade. As a solution, a relief/parallel tile was recommended.
- 1955, Apr. 25          Request by the Board of Supervisors for Neil A. Carpenter to proceed with a detailed Engineer's Report.
- 1955, Nov. 2            Engineer's Report by Neil A. Carpenter is filed. It called for 1935 feet of 18 inch main relief tile to be installed on Drainage District No. 143. This installation starts with an interconnection with the original main tile just east of the intersection of Amanda Street and Ionia Street in the town of Radcliffe. The main relief tile then ran east along Ionia Street and crossed the east line of Section 29 where it ran southeast for approximately 300 feet (into the current golf course). There it interconnected with the original main tile again. For reference, a copy of one of the plan sheets showing the limits of said main relief tile is included in Appendix C.
- 1955, Nov. 24          Publication of Notice of Hearing for on Engineer's Report to repair and improve Drainage District No. 143.
- 1955, Dec. 28          Additional request for Neil A. Carpenter to inspect and determine the condition of the main Drainage District No. 143 tile west of the park in Radcliffe.
- 1956, Feb. 13          Adoption of resolution by the City Council of Radcliffe allowing construction the main relief tile for Drainage District No. 143 and that

construction would be done at no expense to the Town of Radcliffe except for the regular drainage assessments.

1956, Mar. 6 Publication of Notice to Contractors for construction of the main relief tile for Drainage District No. 143.

1956, Mar. 14 Bids were received for the construction of the main relief tile for Drainage District No. 143.

1956, Mar. 26 Construction Contract with Walmer G. Forsber for the construction of the main relief tile for Drainage District No. 143 was signed.

1956, Jun. 4 Engineer's Report on completion of construction of the main relief tile for Drainage District No. 143.

1956, Sept. 4 Publication of Notice for Completion Hearing for construction of the main relief tile for Drainage District No. 143.

1956, Sept. 11 Approval of the Engineer's Report on completion of construction of the main relief tile for Drainage District No. 143.

1984, May 21 Approval of repair of broken tiles at 2 separate locations in Section 33.

1986, Apr. 30 Approval of repair of broken tile in NE¼ Section 33.

1988, Aug. 10 Approval of repair of broken tile in Fairway #6 on the golf course in Section 28.

1991, May 29 Approval of repair of tile blowout in Section 29.

1994, Aug. 3 Request for tile repairs in Sections 28 and 33.

1995 The Town of Radcliffe constructed a new storm sewer system along Ionia Street from Dewey Street to Park Street. Several intakes were installed and the sizes of the storm sewer installed varies from 24 inch to 36 inch. From Park Street to County Highway S-27, no storm sewer is installed, but an earthen ditch is cleaned out along the south side of Ionia Street and an additional culvert is installed under County Highway S-27 to outlet water from the storm sewer. This was done as the main tile and the main relief tile combined did not provide an adequate outlet.

1999, Apr. 15 Request for repair of tile blocked due to tree roots between Hole #1 and #6 on the golf course in Section 28.

2004 Tile repair was performed done in Section 29.

3.0 INVESTIGATION – Review of district history shows that the capacity and condition of the main tile has been questioned since 1954. At that time, a main relief tile was installed to alleviate a bottleneck in the existing main tile. Since then, the land usage in the Town of Radcliffe has grown more intensive (i.e. more hard surfaces, additional storm sewer, etc) as evidenced by the 1995 storm sewer project. This has increased the rate and amount of storm water runoff, which has added to the load on the main tile and main relief tile. In addition, the tile condition over this time period has declined. This is evidenced by the fact that landowners have reported blowouts, plugged tile, and broken tile at least 8 locations in the last 23 years. A comparison of the map of the main tile and main relief tile with a current aerial photograph shows that they run close or under several large trees within the golf course and along the former railroad south of the golf course. Based on this and the most recent repair request, the decision was made to have as much of the main tile cleaned, televised, and located in the golf course.

Therefore, jet cleaning and televising of the main tile was attempted on two different dates from the intake just east of County Highway S-27 (west side of golf course). Initially the main tile was full of water that wasn't flowing, but after jet cleaning the water started to flow slowly. Even with jet cleaning, no televising could be performed downstream at this location due to the large amount of silt in the pipe and the slow moving water. However, televising was performed 400 feet upstream from this location and the main tile appeared to be in good condition as it headed west under Ionia Street. There were only 3 areas that contained broken pipe or pipe in disrepair and both of those were under County Highway S-27. For reference, the Cleaning and Televising map showing these limits is included at the end of Appendix A.

In addition, jet cleaning and televising of the main tile was attempted on two different dates from the intake just north of the former railroad (south side of golf course). There was a small amount of water flowing in the tile, but initially the main tile couldn't be televised upstream to the northwest as there were too many tree roots. After jet cleaning, televising was performed upstream for 600 feet. The main tile appeared to be in poor condition in this area with 3 pipe lengths that were broken and ready to collapse. In addition, there were 4 previous repairs evident with single wall or rusted CMP. Finally, televising could not proceed past 600 feet upstream as there were roots encountered that were large enough that the CCTV equipment could not get past them and jet cleaning could not cut them. Televising was performed for 1200 feet downstream without any problems and the main tile appeared to be in average condition with 6 pipe lengths that were broken and ready to collapse. For reference, the Cleaning and Televising map showing these limits is included at the end of Appendix A.

4.0 DISCUSSION AND CONCLUSIONS – Based on the above, it is obvious that main tile located within the golf course has the following issues:

- The main tile is overloaded by the combination of agricultural drainage and storm water flows leaving the town of Radcliffe. The following chart shows the maximum flow capacities of the tile and storm sewer at the intersection of Ionia Street and Park Street versus the existing main tile at the south side of the golf course. It is should be noted that this chart does not figure any overland flows beyond that conveyed into the area through the mentioned tile or storm sewer.

<u>PIPE</u>	<u>CAPACITY (cfs)</u>
18" Main Tile at Ionia St. and Park St.	4.1 cfs
18" Main Relief Tile at Ionia St. and Park St.	6.2 cfs
36" Storm Sewer at Ionia St. and Park St.	39.2 cfs
+ 15" Storm Sewer at Ionia St. and Park St.	6.0 cfs
TOTAL	55.5 cfs
- 20" Main Tile at South Side Golf Course	9.8 cfs
<b>DEFICIENCY</b>	<b>45.7 cfs</b>

- The main tile through the golf course is restricted due to tree roots and debris that has settled out of the water in the tile as a result of the tree roots.
- The main tile is in poor physical condition.

All the above is evidence by the images from the CCTV reports, the physical location of the main tile relative to trees within the golf course, and slow moving water in the main tile upstream of the golf course. If nothing is done, the main tile will become more restricted by debris and roots and the tile will start to collapse as the physical condition of the tile continues to deteriorate. As a result, the area upstream of the golf course (Town of Radcliffe and farmland southwest of Radcliffe) will have significantly reduced drainage.

It is important to note that a significant portion of the main tile through the heart of the golf course was not televised due to silt and root restrictions. Its condition is unknown, but it is assumed to similar to the 600 feet that was televised from the south side of the golf course as mentioned above. This is assumed as the Cleaning and Televising map included at the end of Appendix A shows the main tile running through or by several additional trees.

5.0 REPAIR METHODS – To repair the above discussed issues there are several options, but the following are the most straightforward ones:

Open Cut Tile Replacement

- Replace the 3 broken pipe or pipe in disrepair upstream of the golf course.
- Replace the 6 broken pipe lengths ready to collapse downstream of the golf course.
- Remove all trees within 50 feet of either side (100 feet total) of the existing main tile.
- Remove the existing main tile through the entire length of the golf course.
- Install a new main tile of the same size (nearest currently manufactured) at the same location as the existing main tile.
- Reconnect the main relief tile and all private tile encountered to the new main tile.

Trenchless Tile Lining

- Replace the 3 broken pipe or pipe in disrepair upstream of the golf course.
- Replace the 6 broken pipe lengths ready to collapse downstream of the golf course.
- Replace the existing intakes on the west and south sides of the golf course with larger intakes/manholes that afford better access to the existing main tile.
- Excavate the existing main tile at 2 locations in the golf course and install intakes/manholes to afford access to the existing main tile.
- Using the intakes/manholes as access points, mechanically cut and remove the tree roots inside the existing main tile.
- Using the intakes/manholes as access points, jet clean the existing main tile to remove the silt and debris.
- Inspect the existing main tile with CCTV to locate all private tile connections, main relief tile connection, and any pipe lengths that need major spot repairs prior to lining. It should be noted that the CCTV inspection may reveal that a significant portion of the untelevised existing main tile through the golf course may need total replacement. If that proves true, then the remainder of this repair method would be abandoned and one of the two other repair methods mentioned in this section would need to be employed.
- Perform all major spot repairs needed.
- Install a CIPP sewer liner in the main tile to repair small defects in the pipe and to prevent tree roots from entering the tile again.
- Reinstate all private tile and main relief tile connections.

Rerouted Tile Replacement

- Replace the 3 broken pipe or pipe in disrepair upstream of the golf course.
- Replace the 6 broken pipe lengths ready to collapse downstream of the golf course.
- Replace the existing intakes on the west and south sides of the golf course with larger intakes/manholes that afford better access to the main tile.
- Connect to the existing main tile on the west side of the golf course at the above mentioned new intake/manhole and plug the downstream end of the existing main tile.
- Install a new main tile of the same size (nearest currently manufactured) at a new location through the golf course that avoid as many of the existing trees as possible. For reference, a map with a suggested Rerouted Tile location is included in Appendix D.
- As the existing main relief tile is encountered, connect it to the new main tile and plug the downstream end of the existing main relief tile.
- Connect the new main tile to the existing main tile on the south side of the golf course at the above mentioned new intake/manhole and plug the upstream end of the existing main tile.

- Reconnect all private tile encountered to the new main tile.

With the above mentioned repairs, the following should be noted:

- With the Rerouted Tile Replacement option, no guarantee can be made that all private tile connected to the existing main tile will be reconnected unless excavation is performed on both sides of the existing main tile along its entire length. This will affect the costs shown in following sections of this report.
- With all the above options except the Trenchless Tile Lining, trees should not be allowed to be replanted in the future within 50 feet of either side (100 feet total) of the main tile.
- The combined drainage coefficient of the main tile and the main relief tile at the west edge of the golf course is 0.3± inches per acre per day. Said repair will not increase the drainage capacity beyond this at that point.
- The drainage coefficient of the main tile at the south edge of the golf course is 0.3± inches per acre per day. Said repair will not increase the drainage capacity beyond this at that point.
- The pipe sizes used are those that are currently manufactured that most closely meet the current main tile size.
- It is our understanding of Iowa Code that the removal of hedges, trees, and obstruction is a power given to the Drainage District Trustees through Iowa Code Chapter 468.138 and 468.139.
- The above repair methods are for those portions of the main tile that have been televised and those portion of the main tile through the golf course. No repairs are proposed for those portions of the main tile that have not been televised or for the main relief tile.
- Repairs have historically been viewed as not having an impact on jurisdictional wetlands. As such, individual landowners should consult with applicable staff at the Hardin County NRCS office to verify the existence of said jurisdictional wetlands and that there will be no impact on them.

Per Iowa Code Chapter 468.126, the above actions would be considered a repair. As such, Subsection 1, paragraph c of Chapter 468.126 states "If the estimated cost of the repair does not exceed fifty thousand dollars, the board may order the work done without conducting a hearing on the matter. Otherwise, the board shall set a date for a hearing. . ." The opinion of probable construction cost contained in the Opinion of Probable Construction Costs section of this report exceeds said \$50,000 limit. Therefore, a hearing will be required. Per Iowa Code Chapter 468.126.1.g, the right of remonstrance does not apply to the proposed repairs.

6.0 IMPROVEMENT METHODS – Based on the above, the drainage coefficient of any repaired portion of the main tile would be limited the current 0.3± inches per acre per day. This drainage capacity is not adequate for any of the current usages upstream of the golf course. If all the land upstream of the golf course were farmed, modern farming standards would prefer drainage coefficients of 0.5 to 1.0 inches per acre per day. However, approximately 1/3 of all the land upstream of the golf course are not farmed, but are within the usage of the town of Radcliffe. This usage is a very different land usage than farming and the owners of town lots typically expect a higher drainage standard. Said higher standard does not involve the standing water or basement backups which a drainage coefficient of 0.5 to 1.0 inches per acre per day would provide. This brings about the following questions concerning improvement to the main:

- To what standard should an improved main be designed to?
- Should the improved main be designed to handle only agricultural drainage?
- Should the improved main be designed to handle agricultural and municipal drainage? If so, to what design standard (i.e. 5 year return period storm, 10 year return period storm) should the improved main be designed?

These questions along with others are all very valid ones that the District Trustees and the landowners within the Drainage District are going to have to answer in order to provide an adequate design if an improvement is chosen. However, something has to be used as a basis for this report and a starting point. To that end, the following are some of the options available to improve drainage for the main, assuming that the desired improved capacity for the main would be the same as that of the maximum flow capacities of the tile and storm sewer at the intersection of Ionia Street and Park Street (55.5 cfs):

#### Parallel Tile Installation

- Chose one of the repair options mentioned above in the repair section to ensure that the existing main tile will provide additional years of service.
- Install a parallel main tile adjacent to and parallel with the existing main tile after the repair has been performed. For reference, a chart with the required tile sizes and capacities is included in Appendix H and the route is shown on the map included in Appendix E.
- The existing main tile and the parallel main tile would be connected at various locations along the route with manholes or buried interconnections to prevent one of them from overloading while the other one is empty.
- The existing main tile and the parallel main tile would be at different grades and elevations. Therefore, the lower one (parallel main tile) would carry water the majority of the time and the higher one (existing main tile) would only carry water once the lower one became full enough to flow into the higher one.
- This method assumes that those portions of the main tile that have not been televised are in similar condition to those that were televised (i.e. 9 repairs required for every 1600 feet of main tile).

