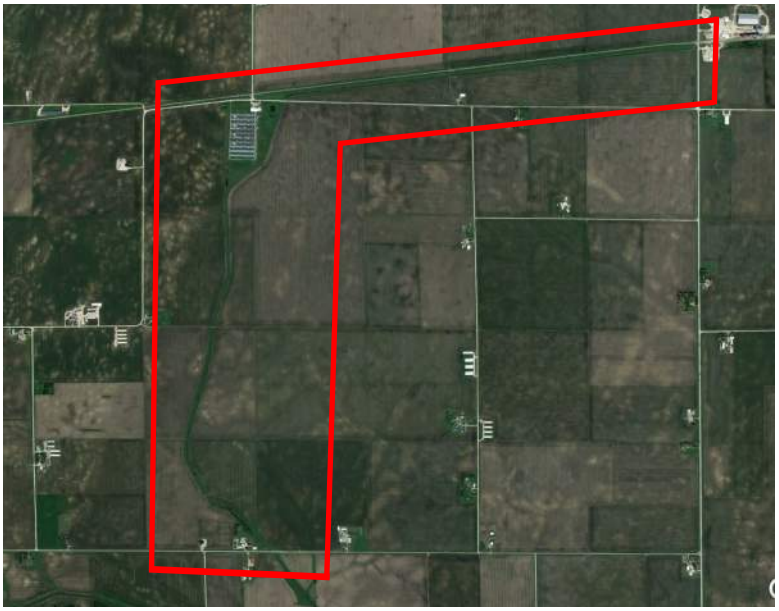


ENGINEER'S REPORT ON REPAIRS TO THE MAIN OPEN DITCH DRAINAGE DISTRICT NO. 18 HARDIN COUNTY, IOWA

JAMES V. SWEENEY LICENSED 2442541 IOWA PROFESSIONAL ENGINEER

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

12/27/2022

JAMES V. SWEENEY, P.E. — DATE

LICENSE NUMBER: 2442541
MY LICENSE RENEWAL DATE IS DECEMBER 31, 2023
PAGES OR SHEETS COVERED BY THIS SEAL:
SHOWN ON TABLE OF CONTENTS

CGA
ENGINEERS • LAND SURVEYORS

CLAPSADDLE-GARBER ASSOCIATES OFFICE LOCATIONS
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

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

Engineer's Report on Repairs to the Main Open Ditch of Drainage District No. 18, Hardin County, Iowa

Table of Contents Pg. 1

Engineer's Report on Repairs to the Main Open Ditch of Drainage District No. 18, Hardin County, Iowa

1.0 INTRODUCTION

A. SCOPE OF WORK – The Landowner District Trustees of Drainage District No. 18 requested Clapsaddle-Garber Associates to investigate and report concerning repairs to the main open ditch of Drainage District No. 18. This report will summarize the history of improvements and repairs, investigate the necessity and feasibility of said repairs, and present an opinion of probable construction costs associated with said repairs. For reference, a copy of the "Request for Repairs" which initiated this process is included in Appendix A.

B. LOCATION – The area of observation was the entire length of the existing main open ditch located in Sections 23, 24, 26, 27, 34, and 35, Township 89 North (T89N), Range 22 West (R22W), and Section 4, Township 88 North (T88N), Range 22 West (R22W), Hardin County, Iowa. Specifically, the downstream limit was the outlet of said main open ditch at the south side of County Highway D25 in the SW¼ of Section 35. Said outlet is approximately 1/3 mile east of D Avenue. Going upstream, the main open ditch goes across Sections 34 & 35 for approximately one mile and crosses into Section 27 approximately 1/3 mile east of the intersection of 150th Street and CC Avenue. Said main open ditch then goes north across Section 27 for approximately 3/4 mile and crosses east into Section 26. It then runs northeast across Section 26 for approximately 1/3 mile where it crosses into the south side of Section 23 just east of the intersection of D Avenue and 140th Street. From there, it continues across Section 23 to the east-northeast for approximately one mile to Section 24, where it continues one more mile to its upstream limit. Said upstream limit is near the west side of County Highway S-27 right of way approximately ¼ mile north of its intersection with 140th Street. For reference, a copy of one of the early Drainage District No. 18 maps showing said main open ditch and the drainage district itself is included in Appendix B.

2.0 DISTRICT HISTORY – The following is a brief summary of the pertinent history of the main open ditch of Drainage District No. 18 as obtained from the Hardin County Auditor's drainage minutes and records.

1910, Sept. 12	Petition to establish a tile drain and open ditch 20 rods west of SW1/4 24-89-22
1911, Jan. 11	Engineer's Report on W.J. Boucher (DD #18) Drainage Petition
1911, Apr. 12	Notice to contractors to submit sealed bids for construction of Hardin County Drainage Ditch 18.
1913, Sept. 9	Engineer's recommendation contractors have completed their contracts and that Supervisors make final settlement to contractors on DD 18 Hardin Co.
1919, Aug. 29	Drainage Engineer's report to Supervisors on DD 18 Hardin County.
1921, Feb. 15	Engineer's report concerning petition asking for converting open ditch on DD 18 to a closed ditch.
1947, Aug. 28	County Engineer's report on Lateral 1 DD 18 to Board of Supervisors.
1953, Sept. 30	Fill ditch and hole on DD 18.
1955, May 2	Bill of Indebtedness, repair holes, 2-6" tile on DD 18.
1955, Jun. 2	Bill of Indebtedness, 4 tile replace on DD 18.
1956, Jul. 28	Bill of Indebtedness, backfill for tile repair and washout on DD 18.
1957, Feb. 2	Bill of Indebtedness, repair tile in DD 18 section 24.
1957, Jun. 4	Bill of Indebtedness, repair tile in DD 18.
1959, Jul. 9	Bill of Indebtedness, repair tile in DD 18.
1961, Aug. 10	Bill of Indebtedness, repair bulkhead on DD 18.
1961, Oct. 3	Warrant 4031 from Hardin Co. Engineering Dept for work done on DD 18.
1961, Dec. 1	Bill of Indebtedness, repair 30" tile on DD 18, replace 6 tile.
1965, Jul. 15	Bill of Indebtedness, repair DD 18, secondary road fund.
1965, Aug. 11	Bill of Indebtedness, tile repair on DD 18.
1966, May 25	Bill of Indebtedness, Engineering service, retrace original plat.
1966, Sept. 3	Bill of Indebtedness, rock for bulkhead DD 18.
1971, Jun. 16	Bill of Indebtedness, drive piling DD 18, secondary road fund.
1971, Jun. 16	Bill on Indebtedness, drive piling DD 18 secondary road fund.
1976, Jan. 20	Preliminary Engineer's Report on Proposed Improvement for Drainage District 18.
1976, Mar. 8	Board of Trustees in the matter of DD 18 hearing to read petition for requested Improvements to DD 18, Engineers report was presented on improvements.

