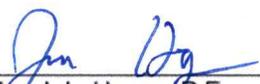


Annexation Report

Drainage District No. 41

Dallas County, Iowa
2025

	<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> <u>11/27/25</u> Jacob L. Hagan, P.E. (date) License No. 25738 My license renewal date is December 31, 2026. Pages or sheets covered by this seal: <u>All</u></p>
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Executive Summary

Introduction

This report recommends the annexation of additional lands into Drainage District No. 41. The objective is to align the district's legal boundaries with the full extent of the lands that materially benefit from its infrastructure, ensuring the system is effective and that maintenance costs are shared equitably among all beneficiaries.

Justification for Annexation

The basis for this annexation is the significant evolution in agricultural practices since the district's formation. A system originally designed to support farming operations with 3-ton equipment and 40-bushel-per-acre yields is now tasked with supporting 50-ton equipment and 200+ bushel-per-acre yields. The hydraulic load placed on the district's drainage facilities has increased substantially. This annexation is a necessary modernization to align the district's legal and financial structure with its current operational reality.

Material Benefits

Annexation requires tangible, material benefits such as increased property value and agricultural productivity. The primary economic benefit is a direct increase in crop yields, as the district's deep, maintained facilities provides a superior outlet that is essential for the effective function of private subsurface tile drainage. This leads to improved soil health and more timely fieldwork. Additional benefits include the protection of non-agricultural property through improved water management, which helps keep basements dry and prevents soil saturation on lawns and driveways. Furthermore, inclusion grants landowner's significant legal rights under Iowa Code, including the right to petition for repairs, the right to object to assessments, and the right of remonstrance to stop a proposed project.

Methodology for Determining Annexation

The parcels recommended for annexation were identified through an objective, data-driven engineering analysis. Every acre was evaluated against five key criteria to determine material benefit. A parcel was identified as benefited if the district provides an improved outlet where the natural slope is insufficient for effective drainage, or if the district provides significantly closer and more efficient access to a drainage outlet than what existed naturally. Additionally, official USDA soil data was used to identify lands with inherent limitations, such as a poor natural drainage class, low soil permeability, or a high-water table, that are overcome by the artificial drainage the district enables. This scientific process ensures that only lands receiving a true, material benefit are recommended for inclusion.

Table of Contents

Introduction	2
Overview	2
Location.....	2
Material Benefits of Drainage	2
Crop Yield Response.....	2
Non-Crop Benefits	3
Existing Infrastructure	3
Main Open Ditch.....	3
Landscape Considerations.....	3
District Landscape.....	3
Soils.....	4
Private Drainage.....	4
Water Flow Behavior	4
Land Use	4
Legal Framework	5
Statutory Requirements.....	5
The "Material Benefit" Standard.....	5
Methodology.....	5
Elevation and Topography Analysis	6
Condition of Drainage.....	6
Specification of Benefits Received	7
Procedure	10
Data Collection and Preparation	10
Evaluation Criteria	10
Conclusion for Annexation	11
Public Hearing on Report.....	12
Objections	12
Recommendations.....	12
Annexation Schedule	12
Recommendations	13
Appendices	14
Appendix A – Benefitted Area.....	14
Appendix B- “Twenty Benefits of Drainage”- Ohio State Extension.....	15
Appendix C – Soil Map.....	17
Appendix D – Elevation Map	19
Appendix E - Water Flow Paths Map	20
Appendix F- Surface Water Management Map	21
Appendix G - Subsurface (Tile) Water Management Map	22
Appendix H - Iowa State Extension- Corn Yield Increase Map.....	23
Annexation Schedule	

Introduction

Overview

The Dallas County Board of Supervisors, serving as Trustees for Drainage District No. 41 (DD 41), has identified additional lands that appear to benefit from the district's drainage infrastructure but are not currently included within the district's boundaries. As authorized by Iowa Code §468.119, the Board appointed AgriVia to serve as the engineer for a potential annexation.

This report examines these additional lands to determine if they receive a material benefit from DD 41. It has been prepared to provide a thorough, transparent, and legally sound basis for the Board and affected landowners to evaluate the proposed annexation. Our investigation includes a review of the lands' elevation, historical and current drainage conditions, and their relationship to the established district facilities.

Location

Drainage District No. 41 (DD 41) serves approximately 4,666 acres including the right-of-way of the open ditch. These lands are located in Sections 11, 12, 13, 14, 23, 24, 25 of Lincoln Township, and Sections 7, 17, 18, 19, 20, 29, 30, 31, 32 of Washington Township in Dallas County, Iowa. A map of the DD 41 benefitted area including the parcels recommended to be annexed is included in Appendix A.

Material Benefits of Drainage

Crop Yield Response

A 1983 ISU study found that poor drainage can reduce yields by up to 32%, but installing tile in these areas often provides strong economic returns. A table showing yield increases from that study is provided below:

Soil Drainage Class	Poor Drainage (Less than ¼" Drainage Coefficient)		High Drainage (1/2" Drainage Coefficient)		Percent Increase	
	Corn Yield (bu/acre)	Soybeans Yield (bu/acre)	Corn Yield (bu/acre)	Soybeans Yield (bu/acre)	Corn Yield	Soybeans Yield
Very Poorly Drained	28	12	123	48	339%	300%
Poorly Drained	80	31	121	47	51%	52%
Somewhat Poorly Drained	90	34	124	48	38%	41%

According to Iowa State University Extension's Understanding the Economics of Tile Drainage (2023), tile drainage can increase corn yields by 10–20 bushels per acre and soybean yields by 4–8 bushels per acre, depending on soil and weather.

Using ISU's Excel-based calculator, we prepared a map of the drainage district showing estimated corn yield increases for tile drainage based on soil drainage class. This calculator is available at: extension.iastate.edu/agdm/wholefarm/xls/c2-90tilinganalysis.xlsx. The map is included in Appendix H.

Long-term research from Ohio State University found similar benefits. Their data showed that tilled fields produced 24–39% more corn and 12–45% more soybeans compared to untilled ground. Benefit-cost ratios ranged from 1.7:1 up to 4:1, meaning a return of \$3–\$4 for every \$1 invested in tile.

For more detail, we have included a summary of drainage benefits from Ohio State in Appendix B.

Non-Crop Benefits

Drainage districts do not just serve farmland. Acreages, conservation areas, and other rural homes depend on district infrastructure to lower the water table, keep basements dry, and manage stormwater that would otherwise pool in yards and create muddy driveways for example. These properties benefit from better growing conditions for trees, lawns, and gardens, similar to how urban properties benefit from storm sewer systems.

Public roads, driveways, and paths are another example. Modern roadways, especially paved ones, shed water quickly. That runoff often enters the drainage system through roadside intakes. Drier roads and driveways are more durable, easier to maintain, and less prone to erosion or frost damage. Iowa Code 468.43 allows for assessing roads because they directly benefit from district facilities.

There are also public health benefits. In the early days, before drainage districts existed, wetlands across Iowa were breeding grounds for mosquitoes and disease. The law (Iowa Code 468.2) recognizes drainage as a tool to improve public health, safety, and overall welfare.

Existing Infrastructure

Main Open Ditch

The district’s open ditch begins in Section 19 of Washington Township, just south of County Road F31. From there, it flows generally southeast through Section 19, crossing 220th Street, then southwest through Section 30, crossing 230th St, and finally south and west before its junction with the West Branch of Panther Creek.

The entire ditch was cleaned out in 2024. The plans are on file at the Auditor’s office.

Tile System

The existing tile system was installed in 1919, and the original plans and profiles, and historical records are on file at the Dallas County Courthouse. As part of the reclassification process, we did not investigate the current condition of the tile. A summary of the drainage district’s main and major branch drainage areas, tile sizes, and grades is provided in the table below:

Drainage District No. 41 Existing Tile				
Section Name	Acres	Diameter (in.)	Grade (%)	Percentage of Modern Standard (%)
Main Tile	1,641	28	0.40	62
Branch No. 1 Tile	453	22	0.10	60
Branch No. 4 Tile	567	18	0.10	60
Branch No. 13 Tile	495	26	0.15	44
Branch No. 17 Tile	484	18	0.15	43

Landscape Considerations

District Landscape

To better understand the watershed, we used publicly available LiDAR (Light Detection and Ranging) technology to map the district’s surface topography. LiDAR uses laser pulses from aircraft to produce highly accurate elevation data, allowing us to identify natural drainage patterns and areas of water accumulation. Based on this analysis, we determined that 4,666 acres drain to the district’s facilities. An elevation map is included in Appendix D, and a water flow paths map is included in Appendix E.