#### Tile Replacement (Upsizing of Tile)

- Remove and replace the existing main tile with new main of a larger size. For reference, a chart with the required tile sizes and capacities is included in Appendix I.
- Typically the replacement main tile would be in the same location as the existing main tile in order to locate and reconnect private tile. For reference, the route is shown on the map included in Appendix F.

#### Tile Replacement (Open Ditch Installation)

- Remove and replace the existing main tile with an open ditch. For reference, a chart with the open ditch capacities is included in Appendix J.
- Typically the open ditch would be in the same location as the existing main tile in order to locate and reconnect private tile. For reference, the route is shown on the map included in Appendix G.

With the above mentioned improvement methods, the following should be noted:

- The parallel tile installation would require higher maintenance costs in the future as a the majority of the existing main tile is near 85 years old.
- The tile replacement (upsizing) method would allow for lower maintenance costs in the future as the entire main tile is new.
- The parallel tile installation and the tile replacement (upsizing) are based on a need of 55.5 cfs at the west side of the golf course, which is 2.3± to 2.6± inches per acre per day. This is similar to a design storm of 2.67 inches per day for a 1 year return period. This means that on average, every year the capacity of the improved tile will be surpassed.
- The tile replacement (open ditch installation) method would involve the taking of right of way. However, some of this right of way is currently grassed waterway.
- The tile replacement (open ditch installation) method would provide far greater capacity (23.3± inches per acre per day) than the other two improvement methods. This exceeds a design storm of 9.37 inches per day for a 500 year return period. This means that on average, the capacity of the improved main will be surpassed once every 500 years. This capacity would probably better match the current land usage and landowner expectations within the drainage district boundaries.
- With all the above options, trees should not be allowed to be replanted in the future within 50 feet of either side (100 feet total) of the main.
- The pipe sizes shown in Appendices H and I are those that are currently manufactured that meet or exceed the ½" and 1" drainage coefficients.
- The above repair methods are for those portions of the main tile downstream of County Highway S-27. No improvements are proposed for those portions of the main tile upstream from County Highway S-27.
- It is our understanding of Iowa Code that the removal of hedges, trees, and obstruction is a power given to the Drainage District Trustees through Iowa Code Chapter 468.138 and 468.139.
- Improvements have historically been viewed as having an impact on jurisdictional wetlands. As such, individual landowners should consult with applicable staff at the Hardin County NRCS office to determine the existence of said jurisdictional wetlands and what said impact may be on them.

Per Iowa Code Chapter 468.126, the above actions would be considered an improvement. As such, Subsection 4, paragraph c of Chapter 468.126 states "If the estimated cost of the improvement does not exceed fifty thousand dollars, the board may order the work done without conducting a hearing on the matter. Otherwise, the board shall set a date for a hearing on whether to construct the proposed improvement and whether there shall be a reclassification of benefits for the cost of the proposed improvement." The opinion of probable construction cost contained in the Opinion of Probable Construction Costs section of this report exceeds said \$50,000 limit. Therefore, a hearing will be required. Per Iowa Code Chapter 468.126.4.e, the right of remonstrance may apply to the proposed improvements.

7.0 OPINION OF PROBABLE CONSTRUCTION COSTS – Using the above methods of repair and improvement, an itemized list of project quantities and associated opinions of probable construction cost for each option was compiled and are included in Appendices K, L, M, and N of this report. A summary of said costs are as follows:

<u>METHOD</u>	<u>DRAINAGE</u> <u>COEFF.</u>	<u>TOTAL</u> <u>COST</u>	<u>ROAD</u> <u>CROSSING</u> <u>COST</u>
Open Cut Tile Replacement (Repair)	Existing	\$ 257,136.00	\$ 0
Trenchless Tile Lining (Repair)	Existing	\$ 343,596.00	\$ 0
Rerouted Tile Replacement (Repair)	Existing	\$ 210,797.40	\$ 0
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Parallel Tile Installation (Improvement)	½"	\$ 1,871,716.80	
		to	\$ 62,000
		\$ 1,992,442.80	
	1"	\$ 2,111,956.80	
		to	\$ 62,000
		\$ 2,232,682.80	
<hr/>			
Tile Replacement - Upsizing (Improvement)	½"	\$ 1,900,932.00	\$ 62,000
	1"	\$ 2,113,716.00	\$ 62,000
<hr/>			
Tile Replacement - Open Ditch (Improvement)	NA	\$ 1,276,558.80	\$ 212,000

It should be noted that said costs include materials, labor, and equipment supplied by the contractor to complete the necessary repair or improvement and includes applicable engineering, construction observation, and project administration fees by Ryken Engineering. It also includes right of way acquisition for the open ditch option only (assumed to require 20 acres at \$12,000 per acre. However, said costs do not include any interest, legal fees, county administrative fees, crop damages, other damages, previous repairs, engineering fees to date, or reclassification fees (if applicable). As always, all costs shown are opinions of Ryken Engineering based on previous lettings on other projects. Said costs are just a guideline and are not a guarantee of actual costs.

8.0 OWNERSHIP AND CLASSIFICATIONS – Any and all information concerning ownership of lands and classifications of said lands within Drainage District No. 143 can be obtained from the Hardin County Auditor’s office.

It should be noted that Iowa Code Chapter 468.65 states “When, after a drainage . . . district has been established . . .” and “. . . a repair . . . has become necessary, the board may consider whether the existing assessments are equitable as a basis for payment of the expense of . . . making the repair . . .” and “If they find the same to be inequitable in any particular . . . they shall . . . order a reclassification . . .” Based on this, it is our opinion that a reclassification may be required if the repair were to move forward.

It should also be noted that Iowa Code Chapter 468.131 states “When an assessment for improvements . . . exceeds twenty-five percent of the original assessment and the original or subsequent assessment . . . did not designate separately the amount each tract should pay for the main ditch and tile lateral drains then the board shall order a reclassification . . .” Based on this, it is our opinion that a reclassification separating all Laterals would be required if the improvement were to move forward.

9.0 RECOMMENDATIONS – There is a definite need to perform one of the above mentioned repairs or improvements. The repair would remove the current restrictions to the main tile and restore the original design capacity. The improvement would increase the capacity to more closely match the mixed land usage of town and agricultural within the watershed. Therefore, it is recommended that the Hardin County Board of Supervisors, acting as District Trustees, should take action to accomplish the following:

- Approve the Engineer’s Report as prepared by Ryken Engineering.
- Hold the required hearing or hearings on the proposed repair and improvement.
- Adopt one of the recommendations of the Engineer’s Report.
- Direct Ryken Engineering to prepare plans and specifications for the proposed repair and improvement.
- Direct Ryken Engineering to proceed with receiving bids from interested contractors.
- Award contract to the lowest responsible contractor.
- If desired or required by Iowa Code, proceed with reclassification proceedings.



# Drainage Work Order Request For Repair

## Hardin County

**COPY**

Date 3/6/2015 Work Order # 59  
 District # 55 Div 3 \$143 Lateral          Main           
 Township Sherman Section 28 Twp 87 Rge 22 Qtr Sec         

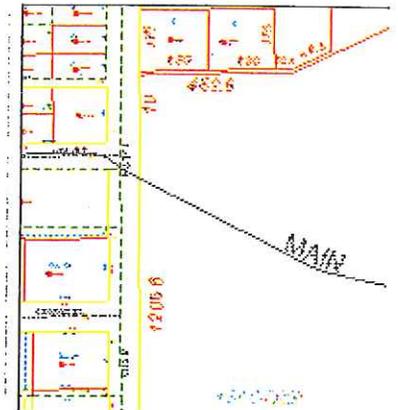
Repair Requested By City of Radcliffe-Chuck Raska  
 Address PO Box 20; Radcliffe Phone (641) 751-5743

Landowner Richard/Charles Drake  
 Address %Radcliffe Friendly Fairways Phone         

Request Taken By Tina Schlemme

Available for Repair Now?  Yes  No Date Available         

Problem Description See Letter (Restriction in main on East side of Radcliffe about 600' East of Hwy S27 under golf course.)



Repair labor, materials and equipment         

Potential Wetlands?  Yes-Repair existing tile only  No-Repair and maintain tile

Repaired By:           
 Date:         

Please send statement for services to:  
 Hardin County Auditor's Office  
 Attn: Tina Schlemme  
 1215 Edgington Ave, Suite 1  
 Eldora, IA 50627  
 Phone (641) 939-8111  
 Fax (641) 939-8245

For Office Use Only

Approved:          Date:

Drainage Work Request.

Request for tile location, ownership and Repair.

I am submitting this request because the I believe there is a restriction in the main storm sewer on the east side of Radcliffe about 600' east of Hwy S27 under the golf course.

Last spring we experienced excessive backup out of an intake in the ditch along the south side of Ionia St 500' west of S27. We had the line jetted from the intake going east 600' stopping just into the golf course. We then dug up the tile revealing it is a concrete 18" pipe that was not flowing and had an excess of 4' of head pressure filling the hole we had dug. We jetted the line another 600' east into the golf course gaining a little bit of flow but still very slow. I put in an 8" cleanout pipe at this location for future cleanout and back filled the hole after the water had gone down.

Last fall after a couple rains the water backed up out of the intake again. I had the line jetted in December and located and marked the tile with flags and metal rods to as far as the jet would reach. There is a tree just above this tile about 500' out that I believe is a problem filling the 18" with roots.

We need to know who's responsible for this 18" tile and where it hooks into the 30" main that travels east. I am requesting that the county locate and televise the main 30" tile in this location to determine what the restriction is and determine what repairs are needed.

Chuck Raska  
City Supt.  
City of Radcliffe  
Cell 641-751-5743

RECEIVED  
MAR -9 2015  
HARDIN CO. AUDITOR

DRAINAGE WORK ORDER  
REQUEST FOR REPAIRS  
HARDIN COUNTY, IOWA

RECEIVED  
MAR - 9 2015

8/6/2015  
HARDIN CO. AUDITOR

District# \_\_\_\_\_ Lateral \_\_\_\_\_  
Township Sherman Section \_\_\_\_\_ TWP 87  
Repair requested by City of Radcliffe (Chuck Raska, City Supt)  
Address Po Box 20 Radcliffe Iowa 50230 Phone 641 751 5743

Landowner Richard Drake, Charles Drake, % Radcliffe Friendly Fairways  
Address PO Box 107 Radcliffe Iowa 50230 Phone \_\_\_\_\_

Request taken by \_\_\_\_\_

Site available for repair now?  YES  NO Date available \_\_\_\_\_

Identification of repair: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_


Repair labor, materials, and equipment \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Potential Wetlands?  YES-Repair existing tile only  NO-Repair and maintain tile

Repaired by: \_\_\_\_\_

Date: \_\_\_\_\_

Please send statement for services to:

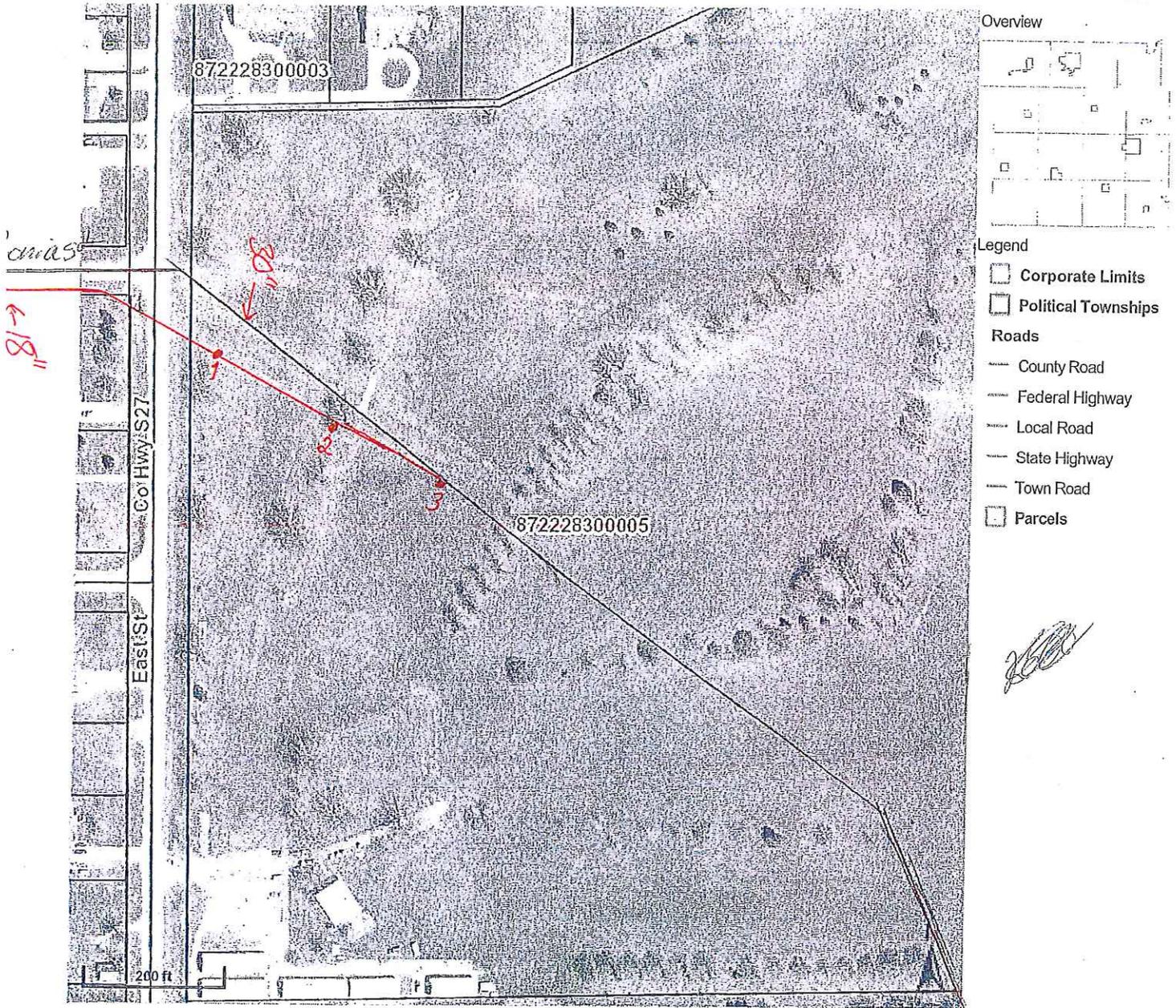
PHONE (641) 939-8111  
FAX (641) 939-8245