1976, Apr. 19	Board of Trustees in the matter of DD 18 Hardin Co. hearing in the matter of constructing recommended improvements and reclassification to DD 18.
1976, May 4	Report of appraisers appointed to assess damages for proposed improvement project for DD 18 Hardin County.
1976, May 10	Board of Trustees in the matter of DD 18 Hardin Co. report of appraisers to assess damages on the proposed improvement project
1976, Nov. 19	Report of commissioners appointed to classify the lands, fix percentage of benefits, and apportion and assess the costs of the improvements to DD 18.
1976, Dec. 20	Amended report of appraisers appointed to assess damages for proposed improvements project DD 18 Hardin County
1977, Jan. 5	Hardin Co. Board of Trustees, in the matter of DD 18 Hardin Co. hearing on Classification, damages, and approval or disapproval of proposed improvements.
1977, Jan. 21	Hardin Co. Board of Trustees, in the matter of DD 18 Hardin Co. assessments for Improvement project to DD 18 Hardin County.
1977, Feb. 3	Notice to contractors, construction of Harding Co. Drainage District 18 Improvements.
1977, Feb. 7	Specifications for Improvements to DD 18 Hardin County for 1977 construction with Contract forms and detailed specifications.
1977, Apr. 19	Drainage District Trustees met for the purpose of setting a date for bid letting for proposed Drainage District 18 improvements.
1977, Apr. 25	Notice to contractors, construction of Drainage Improvements Drainage District No. 18 Hardin County.
1977, May 11	Bid letting for improvements to Drainage District #18 Hardin County, Iowa also contracts awarded for Drainage District #18 improvement Project.
1977, May 17	Contract with Holland Contracting for construction of improvements to Drainage Ditch 18 Hardin County.
1977, May 18	Contract with Reding Gravel and Excavating for construction of improvements to Drainage Ditch #18, Hardin County.
1977, May 19	Contract with Will and Associates for the construction of improvements to Drainage Ditch 18 Hardin County.
1977, Oct. 7	Contract for construction of Drainage District 18 Improvement project Hardin County.
1977, Oct. 7	Engineering services, Ryken Engineering for Hardin County DD 18 Improvement Project.
1977, Oct. 7	Bill of Indebtedness Engineering services for improvement to common outlet DD 17 and 18 Hardin County.

1978, Apr. 25	Final estimate for work under contract with Holland Construction for Improvements to Drainage District #18, Hardin County, Iowa.
1978, May 4	Drainage District #18, Hardin County Iowa – Improvement Project (Plans and Spec. dated 2/7/77) Engineer reports project complete.
1978, Jun. 15	Iowa DOT, payment voucher for installation of U.S. 20 crossing on Lateral #3 of Drainage District #18.
1978, Sept. 20	Report of commissioners appointed to classify the lands, fix the percentages of benefits, and apportion and assess the costs of the improvement to DD# 18 Hardin County, Iowa.
1978, Oct.	Drainage assessment to Leonard and Elena Ites.

3.0 INVESTIGATION – For the investigation portion of this report, field and office investigations were performed. For the field portion, the Main open ditch was viewed in the field and visible defects (i.e. beaver activity, bank washouts/sloughs, vegetative growth, tiles with improper outlets, etc) were noted. This was done in conjunction with surveying of available spot elevations of the edge of water and toes of bank. For reference, a map of the observation area is included in Appendix C.

For the office investigation, available copies of the above-mentioned Engineer's Reports, Plans and Profiles along with the district history were reviewed. Said review showed that despite three instances of plans for a cleanout being completed, no cleanouts main open ditch were recorded to have been performed since the original construction of the Main open ditch nor the construction of the Main open ditch extension. Apart from the Main open ditch extension, only minor repairs were found in the recorded history for both the original and the extension.

Using the above survey information, a profile of the main open dich existing flowline was generated. For comparison purposes, it was necessary to plot the design grade in effect on the profile. Comparison of the two then allowed for approximation of where and how much siltation is in the open ditch. For reference, a copy of said preliminary profile is included in Appendix D.

4.0 DISCUSSION AND CONCLUSIONS – Based on the above investigation, there are really six issues which are restricting drainage and/or leading to degradation of the district facilities. They are as follows:

A. Using the above mentioned profile, the main open ditch has significant siltation along its length between Sta. 94+00 until it's point of termination at Sta. 219+86 (approximately 12,586 feet). This siltation ranges in depth from ¼'± to 4'± with the most extreme siltation being associated with beaver dams and the general siltation depth at around 2½'±. Downstream of Sta. 94+00 the Main open ditch was found to have generally scoured itself of siltation, with only one point of siltation appearing approximately 900' upstream of the outlet.

   In addition to siltation within the flowline of the Main open ditch, shelves of accumulated soil and/or sloughs are present throughout the entirety of such. Within these shelves, the flowline is narrower, and in some cases meanders.

   Without a cleanout, the silt will reduce the cross-sectional area of the ditch through soil deposition into the ditch bottom. A reduction in the cross-sectional area directly results in a reduction in the volume of water that the ditch can convey. This in turn backs water and silt up into the tiles that outlet into the main open ditch. This effect was visible as the main tile outlet and private tile outlets where the soil base of such were below the flow line (silted in). In two cases, the private tile outlets were almost entirely submerged in siltation. In normal-flow conditions, water will submerge most, if not all, of these outlets. It is unclear if there are other existing tile outlets which are partially or totally covered. For reference, the preliminary Main open ditch profile is included in Appendix D.

B. At a minimum of three areas within the Main open ditch, three beaver dams were observed to have been constructed. Due to the time between when the observation was completed and the time of reporting, this number may have fluctuated. The depth of water may also affect the visibility of these structures, as high flow would obscure visibility of smaller dams. These dams reduce drainage by backing water into said tile outlets and slow water. This thereby decreases water velocity and encourages siltation. For reference, a map of the Main open ditch showing said beaver dams is included in Appendix D.

C. Along the length of the main open ditch, there are two areas of heavy vegetative growth, and intermittent areas of light (trees and brush) which can impede drainage in three ways. First, when any of these trees die or lose limbs, the resulting debris can enter the drainage ditch, intertwine, and create "jams", which reduces the volume of water that the ditch can convey. Tree-fall limbs may also divert the flow directly into the face bank, causing erosion and/or sloughs, which is visible in at least one case closer to the outlet of the district. Second, the roots of said trees naturally seek water sources. As such, said roots can infiltrate and plug tile lines which discharge into said open ditch. Obviously, the trees and the tile lines must be in the same vicinity for this to happen. Finally, trees provide an ample building material for beaver, who construct dams. Due to the existence of beavers in the main open ditch already, continued tree growth will only encourage more beaver activity. For reference, a map of the Main open ditch and said vegetative growth is included in Appendix D.

