JACOBSON-WESTERGARD
& ASSOCIATES, INC.

105 South 6th Street
Estherville IA 51334
PHONE 712-362-2647 • FAX 712-362-2668
EMAIL jwa@jacobson-westergard.com

www.jacobson-westergard.com

Scott A Brunsvold, PE
Patrick N Boggess, PLS
Collin J Klingbeil, PE
Chris Towell, PLS

Dale D Jacobson, PE (1922—1995)
Kenneth D Westergard, PE, PLS (1930—2020)
Robert V Bendixen, PLS (1947—2022)
Richard A Hopper, PE (Retired)

"Bettering Iowa since 1970"

May 21, 2025

To: Palo Alto County Board of Supervisors
1010 Broadway St, PO Box 95
Emmetsburg, IA 50536

Re: Drainage District No. 62 Main Open Ditch Improvements **Draft** Report - **Part 2**
Palo Alto County, Iowa
JWA PROJECT NO: E24175

Dear Board Members and Landowners:

We previously filed a letter report dated February 10, 2025 regarding possible improvements to the Main Open Ditch of Drainage District No. 62 in Palo Alto County, Iowa. The report is available on the Palo Alto County website. The report was to be done at a cost not to exceed $10,000. An informational meeting was held on February 18, 2025 where we were directed to proceed with additional survey, a design, and cost estimate for the project at a cost not to exceed an additional $10,000. This report addresses said request.

A. Investigations

Additional survey of the existing Main Open Ditch of DD62 was conducted in April 2025. This included intermittent cross sections, bottom elevation shots, ground shots, and a comprehensive survey of existing tile and surface drain outlets into the ditch.

Also, as discussed at the informational meeting, where tile outlets were found we probed away from the ditch to attempt to find the tile and its depth/elevation compared to the outlet. Often times the elevation of the outlet compared to the ditch bottom is not representative of the tile further out in the field. We were able to probe many of the tile outlets away from the ditch, but not all.

B. Existing Main Open Ditch Design

1. Design of Main Open Ditch Extension

As part of our investigations, we completed additional research on the basis of the design for the 1982 Main Open Ditch extension project. It is apparent that the ditch was dug to a depth nearly equal to that of the original Main Tile it was meant to replace. Under most circumstances this approach would not be advisable, as it would result in the pre-existing tile laterals to outlet at the very bottom of the new ditch thus creating high potential for flow restrictions. Ditches also accumulate sediment over time and this would add to the issue.

In looking at the design profile for the Main Open Ditch extension project, we find that many of the tile laterals are shown to enter the ditch 3 – 4 feet off the design ditch bottom, with a few as low as about 1.5 feet. In looking at the 1913 profiles for the original tile system, it appears the lateral tile were designed to enter the Main Tile at 1.2 – 5.3 feet above it (typical 2 – 3 feet). That is an uncommon design method, because it essentially means the Main Tile was installed deeper than necessary. This led us to wonder whether or not the lateral tile were in fact installed according to the 1913 design profiles, or if adjustments were made during construction.

We were able to probe five district lateral tiles away from the ditch to attempt to determine the approximate elevation difference between the lateral tiles and the design bottom of the existing ditch (which is similar to the flowline of the original Main Tile). The elevation difference ranged from an estimated 2.2 – 4.9 feet, which seems to support the other evidence that the district lateral tiles entered the original Main Tile well above it in elevation.

All of this put together, it appears to make more sense why the new open ditch was dug at approximately the same elevation as the original Main Tile rather than going deeper.

In addition, the original Main Tile was designed at a very flat grade (0.05%) and you would not want an open ditch much flatter than that. The downstream natural creek also somewhat limits the ability to deepen the ditch, at least without extending the ditch further downstream.

2. Existing Tile Outlet Elevations
As previously stated, the elevation of the outlet into the ditch is not representative of the tile further out in the field. Tile outlets are commonly put near the ditch bottom regardless of the elevation of the tile as it approaches the ditch. We were able to probe 29 tiles in the field some distance from the ditch. Of these tiles, we found 13 which we estimate to have a flowline in the field that is less than 1 foot above the existing design ditch bottom. These 13 tile are located along the entire length of the ditch, not just in one specific reach. It's estimated that the flow depth in the existing ditch based on a ½" per day drainage coefficient would typically be 3 – 3.5 feet deep. This shows that the ditch is causing a flow restriction to many of the tile that outlet to it.

