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Engineer's Report for

# Record of Facilities

## Drainage District No. 2

## Subdrainage District No. 1

## Pottawattamie County, Iowa

2018

**Submitted by:**

Bolton & Menk, Inc.

300 W Mckinley St

Jefferson, IA 50129

P: 507-625-4171

# Certification

Engineer's Report

for

Record of Facilities

Drainage District No. 2  
Subdrainage District No. 1  
Pottawattamie County, Iowa  
P12.111254

2018



I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa. My renewal date is December 31, 2018.

By: Jonathan P. Rosengren  
Jonathan P. Rosengren, P.E.  
License No. 21661

Date: July 26, 2018

# Table of Contents

I.	Introduction .....	1
A.	Scope of Work.....	1
B.	Location .....	1
C.	History.....	1
II.	Investigation .....	2
A.	District Right-of-Way .....	2
III.	Proposed Work .....	3
A.	Main Open Ditch Right-of-Way.....	3
B.	Lateral 1 Open Ditch Right-of-Way.....	4
IV.	Assessment Schedule Review .....	4
A.	Benefited Lands Not Now Assessed .....	4
B.	Existing Assessment Schedule Review.....	4
C.	General Reclassification Methodology .....	5
V.	Discussions & Recommendations.....	5

## Tables

Existing Right-of-Way Sub 1 Main Open Ditch .....	2
Recommended Additional Right-of-Way Sub 1 Main Open Ditch.....	3
Recommended Right-of-Way Sub 1 Lateral 1 Open Ditch.....	4

## Appendix

Appendix A: Existing Assessment Schedule Review

Appendix B: Proposed Plans

## I. INTRODUCTION

### A. Scope of Work

In the fall of 2016, Bolton & Menk, Inc. was appointed engineer to review the facilities under the jurisdiction of the Drainage District No. 2 Board of Trustees and recommend necessary repairs or improvements. Upon review of the existing system, records in the office of the County Auditor and discussions with the Board of Trustees, the scope has been modified to include re-establishment of the repair elevation and cross section of the Subdrainage District No. 1 Open Ditch, acquisition of the Lateral 1 open ditch as a district facility and review of existing right-of-way for both open ditches.

### B. Location

Drainage District No. 2, Subdrainage District No. 1 Open Ditch serves an area lying between the Union Pacific Railroad and the west bank of the Pigeon Creek Main Open Ditch in Sections 14 & 23 of Crescent Township (T-76-N; R-44-W) in Pottawattamie County. The sole improvement in the district is an open ditch approximately 7500 feet long lying along the east side of the UPRR tracks.

The contributing watershed to Subdrainage District No. 1 covers approximately 940 acres which includes the lateral 1 watershed, in Sections 11, 13, 14, 23, 24 and 26 of Crescent Township (T-76-N; R-44-W). The schedule of lands currently listed for benefit in Drainage District No. 2, Subdrainage District No. 1 is on file in the Pottawattamie County Auditor's Office.

### C. History

#### September 27, 1917 – Engineer's Report

Land is over washed by overflow from Pigeon DD 2. Recommended that the west bank of Pigeon DD 2 be raised from station 0 in Section 13 to the railroad embankment.

Recommends construction of a ditch with 6' base and 1.5:1 slopes.

Station 0 is north bank of Pigeon DD 2 and ditch extends to the old channel of pigeon creek in the SW ¼ of Section 14-46-44 parallel to railroad right-of-way

Recommends a bulkhead and floodgate or tube and floodgate to prevent back water from DD 2. 60 LF of 60" Dia CMP with cast iron gate was built

Right-of-way is 60 feet wide

#### October 6, 1917 – Petition to Establish Subdistrict

Open Ditches in Sections 16, 21 and 22

#### September 24, 1924 – Engineer's Report

Emergency repairs to the ditch recommended due to severe flooding caused by silted lower end

#### December 2, 1951 – Engineer's Report (Filed by SCS)

Recommends "reconstruction" of channel to an 8' base, 2:1 slopes and 0.05% grade.

## II. INVESTIGATION

Survey of the Drainage District No. 2 facilities was made during the spring of 2018. This survey was used to determine the repair grade of the Subdrainage District No. 1 Open Ditch.

The records of the district show the repair cross section of the open ditch was improved in 1951 to an 8 foot bottom with 2:1 sideslopes and a grade of 0.05%. The capacity of this repair cross section exceeds the design standards for drainage ditches in Iowa as recommended by the Iowa Drainage Guide.

Also found during review of Sub Drainage District No. 1 Open Ditch was a small lateral ditch running east and north from the main ditch at station 43+05. This lateral receives water from approximately 640 acres, or 68% of the full Sub 1 watershed. Because of the large contributing watershed, we believe it to be beneficial for the district to acquire Right-of-Way containing the ditch and maintain the channel as a district facility to ensure proper drainage within the Sub 1 benefiting area.

### A. District Right-of-Way

The existing right-of-way was purchased at the establishment of the district. The right-of-way widths were specified in the original Engineer's Report to be 60 feet measured from the east right-of-way line of the Union Pacific Railroad track in Sections 14 and 23. The existing rights-of-way are adequate to contain the channel, though no access for maintenance is available within the existing easement.

The table below lists the parcels for which Sub 1 currently holds rights-of-way for maintenance of the open ditch:

Existing Right-of-Way Sub 1 Main Open Ditch				
<u>Landowner</u>	<u>S-T-R</u>	<u>Legal</u>	<u>Parcel ID</u>	<u>Right-of-Way (AC)</u>
CLARK, EUGENE	14-76-44	N ½ SW E OF RR S OF CRK & SLY77 ELY443' NE SW N OF CRK	764414300002	1.16
BOSTWICK, BRENDA	14-76-44	SW SW E OF RR	764414300003	1.84
R B D FARMS	23-76-44	NW NW E OF RR EXC DITCH	764423100002	1.82
MORAN BEEF INC	23-76-44	SW NW E OF RR EXC DITCH	764423100004	1.82
MORAN BEEF INC	23-76-44	N ½ SW N & W OF CRK EXC RR E OF CRK NW SW	764423300002	1.75
MORAN BEEF INC	23-76-44	PT SW SW COMM 1319.51'N 100'E SW COR TH E721.99' S1144.69' TO C/L CRK SW276.77' W510.22' N1319.69' TO POB (PARCEL C)	764423300012	1.77
MORAN BEEF INC	26-76-44	PT NW NW N OF PIGEON CRK	764426100001	0.35
<b>Total Right-of-Way Existing (Sub 1 Main Open Ditch)</b>				<b>10.50</b>

### III. PROPOSED WORK

We recommend the district acquire right-of-way for and assume maintenance of the the privately built lateral ditch in Section 23-76-44 described previously in this report. This lateral provides necessary drainage to a large portion of the sub district and would therefore be a benefit to those lands.

Included with this report is a plan set showing the repair grade and cross section of the Sub 1 Open Ditch. This plan set also includes our recommended repair grade and cross section for the lateral ditch which we will hereby refer to as Lateral 1.

We find that the proper repair grade and cross section of the Lateral 1 Open Ditch is a 4' wide bottom with 2:1 sideslopes and a grade of 0.09%. The design flowline of the Lateral 1 Open Ditch corresponds to that of the Sub 1 Main Open Ditch at station 43+05 of the main. This repair cross section exceeds the recommended capacity set forth in the Iowa Drainage Guide.

#### A. Main Open Ditch Right-of-Way

The existing 60 foot Right-of-Way is only wide enough to contain the Main open ditch. We recommend an additional 20 feet of right-of-way be acquired along the east side of channel to allow regular maintenance of the facility.

