

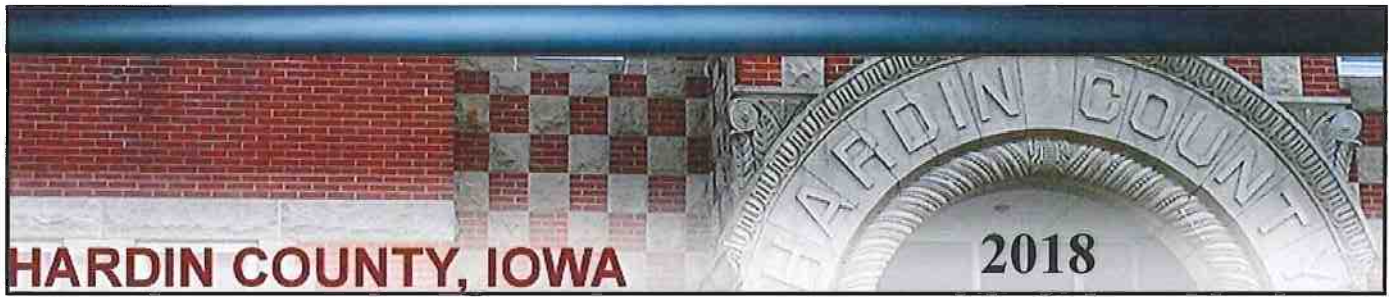
**PUBLIC HEARING AGENDA
ENGINEER'S REPORT ON REPAIRS OR IMPROVEMENTS TO MAIN TILES
DRAINAGE DISTRICT 167, HARDIN COUNTY, IOWA
MARCH 6, 2019 AT 1:00 P.M.**

1. Open Meeting
2. Approve Agenda
3. Introductions/Attendance
4. Open Public Hearing
5. Verify Publication
Published in the Herald Index on February 8, 2019
6. Explanation Of Project


Documents:


[DD 167 ENG RPT 12-28-2018.PDF](#)

7. Written Or Verbal Comments/Discussion
8. Close Public Hearing
9. Possible Action
 - Adopt Recommendation of Engineer's Report
 - Direct CGA to Prepare Plans and Specifications
10. Other Business
11. Adjourn Meeting



**ENGINEER'S REPORT
ON REPAIRS OR
IMPROVEMENTS TO
MAIN TILES
DRAINAGE DISTRICT
NO. 167
HARDIN COUNTY,
IOWA**

	<p>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</p> <p><i>Lee O. Gallentine</i> PE DATE <i>Dec 28, 2018</i></p> <p>LEE O. GALLETINE, P.E.</p> <p>LICENSE NUMBER: 15745 MY LICENSE RENEWAL DATE IS DECEMBER 31, 2018 PAGES OR SHEETS COVERED BY THIS SEAL: SHOWN ON TABLE OF CONTENTS</p>
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	<p>CLAPSADDLE-GARBER ASSOCIATES OFFICE LOCATIONS</p> <p>16 East Main Street, PO Box 754 Marshalltown, IA 50158 1523 S. Bell Avenue, Suite 101 Ames, IA 50010 5106 Nordic Drive Cedar Falls, IA 50613 739 Park Avenue Ackley, IA 50601 511 Bank Street Webster City, IA 50595</p>	<p>Project Office 739 Park Avenue Ackley, IA. 50601 Phone: 641-847-3273 Fax: 641-847-2303</p>
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Engineer's Report on Repairs or Improvements to Main Tiles, Drainage District No. 167 Hardin County, Iowa

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Engineer's Report on Repairs or Improvements to Main Tiles, Drainage District No. 167 Hardin County, Iowa

1.0 INTRODUCTION

- SCOPE OF WORK – The Hardin County Board of Supervisors, acting as District Trustees, requested Clapsaddle-Garber Associates to investigate and report concerning repairs or improvements to the Main tiles of Drainage District No. 167. This report will summarize the history of repairs, investigate the necessity and feasibility of said repairs or improvements, and present opinions of probable construction costs associated with said repairs or improvements. At the Landowner's Meeting held on July 25, 2018, the investigation summary for Work Order #208 was discussed and reviewed by the District Trustees. For reference, a copy of the meeting minutes is included in Appendix G and a copy of the Investigation Summary for Work Order #208 is included in Appendix H. As a result of this meeting, the District Trustees requested Clapsaddle-Garber Associates to move ahead with an investigation and report concerning repairs or improvements to the Main tiles.

- LOCATION – The area of investigation was limited to the lower end of the North and South Main tiles. Said Main tiles are located in Sections 3 and 4, Township 86 North (T86N), Range 20 West (R20W), Hardin County, Iowa. Specifically, the downstream limit of investigation for both Main tiles is at their outlets at a channel just west of the midsection line of Section 4 at approximately ¼ mile north of County Highway D55. Going upstream, the tiles then proceed east, northeast, and southeast and enters Section 3 at approximately ¼ mile north of County Highway D55. The tiles then proceed southeast into the town of New Providence with the upstream limits of investigation being a few hundred feet west of the intersection of North Main Street and Chestnut Street. For reference, a map showing the limits of investigation is included in Appendix I.

2.0 DISTRICT HISTORY – The following is a summary of the pertinent history of Drainage District No. 167 as obtained from the Hardin County Engineer’s Field Books and the Hardin County Auditor’s drainage minutes and records.

- 1947 – 1948 County Engineer’s Field Book 766 contains field notes for design and construction of the district facilities.
- 1949, Feb 20 Date of district map and profiles.
- 1954, Sept 27 Agreement between landowners for establishment. Said agreement called for the outlet of said tile be near the SW Corner NW¼ SE¼ of Section 4 T86N R20W. It then proceeded in a northeasterly direction along the line of natural drainage to the west line of the NE¼ SE¼ Section 4. From there, it continued in an easterly direction extending to a point to the east side of Main Street at the NW Corner of Lot 4 Block 2. It then continued to Orange Street at the south end of Lots 7 and 8 Block 3. The tiles were to consist of 6,780 feet of 8 inch tile and 1,600 feet of 6 inch tile.
- 1961, Apr Repair work completed by secondary road fund.
- 1966, Apr 19 Lots 5 and 6 Block 2 permitted to drain into district tile and be added to said district.
- 1973, Jan 24 Edrich Addition of New Providence granted temporary permit to outlet septic tank into district tile.
- 1977, Dec 30 Request for repair to broken tile in E½ SE¼ Section 4.
- 1999, Mar 3 Repair approved in Section 4.
- 2004, May 5 Repairs approved in Section 4.
- 2007, Apr 4 Investigation of problems with drainage issues approved.
- 2009, Apr 8 Repairs approved.
- 2009 Apr 29 Repairs approved in SE¼ Section 4.
- 2009, May 20 Repairs approved in SE¼ Section 4.
- 2009, Nov 25 Repairs approved in Section 4.
- 2011, June 29 Payment for repair approved.