5.0 REPAIR METHOD – To repair the above discussed issues, the following repairs are recommended:

- Remove all siltation within the main open ditch and return it to the original design flowline and grades
- Install additional corrugated metal surface drains with flared end sections where dictated by topography and spoil bank height.
- Replace existing broken surface drains with corrugated metal surface drains with flared end sections.
- Install corrugated metal tile outlets with rodent guards for existing tile outlets which do not have them.
- Install rodent guards on all existing corrugated metal tile outlets that don't have them.
- Remove all trees and brush on the slopes of the bank or on the spoil bank.

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

- The excavation depths used are those that closely meet the current Main open ditch design.
- The partial Main open ditch would remove excess soil and debris in the existing Main open ditch in those areas.
- The only portion of the Main open ditch which is being cleaned would be as detailed in Appendix E. The rest of the Main open ditch was investigated but was found to be sufficiently free of excess siltation.
- The cleanout would use slopes/grades that match or closely meet the original design.
- The cleanout will not significantly increase the drainage capacity of the Main open ditch beyond its original design.
- 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 offices 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 intend to increase capacity would be considered a repair. Per Iowa Code Chapter 468.126.1.g, the right of remonstrance does not apply to the proposed repairs

6.0 OPINION OF PROBABLE CONSTRUCTION COST – Using the above method of repair, an itemized list of project quantities and associated opinion of probable construction cost was compiled and is included in Appendix F of this report. Since the length of open ditch that has siltation is easier to define when compared to the volume of siltation, the repair for siltation is shown in said appendix in units of stations (STA) or 100-foot intervals. It should be noted that said costs includes materials, labor, and equipment supplied by the contractor to complete the necessary repair and includes 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 damage, 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.

METHOD	DISTRICT COST	ROAD CROSSING COST
Main Open Ditch Cleanout	542,454.00	19,536.00
	Total:	561,990.00

7.0 OWNERSHIP AND CLASSIFICATIONS – Any and all information concerning ownership of lands and classifications of said lands within Drainage District No. 18 can be obtained from the Hardin County Auditor's office.

8.0 RECOMMENDATIONS – To summarize, the repair would return the main open ditch to its original design grades and reduce the chances of backing water and silt up in the tiles discharging into it. Therefore, it is recommended that the 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 repair.
- Adopt the recommendation of the Engineer's Report.
- Direct plans and specifications for the proposed repair 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.

APPENDIX A

Drainage Work Order Request For Repair

Hardin County

Date 3/18/2021

Work Order # _____

District # #18

Lateral Main Open Ditch

Fund # _____

Township Alden

Section _____ Twp 89 Rge 22 Qtr Sec _____

23, 24, 26, 27, 34

Repair Requested By Everett Harms

Address 15574 Co. Hwy D20, Alden

Phone 641-340-0289

Landowner _____

Address _____

Phone _____

Request Taken By _____

Available for Repair Now? ☒ Yes

Date Available _____

Problem Description

Everett Harms and Robert Schager have discussed and would like an investigation into the amount of siltation and lack of good flow through the Main Open ditch to determine necessity of a cleanout. Also report beaver action taking place upstream of the livestock barns (NW¼ NW¼ Section 26).

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:* _____

APPENDIX B

PLAT OF IMPROVEMENTS TO BOUCHER DRAINAGE DIST. NO. 18 HARDIN COUNTY, IOWA

RANGE 22 WEST — RANGE 21 WEST

T. - 89 - N.

T. - 88 - N.

NORTH

SCALE 1"=1000'

LEGEND:

- DISTRICT BOUNDARY #18
- SUB-DIVIDE
- DISTRICT BOUNDARY #17
- NEW TILE LINE
- NEW OPEN CHANNEL
- JUNCTION BOX

PROPOSED DRAINAGE SCHEDULE

MAIN DRAIN

STA. 0+00 (EXTEN.)	TO STA. 21+00 (EXTEN.)	OUTLET EXTENSION	OPEN CHANNEL
STA. 21+00 (EXTEN.)	TO STA. 32+60 (EXTEN.)	EXISTING CHANNEL	NO CHANGE
EQUATION STA. 32+60 (EXTEN.) = STA. 0+00 (ORIG.)			
STA. 0+00 (ORIG.)	TO STA. 112+00 (ORIG.)	EXISTING OPEN CHANNEL	NO CHANGE
STA. 112+00	TO STA. 222+00	NEW MAIN DRAIN	OPEN CHANNEL

UPPER MAIN (STA. 243+00 UPPER MAIN = STA. 222+00 MAIN DRAIN)

STA. 243+00	TO STA. 255+00	28" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 255+00	TO STA. 275+00	26" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 275+00	TO STA. 288+00	22" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 288+00	TO STA. 303+00	20" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 1 (STA. 0+00 LAT. 1 = STA. 112+00 MAIN DRAIN)

STA. 0+00	TO STA. 20+00	22" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 20+00	TO STA. 35+00	20" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 35+00	TO STA. 45+00	15" E.Q. DRAIN TILE @ 0.22 % GRADE
STA. 45+00	TO STA. 55+00	14" E.Q. DRAIN TILE @ 0.22 % GRADE
STA. 55+00	TO STA. 65+00	10" E.Q. DRAIN TILE @ 0.24 % GRADE

LATERAL NO. 2 (STA. 0+00 LAT. 2 = STA. 137+00 MAIN DRAIN)

STA. 0+00	TO STA. 7+50	18" 1500 D DRAIN TILE @ 0.40 % GRADE
STA. 7+50	TO STA. 12+00	14" E.Q. DRAIN TILE @ 0.20 % GRADE
STA. 12+00	TO STA. 22+00	12" E.Q. DRAIN TILE @ 0.20 % GRADE
STA. 22+00	TO STA. 27+00	10" E.Q. DRAIN TILE @ 0.20 % GRADE

LATERAL NO. 3 (STA. 0+00 LAT. 3 = STA. 166+00 MAIN DRAIN)

STA. 0+00	TO STA. 5+00	32" 1500 D DRAIN TILE @ 0.10 % GRADE
STA. 5+00	TO STA. 35+00	24" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 35+00	TO STA. 45+00	20" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 4 (STA. 10+60 LAT. 4 = STA. 186+50 MAIN DRAIN)

STA. 10+60	TO STA. 15+00	20" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 15+00	TO STA. 30+00	18" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 30+00	TO STA. 35+00	14" E.Q. DRAIN TILE @ 0.15 % GRADE

LATERAL NO. 5A (STA. 0+00 LAT. 5A = STA. 35+00 LAT. 1)

STA. 0+00	TO STA. 8+50	10" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 5B (STA. 0+00 LAT. 5B = STA. 152+00 MAIN DRAIN)

STA. 0+00	TO STA. 5+65	10" E.Q. DRAIN TILE @ 0.20 % GRADE

LATERAL NO. 6 (STA. 0+00 LAT. 6 = STA. 214+00 MAIN DRAIN)