<b>Recommended Additional Right-of-Way Sub 1 Main Open Ditch</b>				
<b>Landowner</b>	<b>S-T-R</b>	<b>Legal</b>	<b>Parcel ID</b>	<b>Right-of-Way (AC)</b>
CLARK, EUGENE	14-76-44	N ½ SW E OF RR S OF CRK & SLY77 ELY443' NE SW N OF CRK	764414300002	0.40
BOSTWICK, BRENDA	14-76-44	SW SW E OF RR	764414300003	0.61
R B D FARMS	23-76-44	NW NW E OF RR EXC DITCH	764423100002	0.61
MORAN BEEF INC	23-76-44	SW NW E OF RR EXC DITCH	764423100004	0.61
MORAN BEEF INC	23-76-44	N ½ SW N & W OF CRK EXC RR E OF CRK NW SW	764423300002	0.58
MORAN BEEF INC	23-76-44	PT SW SW COMM 1319.51'N 100'E SW COR TH E721.99' S1144.69' TO C/L CRK SW276.77' W510.22' N1319.69' TO POB (PARCEL C)	764423300012	0.59
MORAN BEEF INC	26-76-44	PT NW NW N OF PIGEON CRK	764426100001	0.11
<b>Total Additional Right-of-Way Recommended (Sub 1 Main Open Ditch)</b>				<b>3.51</b>

B. Lateral 1 Open Ditch Right-of-Way

Additional right-of-way will need to be acquired to maintain the Lateral 1 Open Ditch. Because of the shallow depth of the lateral ditch, we recommend a 60 foot wide right-of-way centered on the ditch.

<b>Recommended Right-of-Way Sub 1 Lateral 1 Open Ditch</b>				
<b>Landowner</b>	<b>S-T-R</b>	<b>Legal</b>	<b>Parcel ID</b>	<b>Right-of-Way (AC)</b>
R B D FARMS	23-76-44	NW NW E OF RR EXC DITCH	764423100002	1.38
R B D FARMS	23-76-44	NE NW EXC E 16.5'	764423100003	1.74
MORAN BEEF INC	23-76-44	SW NW E OF RR EXC DITCH	764423100004	0.22
MURRAY, RONALD E TRUST	23-76-44	SE NW	764423100005	0.90
MURRAY, RONALD E TRUST	23-76-44	NW NE	764423200001	0.40
MORAN BEEF INC	23-76-44	S1/2 NE NW OF DITCH & E 16.5' NE NW	764423200003	0.50
<b>Total Right-of-Way Recommended (Sub 1 Lateral 1 Open Ditch)</b>				<b>5.14</b>

If right-of-way is to be acquired, an appraisal commission, made up of two landowners from the county and the engineer, are appointed to recommend fair payment. The right-of-way appraiser's report is considered at a continued or separate public hearing prior to adoption.

Drainage district rights-of-ways are exempt from real estate taxes and drainage district assessments. Under Iowa law, landowners have the right to the beneficial use of the spoil bank in the right-of-way subject only to the district's use of the right-of-way to monitor, protect, and maintain the open ditch.

Because the landowners will retain the rights of beneficial use, right-of-way is generally compensated at far less than market value. Assuming a compensation rate of \$400 per acre of right-of-way, the estimated cost to the district would be \$1,400 for the Main open ditch and \$2,100 for the Lateral 1 open ditch for a total of \$3,500.

#### IV. ASSESSMENT SCHEDULE REVIEW

A. Benefited Lands Not Now Assessed

There are approximately 190 acres within the Drainage District No. 2 Subdrainage District No. 1 watershed which have never been assessed for benefits received from district facilities. This area is shown on sheet A.02 of the attached plans.

We recommend that all lands which convey water to the facilities of Drainage District No. 2 Subdrainage District No. 1 be annexed.

B. Existing Assessment Schedule Review

Appendix A contains a map showing the existing assessment schedule for the Subdrainage

District No. 1 benefited area. The existing schedule was established at the start of the district and has not been changed since. Considering the age and the general change in reclassification procedures starting in approximately 1970, the current schedule is not wholly inequitable. However, with the annexation of additional lands to the district and the acquisition of a new lateral as a district facility we recommend reclassification to balance the costs between the lateral and main ditches.

If reclassification is ordered, two schedules will be setup, the first for the Main Open Ditch and a second for the Lateral 1 Open Ditch. The cost to create these two schedules will be approximately \$5,000-10,000.

#### C. General Reclassification Methodology

The process of reclassification uses several factors to equitably spread project costs based upon benefits received. The three common factors are; Use, Proximity and Wetness.

The Use Factor takes into account how much of the facility is required to bring an outlet to a particular location. The more a facility is used by any given property, the higher the use factor on that property. A parcel using one mile of a facility should pay less than a parcel using 5 miles of the facility.

The Proximity Factor takes into account the portion of the outlet provided. Lands nearer to the tile or ditch receive a higher assessment because they have easy access to district facilities. Lands farther from the facility must invest in additional private drainage to access the facility. A 40 acre tract which is crossed by a tile should pay more than a 40 acre tract a mile away which must build a private system to reach the tile.

The soil drainage class accounts for the soil types' varying natural wetness and need for drainage. Wet soils in a pothole are high because the soils have more need for drainage than drier soils on the hill tops.

Many other considerations may be necessary to achieve equitable assessments.

## V. DISCUSSIONS & RECOMMENDATIONS

**Acquisition Recommended.** We recommend the district accept the existing privately dug lateral open ditch as a district facility. The district would assume all future maintenance of this lateral open ditch.

**Right-of-Way Recommended.** We recommend the district purchase a permanent right-of-way encompassing the existing privately dug lateral open ditch and widen the existing right-of-way on the main open ditch. This right-of-way would be used to maintain the ditch as a district facility, protecting the drainage rights of those lands which drain to the channel.

**Annexation Recommended.** Approximately 20% of the lands which drain to the improved outlet provided by Drainage District No. 2 Subdrainage District No. 1 (190 acres) are benefited by district facilities, but have not been assessed for maintenance costs of the facilities. In order for these lands to now be assessed to help pay for future maintenance, it is necessary to bring them into Drainage District No. 2 Subdrainage District No. 1 by annexation procedures described in Iowa Drainage laws. Annexation procedures are estimated to cost approximately \$5,000.

**Reclassification Recommended.** The inclusion of approximately 190 acres of land and the acquisition of new district facilities necessitates reclassification of the district to create an equitable basis upon which to spread the costs of future maintenance.