3. Subsidence
High peat soils are located along and adjacent to the Main Open Ditch, in particular in Section 11 of Booth Township (T-94-N, R-34-W). These soils are located in depressional areas and are very high in organic matter. Once drained, the ground surface of these soils subside, or "sink". It is highly likely these areas have subsided significantly since DD62 was established.

As an example of this, the original profile of the Lateral 13 tile showed over 4 feet of cover, whereas this spring we probed the tile out in the field and found only 1.8 feet of cover. This means the ground in this area likely has subsided about 2 feet. If the area is tiled now it would be desirable to install the tile deeper, and a deeper ditch would be beneficial.

4. Original Main Open Ditch
Based on our survey, the lower (north) end of the Main Open Ditch is currently 1 – 2 feet lower than the existing design bottom. It's possible that the ditch was overdug in a previous cleanout, and also that large storm / flow events have flushed sediments further downstream. This is advantageous for possible improvements, as we can use the additional depth at the downstream end to deepen the entire ditch.

5. Possible Future Tile Improvements
As part of our analysis, we looked at the adequacy of the existing tile system of DD62. The design parameter commonly used for drainage tile is known as the drainage coefficient (DC). According to the Iowa Drainage Guide, the drainage coefficient is the rate at which water can be removed from the land and is expressed as the equivalent depth of water covering the surface of the drained area that can be removed in 24 hours. A design drainage coefficient of 1/2" – 1" per day is commonly used in Iowa. However, in the early 1900's tile systems were commonly designed at a drainage coefficient of 1/4" to 1/8" or less. For DD62, the DC of the existing tile laterals typically ranges from **0.15 – 0.30" per day**. See enclosed map. This shows that tile improvements may also be needed for adequate drainage, whether done privately or through the drainage district.

If tile improvements are completed, the problems experienced with the existing open ditch will only continue to worsen. Tile improvements will require larger diameter tile, which often need to be set deeper in order to maintain adequate cover. This once again points to the need for a deeper ditch.

6. Conclusions
Based on our investigations, in our opinion a ditch improvement would be beneficial and is worth evaluating further. The goal would be to deepen and/or widen the ditch in order to provide an adequate outlet for present and future drainage needs for the lands in DD62.

C. Design of Main Open Ditch Improvement

1. Design Process

   Generally, our goal is to design the ditch improvement to provide a channel of adequate depth and capacity in order to allow for a free outlet for subsurface drainage tile under normal flow conditions. This involves evaluating contributing drainage areas at different locations along the ditch, elevations of existing tile, and additional depth needed for possible future tile improvements.

   Lowering the normal flow water elevation in the ditch can be accomplished by digging the ditch deeper, widening the channel, or some combination of both.

2. Ditch Design Proposal

Start Station	End Station	Bottom Width, ft*	Grade, %	Bank Slope	General Location
0+00	27+00	16	0.06%	2:1 (horizontal: vertical)	Start to 440th St
27+00	70+00	12			To just south of Lat 3 Tile
70+00	115+00	10			To just south of Lat 7 Tile
115+00	157+00	6			To 460th St
157+00	213+00	4			To 470th St

*: The existing Main Open Ditch design bottom width ranges from 4 – 6 feet; however, based on our survey it appears to be somewhat wider in its current condition.

3. Crossing Culverts

   There are several road and private crossings along the ditch, with culverts varying in size and shape. This was also discussed in the first letter report. A summary of the crossings and action recommended is shown in the table below.

Station	Crossing	Material	Shape	Dimensions	Action Recommended
26+50	440th Street	CMP	Round	120” dia.	**None**
39+60	N28 (380th Ave)	Concrete	Box	96” x 144”	**Add an adjacent culvert, leave box in place**
63+20	Private	CMP	Round	60” dia.	**Upsize and Lower**
102+85	Private	CMP	Round	60” dia.	**Upsize and Lower**
144+20	N28 (380th Ave)	CMP	Arch	117” x 79”	**Lower**
156+75	460th Street	CMP	Arch	117” x 79”	**Lower**
191+90	Private	CMP	Round	48” dia.	**Permanently Remove**

The 440th Street crossing is estimated to be 2.28 feet below the existing design ditch bottom, and is in line with our proposed ditch improvement profile, which allows us to leave it in place as is.