- 3.0 INVESTIGATION – All field investigation for this report was performed as part of the Investigation Summary for Work Order #208. Said investigation was limited to visual observation (without excavation) and survey data gathered during said investigation. For reference, a copy of the Investigation Summary is included in Appendix H.

A review of district history shows that 7 repairs have been completed over the last 20 years. These repairs have consisted of tile replacement in lengths up to 40 feet and repairs of multiple blowouts/sinkholes. It should be noted that in some cases, lack of ground cover was mentioned as the cause of the tile failure.

All other investigations were limited to office and records research as mentioned. Calculations were performed to determine the drainage coefficient for the length of the existing Main tiles. It appears that for their respective watersheds, the North Main tile was designed to provide a drainage coefficient of 0.27 to 4.51 inches per day and the South Main tile was designed to provide a drainage coefficient of 0.58 to 5.26 inches per day.

- 4.0 DISCUSSION AND CONCLUSIONS – Based on the above, it is obvious that the Main tiles have a history of failure that is attributable to a lack of ground cover. Since the original profiles for the Main tiles show installation depths of approximately 3 feet to 4 feet, either the lack of ground cover is due to design changes during construction or soil erosion since the original installation.

Regardless of the cause of the lack of ground cover, if repairs or improvements are not performed the Main tiles will continue to deteriorate and collapse. This will allow soil to enter the Main tiles, which will manifest itself as more sinkholes and plugged tile. When all these issues are combined, it will lead to further reduced drainage and liability exposure by the drainage district.

5.0 REPAIR METHODS – To repair the existing Main tiles, the following options are the most straightforward available:

Dual Tile Replacement

- For the downstream stretches of the North and South Main tiles, remove and replace the existing tiles with two new tiles of equal or comparable size. For reference, a chart with the required tile sizes and capacities is included in Appendix K.
- Typically, the replacement Main tiles would be in the same location as the existing Main tiles in order to locate and reconnect private tile and lateral connections. However, due to lack of soil cover, it is recommended to shift each of the Main tiles from their current locations to gain additional soil cover. For reference, the general route is shown on the map included in Appendix J.

Single Tile Replacement

- For the downstream stretches of the North and South Main tiles, remove and replace the existing tiles with a single new tile of equal or comparable capacity. For reference, a chart with the required tile sizes and capacities is included in Appendix L.
- Typically, the replacement Main tile would be in the same location as the existing Main tiles in order to locate and reconnect private tile and lateral connections. However, due to lack of soil cover and the larger size of a single tile, it is recommended to shift the single Main tile from the current locations to gain additional soil cover. For reference, the general route is shown on the map included in Appendix J.

With the above-mentioned repair methods, the following should be noted:

- Due to the soil types and soil cover, all replacement tile will have rock bedding for additional stability and strength.
- The Main tiles would be shifted from their existing locations to gain soil cover.
- The only tiles being repaired are the tile identified in Appendix J. The remainder of the tile is not being repaired or modified in any manner.
- The proposed pipe sizes shown in Appendices K and L are those that are currently manufactured that meet or exceed the existing capacity.
- The proposed and existing capacities shown in Appendices K and L are based on the assumptions that the Main tiles are both installed per their respective design and that they are functioning at full capacity (i.e. are not collapsed, broken, plugged, etc).
- The proposed and existing pipe sizes and capacities shown in Appendices K and L are those to serve the lands within the existing District boundaries and not any discharges from other lands outside the District boundaries.
- The stationing and distances shown in Appendices K and L are based on the original district profiles. There are additional lengths of tile downstream that will also be repaired.
- 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, any of the above actions that do not increase capacity 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 next 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 – To improve the drainage capacity for the existing Main tiles, the following options are the most straightforward available:

Dual Tile Upsizing

- For the downstream stretches of the North and South Main tiles, remove and replace the existing tiles with two new tiles of an equal or larger size. For reference, a chart with the required tile sizes and capacities is included in Appendix N.
- Typically, the replacement Main tiles would be in the same location as the existing Main tiles in order to locate and reconnect private tile and lateral connections. However, due to lack of soil cover and the larger size of a single tile, it is recommended to shift each of the Main tiles from their current locations or install them at a flatter grade to gain additional soil cover. For reference, the general route is shown on the map included in Appendix M.

Single Tile Upsizing

- For the downstream stretches of the North and South Main tiles, remove and replace the existing tiles with a single new tile of equal or greater capacity. For reference, a chart with the required tile sizes and capacities is included in Appendix O.
- Typically, the replacement Main tile would be in the same location as the existing Main tiles in order to locate and reconnect private tile and lateral connections. However, due to lack of soil cover and the larger size of a single tile, it is recommended to shift the single Main tile from the current locations or install it at a flatter grade to gain additional soil cover. For reference, the general route is shown on the map included in Appendix M.

With the above-mentioned improvement method, the following should be noted:

- Due to the soil types and soil cover, all replacement tile will have rock bedding for additional stability and strength.
- The Main tiles would be shifted from their existing locations or installed at a flatter grade to gain soil cover.
- The only tiles being improved are the tiles identified in Appendix M. The remainder of the tiles are not being repaired or modified in any manner.
- The proposed pipe sizes shown in Appendices N and O are those that are currently manufactured that meet or exceed the ½” or 1” drainage coefficient or match the existing pipe capacity.
- The proposed and existing capacities shown in Appendices N and O are based on the assumptions that the Main tiles are both installed per their respective design and that they are functioning at full capacity (i.e. are not collapsed, broken, plugged, etc).
- The proposed and existing pipe sizes and capacities shown in Appendices N and O are those to serve the lands within the existing District boundaries and not any discharges from other lands outside the District boundaries.
- The stationing and distances shown in Appendices K and L are based on the original district profiles. There are additional lengths of tile downstream that will also be repaired.
- 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 next 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 repairs and improvements, an itemized list of project quantities and associated opinions of probable construction cost for each option were compiled and are included in Appendices P, Q, R, and S of this report. A summary of said costs are as follows:

METHOD	DRAINAGE COEFF.	CONSTRUCTION COST
Dual Tile Replacement – Repair	Existing	\$464,456.25
Single Tile Replacement – Repair	Existing	\$379,212.50
Dual Tile Upsizing – Improvement (½")	½"	\$565,512.50
Dual Tile Upsizing – Improvement (1")	1"	\$642,418.75
Single Tile Upsizing – Improvement (½")	½"	\$395,312.50
Single Tile Upsizing – Improvement (1")	1"	\$449,650.00

It should be noted that said costs include materials, labor, and equipment supplied by the contractor to complete the necessary repair and include applicable engineering, construction observation, and project administration fees by Clapsaddle-Garber Associates. However, said costs do not include any interest, legal fees, county administrative fees, crop damages, other damages, previous repairs, engineering fees to date, wetland mitigation fees, or reclassification fees (if applicable). As always, all costs shown are opinions of Clapsaddle-Garber Associates 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. 167 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 appears that a reclassification separating laterals may be required if any of the above options were deemed to be an improvement, said improvement were to move forward, and the laterals had not already been separated. Since the proposed project does not involve the laterals, it is not clear if this portion of code is applicable and it is our recommendation that the District Trustees seek advice from their legal counsel.

9.0 RECOMMENDATIONS – There is a definite need to perform one of the above-mentioned actions. The repairs would remove the current restrictions and impediments to the Main tiles and extend the lifespan of the same. The improvement would do the same and increase the capacity of the Main tiles. 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 Clapsaddle-Garber Associates.
- Hold the required hearing on the proposed repairs or improvements.
- Adopt one of the recommendations of the Engineer’s Report.
- Direct plans and specifications for the proposed repairs or improvements be prepared by Clapsaddle-Garber Associates.
- Proceed with receiving bids from interested contractors by Clapsaddle-Garber Associates.
- Award contract to the lowest responsible contractor.
- If desired or required by Iowa Code, proceed with reclassification proceedings

DRAINAGE DISTRICT 167
LANDOWNER MEETING

7/25/2018 - Minutes

1. Open Meeting

Hardin County Board of Supervisors Co-Chairperson, Renee McClellan, opened the meeting. Also present was Supervisor, Lance Granzow; Landowners, Michael Martin, Neil Martin, Lydia Martin, Curt Groen, Dave Bernard, Jim Martin, Larry Balvanz, Ron Reece and Pauline Lloyd; Lee Gallentine with Clapsaddle-Garber Associates (CGA); Drainage Clerk, Tina Schlemme. Absent: Supervisor, BJ Hoffman.

2. Approve Agenda

Granzow moved, McClellan seconded to approve the agenda as presented. All ayes. Motion carried.

3. Attendance/Introductions

Introductions were made and attendance verified.

4. Explanation Of Project

The meeting was turned over to Gallentine who explained the repair summary. An investigation began when a landowner in the NE SE of Section 4-86-20 reported a blowout in the waterway with smaller ones upstream. It is evident that the tile is blocked and needs repaired. It is currently 6 to 8 inch tile but due to low soil cover, it is recommended that it be replaced with concrete pipe which comes in 12 inch pipe. Gallentine further stated that multiple repairs have been submitted over the past 20 years.

5. Comments/Discussion

Granzow asked the landowners if they would like to replace the main tile as is, replace both main tiles into one larger tile or just perform spot repairs. Neil Martin stated he had helped as a boy installing the original tile in the mid 1940's and believed the soil cover to be 4 feet. Gallentine added that the spot they checked the cover was only 1.5 to 2 feet of cover so erosion must have occurred. There was much discussion between land owners regarding replacing all of the tile moving forward. It was agreed that they would pay to have an engineer's report created to see the projected estimated costs with the different options to see how they would like to move forward. When asked if they would consider an open ditch option, Neil Martin stated he would like to keep the drainage underground. Gallentine added that they are busy with construction season right now, but he would hope to have a report completed by the end of the year.

6. Possible Action

Granzow moved, McClellan seconded for CGA to complete an engineer's report with both repair and improvement options and a hearing will be scheduled once submitted. It was discussed that the repair option should include a single line repair and both lines being replaced into one tile. All ayes. Motion carried.

7. Other Business

It was discussed that a reclassification may be considered once the engineer's report is submitted and a plan is approved.

8. Adjourn Meeting

Granzow moved, McClellan seconded to adjourn the meeting. All ayes. Motion carried.

Drainage District:

167

Investigation Summary:

Landowner in the NE¼ SE¼ of Section 4 Township 86 North, Range 20 West reported a blowout/sinkhole in waterway, with smaller depressions upstream (northwest) of said larger blowout/sinkhole. Visual observation found a 6 inch VCP tile 1½'± to 2'± deep (assumed to be south main tile). Water is exiting the tile through multiple holes upstream, flowing overland flow to the southeast through the waterway, and then entering back into the tile.

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

None as only visual observation performed.

Additional Actions Recommended:

Given the nature of the water flow, it is evident that a tile blockage exists within the area of investigation. Said blockage should be found, removed, and then both the blowout/sinkhole repaired. Also, the multiple holes upstream should be excavated and repaired as necessary. Due to the lack of soil cover, repairs would typically be performed with concrete pipe. However, concrete pipe is only available in 12 inch and larger diameter. Therefore, the repairs must either be performed with 6 inch dual wall HPDE tile or 12 inch concrete pipe.

Since this is the second work order in 2 years in this area, the District Trustees may wish investigate relocation or replacement of the district tile to provide for more soil cover, extended lifespan, and fewer repairs.





Drainage Work Order Request For Repair Hardin County

Date: 4/26/2018

Work Order #: WO00000208

Drainage District: Drainage Districts \DD 167

Sec-Twp-Rge: 04-86-20 Qtr Sec: NE SE

Location/GIS: 86-20-04-400-002

Requested By: Robert Jenson

Contact Phone: (641) 849-0341

Contact Email: _____

Landowner (if different): Neil Martin

Description: Blowout in lower end of waterway in NE SE 4-86-20 with "babies" northwest of it. The ground cover over the tile in this area is very shallow.