STA. 0+00	TO STA. 6+00	20" 1500 D DRAIN TILE @ 0.10 % GRADE

SHEET NO. 1

APPENDIX C

PLAT OF IMPROVEMENTS TO BOUCHER DRAINAGE DIST. NO. 18 HARDIN COUNTY, IOWA

NORTH

SCALE 1"=1000'

LEGEND:

- DISTRICT BOUNDARY #18
- SUB-DIVIDE
- DISTRICT BOUNDARY #17
- NEW TILE LINE
- NEW OPEN CHANNEL
- JUNCTION BOX

PROPOSED DRAINAGE SCHEDULE

MAIN DRAIN

STA. 0+00 (EXTEN.)	TO STA. 21+00 (EXTEN.)	OUTLET EXTENSION	OPEN CHANNEL
STA. 21+00 (EXTEN.)	TO STA. 32+60 (EXTEN.)	EXISTING CHANNEL	NO CHANGE
EQUATION STA. 32+60 (EXTEN.) = STA. 0+00 (ORIG.)			
STA. 0+00 (ORIG.)	TO STA. 112+00 (ORIG.)	EXISTING OPEN CHANNEL	NO CHANGE
STA. 112+00	TO STA. 222+00	NEW MAIN DRAIN	OPEN CHANNEL

UPPER MAIN (STA. 243+00 UPPER MAIN = STA. 222+00 MAIN DRAIN)

STA. 243+00	TO STA. 255+00	28" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 255+00	TO STA. 275+00	26" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 275+00	TO STA. 288+00	22" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 288+00	TO STA. 303+00	20" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 1 (STA. 0+00 LAT. 1 = STA. 112+00 MAIN DRAIN)

STA. 0+00	TO STA. 20+00	22" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 20+00	TO STA. 35+00	20" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 35+00	TO STA. 45+00	15" E.Q. DRAIN TILE @ 0.22 % GRADE
STA. 45+00	TO STA. 55+00	14" E.Q. DRAIN TILE @ 0.22 % GRADE
STA. 55+00	TO STA. 65+00	10" E.Q. DRAIN TILE @ 0.24 % GRADE

LATERAL NO. 2 (STA. 0+00 LAT. 2 = STA. 137+00 MAIN DRAIN)

STA. 0+00	TO STA. 7+50	18" 1500 D DRAIN TILE @ 0.40 % GRADE
STA. 7+50	TO STA. 12+00	14" E.Q. DRAIN TILE @ 0.20 % GRADE
STA. 12+00	TO STA. 22+00	12" E.Q. DRAIN TILE @ 0.20 % GRADE
STA. 22+00	TO STA. 27+00	10" E.Q. DRAIN TILE @ 0.20 % GRADE

LATERAL NO. 3 (STA. 0+00 LAT. 3 = STA. 166+00 MAIN DRAIN)

STA. 0+00	TO STA. 5+00	32" 1500 D DRAIN TILE @ 0.10 % GRADE
STA. 5+00	TO STA. 35+00	24" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 35+00	TO STA. 45+00	20" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 4 (STA. 10+60 LAT. 4 = STA. 186+50 MAIN DRAIN)

STA. 10+60	TO STA. 15+00	20" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 15+00	TO STA. 30+00	18" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 30+00	TO STA. 35+00	14" E.Q. DRAIN TILE @ 0.15 % GRADE

LATERAL NO. 5A (STA. 0+00 LAT. 5A = STA. 35+00 LAT. 1)

STA. 0+00	TO STA. 8+50	10" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 5B (STA. 0+00 LAT. 5B = STA. 152+00 MAIN DRAIN)

STA. 0+00	TO STA. 5+65	10" E.Q. DRAIN TILE @ 0.20 % GRADE

LATERAL NO. 6 (STA. 0+00 LAT. 6 = STA. 214+00 MAIN DRAIN)

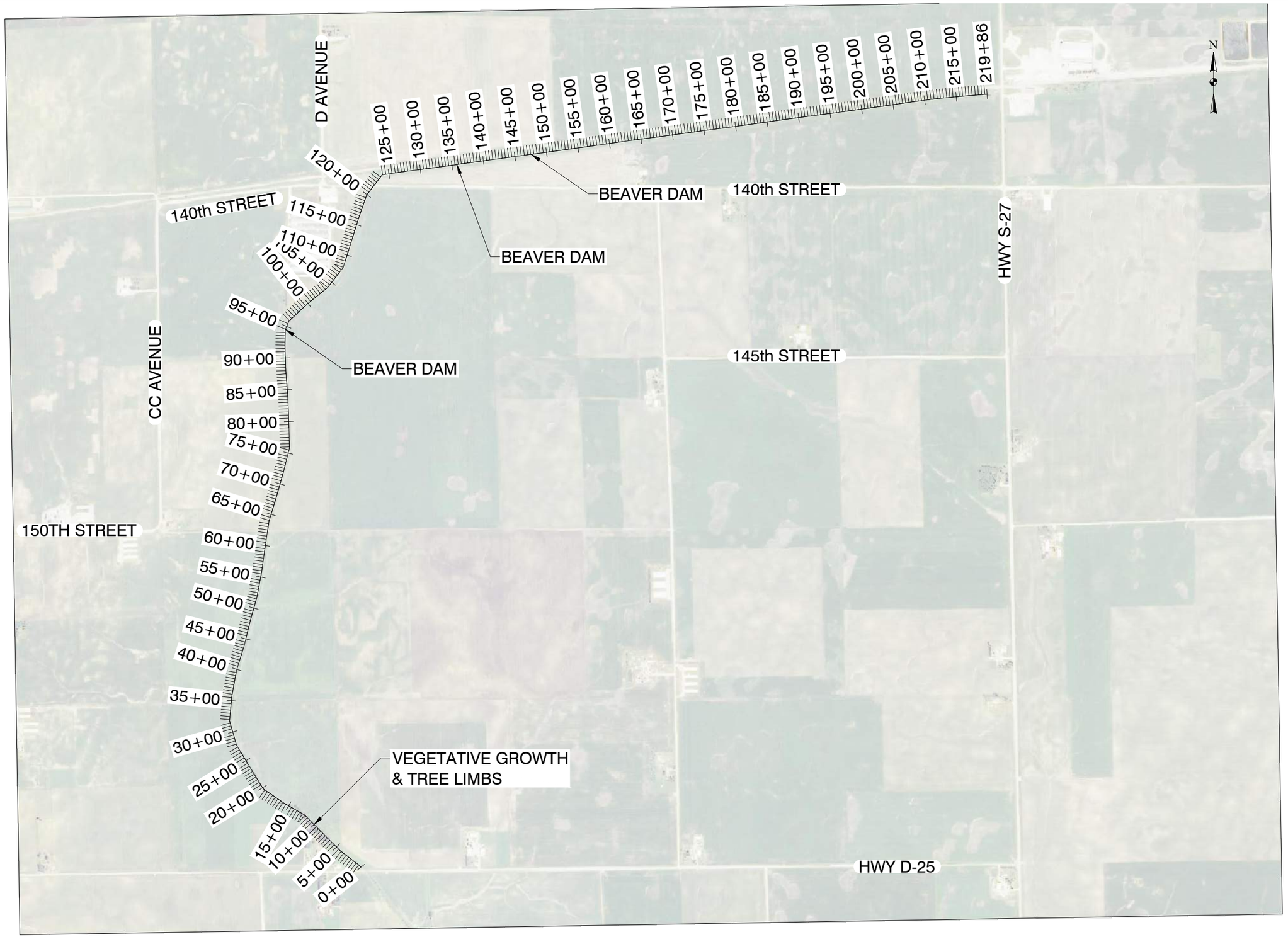
STA. 0+00	TO STA. 6+00	20" 1500 D DRAIN TILE @ 0.10 % GRADE