Soils

The soils in this drainage district are primarily silts and clays. Common soil types include Canisteo, Clarion, and Nicollet, with slopes ranging from flat to moderately steep. Drainage classes vary across the district as shown below:

Soil Drainage Class			
As Noted on Schedule	Drain Class	Acres	Percentage of Watershed
7	Very Poorly Drained	98	2.1%
6	Poorly Drained	2209	47.3%
5	Somewhat Poorly Drained	861	18.4%
4	Moderately Well Drained	0	0%
3	Well Drained	1483	31.8%
2	Somewhat Excessively Drained	15	0.3%
1	Excessively Drained	0	0%

Private Drainage

The primary purpose of a drainage district is to provide a legal and reliable outlet for surface and subsurface drainage, allowing coordinated water management across multiple properties. While the district maintains shared infrastructure, such as main tile lines and open ditches, individual landowners are responsible for installing and maintaining private tile systems on their land to connect to and benefit from the district system.

Water Flow Behavior

Subsurface drainage systems collect excess water using perforated pipes or clay tiles installed below ground. As the soil becomes saturated, water moves through the soil's pores and enters the tile system through small openings. The water is then carried away to the district main. This process lowers the water table, improves soil aeration, and reduces surface runoff.

A key soil property in drainage design is saturated hydraulic conductivity (Ksat), which measures how quickly water moves through saturated soil. Sandy soils have high Ksat values and drain quickly, while clay soils, such as those common in District No. 41, have lower Ksat values and drain more slowly. Most soils in the district are classified as loams and clay loams, with moderate to low Ksat values. These values are used to determine appropriate drainage coefficients and to guide decisions on tile spacing and depth for an effective and efficient drainage system.

Land Use

Landowners are free to manage their land as they choose, regardless of how much benefit they receive from the drainage system. The lands already included in the district since its establishment include some acres not being currently farmed. The current district includes wetlands, grassland, woods, and other non-cropped areas. The proposed annexed lands are mostly cropland.

Whether a property is currently tile drained has no bearing on its inclusion or benefit from a drainage district. District facilities are designed to provide an outlet to all lands within their watershed, regardless of private land use or drainage improvements. The Classification Commission determines relative benefit and assigns corresponding cost shares through its report, ensuring fair distribution. Every drainage district in Iowa includes acres that are not presently tile drained, including this one. Having private tile is not a prerequisite for materially benefiting from a district facility. The law presumes benefit for all included lands; it is up to each landowner to decide how and when to make use of that benefit. The district's role is to provide and maintain the outlet, not to monitor or influence individual property management decisions.

The current classification schedule has been in place for over one hundred years, and in that time, land use on many parcels may have changed. However, the drainage district is focused on providing a drainage outlet, not on how or whether each parcel takes advantage of the outlet. That decision rests entirely with the landowner.

Legal Framework

Statutory Requirements

The annexation of land into a drainage district is governed by Iowa Code Chapter 468. Specifically, §468.119 requires an engineer's report that makes a "survey and plat thereof showing their **relation, elevation, and condition of drainage**" and must "specify the character of the benefits received". Iowa Code §468.120 further requires the Board of Supervisors to be satisfied that the lands are "materially benefited" by the district and that annexation is feasible, expedient, and for the public good before proceeding.

The "Material Benefit" Standard

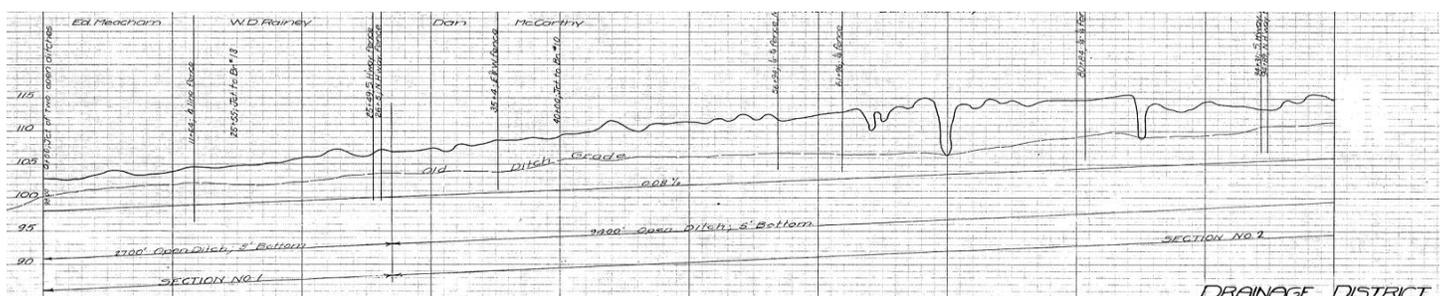
Iowa courts have established a clear and strict standard for what constitutes a "material benefit." This report was prepared with these legal precedents at its core.

- **More Than Just an Outlet:** It is not enough for a drainage district to simply provide an outlet for surface water that would naturally drain off a property anyway. The Iowa Supreme Court has stated that a landowner "may freely avail himself of the topography of his land, and may discharge his surface waters wherever gravitation naturally carries them, without further concern (Thompson v. Bd. of Sup'rs, 1925).
- **A Demonstrable Improvement:** To be "material," benefit must increase the land's value, "either by relieving it of some burden, or by making it adapted for a different purpose, or better adapted for the purpose for which it is used".
- **Specific, Not Conclusory:** An engineer's report cannot simply state that lands are benefitted. The courts require a specific explanation of how they are benefitted. For instance, Lindflott v. Drainage District No. 23 (2017), a material benefit was found because the district's deep ditch enabled the landowner to deepen their own private ditch, an improvement that would have otherwise been impossible.

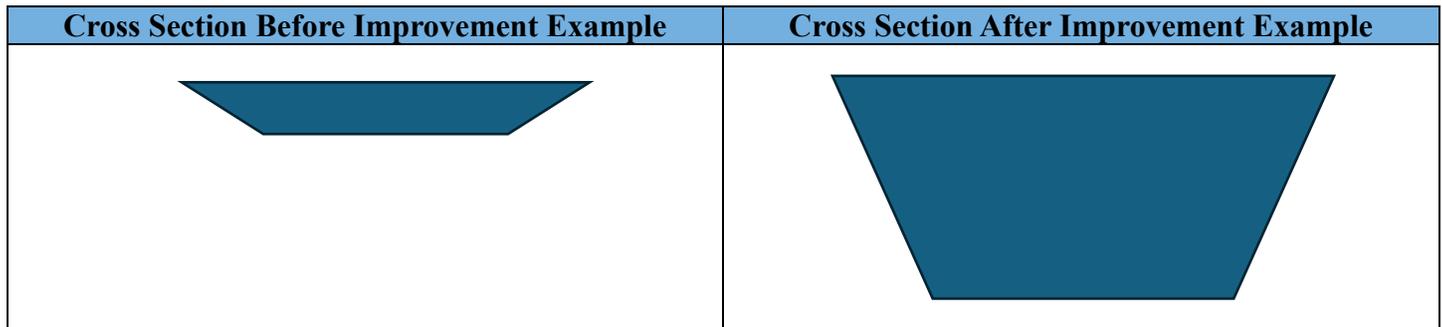
Methodology

Relation of Annexed Lands to District

We analyzed how the proposed annexed lands physically connect to the DD 41 facilities. Using GIS mapping, we traced the water flow paths from every acre of the subject properties to the district's infrastructure. Our analysis shows that the DD 41 system provides a deeper and more stable outlet than what existed in the natural landscape prior to its construction. The original engineer included the average cut for each station ranging from approximately three to six feet deeper than the pre-existing old ditch. The original engineer's profile for the open ditch is shown below. Note how much deeper the ditch is than the original ground elevation.

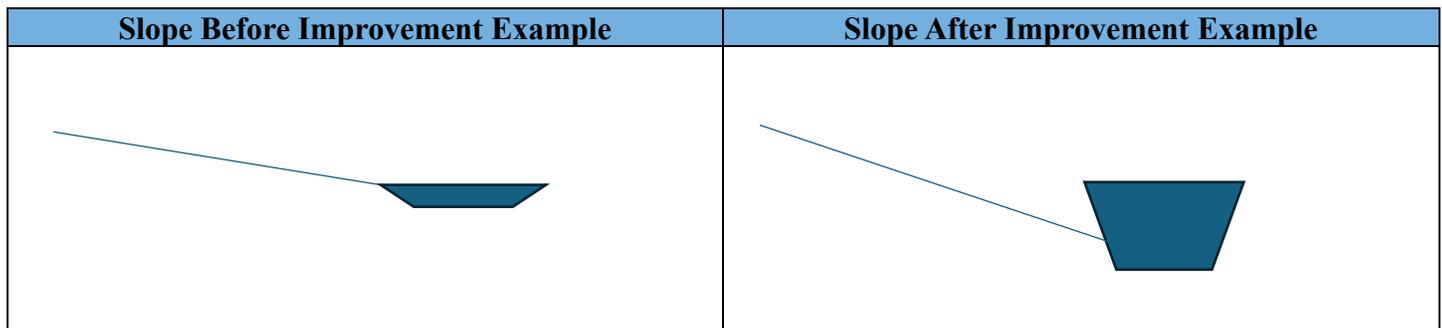


This artificial lowering of the drainage outlet is the key relationship; it creates the opportunity for landowners to install deeper, more effective private subsurface tile systems, a direct and demonstrable benefit that would not exist otherwise. An example is provided below showing how an improved ditch is not only deeper but can carry far more water providing a more reliable and deeper outlet.