Repair labor, materials and equipment: _____

Repaired By: _____ Date: _____

Please reference work order # and send statement for services to:
Hardin County Auditor's Office
Attn: Drainage Clerk
1215 Edgington Ave, Suite 1
Eldora, IA 50627
Phone (641) 939-8111
Fax (641) 939-8245

For Office Use Only

Approved: _____ Date: _____

CONSTRUCTION ENGINEERING
OBSERVATION REPORT

DATE:

5/11/18

PROJECT NUMBER:

6954-1

DAYS OF WEEK:

S | M | T | W | T | F | S

COUNTY, ROUTE, ROAD:

DD 167

SHEET NO.

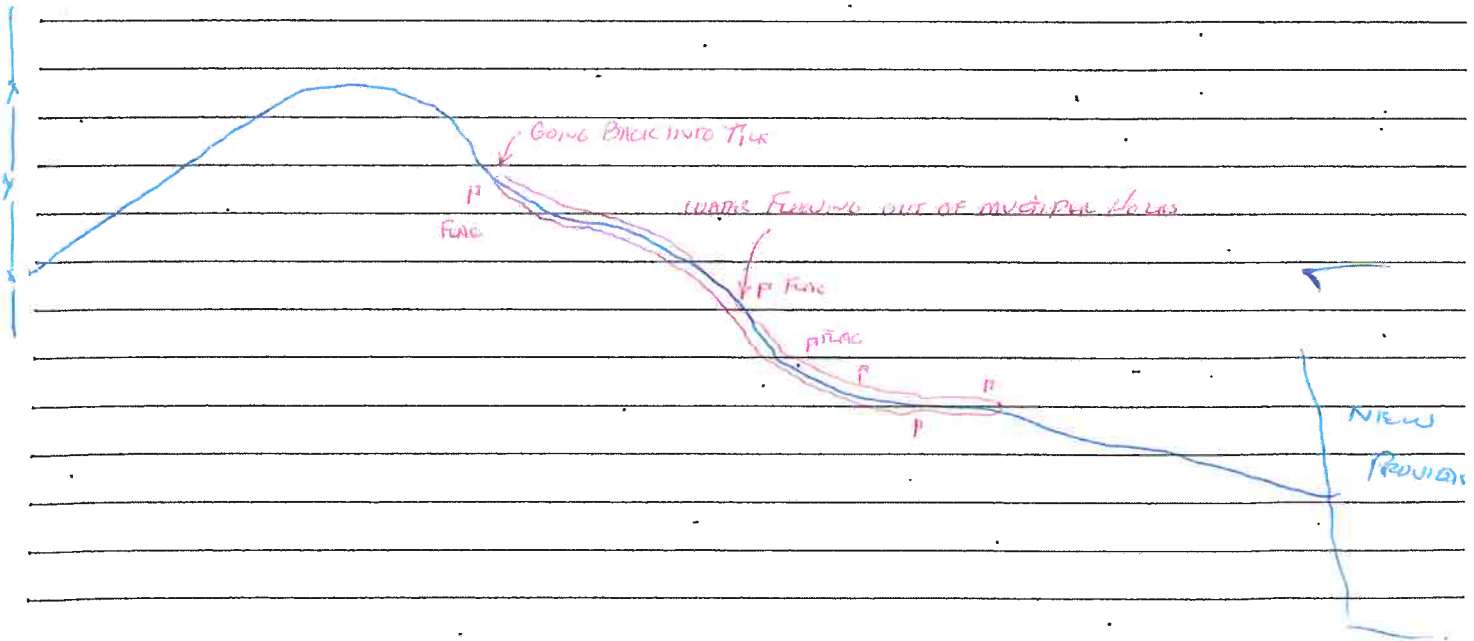
OF

LOCATION:

New Providence, West

DESCRIPTION OF WORK AND MATERIAL USED FOR EACH OPERATION, INCLUDING CONTRACTOR/SU
NAME, ITEM NO. AND LOCATION

Partly Sunny, 65°, Windy From East, Rain Earlier
Arrived @ Job Site 9:00 AM, Called and Talked to Robert Jensen,
He met me and drove his pickup out to Blow-outs Found 6" clay tile
1 1/2 - 2' deep, Blowing out water in multiple places (6 or more) All look to
be joints, must have a collapse down stream causing water to surge up thru
butt joints and then go back into tile past the collapse or blockage.
This looks to be the S. main
Find and fix blockage ASAP, the rest of tile should be OK.
Talked to Robert about shifting swale or tile route to get more cover.
This will be a on going problem with the minimum cover this butt joint tile
has.



I Certify that the work described in this report was incorporated into this contract unless otherwise noted.

Observer's Signature:

[Signature]

Date Prepared:

5/11/18

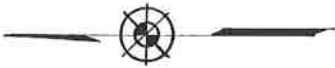
Reviewed by:

Engineer

Date Reviewed

Looking NW @ Blodgett House, 2' cover



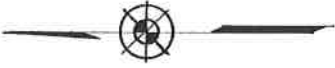


Providence Mutual Title
 District NO. 167
 SE 1/4 Sec. 1, Twp 88N, R. 20W
 SW 1/4 Sec. 3, Twp 88N, R. 20W
 FEB 29 1949 Scale: 1" = 200'

NS 167

TRACED FROM ORIGINAL BY
 RYKEN ENGR CO 1/10/73

Limits of Investigation



Providence Mutual Tile
 District NO. 167
 SE 1/4 Sec 4, Twp 88N, R20W
 SW 1/4 Sec 3, Twp 88N, R20W
 FEB 20 1949 Scale: 1" = 200'

NE 167

TRACED FROM ORIGINAL BY
 RYKEN ENGR CO 1/10/73



Engineer's Opinion of North Main tile Capacities
 Project: North Dual Tile Replacement for D.D. #167
 Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

By: J.V.S.
 Date: 12/17/2018
 Checked By: L.O.G.
 Date: 12/27/2018

		EXISTING				REPAIRED			
STA	EXISTING DESCRIPTION	INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (cfs)	INSTALLED TILE CAPACITY (in/day)	PROPOSED DESCRIPTION	REPAIRED TILE SIZE (in)	REPAIRED TILE CAPACITY (cfs)	REPAIRED TILE CAPACITY (in/day)	
0+00N	Start of Profile	8	0.94	0.27	Start of Profile	8	0.94	0.27	
3+00N	Grade change from 0.60% to 2.50%	8	1.92	0.56	Grade change from 0.60% to 2.50%	8	1.92	0.56	
5+00N	Grade change from 2.50% to 0.80%	8	1.08	0.38	Grade change from 2.50% to 0.80%	8	1.08	0.38	
14+00N	Grade change from 0.80% to 1.10%	8	1.27	0.45	Grade change from 0.80% to 1.10%	8	1.27	0.45	
30+00N	Grade change from 1.10% to 0.50%	8	0.86	0.84	Grade change from 1.10% to 0.50%	8	0.86	0.84	
35+00N	Grade change from 0.50% to 2.10%	8	1.76	2.93	Grade change from 0.50% to 2.10%	8	1.76	2.93	
40+16N	End of repair (i.e. north side of New Providence)	8	1.76	4.51	End of repair (i.e. north side of New Providence)	8	1.76	4.51	
47+00N	End of North Main tile	8			End of North Main tile	8			