ORIGINAL DRAINAGE DISTRICT 18 BOUNDARY

AREA OF OBSERVATION

SHEET NO. 1

APPENDIX D



GRAPHIC SCALE
0 750' 1500'

NO.	REVISION	BY	DATE	NO.	REVISION	BY	DATE

CGA
Clapsaddle-Garber Associates, Inc
739 Park Avenue
Ackley, Iowa 50601
Ph 641-847-3273
www.cgaconsultants.com

DESIGNED: JVS DATE: ####
DRAWN: JVS DATE: ####
CHECKED: LOG DATE: ####
APPROVED: LOG DATE: ####

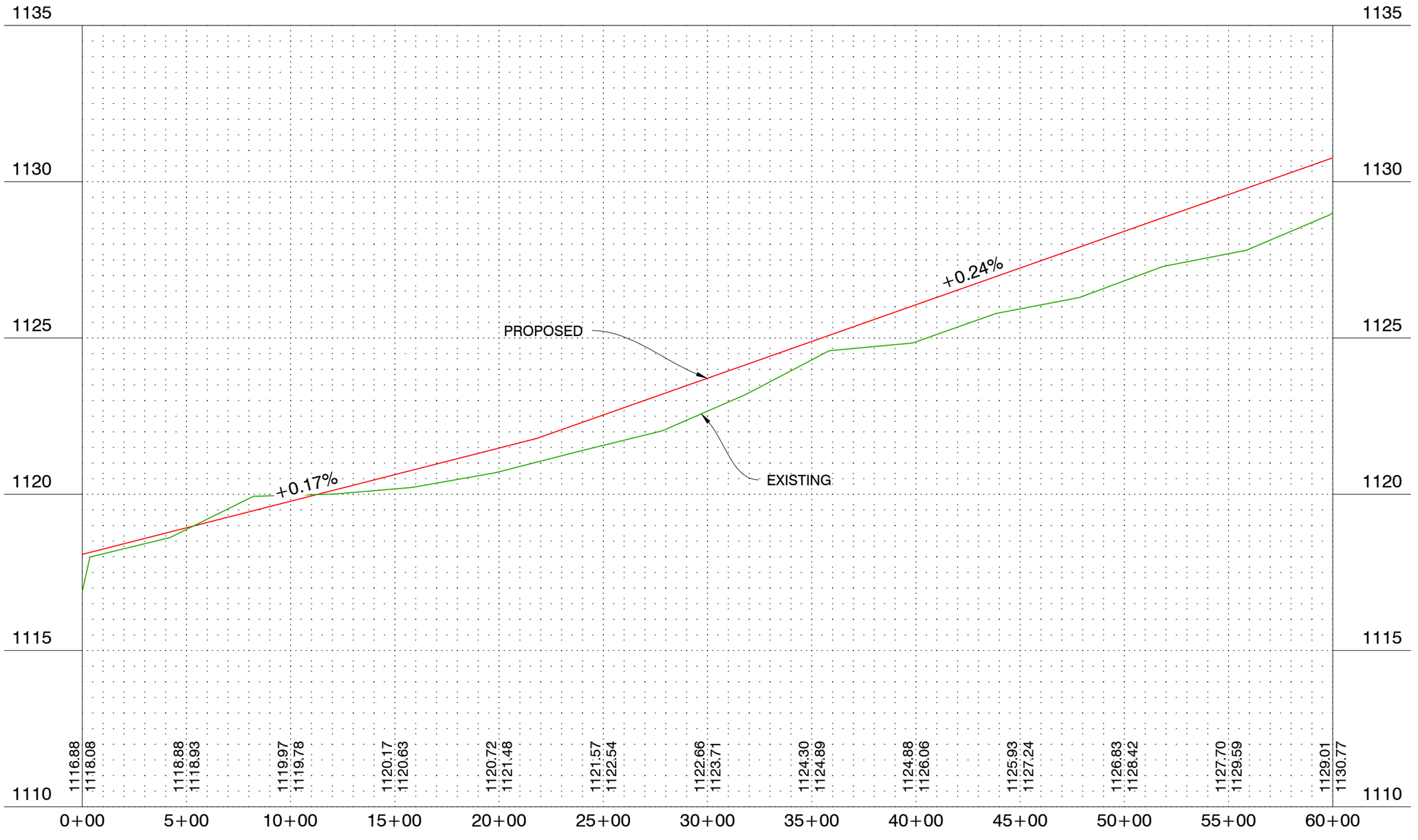
DRAINAGE DISTRICT 18
HARDIN COUNTY, IOWA

PLANVIEW

PROJECT NO. 6737.1
SHEET NO. 1of 5

J:\6737.1-00\dwgs\Topography\6737.1-TOPO-2.dwg - 1 - 10-21-22 - 3:26pm - JVS333

STATION 00+00.00 - 60+00.00



GRAPHIC SCALE
0 250' 500'

NO.	REVISION	BY	DATE	NO.	REVISION	BY	DATE

CGA
Clapsaddle-Garber Associates, Inc
739 Park Avenue
Ackley, Iowa 50601
Ph 641-847-3273
www.cgaconsultants.com