At this point in time, we are hoping to leave the large concrete box culvert under County Road N28 in place. However, with the improvement the box culvert would be about 3 feet above the design ditch bottom. We propose installing a parallel culvert set at the improved open ditch grade, and allow the box culvert to take higher flows through the road.

D. Utilities

As discussed in the first letter report, there are electrical and fiber lines in road rights-of-way that cross the ditch. Additionally, Iowa Lakes Regional Water has a 6” water main on the south side of 460th Street that crosses the ditch. The depths are unknown, and the water main would have to be exposed to determine how deep under the ditch it is. We are hopeful the water main is a minimum of 5 feet below the design grade of the Main Open Ditch, in accordance with the requirements of the “Palo Alto County Underground Utility Permit Application Across Drainage District”. Before any approvals of the project we would want to gather additional information, coordinate with utility companies, and have a plan and understanding of what would need to be done, and who would be paying for it.

We again note that Iowa Code 468.186 requires that in the case of a drainage district improvement, if a utility is required to be relocated it is at the expense of the utility company. If any utilities would need to be relocated as part of this project we would expect that this code section would apply, and the cost would be the responsibility of the utility companies.

E. Right-of-Way (ROW)

The open ditch ROW was discussed at length in our first letter report. See it for additional details. To summarize, ROW was formally acquired by DD62 in 1913 for the original Main Open Ditch approximately 61 – 77 feet in total width centered on the ditch. However, as part of the 1980's Main Open Ditch extension project we find no record that ROW was ever formally acquired.

For the purposes of the proposed improvement, ROW acquisition will be required. This involves appointment of appraisers, and a separate hearing. We would expect that the area occupied by the existing ditch would be included in the appraisers report, but no compensation would be recommended for the ditch that was dug over 40-years ago. However, compensation would be made for any additional land required for the improved (widened and deepened) open ditch.

At this point in time we estimate that roughly 5 acres of additional ROW would need to be acquired. We will need to further refine this if sufficient interest exists to pursue this project further. Any ROW acquisition would need to be done before construction could commence. This would be an additional cost for the project.

F. Permitting

We have begun correspondence with the United States Army Corps of Engineers (USACE) regarding this project. We had a scoping meeting and the USACE was confident costly compensatory stream mitigation would not be required. We hope to find out soon what kind of permitting might be required, if any.

G. Cost Estimate

Note that the following cost estimate is approximate and is subject to change in a final engineer's report. It is intended to give landowners and the Board a rough idea of the cost of doing an improvement, and assumes no stream mitigation would be required.

SECTION 1: CONSTRUCTION ASSESSABLE TO PRIVATE LANDS

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	OPEN DITCH EXCAVATION	130,000	CY	$3.00	$390,000.00
2	SPOIL LEVELING (TWO-SIDED)	213	STA	$200.00	$42,600.00
3	OPEN DITCH SEEDING AND FERTILIZING, TWO SIDES	213	STA	$150.00	$31,950.00
4	RIPRAP, CLASS E	50	TN	$70.00	$3,500.00
5	REMOVE, STOCKPILE, AND REPLACE EXISTING REVETMENT	1	LS	$4,000.00	$4,000.00
6	12" DIA. CMP TILE OUTLET, RIVETED, ANNULAR CORRUGATIONS, 14 GAGE NEW	900	LF	$42.00	$37,800.00
7	12" DIA. CMP TILE OUTLET, REMOVE & RE-PLACE	220	LF	$20.00	$4,400.00
8	15" DIA. CMP TILE OUTLET, RIVETED, ANNULAR CORRUGATIONS, 14 GAGE NEW	40	LF	$45.00	$1,800.00
9	15" DIA. CMP TILE OUTLET, REMOVE & RE-PLACE	200	LF	$22.00	$4,400.00