NORTH DUAL TILE REPLACEMENT (REPAIR)



Engineer's Opinion of South Main tile Capacities
Project: South Dual Tile Replacement for D.D. #167
Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

By: J.V.S.
 Date: 12/17/2018
 Checked By: L.O.G.
 Date: 12/27/2018

		EXISTING				REPAIRED			
STA	EXISTING DESCRIPTION	INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (cfs)	INSTALLED TILE CAPACITY (in/day)	PROPOSED DESCRIPTION	REPAIRED TILE SIZE (in)	REPAIRED TILE CAPACITY (cfs)	REPAIRED TILE CAPACITY (in/day)	
0+00S	Start of Profile	8	1.15	0.58	Start of Profile	8	1.15	0.58	
15+00S	Grade change from 0.90% to 0.56%	8	0.91	0.72	Grade change from 0.90% to 0.56%	8	0.91	0.72	
20+00S	Grade change from 0.56% to 2.34%	8	1.85	4.63	Grade change from 0.56% to 2.34%	8	1.85	4.63	
25+20S	End of repair (i.e., north side of New Providence)	8	1.85	5.26	End of repair (i.e., north side of New Providence)	8	1.85	5.26	
33+95S	End of South Main tile	8			End of South Main tile	8			

SOUTH DUAL TILE REPLACEMENT (REPAIR)



Engineer's Opinion of Single Main tile Capacities
 Project: Single Tile Replacement for D.D. #167
 Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

By: J.V.S.
 Date: 12/17/2018
 Checked By: L.O.G.
 Date: 12/27/2018

		EXISTING				REPAIRED			
STA	EXISTING DESCRIPTION	INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (cfs)	INSTALLED TILE CAPACITY (in/day)	PROPOSED DESCRIPTION	REPAIRED TILE SIZE (in)	REPAIRED TILE CAPACITY (cfs)	REPAIRED TILE CAPACITY (in/day)	
0+00N	Start of Profile	(2) x 8	1.88	0.29	Start of Profile	12	2.77	0.43	
3+00N	Grade change from 0.60% to 2.50%	(2) x 8	3.83	0.60	Grade change from 0.60% to 2.50%	12	5.65	0.89	
5+00N	Grade change from 2.50% to 0.80%	(2) x 8	2.17	0.40	Grade change from 2.50% to 0.80%	12	3.20	0.59	
14+00N	Grade change from 0.80% to 1.10%	(2) x 8	2.54	0.53	Grade change from 0.80% to 1.10%	12	3.75	0.78	
30+00N	Grade change from 1.10% to 0.50%	(2) x 8	1.76	0.77	Grade change from 1.10% to 0.50%	12	2.53	1.11	
35+00N	Grade change from 0.50% to 2.10%	(2) x 8	3.61	3.61	Grade change from 0.50% to 2.10%	12	5.18	5.18	
40+16N	End of repair (i.e. north side of New Providence)	(2) x 8	3.61	4.86	End of repair (i.e. north side of New Providence)	12	5.18	6.98	
47+00N	End of North Main tile	(2) x 8			End of North Main tile				

SINGLE TILE REPLACEMENT (REPAIR)



Providence Mutual Tile
 District NO. 167
 SE 1/4 Sec 27, Twp 88N, R20W
 SW 1/4 Sec 27, Twp 88N, R20W
 FEB 20 1948 Scale: 1" = 200'

NE 167

TRACED FROM ORIGINAL BY
 RYKEN ENGR CO 1/10/73



By: J.V.S.
 Date: 12/17/2018
 Checked By: L.O.G.
 Date: 12/27/2018

Engineer's Opinion of North Main tile Capacities

Project: North Dual Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

NORTH DUAL TILE UPSIZING (IMPROVEMENT)	EXISTING					IMPROVED						
	STA	EXISTING DESCRIPTION	INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (cfs)	INSTALLED TILE CAPACITY (in/day)	PROPOSED DESCRIPTION	1/2" DRAINAGE COEFFICIENT			1" DRAINAGE COEFFICIENT		
							IMPROVED TILE SIZE (in)	IMPROVED TILE CAPACITY (cfs)	IMPROVED TILE CAPACITY (in/day)	IMPROVED TILE SIZE (in)	IMPROVED TILE CAPACITY (cfs)	IMPROVED TILE CAPACITY (in/day)
0+00N	Start of Profile	8	0.94	0.27	Start of Profile	12	2.77	0.81	15	5.02	1.46	
3+00N	Grade change from 0.60% to 2.50%	8	1.92	0.56	Grade change from 0.60% to 2.50%	10	3.47	1.02	12	5.65	1.65	
5+00N	Grade change from 2.50% to 0.80%	8	1.08	0.38	Grade change from 2.50% to 0.80%	10	1.96	0.69	12	3.20	1.11	
14+00N	Grade change from 0.80% to 1.10%	8	1.27	0.45	Grade change from 0.80% to 1.10%	10	2.30	0.82	12	3.75	1.33	
30+00N	Grade change from 1.10% to 0.50%	8	0.86	0.84	Grade change from 1.10% to 0.50%	8	0.86	0.84	10	1.55	1.52	
35+00N	Grade change from 0.50% to 2.10%	8	1.76	2.93	Grade change from 0.50% to 2.10%	8	1.76	2.93	8	1.76	2.93	
40+16N	End of repair (i.e. north side of New Providence)	8	1.76	4.51	End of repair (i.e. north side of New Providence)	8	1.76	4.51	8	1.76	4.51	
47+00N	End of North Main tile	8			End of North Main tile							