DESIGNED: ZJS DATE: ####
DRAWN: JMG DATE: ####
CHECKED: ZJS DATE: ####
APPROVED: LOG DATE: ####

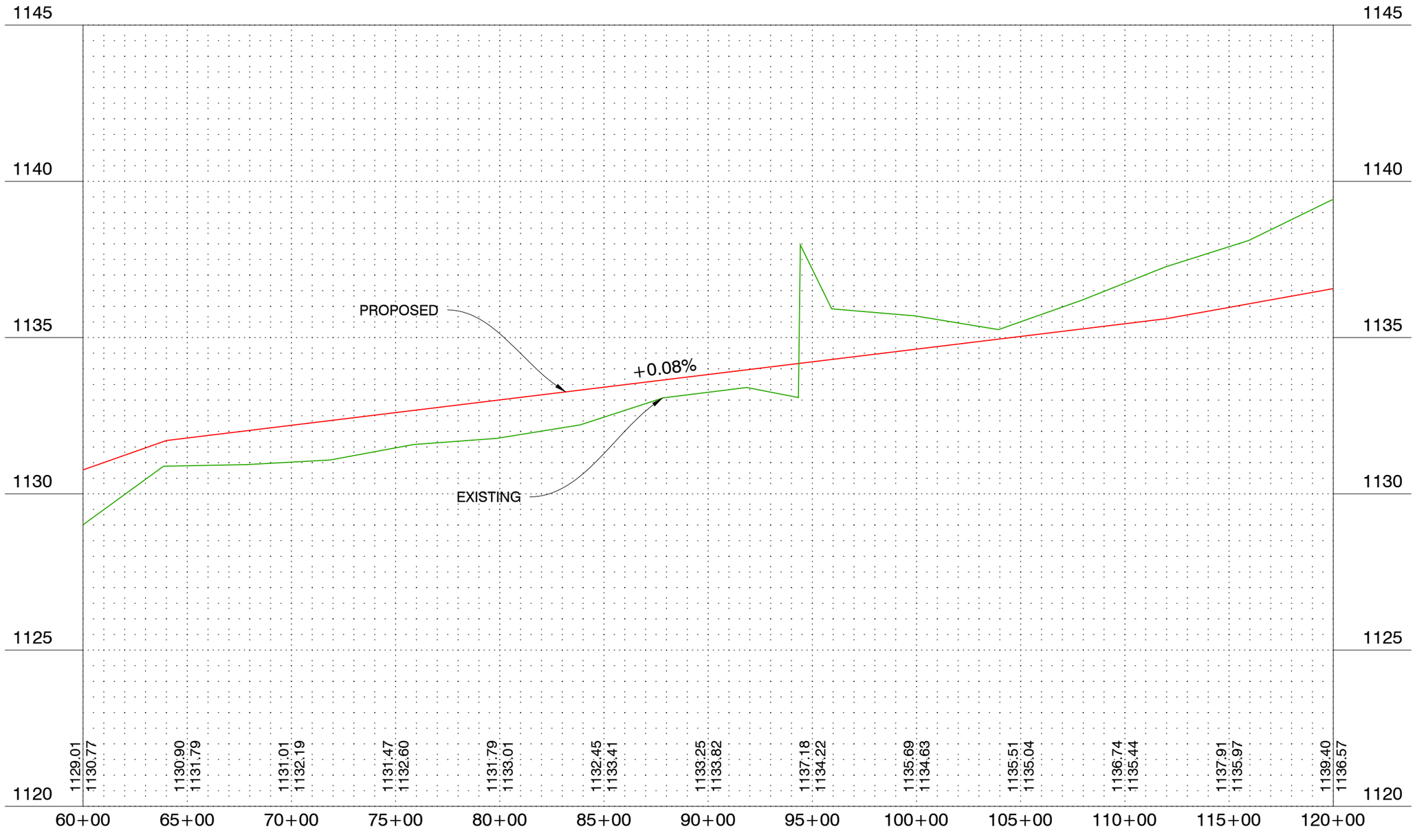
DRAINAGE DISTRICT 18
HARDIN COUNTY, IOWA

PROFILE VIEWS

PROJECT NO. 6737.1
SHEET NO. 2 OF 5

J:\6737.1-dd\dwgs\Topography\6737.1-TOPO-2.dwg - 2 - 10-21-22 - 3:26pm - JVS33

STATION 60+00.00 - 120+00.00



GRAPHIC SCALE
0 250' 500'

NO.	REVISION	BY	DATE	NO.	REVISION	BY	DATE

CGA
Clapsaddle-Garber Associates, Inc
739 Park Avenue
Ackley, Iowa 50601
Ph 641-847-3273
www.cgaconsultants.com

DESIGNED: ZJS DATE: ####
DRAWN: JMG DATE: ####
CHECKED: ZJS DATE: ####
APPROVED: LOG DATE: ####

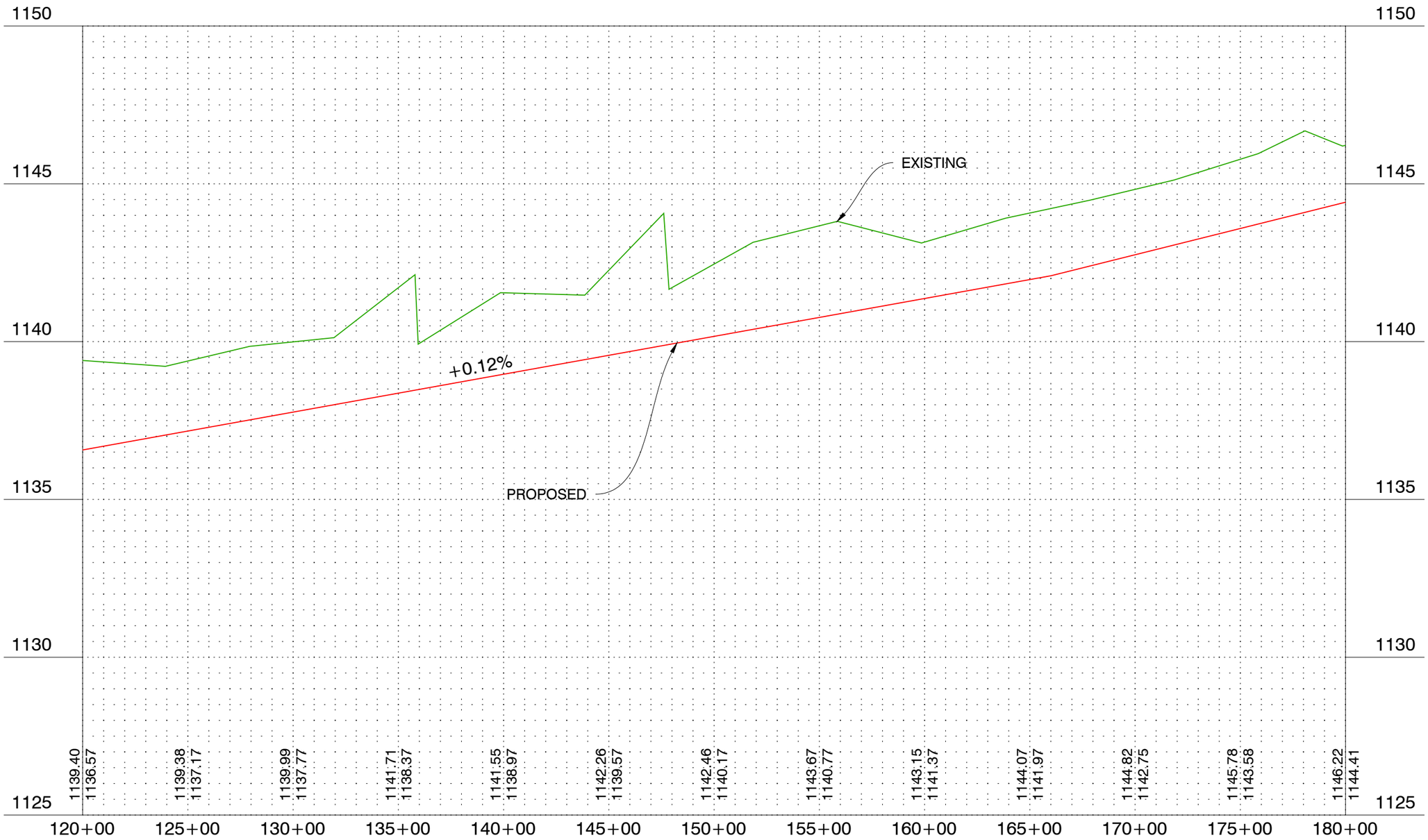
DRAINAGE DISTRICT 18
HARDIN COUNTY, IOWA