Elevation and Topography Analysis

Using LiDAR elevation data, we created a detailed topographic model. While it is obvious that water naturally flows from higher to lower elevations, this alone does not mean higher lands do not receive material benefit from a drainage district.



As illustrated above; by deepening the outlet, a drainage district effectively increases the available "fall" or slope for a private tile system. This allows a landowner to drain otherwise flat or depressional areas and enables them to use smaller, less expensive tile to achieve the same drainage capacity, a direct economic benefit.

Condition of Drainage

We compared the landscape's historical condition, using the 1850's General Land office maps, 1875 Andres Atlas, soil maps, historical plats, and aerial photography with its current state.

The best available information of the condition of drainage prior to the district establishment is soil maps. The soil maps can tell us what the natural drainage of the soil is without artificial drainage, what landscape it sat in, and what formed the soils. For example, high organic matter would indicate the area was peat, and thus very poorly drained and unsuitable for agriculture before artificial drainage.

- Before DD 41: Historically, some of the area proposed for annexation, particularly parcels with poorly drained soils, high water tables, and low Ksat values were limited in their agricultural use. These areas were often saturated, suitable for pasture or hay, and planting was frequently delayed.

- After DD 41: The construction and maintenance of the DD 41 facilities provided an outlet nearer and deep enough to make comprehensive subsurface tiling feasible. This transformed the land's potential, allowing for its conversion into productive row crop agriculture. This change in the land's utility and productivity is a clear and direct material benefit resulting from the existence of DD 41.

Specification of Benefits Received

Based on our analysis, the lands proposed for annexation receive the following material benefits, as required by Iowa Code and defined by case law:

- **Improved Agricultural Productivity**

The largest economic benefit of the district is its direct increase in agricultural productivity. By providing an improved and reliable outlet for drainage, DD 41 enables landowners to:

- Lower the water table, which improves soil aeration and creates a healthier root environment.
- Achieve more timely fieldwork, as soils warm up faster and support equipment sooner in the spring.
- Increase crop yields. Research from the 1983 Iowa State University study shows that effective tile drainage can boost corn yields by over 50% on poorly drained soils, a substantial increase in value directly attributable to the drainage outlet.

- **Enabling Surface Drainage**

The DD 41 facilities provide a direct conveyance for surface overflow waters to escape the district. Landowners can legally install tile surface intakes in upland depressions and construct surface drains along the ditch to remove large volumes of excess water that would otherwise remain trapped in those depressions. Without the facilities, the available grade for private tile lines designed to carry surface water would be significantly reduced or in some cases, nonexistent. Reduced grade requires larger tile sizes to maintain capacity, which substantially increases installation costs. This represents a clear and direct material benefit of the drainage district facility.

The included map in Appendix F, based on USDA Soil Survey data, illustrates the ratings for Surface Water Management Systems, which evaluate how well soils can naturally handle and move excess water across the land through features like ditches, grassy channels, terraces, or diversions. These ratings consider key soil traits in their untouched state, such as depth to bedrock or hard layers, water flow speed through soil, slope, flood or ponding risks, rock or salt content, erosion potential, and gypsum levels, without factoring in current land uses. Every parcel recommended to be annexed is considered either not limited or somewhat limited, indicating improved surface water management systems are possible.

In addition, there would be many cases where draining these areas would be legally impossible without a drainage district outlet. Iowa Code §468.621 prohibits a landowner from increasing the quantity or altering the manner of water discharge onto a downstream neighbor without that neighbor's consent. This means an upland landowner cannot install intakes or surface drains in their depressions and discharge that water onto their neighbor. The presence of a lawful drainage district facility provides a collectively maintained and authorized outlet for such discharges. This allows these depressional areas to be farmed and to achieve much higher crop yields, a direct and measurable material benefit that would not exist without the district facility.

- **Enabling Subsurface Drainage**

The "Iowa Drainage Guide" published by Iowa State Extension states a subsurface (tile) drainage system will only function as well as its outlet. Without the DD 41 facilities, landowners would be limited to the shallow, and in many cases ineffective, natural drainage paths that existed prior to the district's

construction. In numerous areas, there would be no feasible subsurface drainage outlet at all. Without the district facilities, the available grade for private tile lines designed to carry subsurface water would be significantly reduced or in some cases, nonexistent. Reduced grade requires larger tile sizes to maintain capacity, which substantially increases installation costs. This represents a clear and direct material benefit of the drainage district facilities.

Installing a private tile system without an established drainage district outlet could also create legal complications, as Iowa Code §468.621 prohibits a landowner from increasing the quantity or altering the manner of water discharged onto a downstream property without the downstream owner's consent. An upland landowner cannot legally pattern-tile their field and simply discharge water directly across the property line onto their lower neighbor. In addition, landowners are prohibited from tile draining their fields across watershed lines into another creek. The DD 41 facilities provide a lawful, more effective, and collectively maintained outlet, granting all landowners within its benefitted area the right to connect private drainage systems. This relieves them of both the legal exposure and physical limitations that would otherwise prevent adequate drainage.

The included map in Appendix G, based on USDA Soil Survey data, illustrates the ratings for Subsurface Water Management Systems, which assess how effectively soils can be drained underground to remove excess water. These ratings consider key soil traits in their natural state, such as depth to the water table, salt levels, flooding risks, sodicity, sand content, soil acidity or alkalinity, water flow rate, density, gypsum content, and potential for subsidence, without accounting for current land uses. Every parcel recommended to be annexed is considered either not limited or somewhat limited, indicating improved surface water management systems are possible.

- **Increased Land Value and Utility**

The ability to convert land from marginal pasture or wetland to productive cropland directly and materially increases its value. The historical and soil records show that the landscape has been altered for agricultural purposes because of the opportunities created by DD 41. This is not merely an acceleration of natural flow; it is a fundamental change in the land's character and economic potential by making it better adapted for cropland and other uses.

The private landowner ultimately makes the decision of what to do with their land, for some they have chosen to create wildlife habitat, hunting areas, or construct homes. These landowners may argue they do not receive a benefit from the drainage district, because they do not see cropland yield increases, but they benefit from drier basements, improved access paths, upland plant and wildlife population, and less surface ponding. These are a tangible economic benefit, a home with a dry basement has less maintenance and more usable floor space than a home with a wet basement.

Land use can change at any time, and it is not within the district's purview to dictate or evaluate how individual landowners use their property. The district respects each landowner's right to choose their own land use, and those choices are irrelevant to their rights and obligations within the district. State law is clear that all landowners within a drainage district share equal rights to use and benefit from the drainage system.

A property currently in woodland, pasture, or other non-cropland use could be converted to row-crop production and pattern-tiled at any time. The district should not be required to fund additional annexation or reclassification proceedings each time such a change occurs. The system must remain stable and equitable for all members, regardless of individual land use decisions.

Having access to a functioning drainage facility provides landowners with flexibility to change how their land is used in the future. A parcel that currently serves as woodland or pasture retains the option to be

converted to cropland because the necessary outlet already exists. This flexibility carries inherent value. Even if a current owner does not intend to change their land use, the ability to do so increases the property's market value. A prospective buyer who wishes to convert the land to cropland will recognize the benefit of an established drainage outlet and be willing to pay more for a property that can support such a transition. In this way, access to a drainage system not only enhances agricultural productivity but also strengthens long-term land value and marketability.

Most of Iowa's popular game animals, including deer, pheasants, quail, rabbits, turkeys, and coyotes, strongly favor upland habitats over consistently wet or swampy areas because uplands provide better cover, forage, nesting sites, and accessibility. Prolonged saturation reduces habitat quality, limits movement, and increases disease risk for both wildlife and native upland vegetation. Many common Iowa trees and plants such as maples, oaks, hickories, and prairie grasses cannot tolerate extended flooding, quickly dying from root suffocation or oxygen loss. By improving drainage, lands become better suited for upland wildlife, timber production, and recreation such as hunting and bird watching. Ultimately, the district's drainage facilities provide a tangible benefit by giving landowners the flexibility to maintain or enhance their property for the uses they value most.

- **Shared Rights and Benefits**

Landowners included in a drainage district share important rights that ensure access, fairness, and control. They can use the district's drainage system, request repairs or improvements, and take part in public hearings and decisions that affect how the system is managed. Included landowners also have the right to object to unfair costs or oppose major projects they do not support. Together, these rights provide both access to the infrastructure and a voice in how it is maintained and improved, protections not available to landowners outside the district.