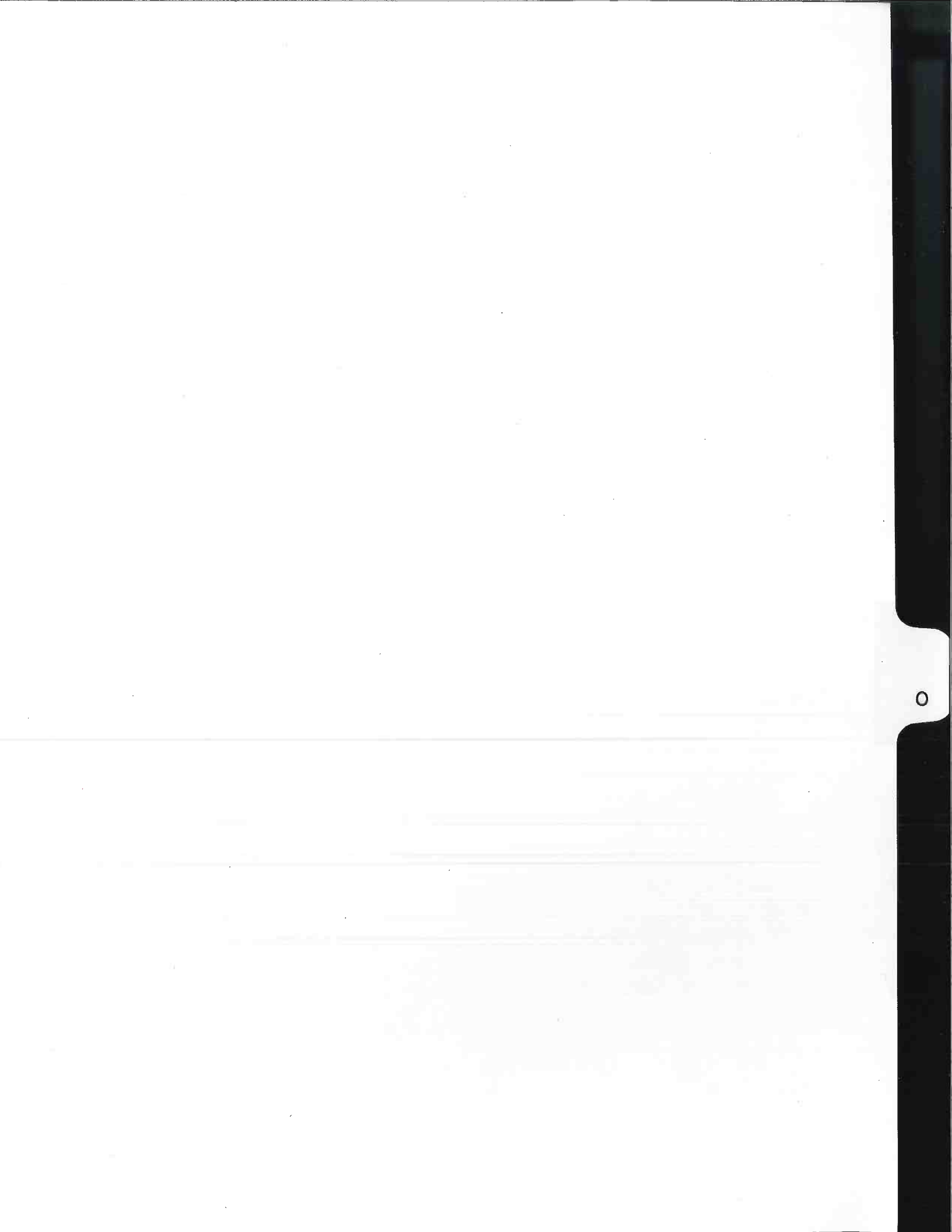
By: J.V.S.
 Date: 12/17/2018
 Checked By: L.O.G.
 Date: 12/27/2018

Engineer's Opinion of South Main tile Capacities

Project: South Dual Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

SOUTH DUAL TILE UPSIZING (IMPROVEMENT)	EXISTING					IMPROVED						
	STA	EXISTING DESCRIPTION	INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (cfs)	INSTALLED TILE CAPACITY (in/day)	PROPOSED DESCRIPTION	1/2" DRAINAGE COEFFICIENT			1" DRAINAGE COEFFICIENT		
							IMPROVED TILE SIZE (in)	IMPROVED TILE CAPACITY (cfs)	IMPROVED TILE CAPACITY (in/day)	IMPROVED TILE SIZE (in)	IMPROVED TILE CAPACITY (cfs)	IMPROVED TILE CAPACITY (in/day)
	0+00S	Start of Profile	8	1.15	0.58	Start of Profile	8	1.15	0.58	10	2.08	1.05
	15+00S	Grade change from 0.90% to 0.56%	8	0.91	0.72	Grade change from 0.90% to 0.56%	8	0.91	0.72	10	1.64	1.31
	20+00S	Grade change from 0.56% to 2.34%	8	1.85	4.63	Grade change from 0.56% to 2.34%	8	1.85	4.63	8	1.85	4.63
	25+20S	End of repair (i.e. north side of New Providence)	8	1.85	5.26	End of repair (i.e. north side of New Providence)	8	1.85	5.26	8	1.85	5.26
	33+95S	End of South Main tile	8			End of South Main tile						