PROFILE VIEWS

PROJECT NO. 6737.1
SHEET NO. 3 OF 5

J:\6737.1-dd\dwgs\Topography\6737.1-TOPO-2.dwg - 3 - 10-21-22 - 3:26pm - JVS33

STATION 120+00.00 - 180+00.00



GRAPHIC SCALE
0 250' 500'

NO.	REVISION	BY	DATE	NO.	REVISION	BY	DATE

CGA
Clapsaddle-Garber Associates, Inc
739 Park Avenue
Ackley, Iowa 50601
Ph 641-847-3273
www.cgaconsultants.com

DESIGNED: ZJS DATE: ####
DRAWN: JMG DATE: ####
CHECKED: ZJS DATE: ####
APPROVED: LOG DATE: ####

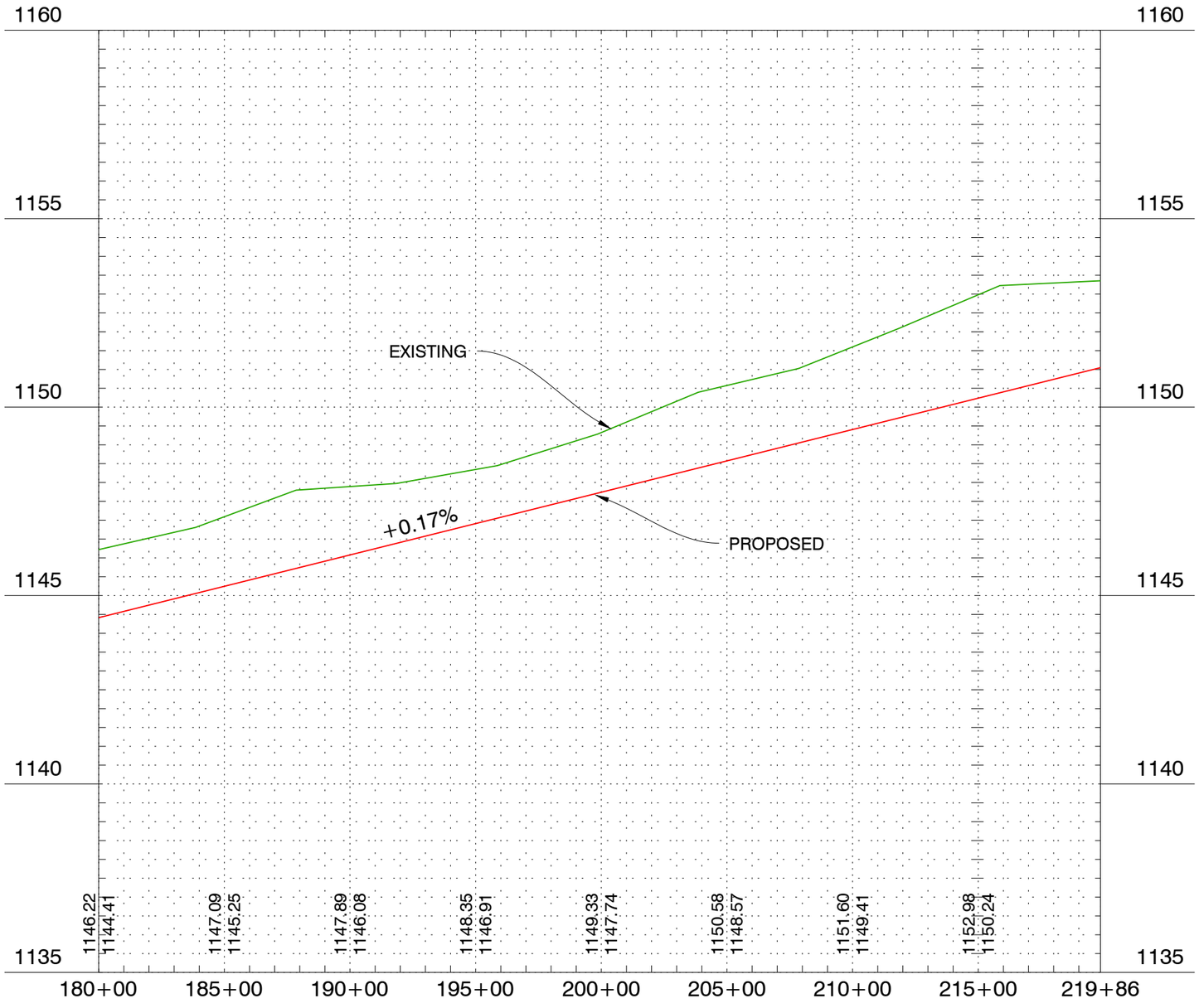
DRAINAGE DISTRICT 18
HARDIN COUNTY, IOWA

PROFILE VIEWS

PROJECT NO. 6737.1
SHEET NO. 4 OF 5

J:\6737.1-dd\dwgs\Topography\6737.1-TOPO-2.dwg - 4 - 10-21-22 - 3:26pm - JVS333

STATION 180+00.00 - 219+86.23



GRAPHIC SCALE
0 250' 500'

NO.	REVISION	BY	DATE	NO.	REVISION	BY	DATE

CGA
Clapsaddle-Garber Associates, Inc
739 Park Avenue
Ackley, Iowa 50601
Ph 641-847-3273
www.cgaconsultants.com

DESIGNED: ZJS DATE: ####
DRAWN: JMG DATE: ####
CHECKED: ZJS DATE: ####
APPROVED: LOG DATE: ####

DRAINAGE DISTRICT 18
HARDIN COUNTY, IOWA

PROFILE VIEWS

PROJECT NO. 6737.1
SHEET NO. 5 OF 5

J:\6737.1-dd\dwgs\Topography\6737.1-TOPO-2.dwg - 5 - 10-21-22 - 3:26pm - JVS333

APPENDIX E

PLAT OF IMPROVEMENTS TO BOUCHER DRAINAGE DIST. NO. 18 HARDIN COUNTY, IOWA

NORTH

SCALE 1"=1000'