HARDIN COUNTY AUDITOR  
ATTN: JANE GEERDES  
1215 EDGINGTON AVE  
SUITE 1  
ELDORA, IA 50627

Approved: \_\_\_\_\_ Date: \_\_\_\_\_

For Office Use Only

1. The City put in a 8" Cleanout in last summer to continue setting east.
2. Its believed to be Pugged with tree roots.
3. I were the 18" tile connects with the 30" main, unknown location



Last Data Upload: 3/5/2015 3:56:47 AM

Disclaimer: The maps included in this website do not represent a survey and are compiled from official records, including plats, surveys, recorded deeds, and contracts, and only contain information required for government purposes. No warranties, expressed or implied, are provided for the data herein, its use or its interpretation. Hardin County assumes no responsibility for use or interpretation of the data. Any person that relies on any information obtained from this site does so at his or her own risk. All critical information should be independently verified.



Developed by  
The Schneider Corporation  
www.schneidercorp.com

*I have located all the pipe marked in red.*

## Drainage District:

#143

## Repair Summary:

City of Radcliffe indicated that main tile line is plugged in golf course (Radcliffe Friendly Fairways) east of East Street. On 5-1-2015, excavated VCP main tile and attempted to televise from the east side of East Street (northwest end of tile line), but was unable to go north or south due to water and debris in VCP tile (tile line was not flowing). Also, excavated VCP main tile and attempted to televise northwest from the north railroad right of way line, but was unable to do so due to debris and roots. However, televised to the south 1200'± from this location. On 5-22-2015, water jetted at both locations and reattempted televising. Televised 600'± north from said north railroad right of way, but was stopped due to tree roots. Attempted to televise south from said northwest end of tile line, but was unable to do so due to silt (water in tile line was now slowly flowing). Was able to televise 400'± north from said northwest end of tile line and tile appeared to be in good shape. At both televising locations, installed temporary patch of 24" HDPE dual wall tile and fabric wrapped joints.

## Contractor Time and Materials (spent while Ryken was on-site):

5.4' of 24" Dual Wall HDPE Pipe with fabric with wrapped joints  
12.5 hours of Mini Backhoe and Operator  
12.5 hours of Workman  
2 hours of Water jetting  
2322.5' of Televising

## Additional Actions Recommended:

Although tile line is flowing slowly, there are large amounts of silt still in tile, there are numerous tree roots in tile, not all of the tile was cleaned or televised through golf course. In addition, there are several partially collapsed pipe and previous repairs in what was televised. Based on this, the following steps need to be accomplished:

- Clean and televise entire main tile through golf course, which will be difficult as access to the tile is currently restricted. Therefore, intakes/access locations need to be installed at tree lines in golf course (see attached drawing).
- Water jet and vacuum clean silt from main tile, cut roots in main tile, and re-televise main tile to determine permanent course of action (lining, replacement or pipe bursting). Main tile can't be relocated as golf course has indicated there are many private tiles connected to it.
- Estimated cost of above work (not including permanent course of action) is \$10,000.