10	18" DIA. CMP TILE OUTLET, REMOVE & RE-PLACE	100	LF	$24.00	$2,400.00
11	24" DIA. CMP TILE OUTLET, REMOVE & RE-PLACE	20	LF	$26.00	$520.00
12	30" DIA. CMP TILE OUTLET, REMOVE & RE-PLACE	20	LF	$28.00	$560.00
13	36" DIA. CMP TILE OUTLET, RIVETED, ANNULAR CORRUGATIONS, 14 GAGE NEW	20	LF	$96.00	$1,920.00
14	48" DIA. CMP TILE OUTLET, RIVETED, ANNULAR CORRUGATIONS, 14 GAGE NEW	20	LF	$192.00	$3,840.00
15	15" DIA. CMP SURFACE DRAIN, RIVETED, ANNULAR CORRUGATIONS, 14 GAGE NEW	500	LF	$40.00	$20,000.00
16	15" DIA. CMP SURFACE DRAIN, REMOVE & RE-PLACE	100	LF	$26.00	$2,600.00
17	18" DIA. CMP SURFACE DRAIN, REMOVE & RE-PLACE	300	LF	$28.00	$8,400.00
18	24" DIA. CMP SURFACE DRAIN, REMOVE & RE-PLACE	150	LF	$30.00	$4,500.00
19	30" DIA. CMP SURFACE DRAIN, REMOVE & RE-PLACE	50	LF	$32.00	$1,600.00
20	PRIVATE CROSSING	2	EA	$2,000.00	$4,000.00
21	72" DIA. CMP PRIVATE CROSSING CULVERT, RIVETED, ANNULAR CORRUGATIONS, 14 GAGE	100	LF	$350.00	$35,000
22	MOBILIZATION	1	LS	$9,000.00	$9,000.00
				ESTIMATED SECTION 1 COST:	$615,000

SECTION 2: CONSTRUCTION ASSESSABLE TO SECONDARY ROADS

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
23	NEW CULVERT THROUGH N28, 72" DIA. CMP	70	LF	$375.00	$26,250.00
24	LOWER EXISTING 117" x 79" ARCH CULVERT THOUGH N28 (PAVED)	70	LF	$250.00	$17,500.00
25	LOWER EXISTING 117" x 79" ARCH CULVERT THOUGH 460th ST (GRAVEL)	85	LF	$200.00	$17,000.00
26	N28 RESTORATION	2	EA	$2,500.00	$5,000.00
27	TRENCH STABILIZATION AND BEDDING STONE	50	TN	$40.00	$2,000.00
28	MOBILIZATION	1	LS	$3,000.00	$3,000.00
				ESTIMATED SECTION 2 COST:	$71,000

ESTIMATED SUBTOTAL CONSTRUCTION COST:	**$686,000**
CONSTRUCTION CONTINGENCIES	**$69,000**
ESTIMATED TOTAL CONSTRUCTION COST	**$755,000**
ESTIMATED TOTAL ASSESSABLE CONSTRUCTION COST	**$677,000**

NON-CONSTRUCTION COSTS	
ENGINEERING - (REPORT, HEARINGS, PLANS & SPECS, BID LETTING, CONSTRUCTION, COMPLETION)	$110,000
LEGAL, PUBLICATIONS, MAILINGS, ETC.	$3,000
PERMITTING ASSISTANCE	$10,000
RE-CLASSIFICATION	$8,000
RIGHT-OF-WAY ACQUISITION (5 Acres)	$50,000
TEMPORARY EASEMENT (60 Acres @ $1,000/AC)	$60,000
INTEREST	$46,000
ESTIMATED TOTAL DISTRICT COST	**$893,000**

AVG COST PER ACRE (BASED ON 4,646 ACRES):	$192
AVERAGE COST PER ACRE PER YEAR AT 5% INTEREST FOR 10 YEARS:	$25
AVERAGE COST PER ACRE PER YEAR AT 5% INTEREST FOR 20 YEARS:	$15

H. Next Steps

We recommend scheduling an informational meeting, where all landowners in DD62 are invited to discuss the project.

If we continue moving forward, next steps will generally include the following:

1. Complete and file engineer's report
    i. Complete additional survey
    ii. Finalize design and cost estimate
    iii. Determine exact right-of-way needs
2. Possible preliminary classification
3. Work with Army Corps of Engineers to determine whether a permit or stream mitigation would be required for an improvement
4. Determine whether there will be any utility conflicts and coordinate with utility companies
5. Formal hearing on proposed improvements to decide whether to proceed with the project

Sincerely,

JACOBSON-WESTERGARD & ASSOCIATES, INC.