- **Right to Petition for Repairs §468.126**

Iowa Code §468.126 grants landowners within a drainage district the right to petition for repairs or improvements to the district's facilities. This includes restoring the system to its original capacity or upgrading it to meet evolving drainage needs. These rights ensure that any landowner within the district, regardless of current land use, can initiate action to benefit their property. For woodland owners or those not presently utilizing the facility, inclusion preserves the legal right to request repairs or improvements if land use changes, drainage issues emerge, or neighboring development alters runoff patterns.

Landowners outside the district do not have this right: they cannot petition for repairs, cannot compel trustee action, and may be left unprotected if the system deteriorates or access is denied when drainage becomes necessary. Inclusion under §468.126 guarantees agency, protection, and access.

- **Rights of Participation in Public Hearings §468.14–§468.22**

Iowa Code §468.14–§468.22 establishes the procedural rights of landowners during the establishment or improvement of a drainage district, ensuring due process through notice, hearing, objection, and review. These provisions guarantee that every landowner within the district has a formal opportunity to be heard before any classification, assessment, or construction proceeds. Landowners receive written notice of proposed actions, may appear at public hearings to support or oppose the plans, and can contest benefit classifications or cost allocations. This framework safeguards against unilateral decisions and promotes transparency, fairness, and accountability in district governance.

In contrast, landowners whose water drains toward the district but who are not formally included do not receive notice, cannot object, and lack standing to influence decisions, even when district actions may affect downstream conditions or future access. Inclusion ensures not only the right to use the facility, but also the right to participate in its planning and oversight.

- **Rights of Use §468.2 and Case Law**

Iowa Code §468.2 establishes the foundational principle that all lands within a drainage district are presumed to be benefited and entitled to the use of the district’s improvements. This includes the right to tile into a district facility, a critical benefit for landowners, even if their property is not currently tilled or under cultivation. Inclusion in the district automatically secures this right, without requiring a separate petition, or legal proceeding. Landowners may connect private tile systems to district mains, laterals, or outlets as needed.

In contrast, landowners whose water drains toward the district but who are not formally included do not possess this automatic right. They must request permission, negotiate access, or face potential denial or special assessments. Inclusion ensures that drainage infrastructure is available when needed, without delay or uncertainty, and that landowners retain full legal standing to use, maintain, and benefit from the system. This right becomes especially valuable as land use changes, such as when woodland is converted to cropland, or when drainage needs evolve due to shifting soil, weather, or development conditions.

- **Right of Objection §468.83, §468.84**

Sections 468.83 and 468.84 of the Iowa Code grant landowners within a drainage district the right to formally object to assessments and classifications they believe are unfair and to appeal those decisions through the courts. Landowners outside the district, whose water may drain into it but who are not formally included, do not have these rights. They cannot object to assessments, or influence district decisions, even though their land may depend on or affect the system.

- **Right of Remonstrance §468.28**

Iowa Code §468.28 grants landowners within a drainage district the right to file a remonstrance, a formal objection that can prevent the establishment or improvement of a drainage facility if signed by at least 50% of the landowners representing at least 70% of the affected land area. It represents a distinct benefit of district inclusion: only included landowners have standing to exercise this right. Those whose land drains into the district but who are not formally included cannot participate in a remonstrance, cannot vote on improvements, and cannot influence district decisions, even if the outcomes affect their property.

Procedure

Data Collection and Preparation

To establish a fair and measurable system for identifying lands that benefit from the drainage district facilities, a comprehensive analysis was conducted on the entire potential area. This process is designed to be objective, relying on established scientific data and engineering principles.

The entire area was divided into a grid of one-acre squares. For each square, we compiled data from trusted and publicly available sources. Elevation and slope data were derived from high-precision LiDAR (Light Detection and Ranging) datasets provided by Iowa State University. Soil characteristics, including drainage class, depth to the water table, and Saturated Hydraulic Conductivity (Ksat), were obtained from official USDA-NRCS (Natural Resources Conservation Service) soil surveys. Finally, we performed spatial measurements within GIS to define each acre's physical relationship to the existing drainage district infrastructure.

Evaluation Criteria

Each parcel was evaluated across three main categories: Elevation, Relation to District Facilities, and Natural Condition of Drainage. On the assessment schedule, values highlighted in red indicate that a specific criterion for benefit has been met. The five criteria are detailed below.

Elevation

- Slope: Effective subsurface drainage depends on having sufficient grade for pipe flow capacity. To quantify the improvement in grade provided by the district facility, the average ground slope from each acre to the district outlet was calculated by tracing the natural flow path. Using that slope, we then determined the drainage coefficient achievable with a standard 4-inch subsurface drain. The 1983 Iowa State University study found that increases in drainage coefficient up 1.0 inches per day resulted in meaningful corn and soybean yield increases. Where the natural slope was insufficient to achieve a drainage coefficient of at least 1.0 inches per day, the land is materially benefitting from the increased depth and outlet capacity provided by the district facility.

Relation to District Facilities

- Improved Outlet Access: The district facility provides a shorter and more direct path to a usable drainage outlet than existed under the previous natural conditions. To quantify this improvement, we calculated the reduction in flow distance from each parcel to its nearest viable outlet. Any parcel for which the district facility reduced that distance (thereby bringing a usable outlet closer) has been materially benefitted by the facility. For example, under pre-district conditions, a parcel's nearest outlet of sufficient depth for subsurface drainage may have been 5,000 feet away. Following construction of the district facility, that outlet distance may now be only 1,000 feet. This reduction in length needed and subsequent cost of tile is a clear, direct, and material benefit to the landowner.

Natural Condition of Drainage

- Drainage Class: Using USDA soil classifications, we identified the drainage condition of each 1-acre square within every parcel. Based on guidance from the Ag Decision Maker of Iowa State University Extension, soils classified as very poorly drained, poorly drained, somewhat poorly drained, or moderately well drained show a notable crop yield increase when artificially drained. Therefore, any parcel containing these soils will receive a material benefit from artificial drainage.
- Saturated Hydraulic Conductivity (Ksat): Ksat (saturated hydraulic conductivity) measures how quickly water moves through saturated soil. Ksat values (less than approximately 115 inches per day) indicate soils with poor permeability and a strong need for artificial drainage. In such soils, effective drainage generally requires tile spacings of about 120 feet using standard 4-inch diameter tile installed at a depth of four feet. This configuration is designed to lower the water table to at least two feet below the surface, assuming a restrictive layer at 8 feet and a drainage coefficient of 0.5 inches per day. A spacing of 120 feet represents the practical upper limit for most private pattern-tile systems. Areas identified as suitable for or requiring pattern tile drainage require a legal and functional outlet such as the one provided by the drainage district facility.
- Water Table Depth: For optimal crop production, Iowa State University research recommends maintaining a water table depth of at least twenty-four inches during the growing season. Any acre with a naturally occurring average water table depth of less than 24 benefits from artificial drainage, as its natural condition is not ideal for modern agricultural yields.

Conclusion for Annexation

A parcel does not need to meet all five criteria to be considered for annexation, as the benefits vary from one property to another. Every parcel proposed for annexation meets at least four of the metrics defined above, and several met all five criteria.

This data-driven system ensures that the determination of benefit is both repeatable, scientific, and equitable. For a detailed assessment of the benefit allocated to each individual parcel (both existing and newly annexed), please consult the official Reclassification Report filed with this Annexation Report.

Landowner Considerations

Public Hearing on Report

A public hearing will be scheduled to review this annexation report. Per Iowa Code § 468.14, all affected landowners will be notified by mail, and notice will also be published in a local newspaper. At the hearing, we will present our findings, proposed annexation, and will be available to answer questions and address concerns. The Board of Trustees will conduct the hearing and may continue it to a later date if more discussion or information is needed. No decision can be made until the hearing is held and all landowner input is considered. This report may be amended as needed in response to feedback received during the hearing.

Objections

Landowners who have concerns about the proposed annexation are encouraged to submit written objections either before or during the public hearing. These written objections will be included in the official record and are necessary to preserve the right to appeal the Board's final decision.

Landowners who wish to object to their assessment are strongly encouraged to provide any relevant information, such as tile maps, permanent wetland easements, or other documentation not available to us, that could assist in refining the schedule if necessary.

Recommendations

Annexation Schedule

We find that the parcels included in the Annexation Schedule are materially benefitted by the facilities of Drainage District No. 41. The benefits derived, specifically the provision of a sufficiently deep and legal outlet enabling the conversion of land to more productive agricultural use, and supporting modern subsurface drainage systems, are substantial and extend far beyond the mere conveyance of natural surface flow. Historical data demonstrates that the landscape within the district has been fundamentally improved and transformed into a significantly more economically productive area.

Our parcel-level analyses confirm that each tract possesses measurable potential to benefit from the district facilities, regardless of the current land use decisions of individual owners. We have provided our five criteria for determining material benefit from the district facility. These were based on physical and soil factors including improved available slope, closer proximity to outlets, and natural condition of drainage (soil drainage class, saturated hydraulic conductivity (Ksat), and water table depth). Together, these criteria quantify each parcel's improved capacity for effective drainage and demonstrate how the district facility provides that improvement and material benefit.