**USMH: East of blacktop**

**DSMH: Hole 2**

**Upstream**

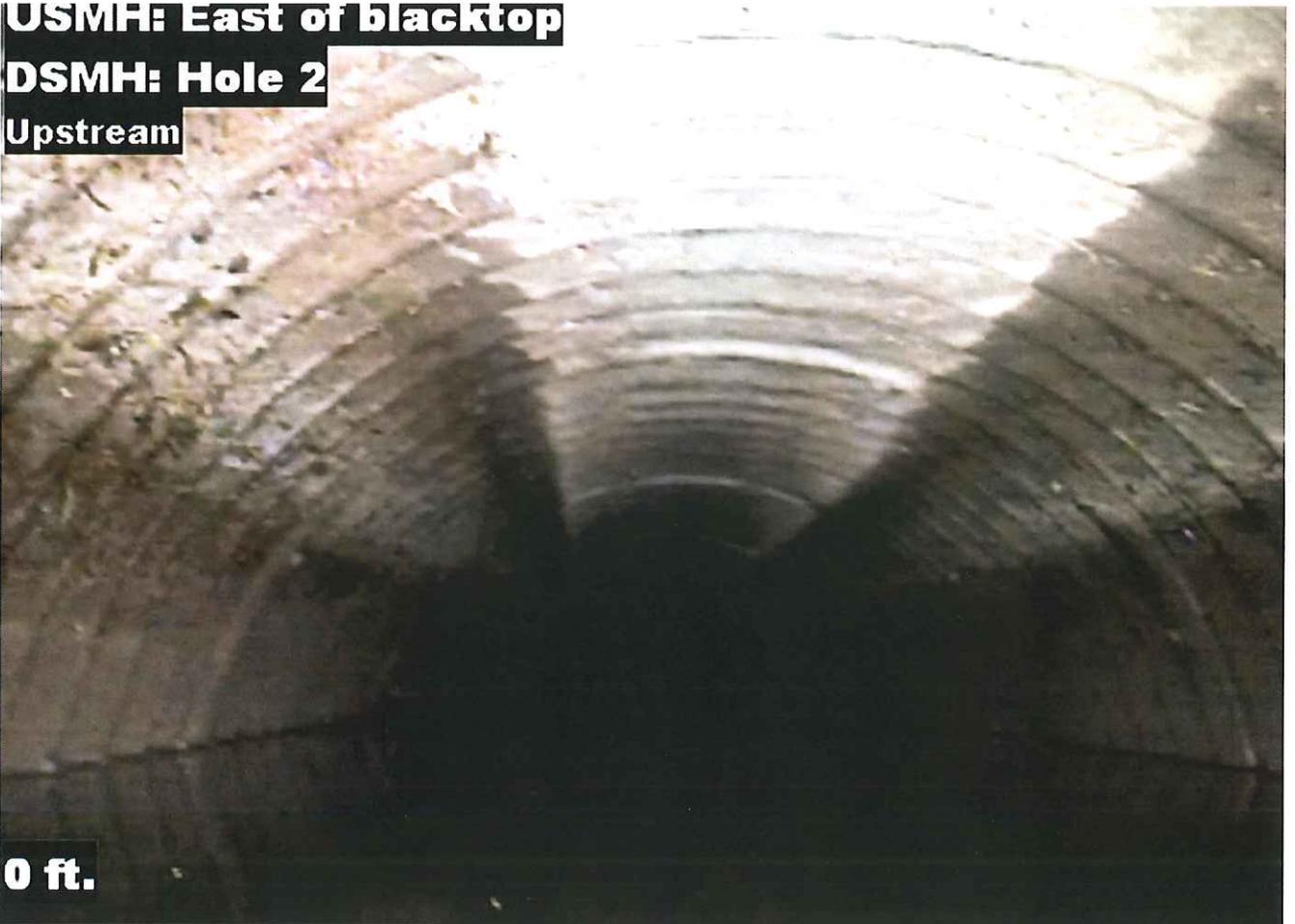


**39.4 ft.**

**USMH: East of blacktop**

**DSMH: Hole 2**

**Upstream**



**0 ft.**

**USMH: East of blacktop**

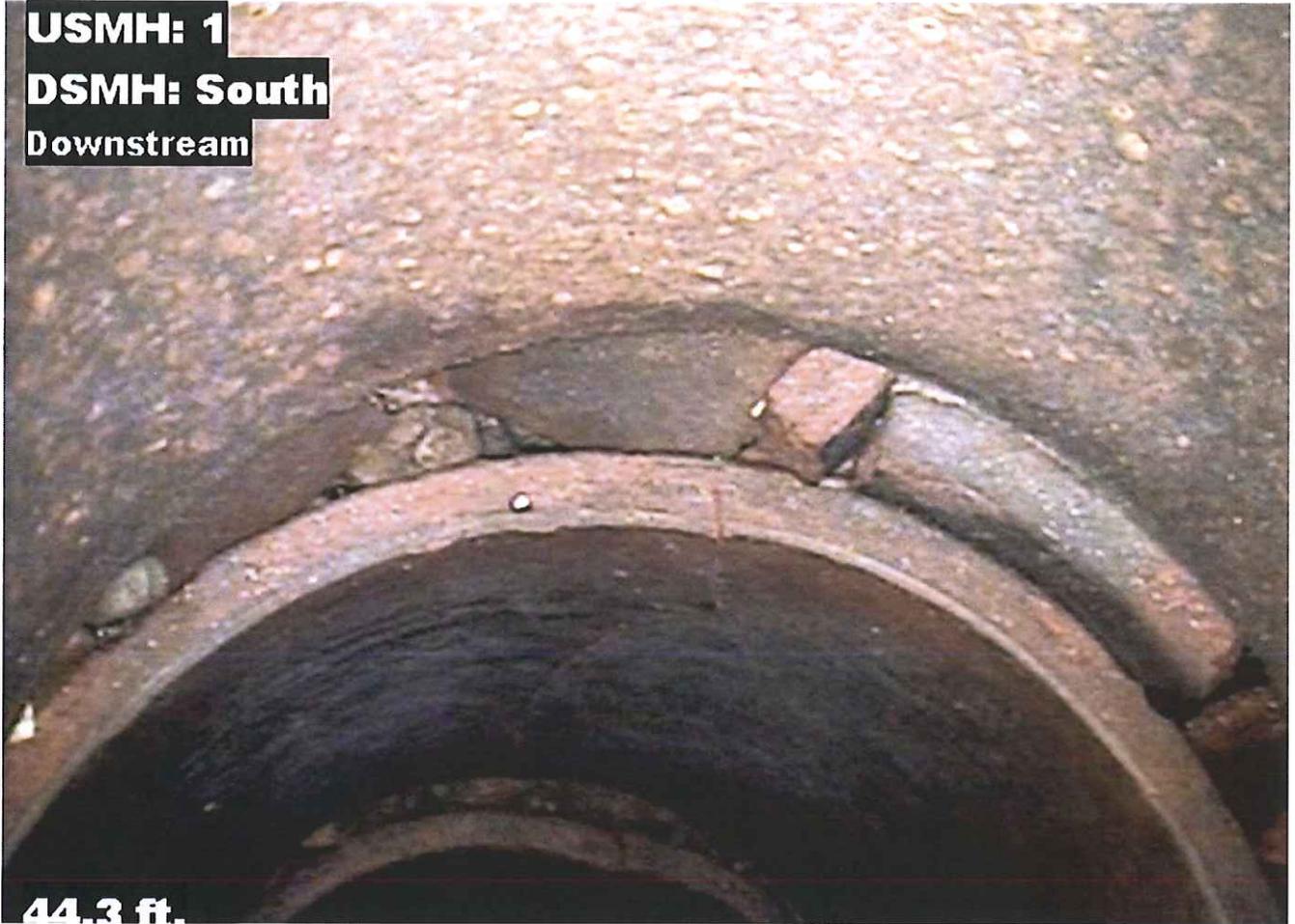
**DSMH: Hole 2**

**Upstream**



**18.5 ft.**

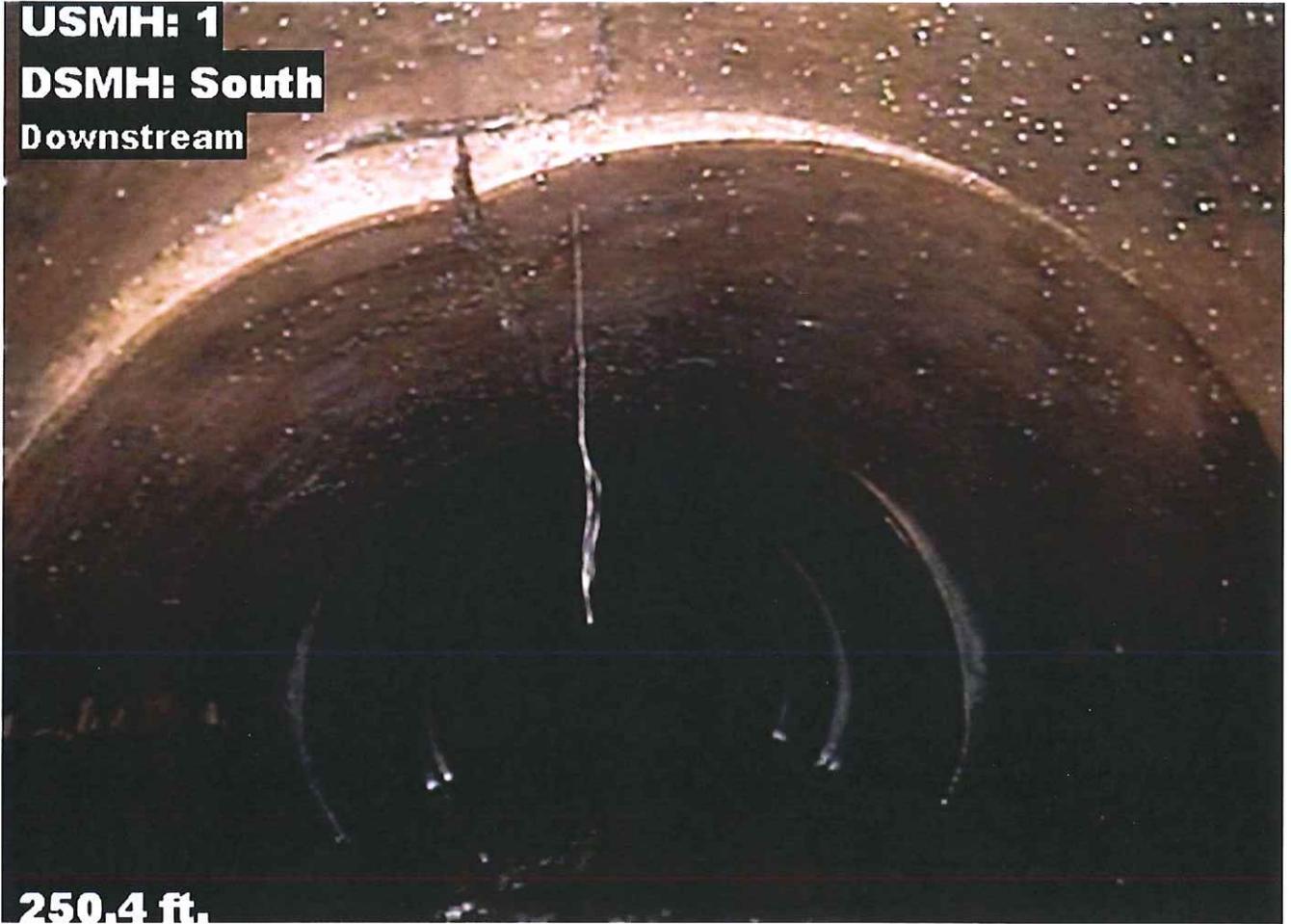
**USMH: 1**  
**DSMH: South**  
**Downstream**