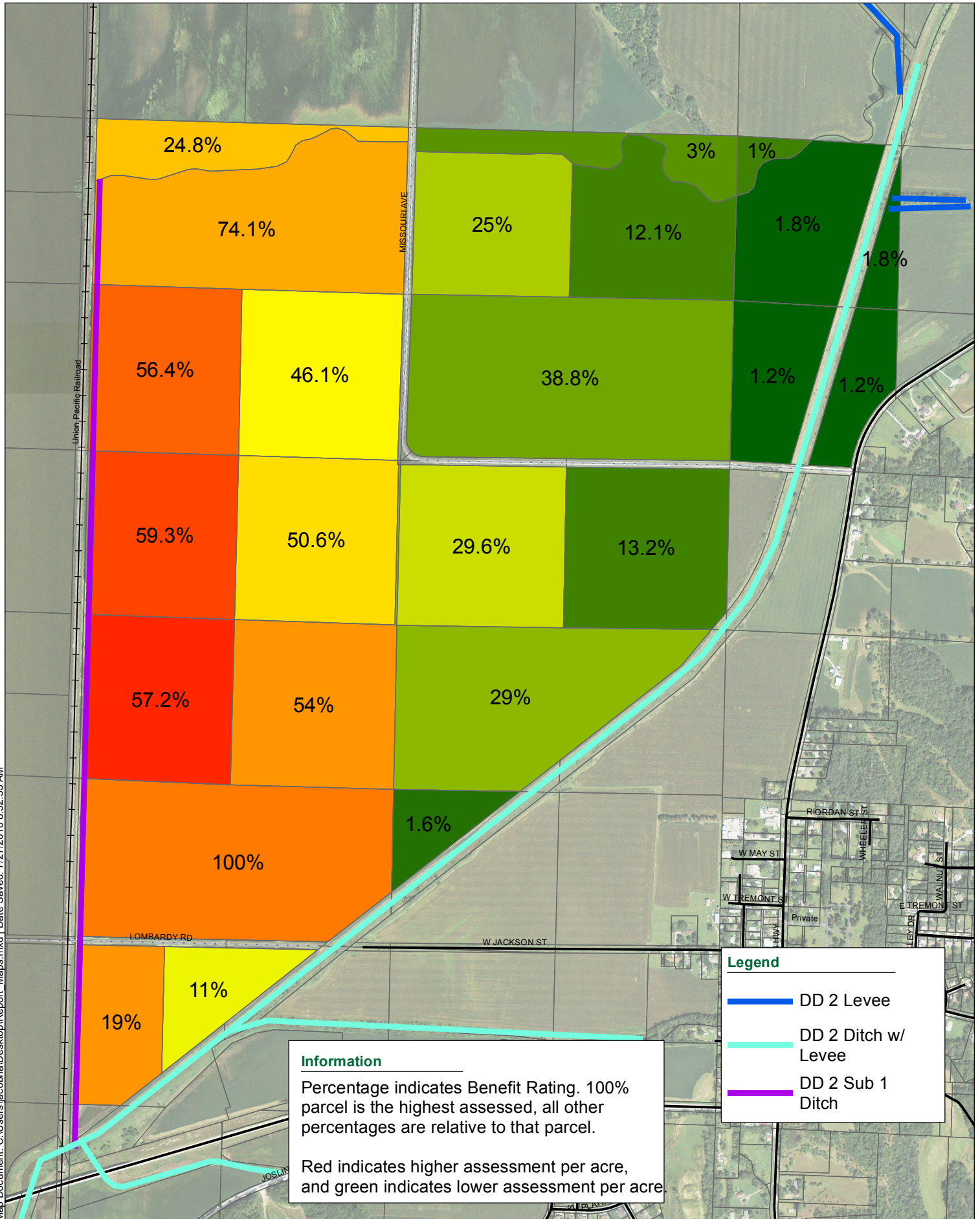
It is recommended that the Board of Trustees for Drainage District No. 2 Subdrainage District No. 1, take appropriate action, with legal guidance, to accomplish the following:

- Tentatively approve this engineer's report.
- Appoint rights-of-way appraisers and continue hearing.
- Approve rights-of-way compensation.
- Initiate procedures to annex benefited lands to Drainage District No. 2 Subdrainage District No. 1.
- Initiate reclassification procedures.

Respectfully submitted,

**Bolton & Menk, Inc.**

# Appendix A: Existing Assessment Schedule Review

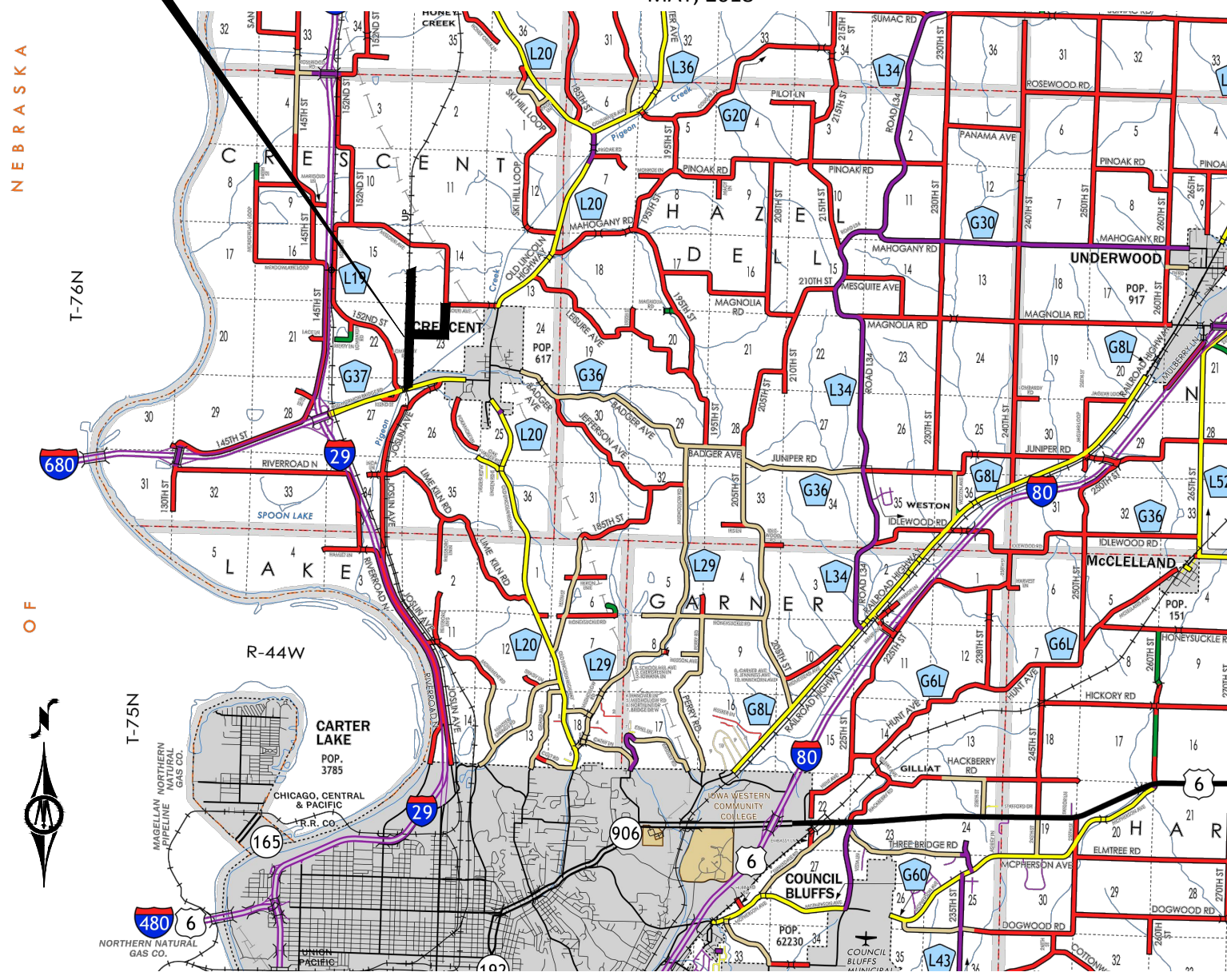


## Appendix B: Proposed Plans

# PRELIMINARY PLANS FOR DRAINAGE DISTRICT NO. 2 SUBDRAINAGE DISTRICT NO. 1 RECORD OF FACILITIES

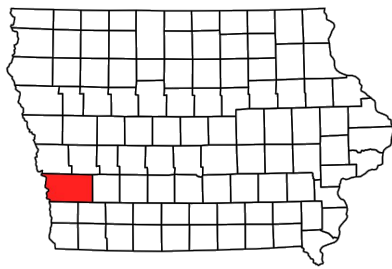
PROJECT LOCATION

MAY, 2018



NOTE: EXISTING UTILITY INFORMATION SHOWN ON THIS PLAN HAS BEEN PROVIDED BY THE UTILITY OWNER. THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY IOWA ONE CALL, 1-800-292-8989.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D UNLESS OTHERWISE NOTED. THIS UTILITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."



MAP LEGEND

PROJECT LIMITS

Sheet List Table	
Sheet Number	Sheet Title
A.01	TITLE SHEET
A.02	LANDOWNER PLAT
D.01	SUB 1 MAIN OPEN DITCH PLAN & PROFILE
D.02	SUB 1 MAIN OPEN DITCH PLAN & PROFILE
D.03	SUB 1 MAIN OPEN DITCH PLAN & PROFILE
D.04	SUB 1 LAT 1 OPEN DITCH PLAN & PROFILE
D.05	SUB 1 LAT 1 OPEN DITCH PLAN & PROFILE
G.01	BENCHMARKS
G.02	ALIGNMENT GEOMETRY

NOTE: NO SURVEY CONDUCTED ON SUBDRAINAGE DISTRICT NO. 1 OPEN DITCHES. ALL GRADES SHOWN ARE LIDAR OR DESIGNS ONLY.