Recommendations

We recommend that the Board accept the filing of this report and schedule a public hearing to formally present the findings and proposed annexation schedule to all affected landowners. At the closing of the hearing, we further recommend that the Board proceed with adopting the annexation as presented.

If the Board of Trustees or landowners have any questions or concerns, please contact AgriVia at the phone number or email listed.

Sincerely,

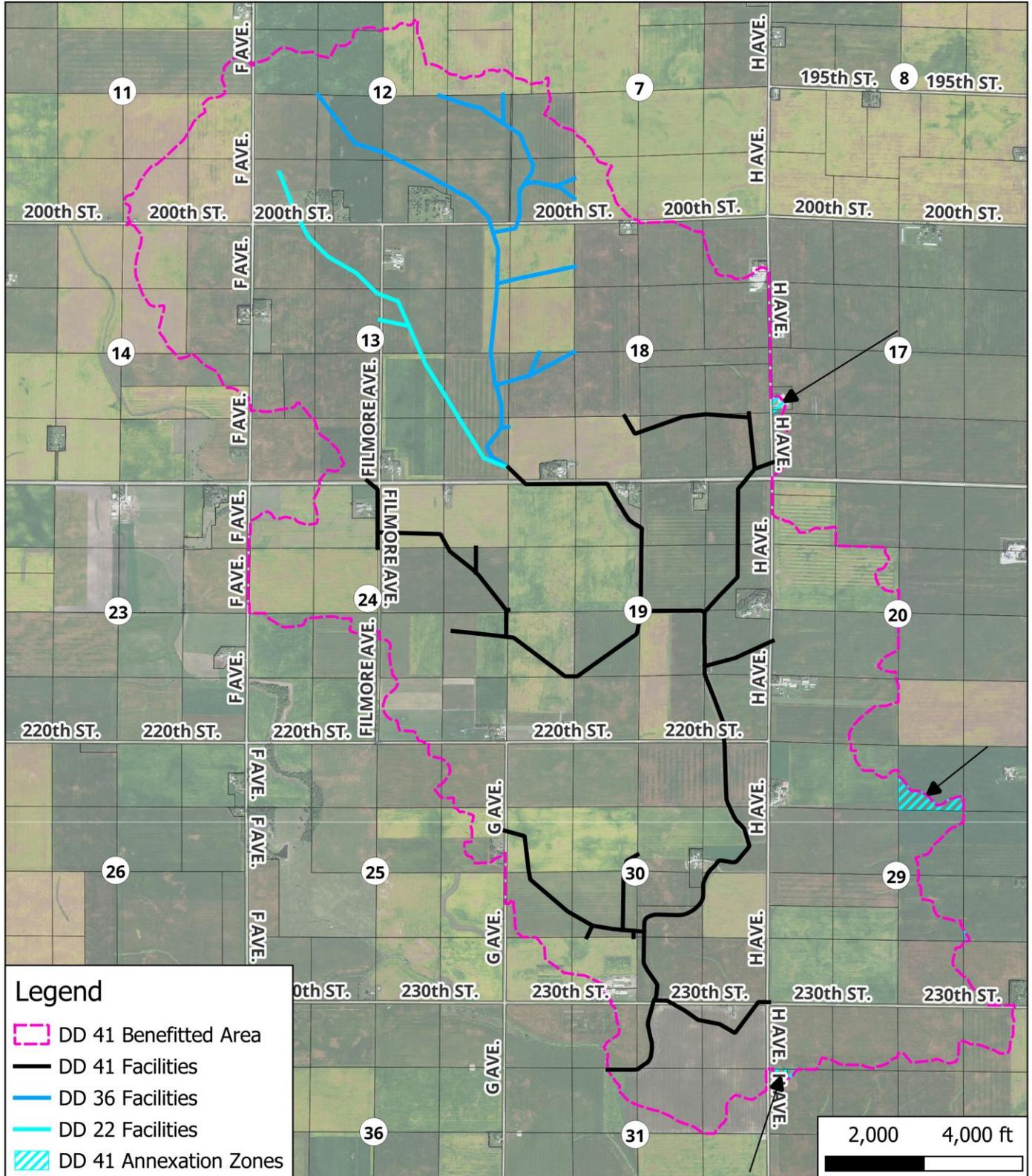
A handwritten signature in black ink that reads "Jacob Hagan". The signature is written in a cursive style with a large initial "J" and "H".

Jacob Hagan, P.E.

AgriVia

712-250-4318

jacob.agrivia@gmail.com



Appendix B- "Twenty Benefits of Drainage"- Ohio State Extension

AGRICULTURAL
ENGINEERING

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Cooperative Extension Service
The Ohio State University

Agricultural Engineering
2073 Neil Avenue
Columbus, Ohio 43210

SOIL AND WATER NO. 31

JULY 1982

TWENTY BENEFITS OF DRAINAGE

Many of the best soils in the United States and throughout the world have drainage problems that need to be solved before efficient agricultural production can be achieved. This discussion of drainage benefits is based on an earlier paper by the author entitled "Ten Benefits of Drainage" and several reports from other agricultural engineers in the United States, Canada, and England. Some of these drainage benefits are difficult to measure precisely, and many are interrelated, but their combined effect has been observed in numerous drainage studies.

1. Better soil aeration results from good drainage (surface water and free water in the root zone removed within 24 hours after heavy rainfall). This permits more extensive root development and a more favorable environment for beneficial soil microorganisms and earthworms. When soil aeration is reduced, the severity of soil-borne root diseases is increased.
2. Better soil moisture conditions with good drainage permit more efficient operation of tillage, planting, and harvesting equipment.
3. Better soil structure can be developed and maintained with good drainage, since there is less chance of destroying soil tilth due to compaction when working soil that is too wet.
4. Soils warm up more quickly in the spring when free water is removed by a drainage system. This results in better seed germination and an increased rate of plant growth.
5. An increased supply of nitrogen can be obtained from the soil when drainage lowers the water table in the root zone. Denitrification often occurs in soils with poor drainage.
6. Longer growing seasons can be achieved with good drainage due to earlier possible planting dates. This also permits the use of higher-yielding crop varieties or extended grazing periods for livestock.
7. Certain toxic substances and disease organisms are removed from the soil due to better drainage and soil aeration. In wet soil, roots can be injured by toxic substances produced in the reduction of iron and manganese salts and the reduction of nitrates to nitrites.
8. Winds are less liable to uproot plants growing in soils that have been properly drained, since root systems are deeper.
9. Soil erosion and sediment loss can be reduced by subsurface drainage, since drained soils have a greater capacity to absorb rainfall and the soil filters out suspended sediment.
10. Good drainage saves fuel that would be used in working around wet areas in fields

(over)

College of Agriculture and Home Economics of The Ohio State University and The United States Department of Agriculture Cooperating

that are not properly drained. Also, since drained land is easier to work, there is less need for dual wheels or four-wheel drive tractors.

11. Good drainage reduces winter crop damage such as frost heaving of alfalfa and smothering of wheat under patches of ice.
12. Good drainage promotes earlier crop maturity and earlier fall harvests when climatic conditions are better for natural drying of grain in the field, thereby saving artificial drying costs.
13. A greater variety of crops can be grown on a farm that has good drainage. Alfalfa and sweet corn are examples of those that a farmer may choose.
14. Weed control is easier with good drainage since shallow-rooted weeds and undesirable grasses often thrive in wet soil, crowding out the planted crop.
15. Well-drained grazing land supports more livestock, with less compaction damage to vegetation and soil from animal traffic.
16. Good drainage reduces diseases that thrive on wet land. These include foot rot and liver fluke that infect livestock, and diseases carried by mosquitoes to both livestock and people.
17. Valuable livestock water supplies can be obtained by draining hillside seeps and piping the water to stock water tanks.
18. Plants are better able to withstand summer droughts with good drainage, since lower water tables in the spring permit deeper root development for extraction of soil moisture and nutrients.
19. Drainage is essential for salinity control in drier regions where irrigation is needed for permanent agricultural production.
20. Overall, good drainage results in higher crop yields, improved crop quality, and reduced risk of crop loss due to waterlogged soil. Also, fewer acres are required to produce our needed food supplies.