**USMH: 1**  
**DSMH: South**  
**Downstream**



**USMH: 1**  
**DSMH: South**  
**Downstream**



**250.4 ft.**

**USMH: 1**  
**DSMH: South**  
**Downstream**



**654.8 ft.**

**USMH: 1**

**DSMH: South**

**Downstream**



**677.9 ft.**

**USMH: Golf Course**

**DSMH: Hole**

Upstream

**139.9 ft.**

**USMH: Golf Course**

**DSMH: Hole**

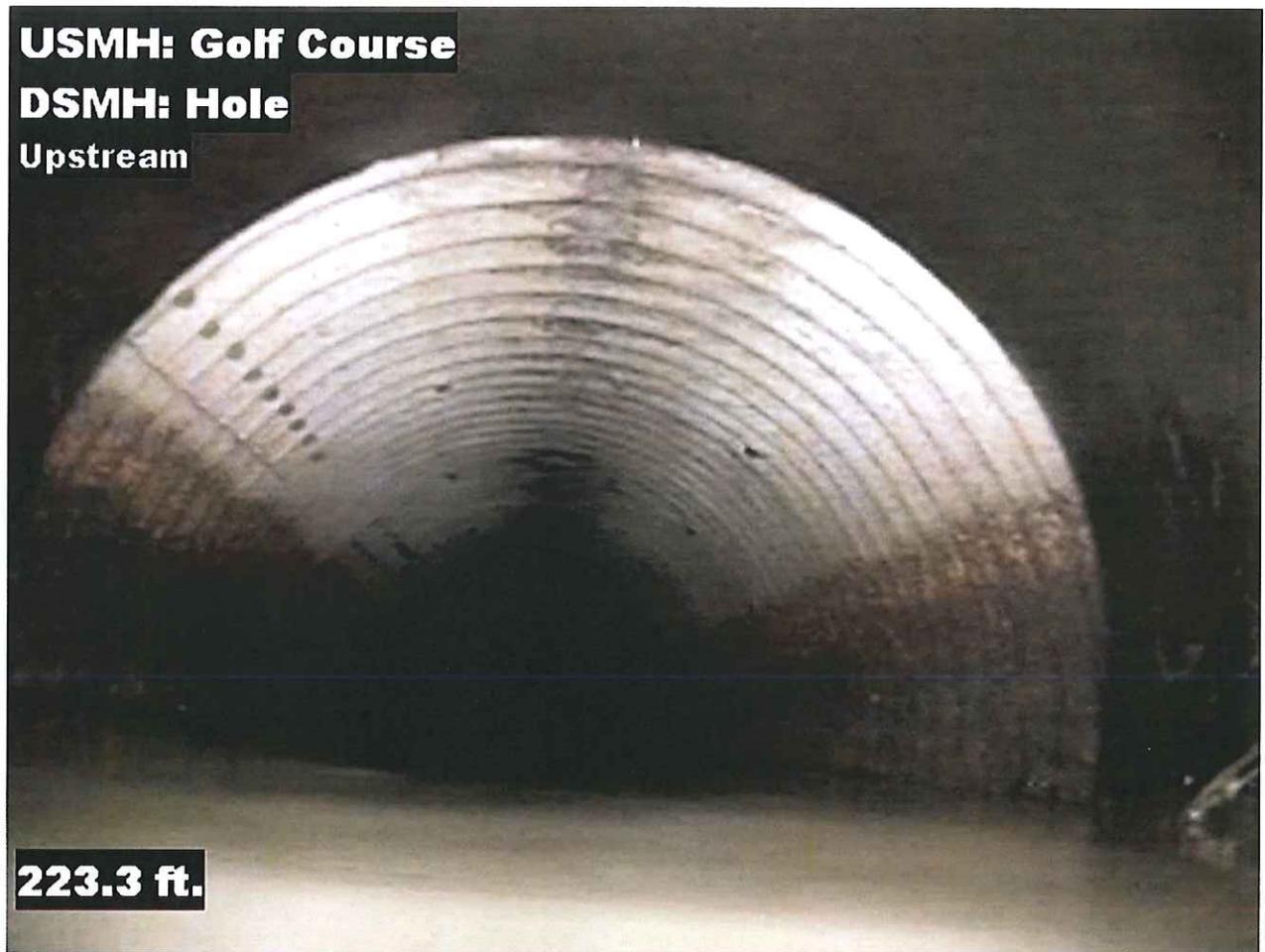
Upstream

**171.1 ft.**

**USMH: Golf Course**

**DSMH: Hole**

Upstream



**223.3 ft.**

**USMH: Golf Course**

**DSMH: Hole**

Upstream



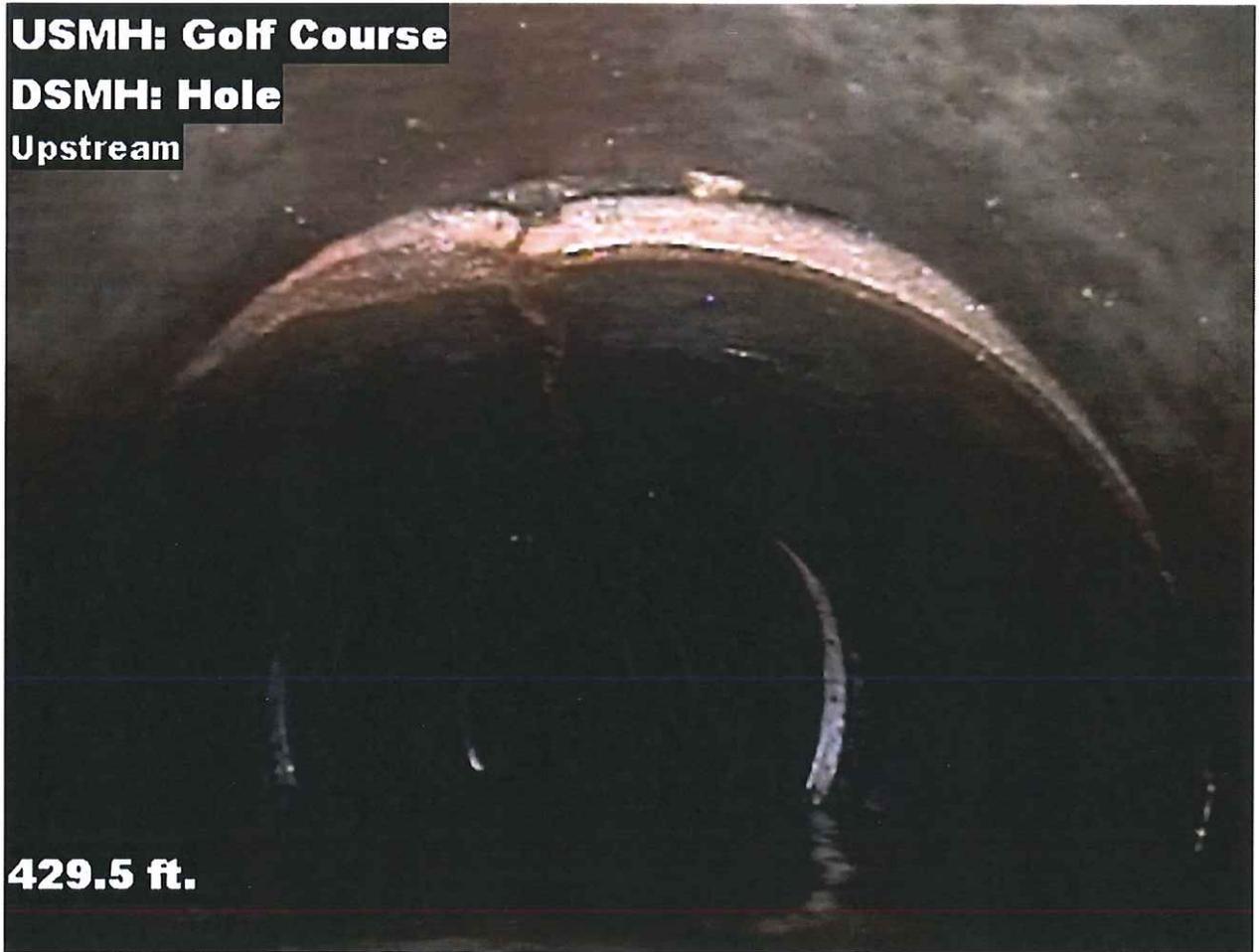
**265.6 ft.**

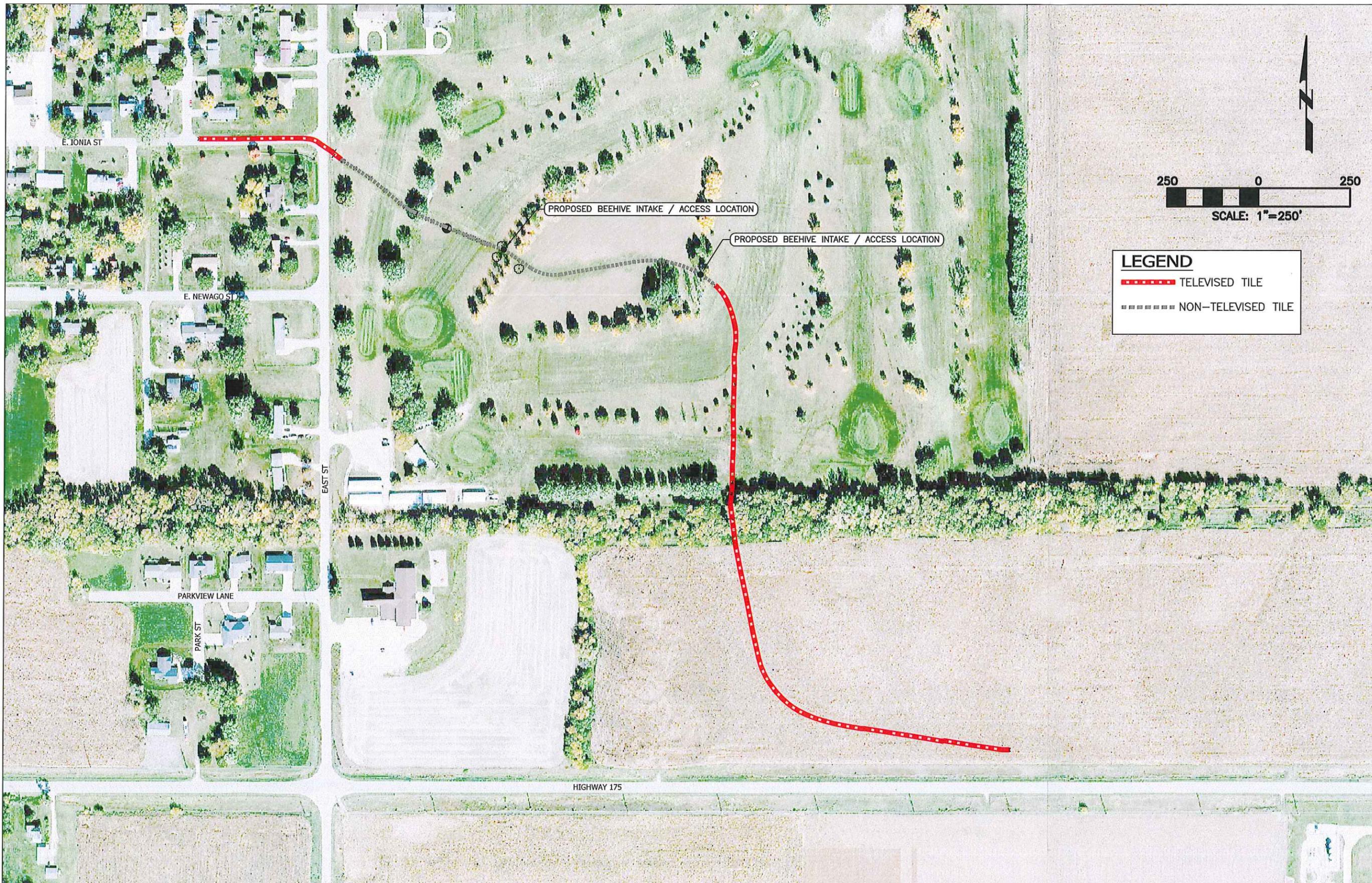
**USMH: Golf Course**

**DSMH: Hole**

**Upstream**

**429.5 ft.**





**LEGEND**

----- TELEVISED TILE

----- NON-TELEVISED TILE

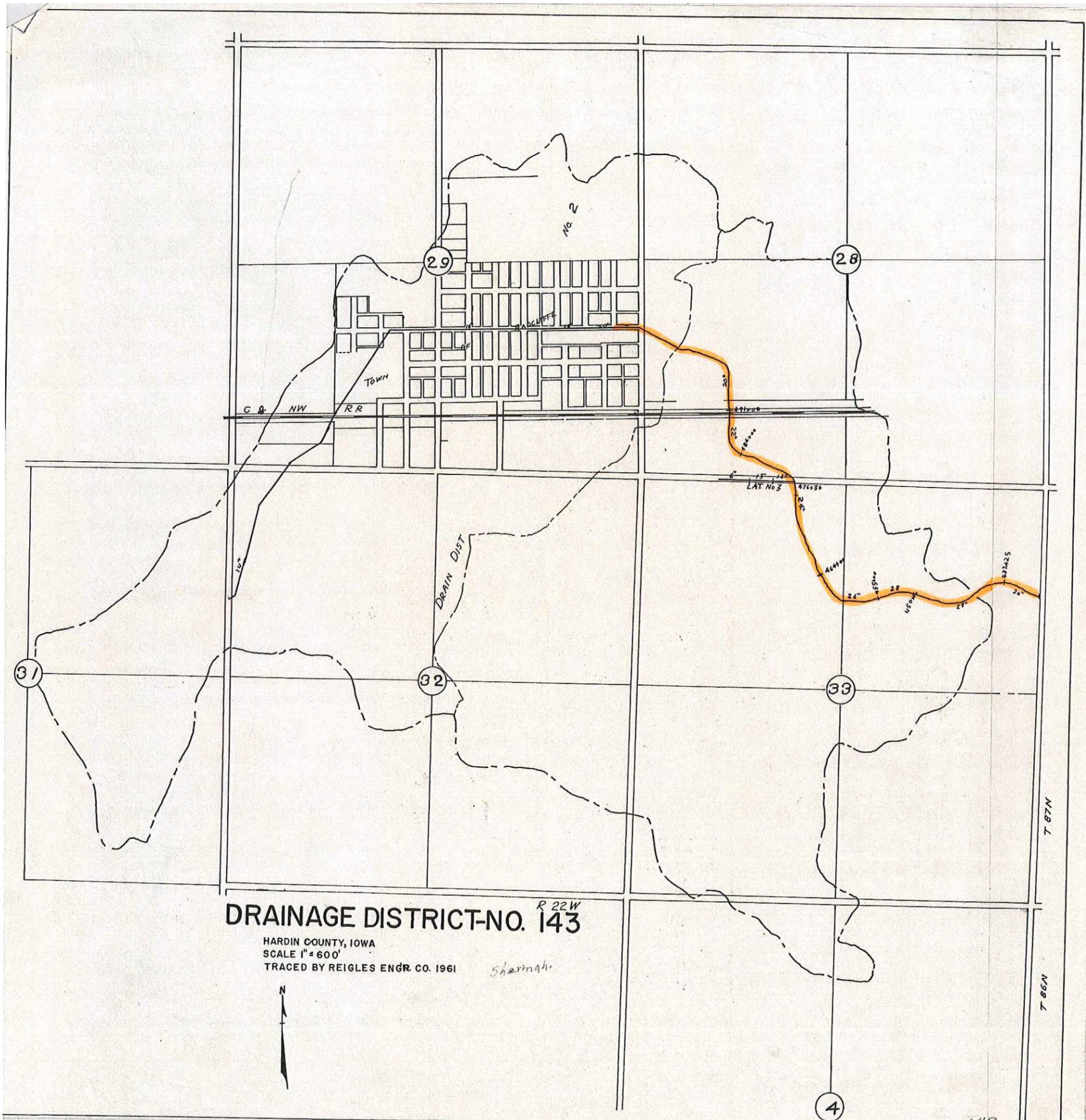
DRAWN BY: MAH	APPROVED BY: LOG	REVISIONS: 7/8/2015 ADDED LIMITS OF TELEVISION
DATE: 05/04/2015	PROJ. NO.: 6771	
FIELD BK: -		
P:\6771\CADD\DESIGN\6771 - EXCON.DWG; 2/11/2016		

**RYKEN**  
 ENGINEERING & LAND SURVEYING, INC.  
 ACKLEY, MASON CITY &, WEBSTER CITY, IOWA

ADDRESS:  
 739 PARK AVENUE  
 ACKLEY, IOWA 50601  
 PH 641-847-3273 FAX 641-847-2303

PROJECT:  
 SW¼ 28-87-22 & SE¼ 29-87-22  
 HARDIN COUNTY, IOWA  
 2015

SHT. NAME:  
 DD 143 MAIN TILE  
 CLEANING AND TELEVISION



**DRAINAGE DISTRICT-NO. 143**

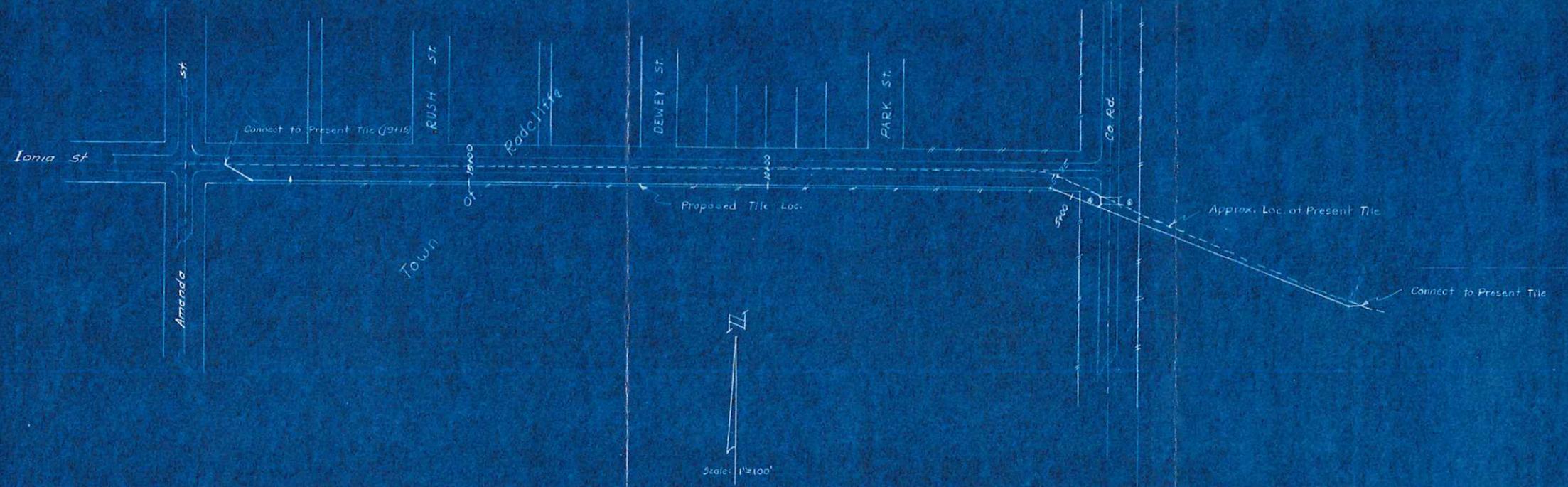
HARDIN COUNTY, IOWA  
 SCALE 1" = 600'  
 TRACED BY REIGLES ENGR. CO. 1961

*Sharma*



 = Area of Investigation

**PLAN**  
 DATE: \_\_\_\_\_  
 DRAWN BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_  
 NO. \_\_\_\_\_



**PROFILE**  
 DATE: \_\_\_\_\_  
 DRAWN BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_  
 NO. \_\_\_\_\_

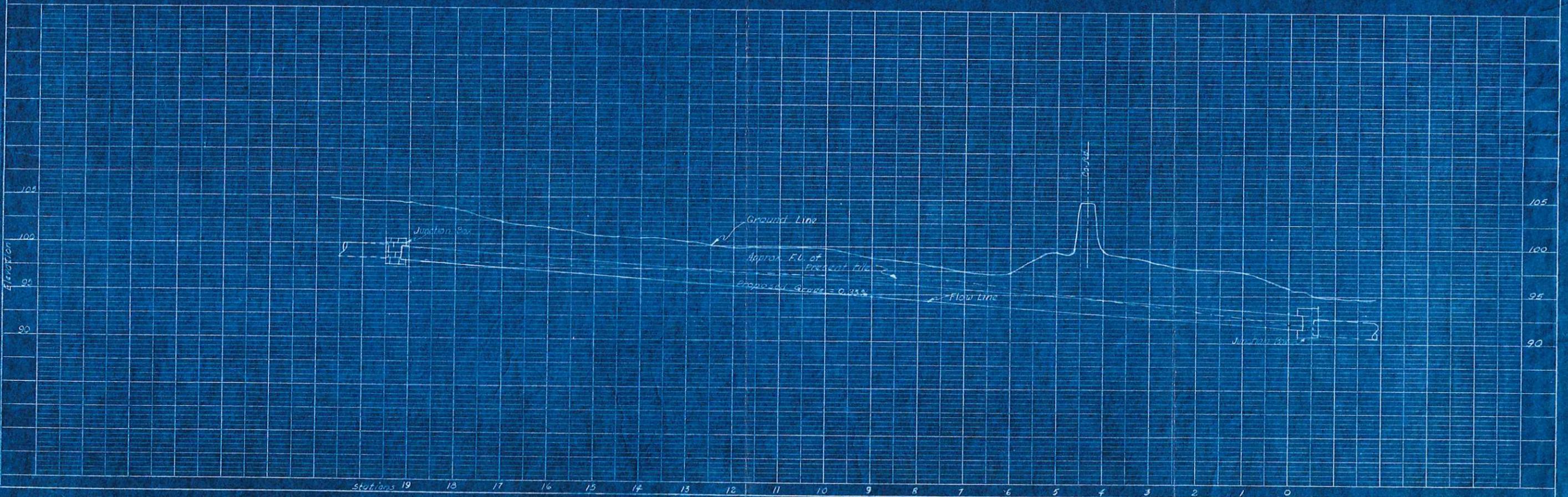
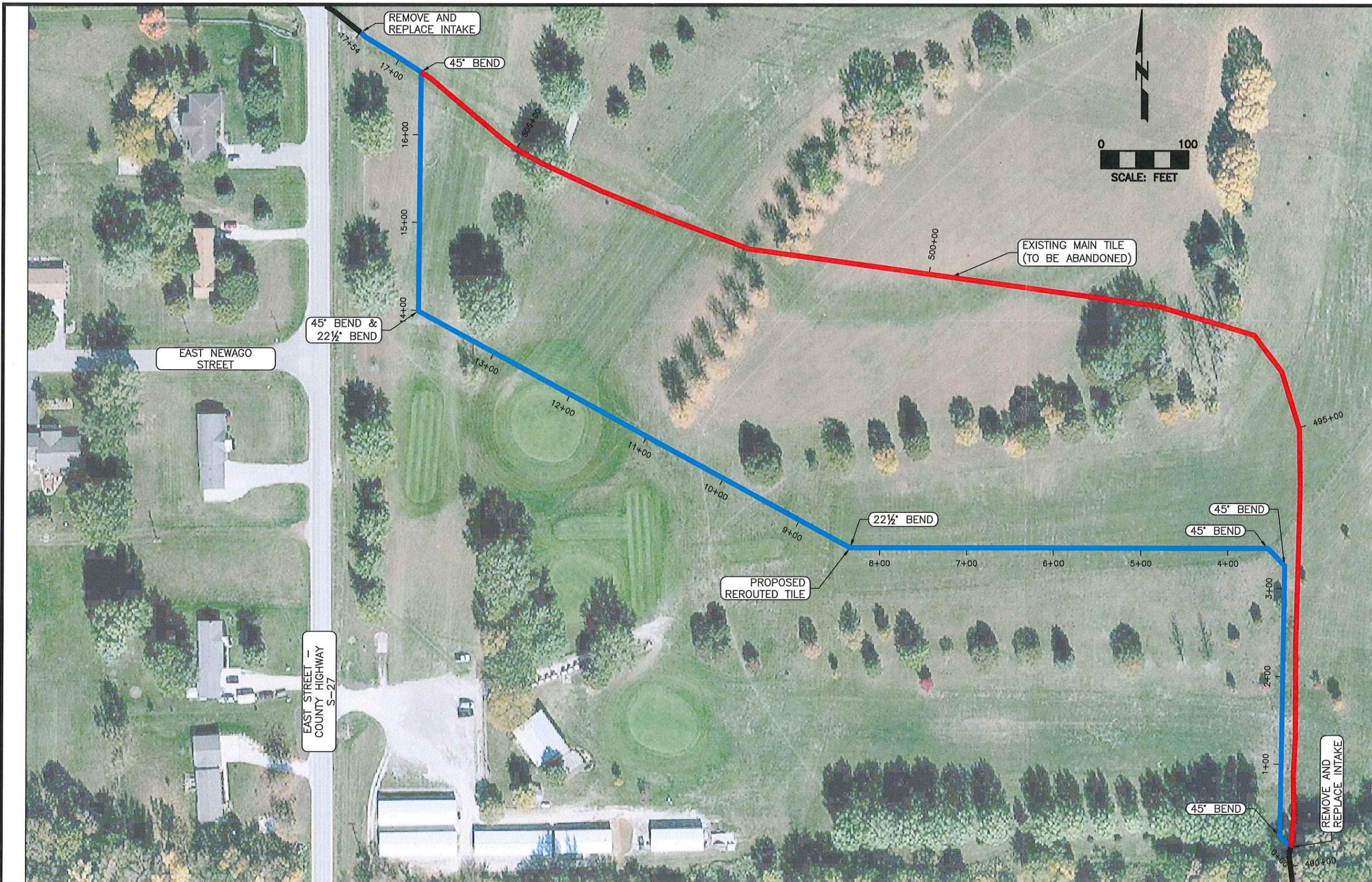