By: J.V.S.
 Date: 12/17/2018
 Checked By: L.O.G.
 Date: 12/27/2018

Engineer's Opinion of Single Main tile Capacities

Project: Single Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

SINGLE TILE UPSIZING (IMPROVEMENT)	EXISTING					IMPROVED						
	STA	EXISTING DESCRIPTION	INSTALLED TILE SIZE (in)	INSTALLED TILE CAPACITY (cfs)	INSTALLED TILE CAPACITY (in/day)	PROPOSED DESCRIPTION	1/2" DRAINAGE COEFFICIENT			1" DRAINAGE COEFFICIENT		
							IMPROVED TILE SIZE (in)	IMPROVED TILE CAPACITY (cfs)	IMPROVED TILE CAPACITY (in/day)	IMPROVED TILE SIZE (in)	IMPROVED TILE CAPACITY (cfs)	IMPROVED TILE CAPACITY (in/day)
	0+00N	Start of Profile	(2) x 8	1.88	0.29	End of historical records	15	5.02	0.78	18	8.16	1.27
	3+00N	Grade change from 0.60% to 2.50%	(2) x 8	3.83	0.60	Grade change from 0.60% to 2.50%	12	5.65	0.89	15	10.24	1.61
	5+00N	Grade change from 2.50% to 0.80%	(2) x 8	2.17	0.40	Grade change from 2.50% to 0.80%	12	3.20	0.59	15	5.79	1.06
	14+00N	Grade change from 0.80% to 1.10%	(2) x 8	2.54	0.53	Grade change from 0.80% to 1.10%	12	3.75	0.75	15	6.79	1.41
	30+00N	Grade change from 1.10% to 0.50%	(2) x 8	1.76	0.77	Grade change from 1.10% to 0.50%	10	1.55	0.68	12	2.53	1.11
	35+00N	Grade change from 0.50% to 2.10%	(2) x 8	3.61	3.61	Grade change from 0.50% to 2.10%	12	5.18	5.18	12	5.18	5.18
	40+16N	End of repair (i.e. north side of New Providence)	(2) x 8	3.61	4.86	End of repair (i.e. north side of New Providence)	12	5.18	6.98	12	5.18	6.98
	47+00N	End of North Main tile	(2) x 8			End of North Main tile						



By: J.V.S.

Date: 12/20/2018

Checked By: L.O.G.

Date: 12/27/2018

Engineer's Opinion of Probable Construction Cost

Project: Dual Tile Replacement for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

DUAL TILE REPLACEMENT (REPAIR)	ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost	
	DISTRICT CONSTRUCTION COSTS							
	1	10" DUAL WALL HDPE TILE	\$ 30.00	LF	600	LF	\$ 18,000.00	
	2	8" DUAL WALL HDPE TILE	\$ 25.00	LF	8800	LF	\$ 220,000.00	
	3	40' x 10" CMP TILE W/ FLARED END	\$ 2,400.00	EA	1	EA	\$ 2,400.00	
	4	40' x 8" CMP TILE W/ FLARED END	\$ 2,200.00	EA	1	EA	\$ 2,200.00	
	5	10" X 8" DUAL WALL HDPE REDUCER	\$ 400.00	EA	1	EA	\$ 400.00	
	6	OUTLET BANK STABILIZATION	\$ 50.00	TON	100	TON	\$ 5,000.00	
	7	LATERAL CONNECTIONS	\$ 1,000.00	EA	7	EA	\$ 7,000.00	
	8	CONCRETE COLLAR	\$ 500.00	EA	4	EA	\$ 2,000.00	
	9	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00	
	10	TILE LOCATION	\$ 150.00	STA	94	STA	\$ 14,100.00	
11	TILE REMOVAL	\$ 5.00	LF	9400	LF	\$ 47,000.00		
		CONSTRUCTION SUBTOTAL					\$ 323,100.00	
		Contingency (15%)					\$ 48,465.00	
		CONSTRUCTION TOTAL					\$ 371,565.00	
		Engr. & Const. Observation (25%)					\$ 92,891.25	
		TOTAL COST					\$ 464,456.25	



By: J.V.S.

Date: 12/20/2018

Checked By: L.O.G.

Date: 12/27/2018

Engineer's Opinion of Probable Construction Cost

Project: Single Tile Replacement for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

SINGLE TILE REPLACEMENT (REPAIR)	ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost	
	DISTRICT CONSTRUCTION COSTS							
	101	12" DUAL WALL PPE or RCP TILE	\$ 35.00	LF	4700	LF	\$ 164,500.00	
	102	40' x 12" CMP TILE W/ FLARED END	\$ 2,400.00	EA	1	EA	\$ 2,400.00	
	103	JUNCTION STRUCTURE	\$ 1,000.00	EA	1	EA	\$ 1,000.00	
	104	OUTLET BANK STABILIZATION	\$ 50.00	TON	50	TON	\$ 2,500.00	
	105	LATERAL CONNECTIONS	\$ 1,000.00	EA	7	EA	\$ 7,000.00	
	106	CONCRETE COLLAR	\$ 500.00	EA	3	EA	\$ 1,500.00	
	107	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00	
	108	TILE LOCATION	\$ 150.00	STA	94	STA	\$ 14,100.00	
109	TILE REMOVAL	\$ 7.00	LF	9400	LF	\$ 65,800.00		
		CONSTRUCTION SUBTOTAL					\$ 263,800.00	
		Contingency (15%)					\$ 39,570.00	
		CONSTRUCTION TOTAL					\$ 303,370.00	
		Engr. & Const. Observation (25%)					\$ 75,842.50	
		TOTAL COST					\$ 379,212.50	



By: J.V.S.

Date: 12/20/2018

Checked By: L.O.G.

Date: 12/27/2018

Engineer's Opinion of Probable Construction Cost

Project: Dual Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

DUAL TILE UPSIZING (1/2" IMPROVEMENT)

ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost
DISTRICT CONSTRUCTION COSTS						
201	12" DUAL WALL PPE or RCP TILE	\$ 35.00	LF	1970	LF	\$ 68,950.00
202	10" DUAL WALL HDPE TILE	\$ 30.00	LF	3900	LF	\$ 117,000.00
203	8" DUAL WALL HDPE TILE	\$ 25.00	LF	3530	LF	\$ 88,250.00
204	40' x 12" CMP TILE W/ FLARED END	\$ 2,400.00	EA	2	EA	\$ 4,800.00
205	12" X 10" DUAL WALL HDPE REDUCER	\$ 400.00	EA	2	EA	\$ 800.00
206	10" X 8" DUAL WALL HDPE REDUCER	\$ 400.00	EA	2	EA	\$ 800.00
207	OUTLET BANK STABILIZATION	\$ 50.00	TON	100	TON	\$ 5,000.00
208	LATERAL CONNECTIONS	\$ 1,000.00	EA	7	EA	\$ 7,000.00
209	CONCRETE COLLAR	\$ 600.00	EA	4	EA	\$ 2,400.00
210	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00
211	INTERCONNECTION STRUCTURES	\$ 1,500.00	EA	9	EA	\$ 13,500.00
212	TILE LOCATION	\$ 150.00	STA	94	STA	\$ 14,100.00
213	TILE REMOVAL	\$ 7.00	LF	9400	LF	\$ 65,800.00
CONSTRUCTION SUBTOTAL						\$ 393,400.00
Contingency (15%)						\$ 59,010.00
CONSTRUCTION TOTAL						\$ 452,410.00
Engr. & Const. Observation (25%)						\$ 113,102.50
TOTAL COST						\$ 565,512.50



By: J.V.S.