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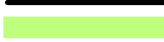
300 WEST MCKINLEY ST, P.O. BOX 68  
JEFFERSON, IOWA 50129  
Phone: (515) 386-4101  
Email: jefferson@bolton-menk.com  
www.bolton-menk.com

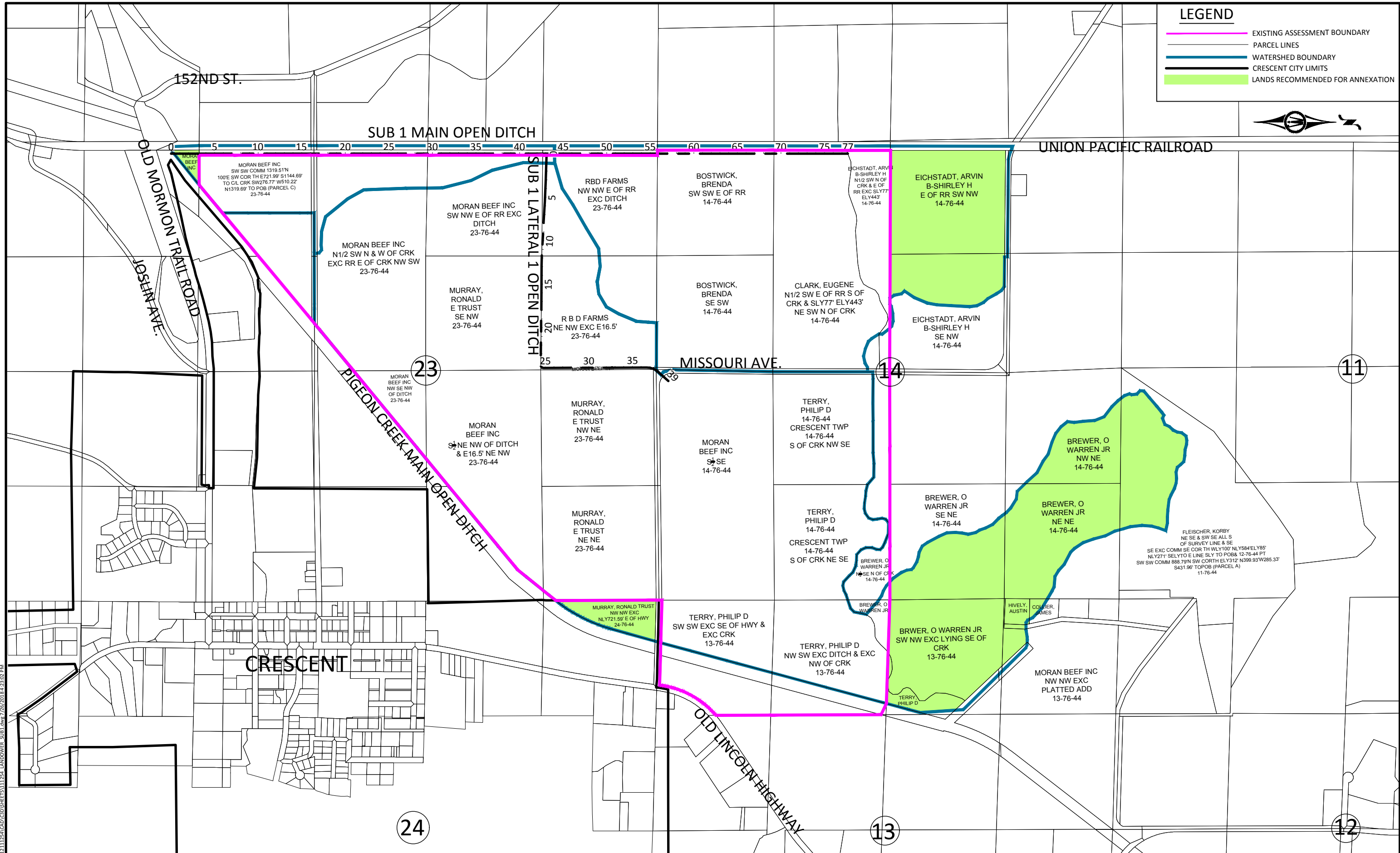
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JPR			
DDE			
CLIENT PROJ. NO.	P12.111254		

⚡ BM=994.00 USGS MONUMENT V138 W END OF S WING WALL OF RR BRIDGE	PROJECT DATUM:	RECORD DRAWING INFORMATION
	HORIZONTAL: IOWA STATE PLANE SOUTH ZONE VERTICAL: NAVD 88	OBSERVER: CONTRACTOR: DATE:

PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA		SHEET A.01
SUBDRAINAGE DISTRICT NO. 1 RECORD OF FACILITIES		
TITLE SHEET		

**LEGEND**

-  EXISTING ASSESSMENT BOUNDARY
-  PARCEL LINES
-  WATERSHED BOUNDARY
-  CRESCENT CITY LIMITS
-  LANDS RECOMMENDED FOR ANNEXATION



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Email: [Jefferson@bolton-menk.com](mailto:Jefferson@bolton-menk.com)  
[www.bolton-menk.com](http://www.bolton-menk.com)

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CLIENT PROJ. NO.	P12.111254		

PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
SUBDRAINAGE DISTRICT NO. 1 RECRD OF FACILITIES  
LANDOWNER PLAT

SHEET  
A.02

STROY, JANICE  
E TRUST  
EXC N OF  
CR SE SE  
15-76-44

STROY, JANICE E TRUST  
S OF CR NE SE  
15-76-44

GUNDY, SHARON A TRUST  
N OF CRK NE SE  
15-76-44

GUNDY, SHARON  
A TRUST  
SE NE  
15-76-44



UNION PACIFIC RAILROAD

60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77

PROPOSED DRAINAGE DISTRICT ROW

EXISTING DRAINAGE DISTRICT ROW

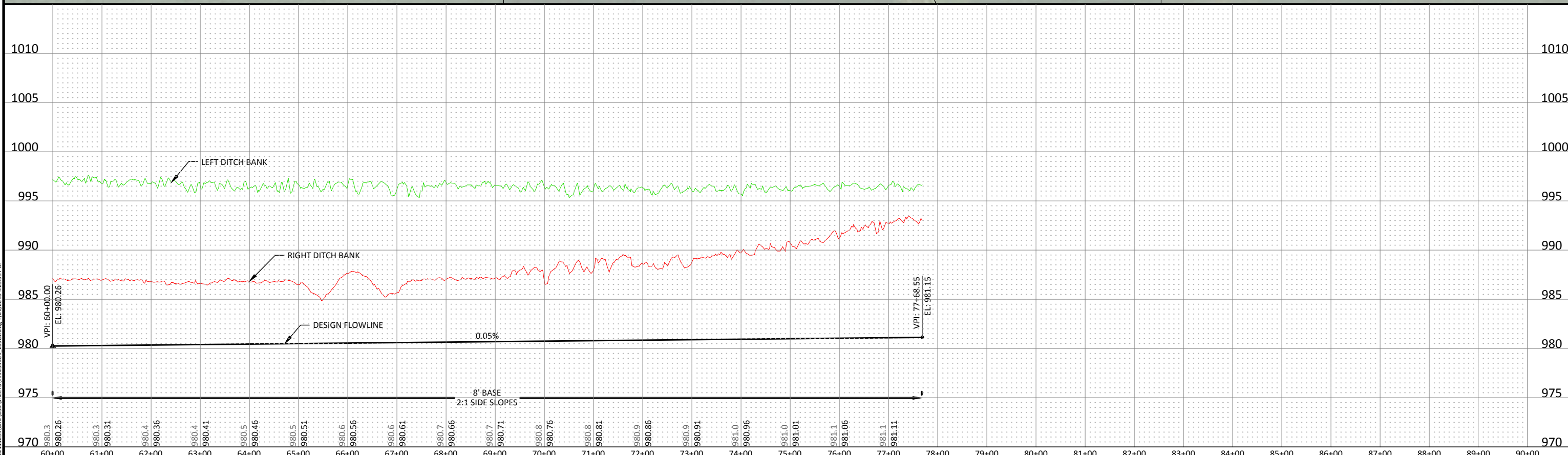
BOSTWICK,  
BRENDA  
SW SW E OF RR  
14-76-44