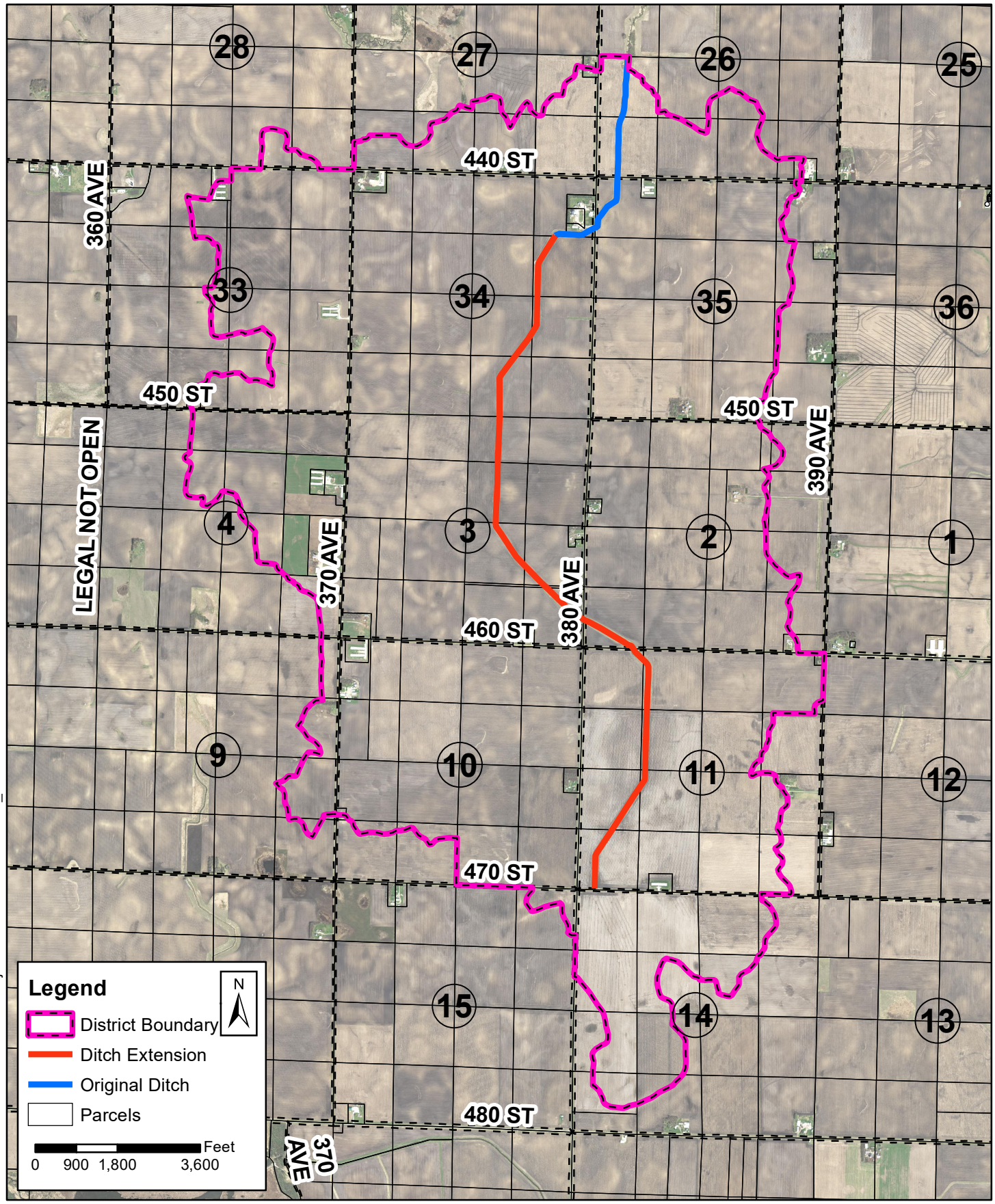
Collin J. Klingbeil, PE

Encl. Main Open Ditch Map
Tile Laterals Drainage Coefficient Map

Drainage District No. 62
Main Open Ditch Map

Palo Alto County, Iowa

JACOBSON-WESTERGARD
& ASSOCIATES, INC.
Consulting Engineers & Land Surveyors
www.jacobson-westergard.com