Date: 12/20/2018

Checked By: L.O.G.

Date: 12/27/2018

Engineer's Opinion of Probable Construction Cost

Project: Dual Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

DUAL TILE UPSIZING (1" IMPROVEMENT)	ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost	
	DISTRICT CONSTRUCTION COSTS							
	301	15" DUAL WALL PPE OR RCP TILE	\$ 45.00	LF	1970	LF	\$ 88,650.00	
	302	12" DUAL WALL PPE OR RCP TILE	\$ 35.00	LF	3900	LF	\$ 136,500.00	
	303	10" DUAL WALL HDPE TILE	\$ 30.00	LF	2500	LF	\$ 75,000.00	
	304	8" DUAL WALL HDPE TILE	\$ 25.00	LF	1030	LF	\$ 25,750.00	
	305	40' x 15" CMP TILE W/ FLARED END	\$ 2,800.00	EA	2	EA	\$ 5,600.00	
	304	15" X 12" DUAL WALL PPE OR CONCRETE REDUCER	\$ 500.00	EA	2	EA	\$ 1,000.00	
	305	12" X 10" DUAL WALL HDPE REDUCER	\$ 400.00	EA	2	EA	\$ 800.00	
	306	10" X 8" DUAL WALL HDPE REDUCER	\$ 400.00	EA	2	EA	\$ 800.00	
307	OUTLET BANK STABILIZATION	\$ 50.00	TON	100	TON	\$ 5,000.00		
308	LATERAL CONNECTIONS	\$ 1,000.00	EA	7	EA	\$ 7,000.00		
309	CONCRETE COLLAR	\$ 600.00	EA	4	EA	\$ 2,400.00		
310	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00		
311	PRESSURE EQUILIZER	\$ 1,500.00	EA	9	EA	\$ 13,500.00		
312	TILE LOCATION	\$ 150.00	STA	94	STA	\$ 14,100.00		
313	TILE REMOVAL	\$ 7.00	LF	9400	LF	\$ 65,800.00		
CONSTRUCTION SUBTOTAL							\$ 446,900.00	
Contingency (15%)							\$ 67,035.00	
CONSTRUCTION TOTAL							\$ 513,935.00	
Engr. & Const. Observation (25%)							\$ 128,483.75	
TOTAL COST							\$ 642,418.75	



By: J.V.S.

Date: 12/20/2018

Checked By: L.O.G.

Date: 12/27/2018

Engineer's Opinion of Probable Construction Cost

Project: Single Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

SINGLE TILE UPSIZING (1/2" IMPROVEMENT)	ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost	
	DISTRICT CONSTRUCTION COSTS							
	401	15" DUAL WALL PPE OR RCP TILE	\$ 45.00	LF	1000	LF	\$ 45,000.00	
	402	12" DUAL WALL PPE OR RCP TILE	\$ 35.00	LF	3700	LF	\$ 129,500.00	
	403	40' x 15" CMP TILE W/ FLARED END	\$ 2,800.00	EA	1	EA	\$ 2,800.00	
	404	JUNCTION STRUCTURE	\$ 1,000.00	EA	1	EA	\$ 1,000.00	
	405	15" X 12" DUAL WALL PPE OR CONCRETE REDUCER	\$ 500.00	EA	1	EA	\$ 500.00	
	406	OUTLET BANK STABILIZATION	\$ 50.00	TON	50	TON	\$ 2,500.00	
	407	LATERAL CONNECTIONS	\$ 1,000.00	EA	7	EA	\$ 7,000.00	
	408	CONCRETE COLLAR	\$ 600.00	EA	3	EA	\$ 1,800.00	
	409	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00	
	410	TILE LOCATION	\$ 150.00	STA	94	STA	\$ 14,100.00	
411	TILE REMOVAL	\$ 7.00	LF	9400	LF	\$ 65,800.00		
		CONSTRUCTION SUBTOTAL					\$ 275,000.00	
		Contingency (15%)					\$ 41,250.00	
		CONSTRUCTION TOTAL					\$ 316,250.00	
		Engr. & Const. Observation (25%)					\$ 79,062.50	
		TOTAL COST					\$ 395,312.50	



By: J.V.S.

Date: 12/20/2018

Checked By: L.O.G.

Date: 12/27/2018

Engineer's Opinion of Probable Construction Cost

Project: Single Tile Upsizing for D.D. #167

Location: Sections 3 & 4 T86N, R20W Hardin County, Iowa

SINGLE TILE UPSIZING (1" IMPROVEMENT)	ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost	
	DISTRICT CONSTRUCTION COSTS							
	501	18" DUAL WALL PPE OR RCP TILE	\$ 55.00	LF	1000	LF	\$ 55,000.00	
	502	15" DUAL WALL PPE OR RCP TILE	\$ 45.00	LF	2700	LF	\$ 121,500.00	
	503	12" DUAL WALL HDPE TILE	\$ 35.00	LF	1000	LF	\$ 35,000.00	
	504	JUNCTION STRUCTURE	\$ 1,000.00	EA	1	EA	\$ 1,000.00	
	504	40' x 18" CMP TILE W/ FLARED END	\$ 3,000.00	EA	1	EA	\$ 3,000.00	
	505	18" X 15" DUAL WALL PPE OR CONCRETE REDUCER	\$ 600.00	EA	1	EA	\$ 600.00	
	506	15" X 12" DUAL WALL PPE OR CONCRETE REDUCER	\$ 500.00	EA	1	EA	\$ 500.00	
	507	OUTLET BANK STABILIZATION	\$ 50.00	TON	50	TON	\$ 2,500.00	
	508	LATERAL CONNECTIONS	\$ 1,000.00	EA	7	EA	\$ 7,000.00	
	509	CONCRETE COLLAR	\$ 600.00	EA	3	EA	\$ 1,800.00	
	510	PRIVATE TILE CONNECTIONS	\$ 500.00	EA	10	EA	\$ 5,000.00	
511	TILE LOCATION	\$ 150.00	STA	94	STA	\$ 14,100.00		
512	TILE REMOVAL	\$ 7.00	LF	9400	LF	\$ 65,800.00		
		CONSTRUCTION SUBTOTAL					\$ 312,800.00	
		Contingency (15%)					\$ 46,920.00	
		CONSTRUCTION TOTAL					\$ 359,720.00	
		Engr. & Const. Observation (25%)					\$ 89,930.00	
		TOTAL COST					\$ 449,650.00	