CLARK, EUGENE  
N1/2 SW E OF RR S OF  
CRK & SLY77' ELY443'  
NE SW N OF CRK  
14-76-44

EICHSTADT, ARVIN  
B-SHIRLEY H  
N1/2 SW N OF  
CRK & E OF  
RR EXC SLY77'  
ELY443'  
14-76-44

EICHSTADT, ARVIN  
B-SHIRLEY H  
E OF RR SW NW  
14-76-44

OLD PIGEON CREEK BED



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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
SUBDRAINAGE DISTRICT NO. 1 REOCRD OF FACILITIES  
SUB 1 MAIN OPEN DITCH PLAN & PROFILE

SHEET  
D.03



CRESCENT IOWA  
FARM LLC  
PT G/L E CO RD & N  
OF MORMAN BRDIGE  
RD & CR  
27-76-44

CRESCENT IOWA  
FARM LLC  
G/L 7 E 1 SE  
22-76-44

CRESCENT IOWA  
FARM LLC  
G/L 7 E 1 SE  
22-76-44

UNION PACIFIC RAILROAD

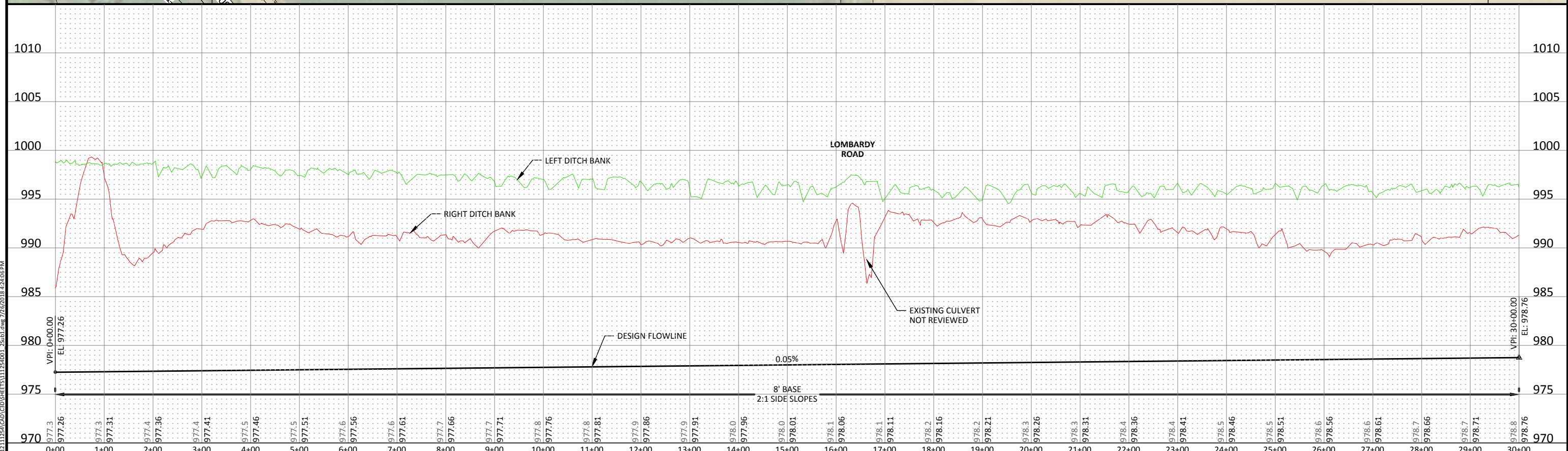
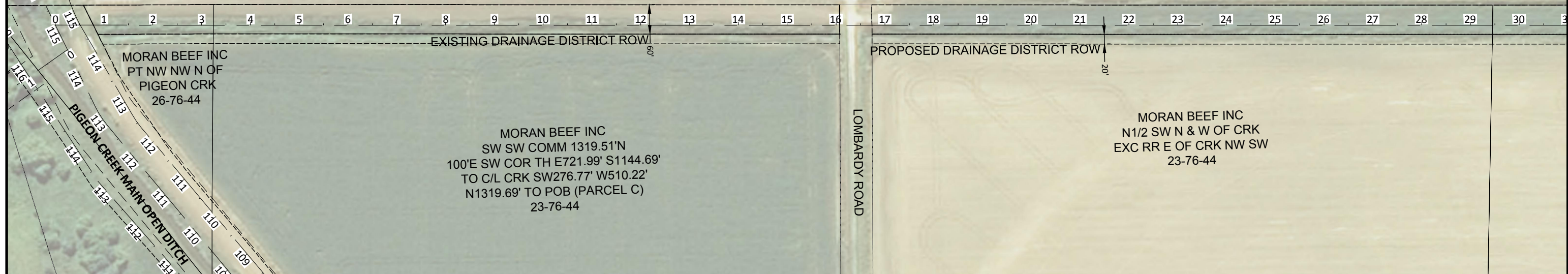
LOMBARDY ROAD

LOMBARDY ROAD

MORAN BEEF INC  
PT NW NW N OF  
PIGEON CRK  
26-76-44

MORAN BEEF INC  
SW SW COMM 1319.51'N  
100'E SW COR TH E721.99' S1144.69'  
TO C/L CRK SW276.77' W510.22'  
N1319.69' TO POB (PARCEL C)  
23-76-44

MORAN BEEF INC  
N1/2 SW N & W OF CRK  
EXC RR E OF CRK NW SW  
23-76-44



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DESIGNED	NO.	REVISION	DATE
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
SUBDRAINAGE DISTRICT NO. 1 RECORDED FACILITIES  
SUB 1 MAIN OPEN DITCH PLAN & PROFILE