LEGEND:

- DISTRICT BOUNDARY #18
- SUB-DIVIDE
- DISTRICT BOUNDARY #17
- NEW TILE LINE
- NEW OPEN CHANNEL
- JUNCTION BOX

PROPOSED DRAINAGE SCHEDULE

MAIN DRAIN

STA. 0+00 (EXTEN.)	TO STA. 21+00 (EXTEN.)	OUTLET EXTENSION	OPEN CHANNEL
STA. 21+00 (EXTEN.)	TO STA. 32+60 (EXTEN.)	EXISTING CHANNEL	NO CHANGE
EQUATION STA. 32+60 (EXTEN.) = STA. 0+00 (ORIG.)			
STA. 0+00 (ORIG.)	TO STA. 112+00 (ORIG.)	EXISTING OPEN CHANNEL	NO CHANGE
STA. 112+00	TO STA. 222+00	NEW MAIN DRAIN	OPEN CHANNEL

UPPER MAIN (STA. 243+00 UPPER MAIN = STA. 222+00 MAIN DRAIN)

STA. 243+00	TO STA. 255+00	28" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 255+00	TO STA. 275+00	26" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 275+00	TO STA. 288+00	22" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 288+00	TO STA. 303+00	20" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 1 (STA. 0+00 LAT. 1 = STA. 112+00 MAIN DRAIN)

STA. 0+00	TO STA. 20+00	22" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 20+00	TO STA. 35+00	20" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 35+00	TO STA. 45+00	15" E.Q. DRAIN TILE @ 0.22 % GRADE
STA. 45+00	TO STA. 55+00	14" E.Q. DRAIN TILE @ 0.22 % GRADE
STA. 55+00	TO STA. 65+00	10" E.Q. DRAIN TILE @ 0.24 % GRADE

LATERAL NO. 2 (STA. 0+00 LAT. 2 = STA. 137+00 MAIN DRAIN)

STA. 0+00	TO STA. 7+50	18" 1500 D DRAIN TILE @ 0.40 % GRADE
STA. 7+50	TO STA. 12+00	14" E.Q. DRAIN TILE @ 0.20 % GRADE
STA. 12+00	TO STA. 22+00	12" E.Q. DRAIN TILE @ 0.20 % GRADE
STA. 22+00	TO STA. 27+00	10" E.Q. DRAIN TILE @ 0.20 % GRADE

LATERAL NO. 3 (STA. 0+00 LAT. 3 = STA. 166+00 MAIN DRAIN)

STA. 0+00	TO STA. 5+00	32" 1500 D DRAIN TILE @ 0.10 % GRADE
STA. 5+00	TO STA. 35+00	24" E.Q. DRAIN TILE @ 0.10 % GRADE
STA. 35+00	TO STA. 45+00	20" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 4 (STA. 10+60 LAT. 4 = STA. 186+50 MAIN DRAIN)

STA. 10+60	TO STA. 15+00	20" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 15+00	TO STA. 30+00	18" E.Q. DRAIN TILE @ 0.15 % GRADE
STA. 30+00	TO STA. 35+00	14" E.Q. DRAIN TILE @ 0.15 % GRADE

LATERAL NO. 5A (STA. 0+00 LAT. 5A = STA. 35+00 LAT. 1)

STA. 0+00	TO STA. 8+50	10" E.Q. DRAIN TILE @ 0.10 % GRADE

LATERAL NO. 5B (STA. 0+00 LAT. 5B = STA. 152+00 MAIN DRAIN)

STA. 0+00	TO STA. 5+65	10" E.Q. DRAIN TILE @ 0.20 % GRADE

LATERAL NO. 6 (STA. 0+00 LAT. 6 = STA. 214+00 MAIN DRAIN)

STA. 0+00	TO STA. 6+00	20" 1500 D DRAIN TILE @ 0.10 % GRADE

ORIGINAL DRAINAGE DISTRICT 18 BOUNDARY

AREA OF TREE REMOVAL & CLEANOUT

AREA OF CLEANOUT

SHEET NO. 1

APPENDIX F

CGA
ENGINEERS • LAND SURVEYORS

By: J.V.S.
Date: 11/21/2022
Checked By: L.O.G.
Date: 11/22/2022

Engineer's Opinion of Probable Construction Cost

Project: Main Open Ditch Repair for D.D. #18

Location: Sections 23, 24, 26, 27, 34, 35, T89N, R22W, Hardin County, Iowa

OPEN DITCH REPAIR

ITEM #	DESCRIPTION	Unit Cost	Units	Quantity	Units	Total Cost
	CONSTRUCTION COSTS					
100	OPEN DITCH CLEANOUT	$ 1,200.00	STA	131	STA	157,200.00
101	30" CMP OUTLET	$ 150.00	FT	40	FT	6,000.00
102	RIP-RAP	$ 90.00	TN	50	TN	4,500.00
103	SURFACE DRAINS	$ 2,000.00	EA	26	EA	52,000.00
104	PRIVATE TILE OUTLETS	$ 1,500.00	EA	13	EA	19,500.00
105	CONCRETE COLLAR	$ 1,100.00	EA	8	EA	8,800.00
106	30" RODENT GUARD & ANTI-SEEP COLLAR	$ 700.00	EA	1	EA	700.00
107	PERMANENT SEEDING	$ 500.00	STA	131	STA	65,500.00
108	SEEDING WARRANTY	$ 32,750.00	LS	1	LS	32,750.00
109	STORMWATER POLLUTION PREVENTION & FLOATING SILT CURTAIN	$ 7,000.00	LS	1	LS	7,000.00
110	BEAVER DAM REMOVAL	$ 1,000.00	EA	3	EA	3,000.00
111	TREE REMOVAL	$ 6,000.00	STA	9	STA	54,000.00
		CONSTRUCTION SUBTOTAL				410,950.00
		Contingency (10%)				41,095.00
		CONSTRUCTION TOTAL				**452,045.00**
		Engr. & Const. Observation (20%)				90,409.00
		TOTAL COST				**542,454.00**
	CONSTRUCTION COSTS WITHIN ROAD RIGHT OF WAY					
200	CULVERT CLEANOUT	$ 35.00	LF	80	LF	*$ 2,800.00*
201	SURFACE DRAINS	$ 2,000.00	EA	4	EA	*$ 8,000.00*
202	PERMANENT SEEDING AND WARRANTY	$ 2,000.00	LS	1	LS	*$ 2,000.00*
203	TRAFFIC CONTROL	$ 2,000.00	LOC	1	LOC	*$ 2,000.00*
		CONSTRUCTION SUBTOTAL				*$ 14,800.00*
		Contingency (10%)				*$ 1,480.00*
		CONSTRUCTION TOTAL				***$ 16,280.00***
		Engr. & Const. Observation (20%)				*$ 3,256.00*
		TOTAL COST				***$ 19,536.00***

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