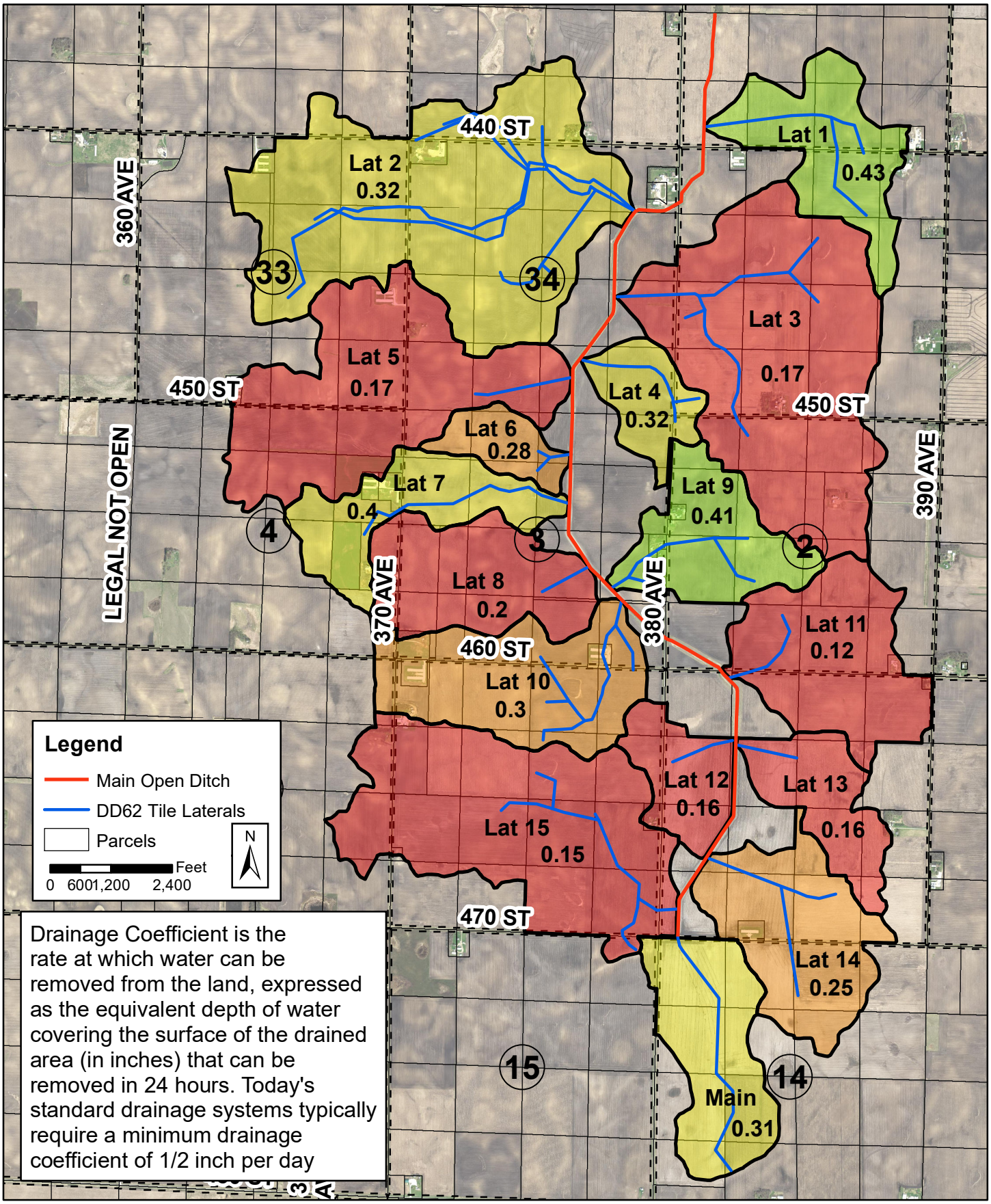


Document Path: P:\Arc View 8 Projects\2024\E24175\E24175_DD62.mxd

Drainage District No. 62
Tile Laterals
Drainage Coefficient Map

Palo Alto County, Iowa

JACOBSON-WESTERGARD
& ASSOCIATES, INC.
Consulting Engineers & Land Surveyors
www.jacobson-westergard.com



Drainage Coefficient is the rate at which water can be removed from the land, expressed as the equivalent depth of water covering the surface of the drained area (in inches) that can be removed in 24 hours. Today's standard drainage systems typically require a minimum drainage coefficient of 1/2 inch per day

Document Path: P:\Arc View 8 Projects\2024\E24175\E24175_DD62.mxd