SHEET  
D.01



CRESCENT IOWA  
FARM LLC  
S 1/4 G/L 6 SE NE  
22-76-44

CRESCENT IOWA  
FARM LLC  
N 1/4 G/L 6 SE NE  
22-76-44



CRESCENT IOWA  
FARM LLC  
G/L 5 N 1/4 N 1/4  
22-76-44

STROY, JANICE  
E TRUST  
EXC N OF  
CRK SE SE  
15-76-44

UNION PACIFIC RAILROAD

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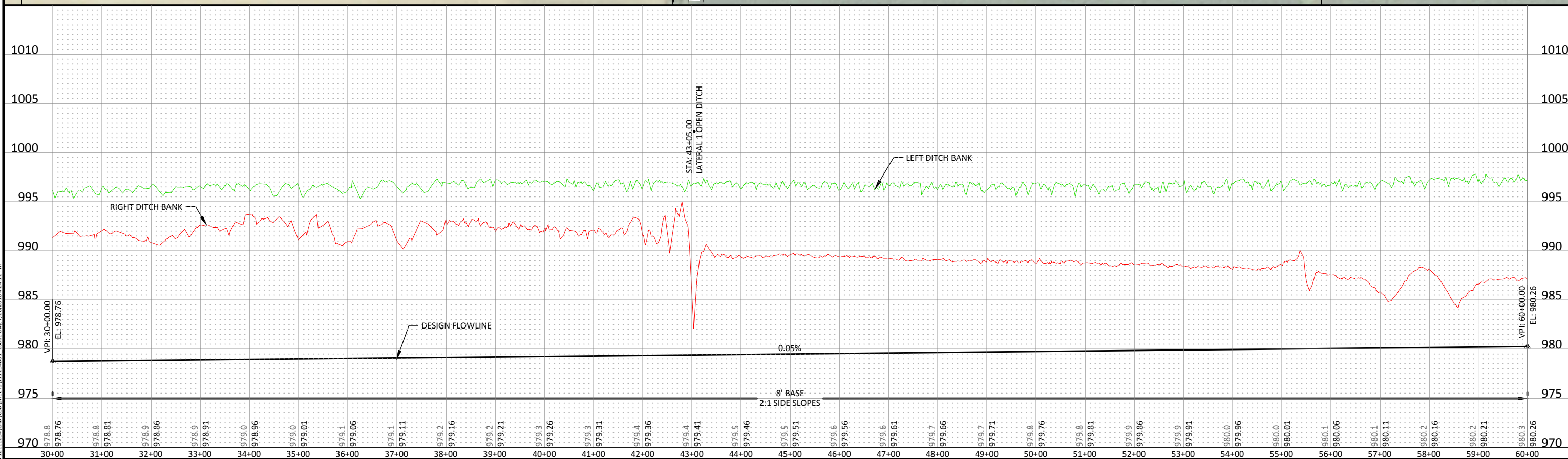
EXISTING DRAINAGE DISTRICT ROW

PROPOSED DRAINAGE DISTRICT ROW

MORAN BEEF INC  
SW NW E OF RR EXC  
DITCH  
23-76-44

RBD FARMS  
NW NW E OF RR  
EXC DITCH  
23-76-44

BOSTWICK,  
BRENDA  
14-76-44



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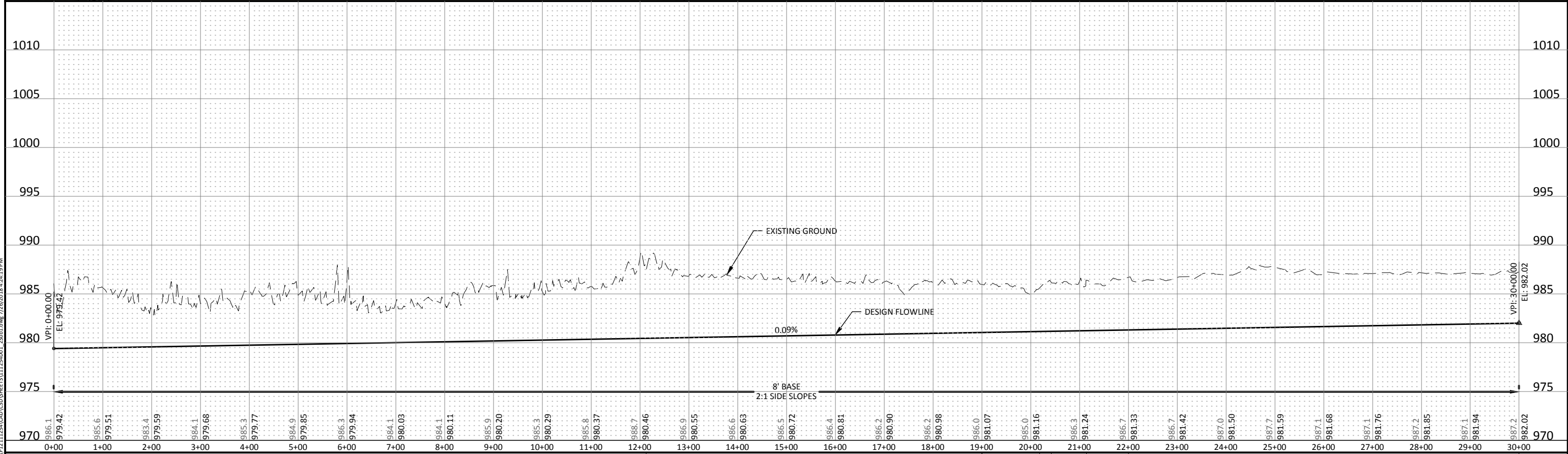
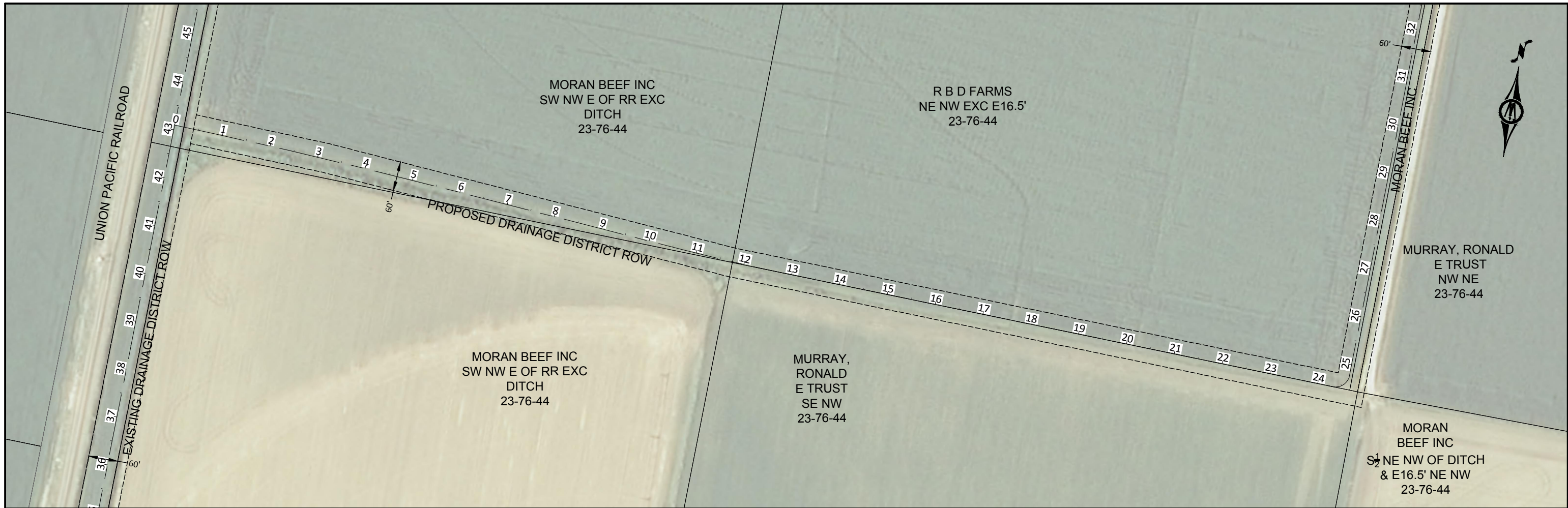


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CLIENT PROJ. NO. P12.111254			

PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
SUBDRAINAGE DISTRICT NO. 1 RECRD OF FACILITIES  
SUB 1 MAIN OPEN DITCH PLAN & PROFILE