PLATE NO. \_\_\_\_\_  
 PROJECT OF \_\_\_\_\_  
 CITY OF \_\_\_\_\_



DRAWN BY: ZJS	APPROVED BY: LOG	REVISIONS:
DATE: 10-07-2015	PROJ. NO.: 6771	
FIELD BK: P:\6771\CADD\CONCEPTS\6771 - CONCEPTS.DWG; 2/15/2016		

**RYKEN**  
 ENGINEERING & LAND SURVEYING, INC.  
 ACKLEY, MASON CITY &, WEBSTER CITY, IOWA

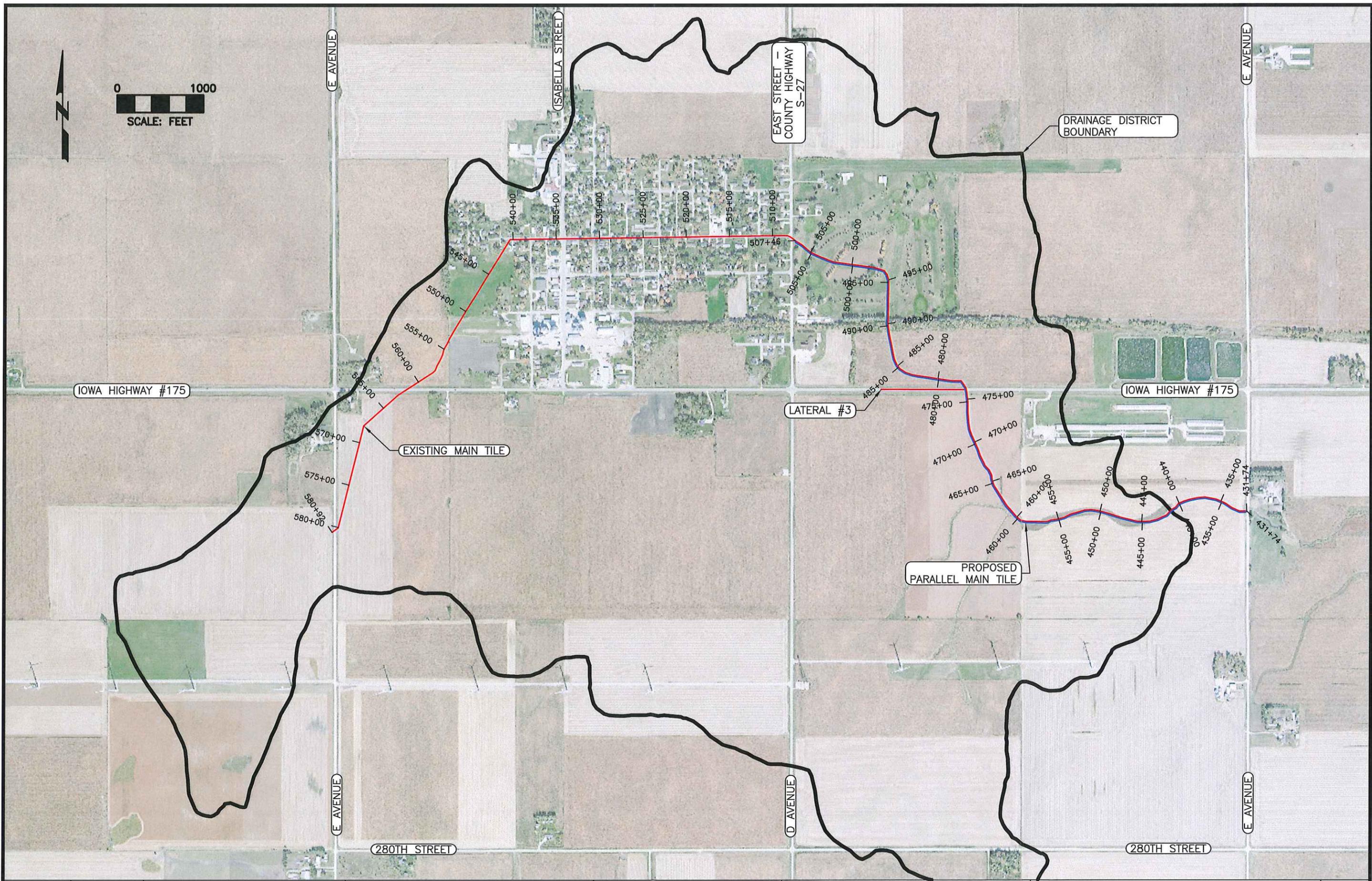
ADDRESS:  
 739 PARK AVENUE  
 ACKLEY, IOWA 50601  
 PH 641-847-3273 FAX 641-847-2303

PROJECT:  
 DRAINAGE DISTRICT #143  
 HARDIN COUNTY, IOWA  
 2016

SHT. NAME:  
 REROUTED TILE  
 MAP



0 1000  
SCALE: FEET



DRAWN BY: ZJS  
DATE: 10-08-2015  
FIELD BK:

APPROVED BY: LOG  
PROJ. NO.: 6771

REVISIONS:

**RYKEN**  
ENGINEERING & LAND SURVEYING, INC.  
ACKLEY, MASON CITY & WEBSTER CITY, IOWA

ADDRESS:  
739 PARK AVENUE  
ACKLEY, IOWA 50601  
PH 641-847-3273 FAX 641-847-2303

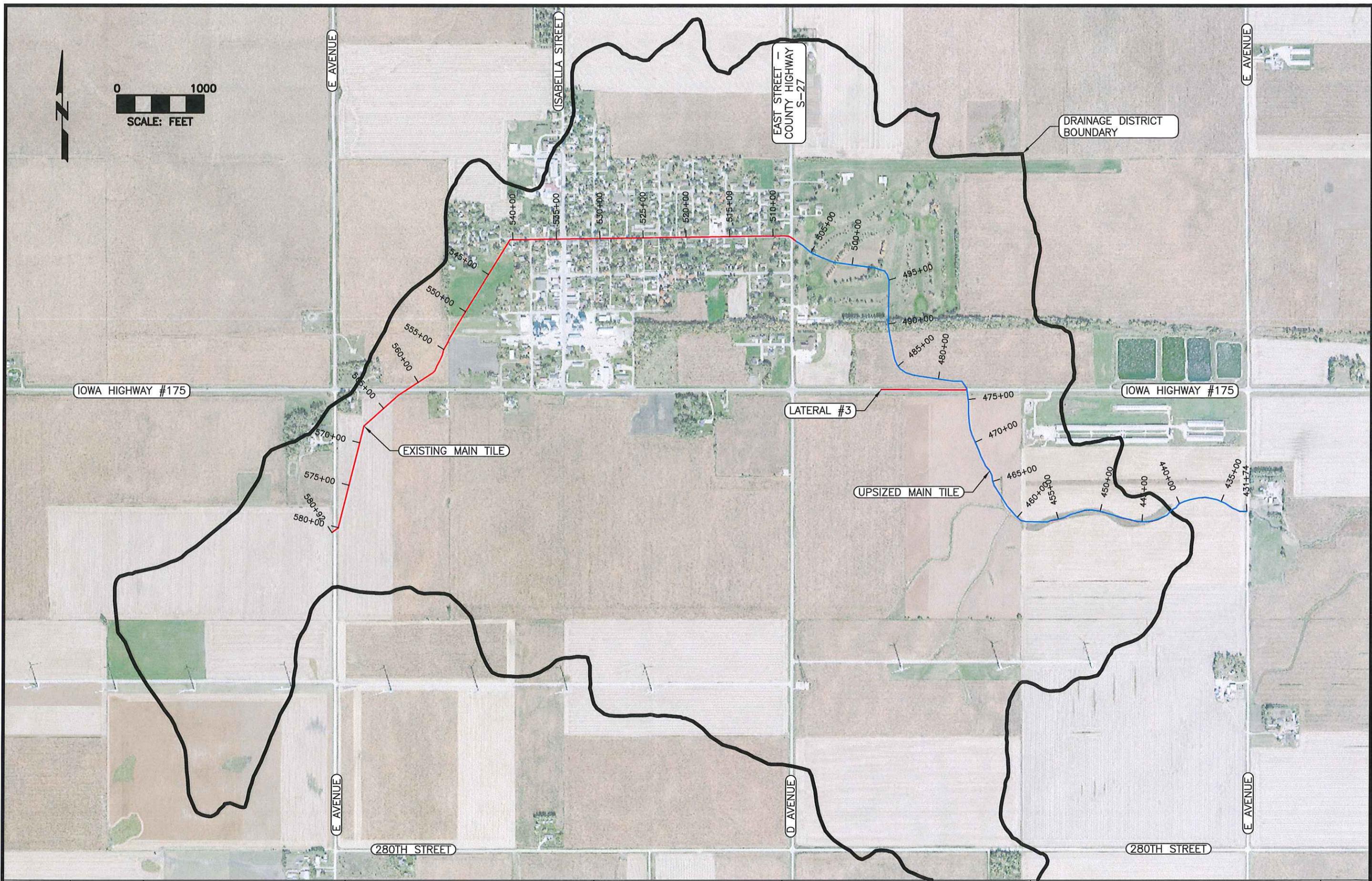
PROJECT:  
DRAINAGE DISTRICT #143  
HARDIN COUNTY, IOWA  
2016

SHT. NAME:  
PARALLEL TILE INSTALLATION  
MAP

SHT. NO.:  
1 OF 1



0 1000  
SCALE: FEET



DRAWN BY: ZJS  
DATE: 10-08-2015  
FIELD BK: P:\6771\CADD\CONCEPTS\6771 - CONCEPTS.DWG; 2/15/2016

APPROVED BY: LOG  
PROJ. NO.: 6771  
REVISIONS:

**RYKEN**  
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ACKLEY, MASON CITY &, WEBSTER CITY, IOWA

ADDRESS:  
739 PARK AVENUE  
ACKLEY, IOWA 50601  
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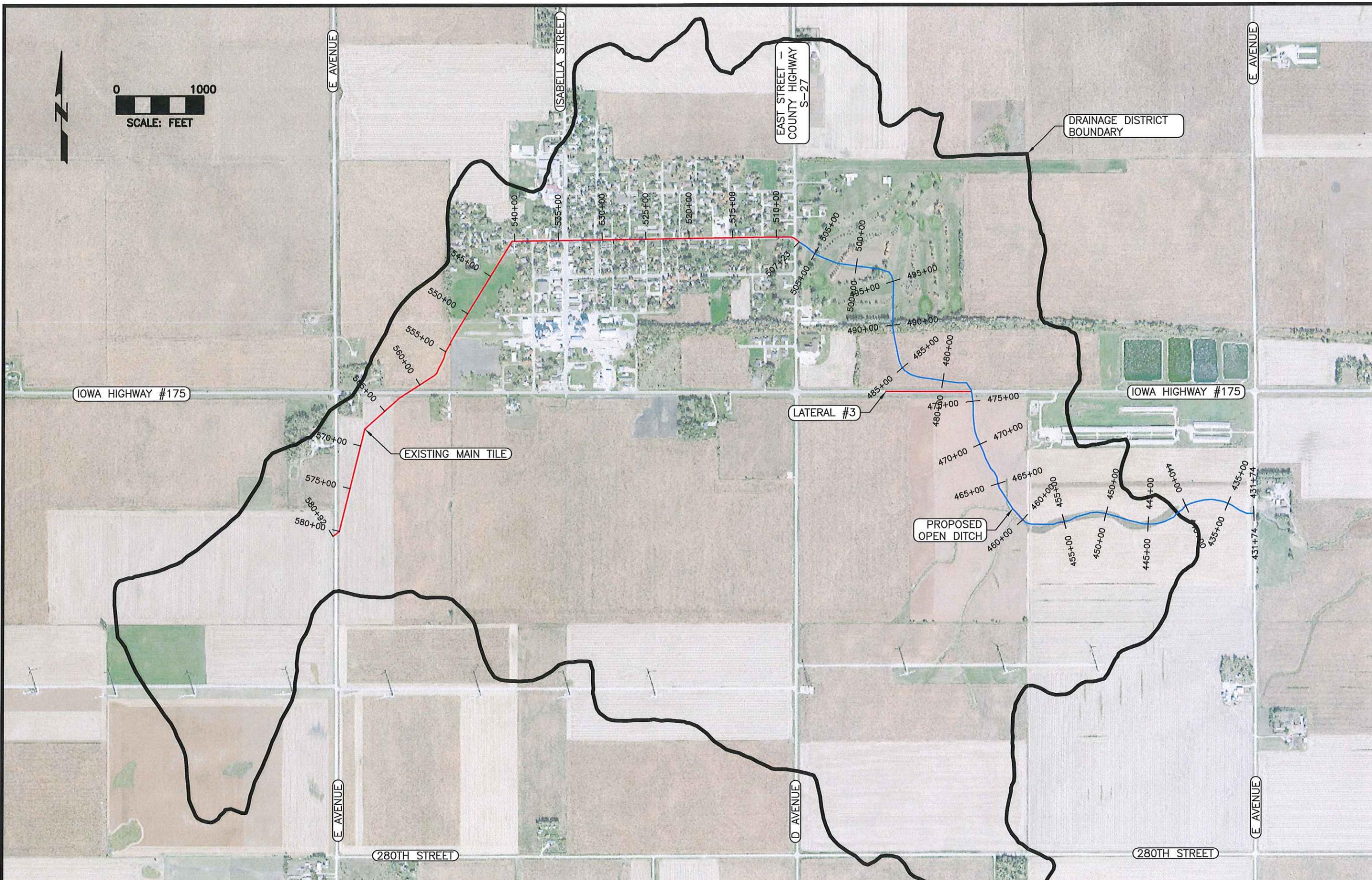
PROJECT:  
DRAINAGE DISTRICT #143  
HARDIN COUNTY, IOWA  
2016

SHT. NAME:  
TILE REPLACEMENT-UPSIZING  
MAP

SHT. NO.:  
1 OF 1



0 1000  
SCALE: FEET



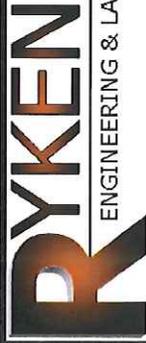
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DATE: 10-08-2015	PROJ. NO.: 6771	
FIELD BK:		
P:\6771\CADD\CONCEPTS\6771 - CONCEPTS.DWG; 2/15/2016		

**RYKEN**  
ENGINEERING & LAND SURVEYING, INC.  
ACKLEY, MASON CITY & WEBSTER CITY, IOWA

ADDRESS:  
739 PARK AVENUE  
ACKLEY, IOWA 50601  
PH 641-847-3273 FAX 641-847-2303

PROJECT:  
DRAINAGE DISTRICT #143  
HARDIN COUNTY, IOWA  
2016

SHT. NAME:  
TILE REPLACEMENT-OPEN DITCH  
MAP



ENGINEERING & LAND SURVEYING, INC.

**Engineer's Opinion of Main Capacities**

Project: Main Improvements for D.D. #143

Location: Sections 28, 29, and 33, T87N, R22W, Hardin County, Iowa

By: Z.J.S.

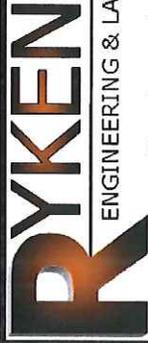
Date: 11/24/2015

Checked By: L.O.G.

Date: 2/14/2016

**PARALLEL TILE INSTALLATION**

STA	DESCRIPTION	INSTALLED		IMPROVEMENT (PARALLEL)		1" DRAINAGE COEF.	
		INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (in*acres/day)	1/2" DRAINAGE COEF. PARALLEL TILE SIZE (in)	COMBINED IMPROVED TILE CAPACITY (in*acres/day)	PARALLEL TILE SIZE (in)	COMBINED IMPROVED TILE CAPACITY (in*acres/day)
	<b>Main</b>						
431+74	Main Tile Outlet on west side of E. Avenue	30	0.35	54	1.30	60	1.61
437+25	Pipe size change 30" - 28"	28	0.29	54	1.26	60	1.57
441+50	Boundary of Drainage District #143	28	0.29	54	1.27	60	1.59
455+00	Pipe size change 28" - 26"	26	0.25	48	1.46	60	1.61
464+00	Pipe size change 26" - 24"	24	0.23	48	1.62	48	1.62
476+36	Connection with Lateral 3	24	0.26	48	1.82	48	1.82
476+37	Upstream of Connection with Lateral 3 - pipe size change 24" - 22"	22	0.26	48	2.23	48	2.23
491+00	Pipe size change 22" - 20"	20	0.28	42	2.30	42	2.22
503+00	Boundary of original Drainage District #2	18 or 20	0.34	42	2.66	42	2.56
508+00	Connection with Main on east side of Co Hwy S-27	18 and 18	0.34				



**Engineer's Opinion of Main Capacities**

Project: **Main Improvements** for D.D. #143

Location: Sections 28, 29, and 33, T87N, R22W, Hardin County, Iowa

By: Z.J.S.

Date: 11/24/2015

Checked By: L.O.G.

Date: 2/14/2016

**TILE REPLACEMENT - UPSIZING**

STA	DESCRIPTION	INSTALLED		IMPROVEMENT (UPSIZING)					
		INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (in <sup>2</sup> acres/day)	1/2" DRAINAGE COEF.		1" DRAINAGE COEF.			
				UPSIZING TILE SIZE (in)	IMPROVED TILE CAPACITY (in <sup>2</sup> acres/day)		UPSIZING TILE SIZE (in)	IMPROVED TILE CAPACITY (in <sup>2</sup> acres/day)	
	<b>Main</b>								
431+74	Main Tile Outlet on west side of E Avenue	30	0.35	60	1.27	66	1.63		
437+25	Pipe size change 30" - 28"	28	0.29	60	1.28	66	1.65		
441+50	Boundary of Drainage District #143	28	0.29	60	1.30	66	1.67		
455+00	Pipe size change 28" - 26"	26	0.25	48	1.26	66	1.75		
464+00	Pipe size change 26" - 24"	24	0.23	48	1.44	54	1.79		
476+36	Connection with Lateral 3	24	0.26	48	1.62	48	1.46		
476+37	Upstream of Connection with Lateral 3 - pipe size change 24" - 22"	22	0.26	48	2.04	48	2.15		
491+00	Pipe size change 22" - 20"	20	0.28	42	1.87	42	2.00		
503+00	Boundary of original Drainage District #2	18 or 20	0.34	42	2.15	42	2.29		
508+00	Connection with Main on east side of Co Hwy S-27	18 and 18	0.34						



**Engineer's Opinion of Main Capacities**

**Project: Main Improvements for D.D. #143**

Location: Sections 28, 29, and 33, T87N, R22W, Hardin County, Iowa

By: Z.J.S.

Date: 11/24/2015

Checked By: L.O.G.

Date: 2/14/2016

**TILE REPLACEMENT - OPEN DITCH**

STA	DESCRIPTION	INSTALLED		IMPROVEMENT (OPEN DITCH)	
		INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (in*acres/day)	MAIN	IMPROVED MAIN CAPACITY (in*acres/day)
	<b>Main</b>				
431+74	Main Tile Outlet on west side of E Avenue	30	0.35	Open	8.57
437+25	Pipe size change 30" - 28"	28	0.29	Open	8.67
441+50	Boundary of Drainage District #143	28	0.29	Open	8.77
455+00	Pipe size change 28" - 26"	26	0.25	Open	9.20
464+00	Pipe size change 26" - 24"	24	0.23	Open	10.55
476+36	Connection with Lateral 3	24	0.26	Open	19.10
476+37	Upstream of Connection with Lateral 3 - pipe size change 24" - 22"	22	0.26	Open	20.43
491+00	Pipe size change 22" - 20"	20	0.28	Open	20.43
503+00	Boundary of original Drainage District #2	18 or 20	0.34	Open	23.43
508+00	Connection with Main on east side of Co Hwy S-27	18 and 18	0.34		

## Engineer's Opinion of Probable Construction Cost

Project: Main Repairs for D.D. #143

Location: SE¼ Section 29 and SW¼ Section 28, T87N, R22W, Hardin County, Iowa

	ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost
	<b>OPEN CUT TILE REPLACEMENT</b>	<b>CONSTRUCTION COSTS</b>					
101		24" REINFORCED CONCRETE TILE	\$ 70.00	LF	1800	LF	\$ 126,000.00
102		CONCRETE COLLAR	\$ 400.00	EA	2	EA	\$ 800.00
103		HICKENBOTTOM INTAKE	\$ 1,500.00	EA	2	EA	\$ 3,000.00
104		MAIN RELIEF TILE JUNCTION MANHOLE	\$ 5,000.00	EA	1	EA	\$ 5,000.00
105		PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00
106		TREE REMOVAL	\$ 400.00	EA	30	EA	\$ 12,000.00
107		SEEDING (GOLF COURSE)	\$ 10,000.00	LS	1	LS	\$ 10,000.00
108		SPOT REPAIR	\$ 1,500.00	EA	9	EA	\$ 13,500.00
109		STRUCTURE REMOVAL	\$ 500.00	EA	3	EA	\$ 1,500.00
110		REMOVE EXISTING TILE	\$ 10.00	LF	1800	LF	\$ 18,000.00
	<b>CONSTRUCTION SUBTOTAL</b>						\$ 194,800.00
	Contingency (10%)						\$ 19,480.00
	<b>CONSTRUCTION TOTAL</b>						\$ 214,280.00
	Engr. & Const. Observation (20%)						\$ 42,856.00
	<b>OPEN CUT TILE REPLACEMENT TOTAL COST</b>						\$ 257,136.00
<b>TRENCHLESS TILE LINING</b>	<b>CONSTRUCTION COSTS</b>						
	201	CIPP LINER	\$ 100.00	LF	1800	LF	\$ 180,000.00
	202	MECHANICALLY CUT TREE ROOTS	\$ 10.00	LF	1800	LF	\$ 18,000.00
	203	JET CLEAN TILE	\$ 4.00	LF	1800	LF	\$ 7,200.00
	204	CCTV INSPECT TILE	\$ 2.00	LF	1800	LF	\$ 3,600.00
	205	INTAKE/MANHOLE	\$ 5,000.00	EA	4	EA	\$ 20,000.00
	206	SPOT REPAIR	\$ 1,500.00	LOC	15	LOC	\$ 22,500.00
	207	SEEDING (GOLF COURSE)	\$ 5,000.00	LS	1	LS	\$ 5,000.00
	208	STRUCTURE REMOVAL	\$ 500.00	EA	2	EA	\$ 1,000.00
	209	PRIVATE TILE REINSTATEMENT	\$ 200.00	EA	10	EA	\$ 2,000.00
	210	MAIN RELIEF TILE REINSTATEMENT	\$ 1,000.00	EA	1	EA	\$ 1,000.00
	<b>CONSTRUCTION SUBTOTAL</b>						\$ 260,300.00
	Contingency (10%)						\$ 26,030.00
	<b>CONSTRUCTION TOTAL</b>						\$ 286,330.00
	Engr. & Const. Observation (20%)						\$ 57,266.00
	<b>TRENCHLESS TILE LINING TOTAL COST</b>						\$ 343,596.00
<b>REROURED TILE REPLACEMENT</b>	<b>CONSTRUCTION COSTS</b>						
	301	24" DUAL WALL HDPE TILE	\$ 55.00	LF	1249	LF	\$ 68,695.00
	302	24" POLYPROPYLENE TILE	\$ 60.00	LF	300	LF	\$ 18,000.00
	303	24" REINFORCED CONCRETE TILE	\$ 70.00	LF	205	LF	\$ 14,350.00
	304	45° X 24" REINFORCED CONCRETE BEND	\$ 2,000.00	EA	2	EA	\$ 4,000.00
	305	22½° X 24" HDPE BEND	\$ 1,000.00	EA	2	EA	\$ 2,000.00
	306	45° X 24" HDPE BEND	\$ 1,250.00	EA	3	EA	\$ 3,750.00
	307	INTAKE/MANHOLE	\$ 5,000.00	EA	2	EA	\$ 10,000.00
	308	STRUCTURE REMOVAL	\$ 500.00	EA	3	EA	\$ 1,500.00
	309	CONCRETE PLUG	\$ 400.00	EA	3	EA	\$ 1,200.00
	310	CONCRETE COLLAR	\$ 400.00	EA	3	EA	\$ 1,200.00
	311	SPOT REPAIR	\$ 1,500.00	LOC	9	LOC	\$ 13,500.00
	312	MAIN RELIEF TILE JUNCTION MANHOLE	\$ 5,000.00	EA	1	EA	\$ 5,000.00
	313	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	5	EA	\$ 2,500.00
	314	TREE REMOVAL	\$ 400.00	EA	10	EA	\$ 4,000.00
315	SEEDING (GOLF COURSE)	\$ 10,000.00	LS	1	LS	\$ 10,000.00	
	<b>CONSTRUCTION SUBTOTAL</b>						\$ 159,695.00
	Contingency (10%)						\$ 15,969.50
	<b>CONSTRUCTION TOTAL</b>						\$ 175,664.50
	Engr. & Const. Observation (20%)						\$ 35,132.90
	<b>REROURED TILE REPLACEMENT TOTAL COST</b>						\$ 210,797.40



ENGINEERING & LAND SURVEYING, INC.