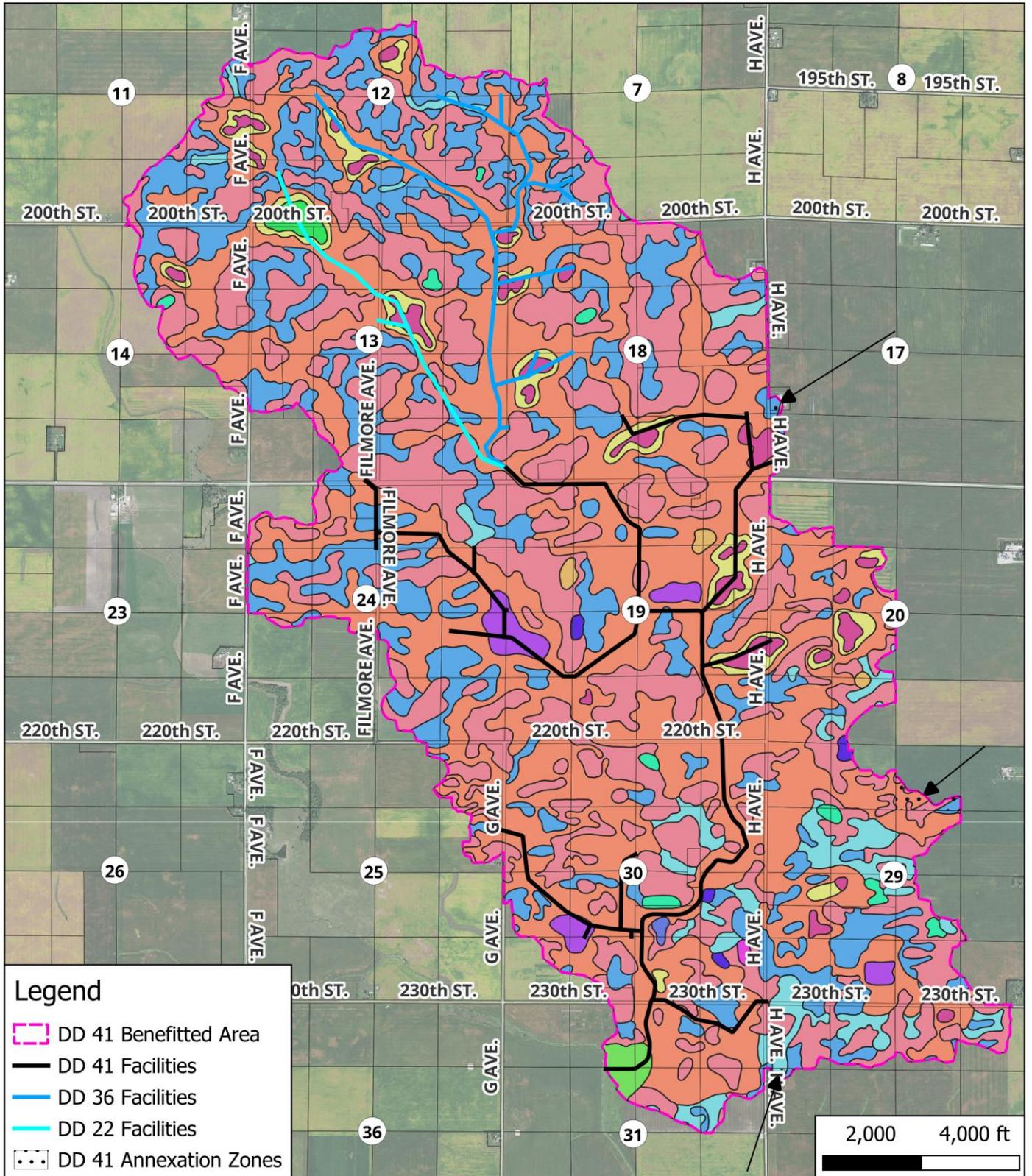
Several years of drainage research in Ohio has compared corn and soybean yields from undrained, surface drained only, tile drained only, and combined tile plus surface drained plots. Annual benefit/cost ratios were also calculated for these alternative drainage systems. It was shown that the average annual return per \$100 invested in drainage ranged from \$120 to \$210 for soybeans, and from \$170 to \$220 for corn. Further details on this research are reported in Soil and Water No. 23 (DRAINAGE--What is it Worth on CORN Land?) and Soil and Water No. 24 (DRAINAGE--What is it Worth for SOYBEAN Land?). These leaflets are available from Extension Agricultural Engineers, 2073 Neil Avenue, Columbus, OH 43210.

Actual returns on a drainage investment for a particular farm will vary with factors such as soil type, weather conditions, cost of the drainage system, crops grown, and management. Drainage improvements may involve surface drainage, subsurface drainage, outlet ditches, or a combination of practices. Changes in soil and crop management techniques may also be desirable to improve soil structure and water movement in the soil. Almost 60 percent of Ohio's cropland and 25 percent of all U. S. cropland is in need of drainage.

Melville L. Palmer

Melville L. Palmer
Extension Agricultural Engineer

All educational programs and activities conducted by the Ohio Cooperative Extension Service are available to all potential clientele on a non-discriminatory basis without regard to race, color, national origin, sex, handicap or religious affiliation.



Legend

Soil Types

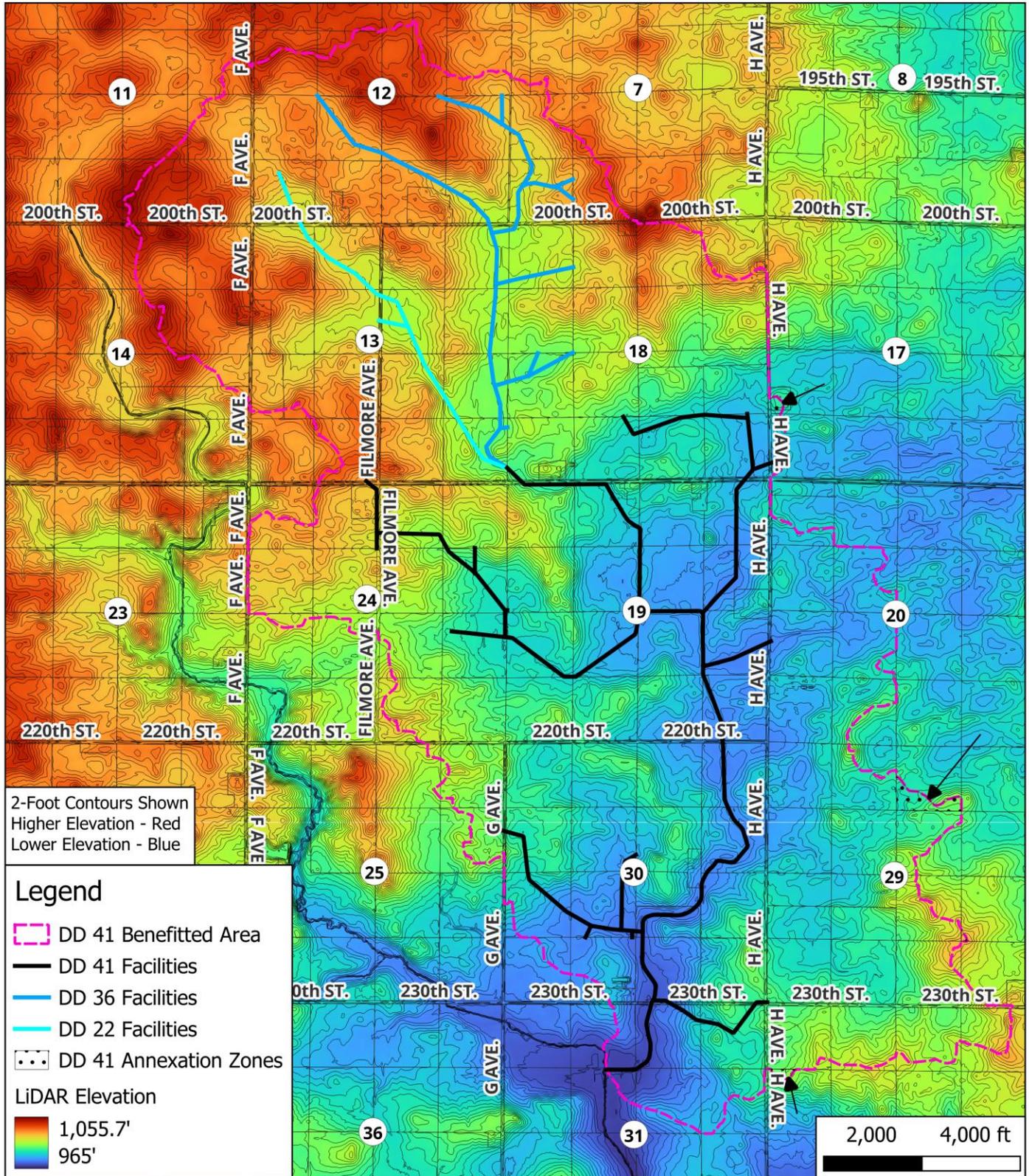
-  Canisteo clay loam, Bemis moraine, 0 to 2 percent slopes
-  Clarion loam, Bemis moraine, 2 to 6 percent slopes
-  Clarion loam, Bemis moraine, 6 to 10 percent slopes
-  Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded
-  Coland clay loam, 0 to 2 percent slopes, occasionally flooded
-  Harps clay loam, Bemis moraine, 0 to 2 percent slopes
-  Harps-Okoboji complex, Bemis moraine, 0 to 2 percent slopes
-  Nicollet loam, 1 to 3 percent slopes
-  Okoboji mucky silt loam, 0 to 1 percent slopes
-  Okoboji silty clay loam, 0 to 1 percent slopes
-  Storden loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded
-  Webster clay loam, Bemis moraine, 0 to 2 percent slopes
-  Zenor sandy loam, 2 to 5 percent slopes
-  Zenor sandy loam, 5 to 9 percent slopes, moderately eroded