SHEET  
D.02



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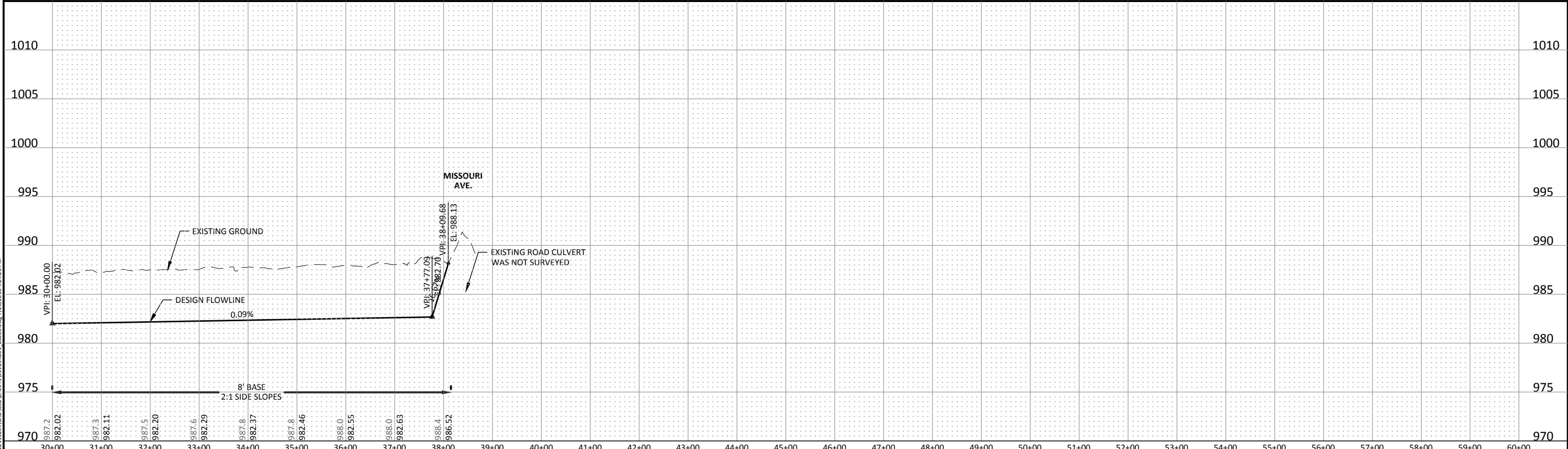
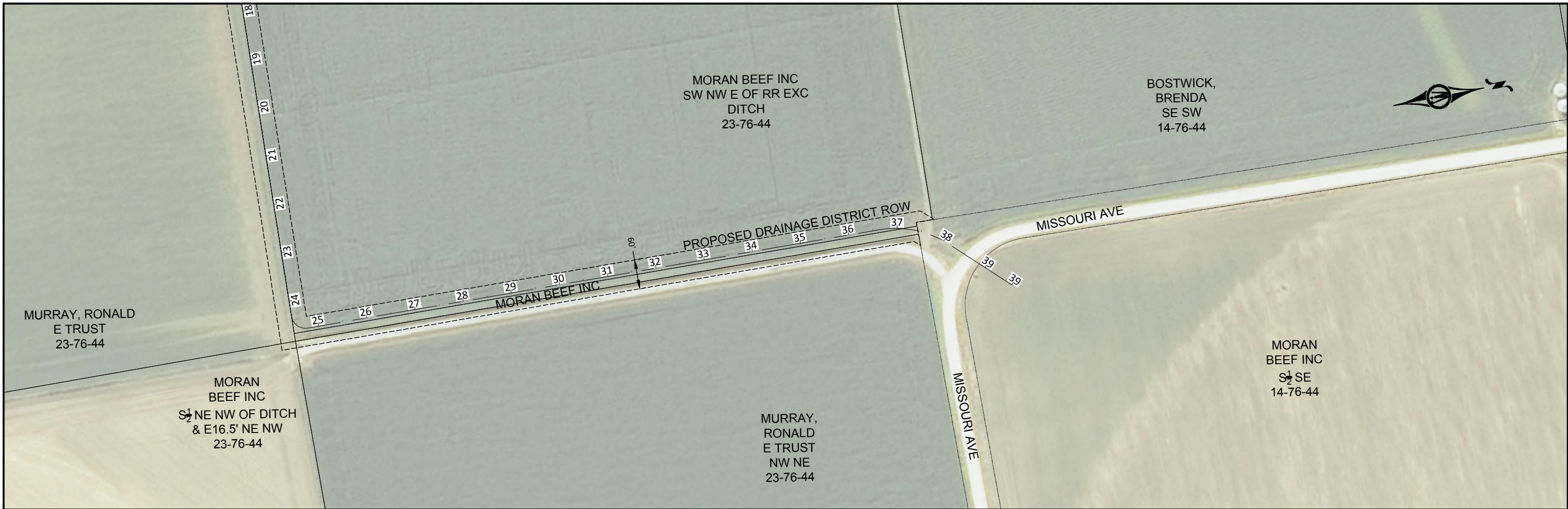


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Phone: (515) 386-4101  
Email: Jefferson@bolton-menk.com  
www.bolton-menk.com

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JPR			
DDE			
CLIENT PROJ. NO.	P12.111254		

PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
SUBDRAINAGE DISTRICT NO. 1 RECRD OF FACILITIES  
SUB 1 LAT 1 OPEN DITCH PLAN & PROFILE

SHEET  
D.04



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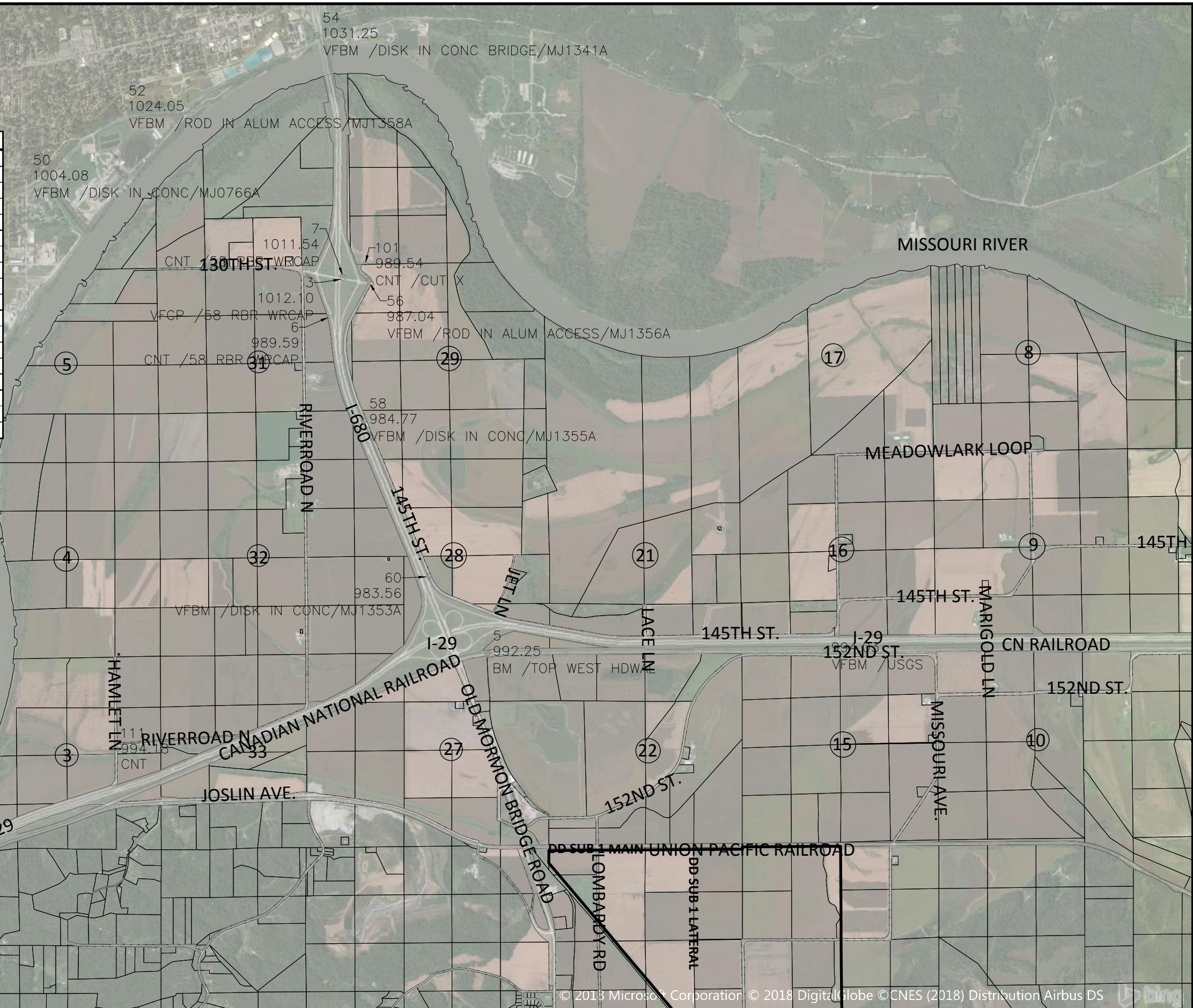
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CLIENT PROJ. NO.	P12.111254		

PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
SUBDRAINAGE DISTRICT NO. 1 REOCD OF FACILITIES  
SUB 1 LAT 1 OPEN DITCH PLAN & PROFILE

SHEET  
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DD 2 BENCHMARKS				
No.	Northing	Easting	Elevation	Description
1	512861.02	982290.01	994.031	VFBM /USGS
2	499701.08	972779.43	989.608	VFCP /58 RBR WRCAP
2	512861.03	982290.03	994.075	BM /USGS MON BRIDE ABUT 459+91.6
3	500081.42	971767.39	1012.104	VFCP /58 RBR WRCAP
5	503665.54	982079.27	992.246	BM /TOP WEST HDWAL
6	499701.10	972779.45	989.586	CNT /58 RBR WRCAP
7	500079.74	971678.31	1011.538	CNT /58 RBR WRCAP
10	512861.01	982290.02	993.995	VFBM /RR VFBM SAME POINT AS LUKES
50	491613.22	968727.13	1004.085	VFBM /DISK IN CONC/MJ0766A
52	494270.12	966927.20	1024.052	VFBM /ROD IN ALUM ACCESS/MJ1358A
54	499606.07	965127.35	1031.251	VFBM /DISK IN CONC BRIDGE/MJ1341A
56	500769.29	971846.54	987.039	VFBM /ROD IN ALUM ACCESS/MJ1356A
58	500521.63	975653.64	984.769	VFBM /DISK IN CONC/MJ1355A
60	502132.32	979939.65	983.563	VFBM /DISK IN CONC/MJ1353A
101	500707.97	971370.43	989.541	CNT /CUT X
111	493467.60	984321.94	994.175	CNT
289	493467.55	984321.92	994.258	VFCP /CHECK ON 111



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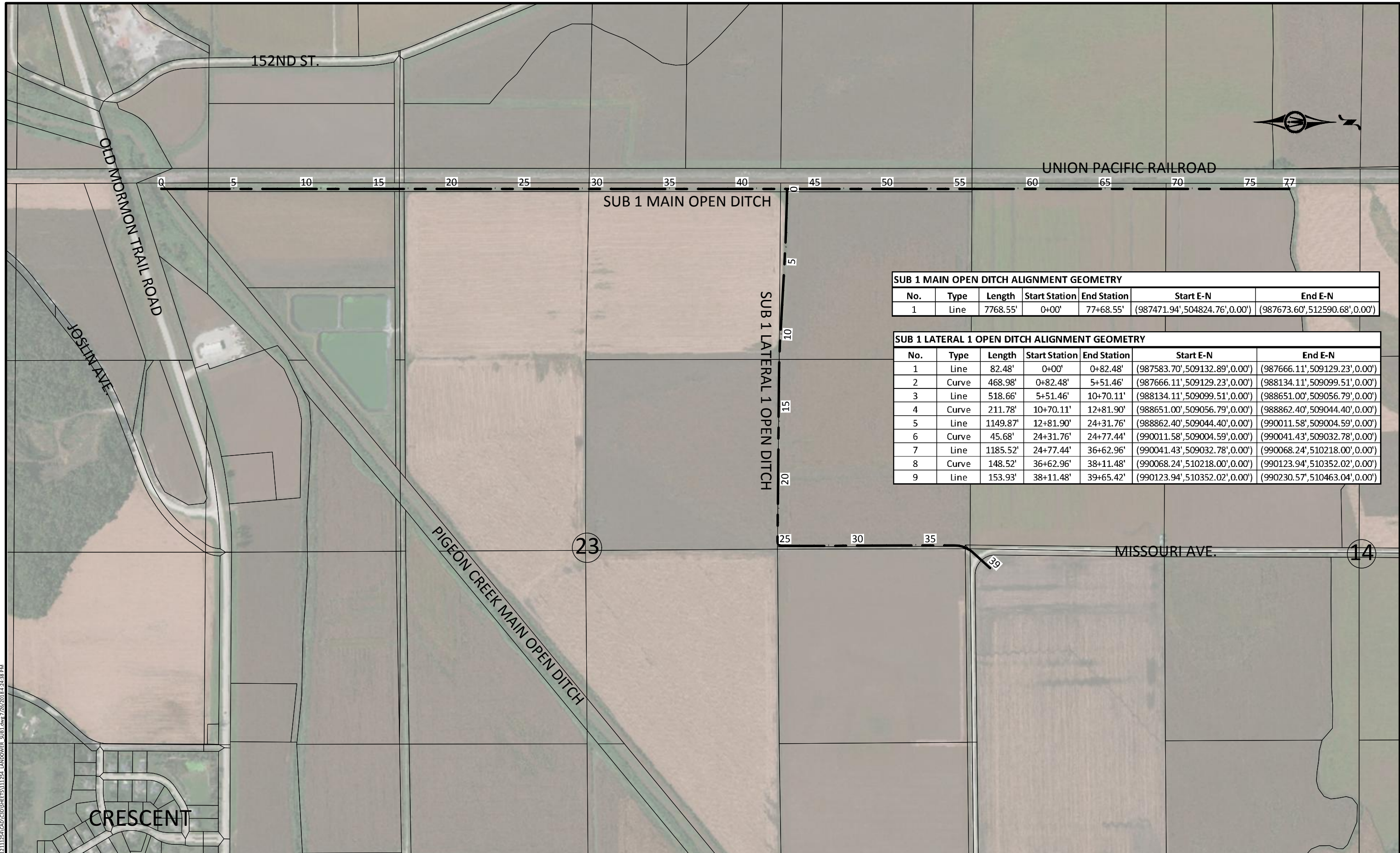
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
 SUBDRAINAGE DISTRICT NO. 1 RECORD OF FACILITIES  
 BENCHMARKS

SHEET  
 G.01

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SUB 1 MAIN OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	7768.55'	0+00'	77+68.55'	(987471.94', 504824.76', 0.00')	(987673.60', 512590.68', 0.00')

SUB 1 LATERAL 1 OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	82.48'	0+00'	0+82.48'	(987583.70', 509132.89', 0.00')	(987666.11', 509129.23', 0.00')
2	Curve	468.98'	0+82.48'	5+51.46'	(987666.11', 509129.23', 0.00')	(988134.11', 509099.51', 0.00')
3	Line	518.66'	5+51.46'	10+70.11'	(988134.11', 509099.51', 0.00')	(988651.00', 509056.79', 0.00')
4	Curve	211.78'	10+70.11'	12+81.90'	(988651.00', 509056.79', 0.00')	(988862.40', 509044.40', 0.00')
5	Line	1149.87'	12+81.90'	24+31.76'	(988862.40', 509044.40', 0.00')	(990011.58', 509004.59', 0.00')
6	Curve	45.68'	24+31.76'	24+77.44'	(990011.58', 509004.59', 0.00')	(990041.43', 509032.78', 0.00')
7	Line	1185.52'	24+77.44'	36+62.96'	(990041.43', 509032.78', 0.00')	(990068.24', 510218.00', 0.00')
8	Curve	148.52'	36+62.96'	38+11.48'	(990068.24', 510218.00', 0.00')	(990123.94', 510352.02', 0.00')
9	Line	153.93'	38+11.48'	39+65.42'	(990123.94', 510352.02', 0.00')	(990230.57', 510463.04', 0.00')

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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA  
 SUBDRAINAGE DISTRICT NO. 1 RECRD OF FACILITIES  
 ALIGNMENT GEOMETRY

SHEET  
 G.02