By: Z.J.S.  
 Date: 11/18/2015  
 Checked By: L.O.G.  
 Date: 2/14/2016

**Engineer's Opinion of Probable Construction Cost**

Project: Main Improvements for D.D. #143

Location: Sections 28, 29, and 33, T87N, R22W, Hardin County, Iowa

ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost
<b>CONSTRUCTION COSTS</b>						
501	54" REINFORCED CONCRETE TILE	\$ 200.00	LF	2300	LF	\$ 460,000.00
502	48" DUAL WALL HDPE TILE	\$ 120.00	LF	3600	LF	\$ 432,000.00
503	42" DUAL WALL HDPE TILE	\$ 100.00	LF	1690	LF	\$ 169,000.00
504	54" X 48" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
505	48" X 42" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
506	INTERCONNECTIONS	\$ 10,000.00	EA	4	EA	\$ 40,000.00
507	60" CMP OUTLET	\$ 200.00	LF	40	LF	\$ 8,000.00
508	HEADWALL	\$ 10,000.00	EA	1	EA	\$ 10,000.00
509	RIP-RAP	\$ 40.00	TN	50	TN	\$ 2,000.00
510	HICKENBOTTOM INTAKE	\$ 1,500.00	EA	4	EA	\$ 6,000.00
511	JACK AND BORE (IDOT CROSSING)	\$ 1,000.00	LF	50	LF	\$ 50,000.00
512	CONCRETE COLLAR	\$ 800.00	EA	1	EA	\$ 800.00
513	SEEDING (IDOT RIGHT OF WAY)	\$ 2,000.00	LS	1	LS	\$ 2,000.00
514	TRAFFIC CONTROL	\$ 10,000.00	LS	1	LS	\$ 10,000.00
515	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	15	EA	\$ 7,500.00
516	TREE REMOVAL	\$ 400.00	EA	10	EA	\$ 4,000.00
517	SPOT REPAIR	\$ 1,500.00	EA	32	EA	\$ 48,000.00
518	CCTV INSPECT TILE	\$ 3.00	LF	5830	LF	\$ 17,490.00
<b>CONSTRUCTION SUBTOTAL</b>						\$ 1,272,790.00
Contingency (10%)						\$ 127,279.00
<b>CONSTRUCTION TOTAL</b>						\$ 1,400,069.00
Engr. & Const. Observation (20%)						\$ 280,013.80
Repair \$ 191,634.00 to						\$ 312,360.00
<b>1/2" COEFFICIENT TOTAL COST</b>						<b>\$ 1,871,716.80 to \$ 1,992,442.80</b>
<b>PARALLEL TILE INSTALLATION (1" COEFFICIENT)</b>						
<b>CONSTRUCTION COSTS</b>						
601	60" REINFORCED CONCRETE TILE	\$ 250.00	LF	2800	LF	\$ 700,000.00
602	48" DUAL WALL HDPE TILE	\$ 120.00	LF	3100	LF	\$ 372,000.00
603	42" DUAL WALL HDPE TILE	\$ 100.00	LF	1690	LF	\$ 169,000.00
604	60" X 48" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
605	48" X 42" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
606	INTERCONNECTIONS	\$ 10,000.00	EA	4	EA	\$ 40,000.00
607	72" CMP OUTLET	\$ 250.00	LF	40	LF	\$ 10,000.00
608	HEADWALL	\$ 10,000.00	EA	1	EA	\$ 10,000.00
609	RIP-RAP	\$ 40.00	TN	50	TN	\$ 2,000.00
610	HICKENBOTTOM INTAKE	\$ 1,500.00	EA	4	EA	\$ 6,000.00
611	JACK AND BORE (IDOT CROSSING)	\$ 1,000.00	LF	50	LF	\$ 50,000.00
612	CONCRETE COLLAR	\$ 800.00	EA	1	EA	\$ 800.00
613	SEEDING (IDOT RIGHT OF WAY)	\$ 2,000.00	LS	1	LS	\$ 2,000.00
614	TRAFFIC CONTROL	\$ 10,000.00	LS	1	LS	\$ 10,000.00
615	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	15	EA	\$ 7,500.00
616	TREE REMOVAL	\$ 400.00	EA	10	EA	\$ 4,000.00
617	SPOT REPAIR	\$ 1,500.00	EA	32	EA	\$ 48,000.00
618	CCTV INSPECT TILE	\$ 3.00	LF	5830	LF	\$ 17,490.00
<b>CONSTRUCTION SUBTOTAL</b>						\$ 1,454,790.00
Contingency (10%)						\$ 145,479.00
<b>CONSTRUCTION TOTAL</b>						\$ 1,600,269.00
Engr. & Const. Observation (20%)						\$ 320,053.80
Repair \$ 191,634.00 to						\$ 312,360.00
<b>1" COEFFICIENT TOTAL COST</b>						<b>\$ 2,111,956.80 to \$ 2,232,682.80</b>

Note: Per Iowa Code, road crossings (highlighted orange) are not typically district expense



ENGINEERING & LAND SURVEYING, INC.

By: Z.J.S.  
 Date: 11/18/2015  
 Checked By: L.O.G.  
 Date: 2/14/2016

**Engineer's Opinion of Probable Construction Cost**

**Project: Main Improvements for D.D. #143**

Location: Sections 28, 29, and 33, T87N, R22W, Hardin County, Iowa

ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost
<b>CONSTRUCTION COSTS</b>						
701	60" REINFORCED CONCRETE TILE	\$ 250.00	LF	2500	LF	\$ 625,000.00
702	48" DUAL WALL HDPE TILE	\$ 120.00	LF	3400	LF	\$ 408,000.00
703	42" DUAL WALL HDPE TILE	\$ 100.00	LF	1690	LF	\$ 169,000.00
704	60" X 48" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
705	48" X 42" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
706	72" CMP OUTLET	\$ 250.00	LF	40	LF	\$ 10,000.00
707	HEADWALL	\$10,000.00	EA	1	EA	\$ 10,000.00
708	RIP-RAP	\$ 40.00	TN	50	TN	\$ 2,000.00
709	HICKENBOTTOM INTAKE	\$ 1,500.00	EA	6	EA	\$ 9,000.00
710	JACK AND BORE (IDOT CROSSING)	\$ 1,000.00	LF	50	LF	\$ 50,000.00
711	CONCRETE COLLAR	\$ 800.00	EA	1	EA	\$ 800.00
712	SEEDING (GOLF COURSE)	\$10,000.00	LS	1	LS	\$ 10,000.00
713	SEEDING (IDOT RIGHT OF WAY)	\$ 2,000.00	LS	1	LS	\$ 2,000.00
714	TRAFFIC CONTROL	\$10,000.00	LS	1	LS	\$ 10,000.00
715	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	40	EA	\$ 20,000.00
716	TREE REMOVAL	\$ 400.00	EA	40	EA	\$ 16,000.00
717	SPOT REPAIR	\$ 1,500.00	EA	3	EA	\$ 4,500.00
718	REMOVE EXISTING TILE	\$ 10.00	LF	7630	LF	\$ 76,300.00
719	STRUCTURE REMOVAL	\$ 500.00	EA	3	EA	\$ 1,500.00
720	INTAKE/MANHOLE	\$ 5,000.00	EA	2	EA	\$ 10,000.00
<b>CONSTRUCTION SUBTOTAL</b>						\$ 1,440,100.00
Contingency (10%)						\$ 144,010.00
<b>CONSTRUCTION TOTAL</b>						\$ 1,584,110.00
Engr. & Const. Observation (20%)						\$ 316,822.00
<b>1/2" COEFFICIENT TOTAL COST</b>						\$ 1,900,932.00
<b>CONSTRUCTION COSTS</b>						
801	66" REINFORCED CONCRETE TILE	\$ 275.00	LF	2800	LF	\$ 770,000.00
802	60" DUAL WALL HDPE TILE	\$ 150.00	LF	1640	LF	\$ 246,000.00
803	48" DUAL WALL HDPE TILE	\$ 120.00	LF	1460	LF	\$ 175,200.00
804	42" DUAL WALL HDPE TILE	\$ 100.00	LF	1690	LF	\$ 169,000.00
805	66" X 60" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
806	60" X 48" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
807	48" X 42" HDPE REDUCER	\$ 3,000.00	EA	1	EA	\$ 3,000.00
808	72" CMP OUTLET	\$ 250.00	LF	40	LF	\$ 10,000.00
809	HEADWALL	\$10,000.00	EA	1	EA	\$ 10,000.00
810	RIP-RAP	\$ 40.00	TN	50	TN	\$ 2,000.00
811	HICKENBOTTOM INTAKE	\$ 1,500.00	EA	6	EA	\$ 9,000.00
812	JACK AND BORE (IDOT CROSSING)	\$ 1,000.00	LF	50	LF	\$ 50,000.00
813	CONCRETE COLLAR	\$ 800.00	EA	1	EA	\$ 800.00
814	SEEDING (GOLF COURSE)	\$10,000.00	LS	1	LS	\$ 10,000.00
815	SEEDING (IDOT RIGHT OF WAY)	\$ 2,000.00	LS	1	LS	\$ 2,000.00
816	TRAFFIC CONTROL	\$10,000.00	LS	1	LS	\$ 10,000.00
817	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	40	EA	\$ 20,000.00
818	TREE REMOVAL	\$ 400.00	EA	40	EA	\$ 16,000.00
819	SPOT REPAIR	\$ 1,500.00	EA	3	EA	\$ 4,500.00
820	REMOVE EXISTING TILE	\$ 10.00	LF	7630	LF	\$ 76,300.00
821	STRUCTURE REMOVAL	\$ 500.00	EA	3	EA	\$ 1,500.00
822	INTAKE/MANHOLE	\$ 5,000.00	EA	2	EA	\$ 10,000.00
<b>CONSTRUCTION SUBTOTAL</b>						\$ 1,601,300.00
Contingency (10%)						\$ 160,130.00
<b>CONSTRUCTION TOTAL</b>						\$ 1,761,430.00
Engr. & Const. Observation (20%)						\$ 352,286.00
<b>1" COEFFICIENT TOTAL COST</b>						\$ 2,113,716.00

TILE REPLACEMENT - UPSIZING (1/2" COEFFICIENT)

TILE REPLACEMENT - UPSIZING (1" COEFFICIENT)

Note: Per Iowa Code, road crossings (highlighted orange) are not typically district expense



ENGINEERING & LAND SURVEYING, INC.

By: Z.J.S.

Date: 11/18/2015

Checked By: L.O.G.

Date: 2/14/2016

**Engineer's Opinion of Probable Construction Cost**

**Project: Main Improvements for D.D. #143**

Location: Sections 28, 29, and 33, T87N, R22W, Hardin County, Iowa

ITEM #	DESCRIPTION	Unit Cost	Units	Quantity		Total Cost
				Units		
<b>CONSTRUCTION COSTS</b>						
901	OPEN DITCH CONSTRUCTION	\$ 2,500.00	STA	76.3	STA	\$ 190,750.00
902	CMP OUTLET	\$ 55.00	LF	120	LF	\$ 6,600.00
903	HEADWALL	\$ 10,000.00	EA	3	EA	\$ 30,000.00
904	RIP-RAP	\$ 40.00	TN	150	TN	\$ 6,000.00
905	CONCRETE COLLAR	\$ 400.00	EA	3	EA	\$ 1,200.00
906	RCP CULVERT (IDOT CROSSING)	\$ 200,000.00	LS	1	LS	\$ 200,000.00
907	SURFACE DRAINS	\$ 2,000.00	EA	40	EA	\$ 80,000.00
908	PRIVATE TILE OUTLETS	\$ 2,000.00	EA	40	EA	\$ 80,000.00
909	SEEDING (OPEN DITCH)	\$ 500.00	STA	78	STA	\$ 39,000.00
910	SEEDING (IDOT RIGHT OF WAY)	\$ 2,000.00	LS	1	LS	\$ 2,000.00
911	TRAFFIC CONTROL	\$ 10,000.00	LS	1	LS	\$ 10,000.00
912	TREE REMOVAL	\$ 400.00	EA	40	EA	\$ 16,000.00
913	SPOT REPAIR	\$ 1,500.00	EA	3	EA	\$ 4,500.00
914	REMOVE EXISTING TILE	\$ 8.00	LF	7630	LF	\$ 61,040.00
915	RIGHT OF WAY	\$ 12,000.00	AC	20	AC	\$ 240,000.00
<b>CONSTRUCTION SUBTOTAL</b>						\$ 967,090.00
Contingency (10%)						\$ 96,709.00
<b>CONSTRUCTION TOTAL</b>						\$ 1,063,799.00
Engr. & Const. Observation (20%)						\$ 212,759.80
<b>TOTAL COST</b>						\$ 1,276,558.80

TILE REPLACEMENT - OPEN DITCH

Note: Per Iowa Code, road crossings (highlighted orange) are not typically district expense