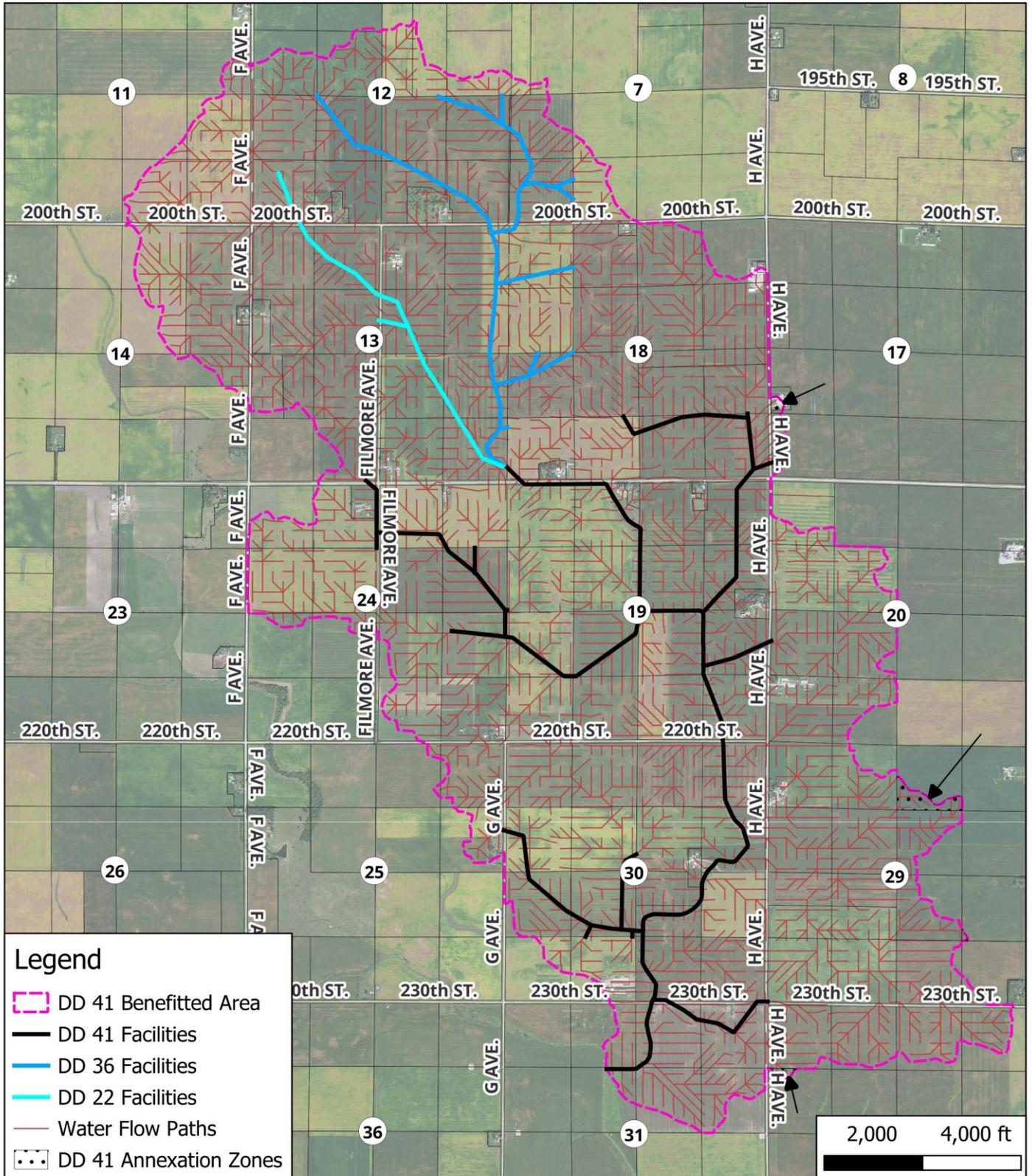
Appendix D – Elevation Map



Drainage District No. 41
Dallas County, IA

Elevation
November 2025



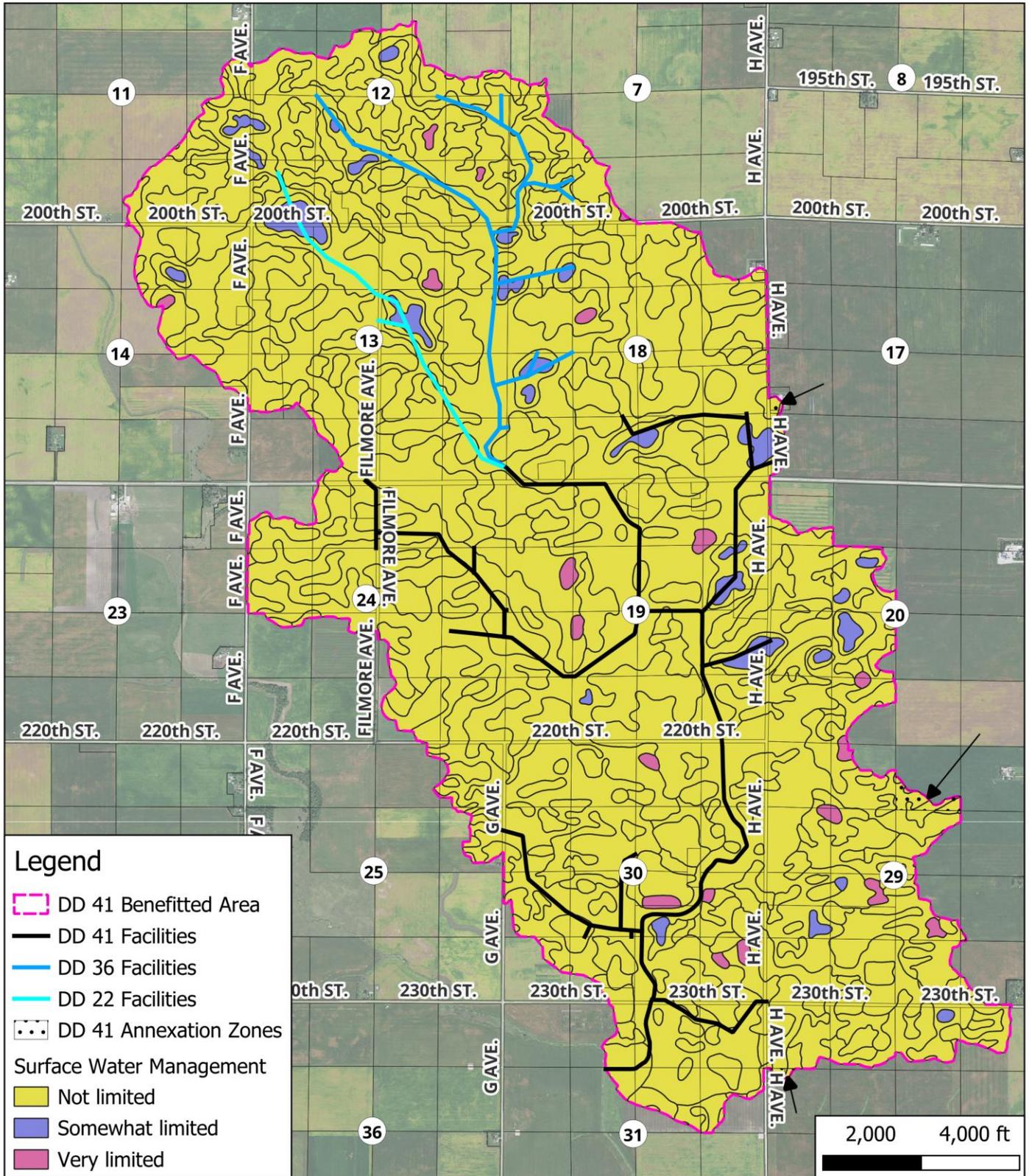


Appendix F- Surface Water Management Map



Drainage District No. 41
Dallas County, IA

Surface Water Management
November 2025

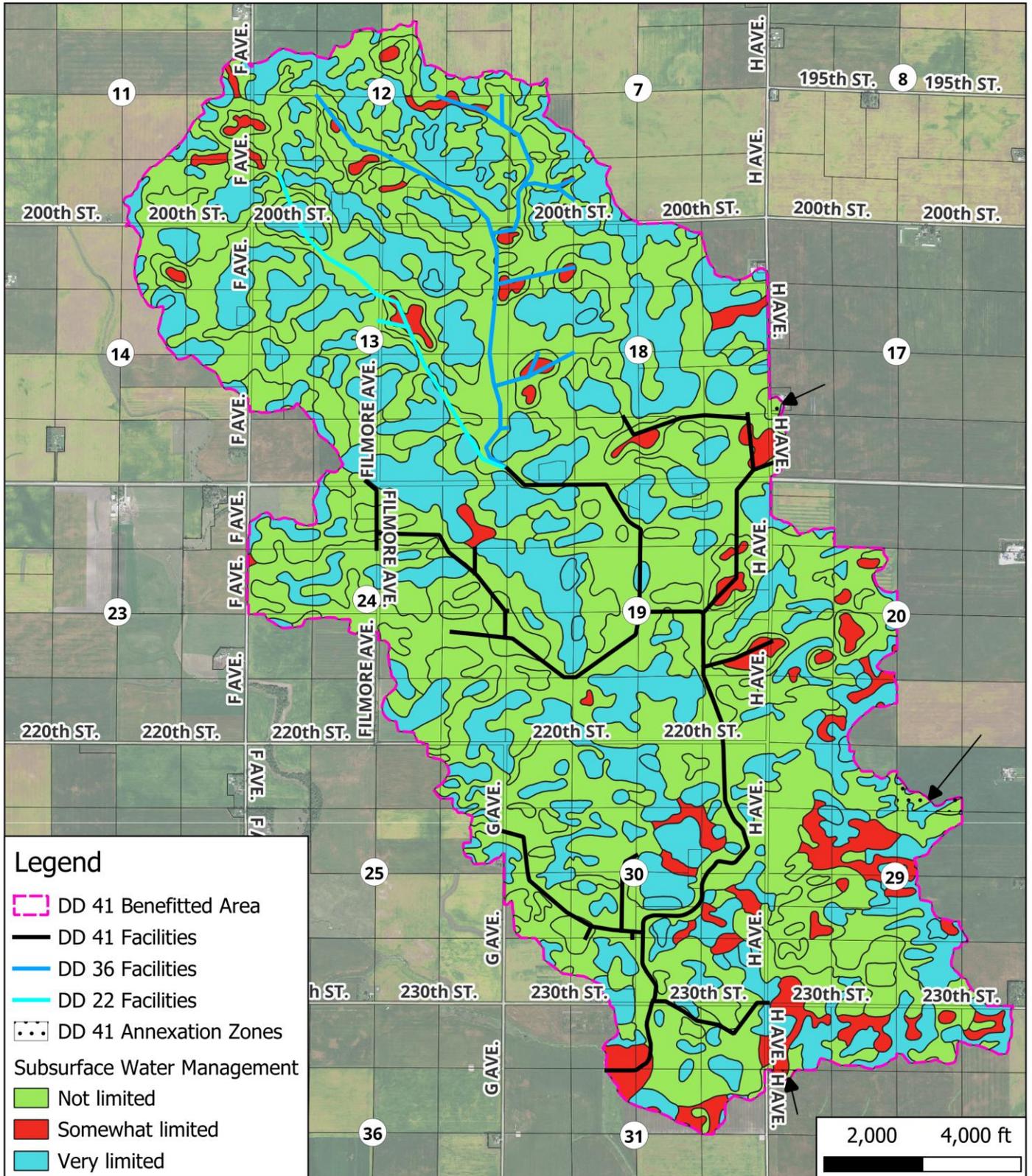


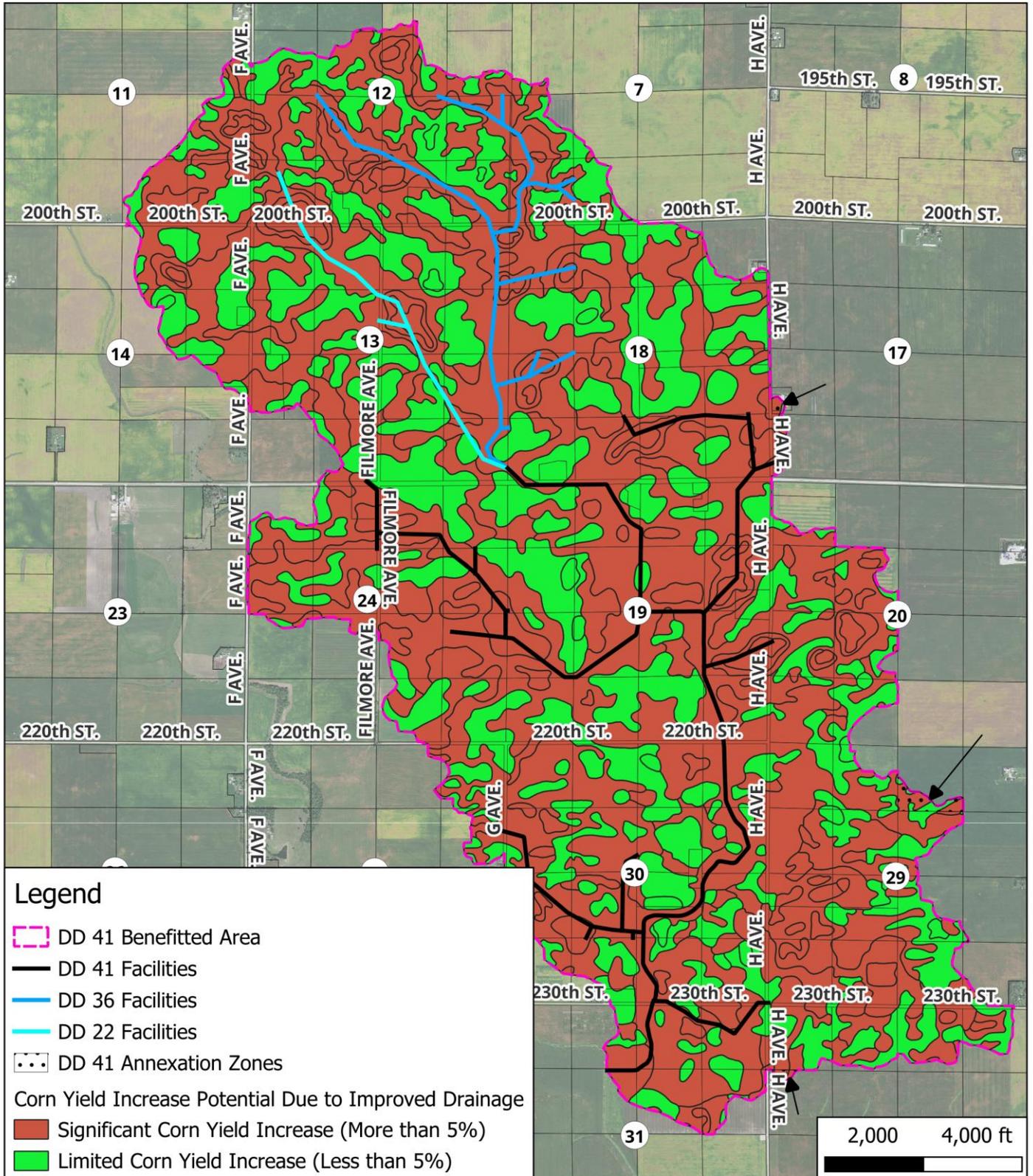
Appendix G - Subsurface (Tile) Water Management Map



Drainage District No. 41
Dallas County, IA

Subsurface Water
Management
November 2025





PIN	Deedholder	S-T-R	Legal Description	Area (Acres)	Elevation		Relation to Facility		Condition of Drainage		
					Elevation (ft)	Slope (%)	Outlet Closer (%)	Proximity (ft)	Drain Class	Ksat (in/day)	Water Table Depth (in)
0617300005	BOCK FAMILY FOUNDATION, INC	17 80 28	NW SW /EX LOT A/	1.2	992.5	0.01	71.4	4613.0	5	53.0	13.8
0617300006	SCHRECK, DANIEL & KARA JTRS	17 80 28	LOT A NW SW	0.5	998.6	0.12	69.1	5167.0	5	126.8	20.4
0629200001	TAYLOR, KAREN P TRUST	29 80 28	NW NE	9.8	995.9	0.08	66.1	3558.0	6	36.4	6.1
0629400002	TAYLOR, KAREN P TRUST	29 80 28	NE SE	0.4	1023.2	0.06	45.3	8171.0	4	37.0	33.6
0632100005	KOONS, JOE & WENDY JTRS	32 80 28	PARCEL A SW NW	1	1004.2	0.04	38.6	3140.0	6	48.7	8.0
0632100006	REPWAY FARMS INC	32 80 28	SW NW /EX PARCEL A/	0.8	1005.7	0.01	37.2	3341.0	6	31.4	8.0
Total Acres				13.7							