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Engineer's Report for

Proposed Drainage Improvements

Drainage District No. 74

Pocahontas County, Iowa

2021

Submitted by:
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Certification

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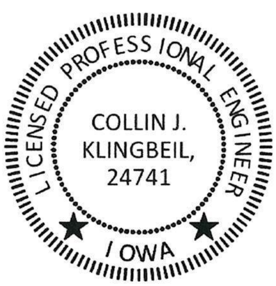
A16.120745

2021



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, 2021.

By: Collin Klingbeil

Collin J. Klingbeil, P.E.
License No. 24741

Date: November 1, 2021

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I. INTRODUCTION

A. Scope of Work

A petition for drainage relief in the Main Tile and Branch 1 of Drainage District No. 74 (DD74) was filed with the Board of Supervisors of Pocahontas County on February 5th, 2020. The petition requests an investigation to determine repairs or improvements needed to bring drainage relief to the lands of the district. The Board appointed Bolton & Menk, Inc. to complete the necessary survey, study, plan, and report. A preliminary engineering analysis was filed April 8, 2020 and an informational meeting was held on June 23, 2020 to discuss the analysis with landowners in the district. At the meeting it was decided to proceed with the engineer's report but not to include a proposal for Branch 2 improvements. A preliminary classification was also requested, to give landowners a preliminary estimate of their share of the project cost.

This report addresses the petitioners' request for improvements DD74, which is located in Pocahontas County. A copy of the petition is contained in Appendix A of this report.

B. Location

The watershed of the Main Open Ditch of DD74 covers an area of approximately 5,445 acres in Dover Township (T-91-N, R-34-W) in Pocahontas County, Iowa. The watershed of the Main Tile spans approximately 2,985 acres in Sections 3, 4, 9, 10, 11, 14, 15, 16, 17, 21, & 22. The watershed of Branch 1 spans approximately 650 acres in Sections 10, 14, 15, 22 & 23. The watershed of Branch 2 spans approximately 431 acres in Sections 21, 22, & 28.

C. History

June 29, 1912	Petition filed for drainage relief
February 25, 1913	Engineer's Report Filed
September 9, 1913	Proposed improvements approved at hearing
September 18, 1913	Report of appraisers filed for right of way acquisition (13.85 ac)
September 24, 1913	Drainage District No. 74 established
1913 – 1915	Construction of original improvements
July 23, 1915	Classification approved at hearing
January 19, 1954	Removal of trees along open ditch in NE1/4 Section 27 Dover Township approved
July 8, 1954	Petition received for ditch cleaning and tree removal, approved September 12, 1955
February 1, 1955	Petition filed for voluntary annexation of lands into DD74
June 15, 1955	Engineer's Report for open ditch repairs filed
September 12, 1955	Ditch Repairs approved at hearing
August 9, 1956	Annexation report filed, recommending 317 acres to be annexed
October 18, 1956	Annexation approved at hearing
November 29, 1956	Classification of annexed land report filed
January 22, 1957	Hearing on classification of annexed lands, report approved.

	Additional downstream ROW acquired (NE1/4 of the SE1/4 Section 27 of Dover Twp, 950 feet long, 100 feet wide)
July 1, 1969	Petition filed to investigate DD74 tile
January 16, 1970	Engineer’s report filed by W. C. Otto
April 17, 1970	Proposed improvements dismissed at hearing
October 2, 1979	Additional ROW acquired (widened from 50’ to 100’ in NE ¼ Section 27)
August 31, 1984	Petition filed for drainage improvements, tabled
February 23, 2016	Informational meeting for DD74 open ditch clean out
	Petition filed
Summer 2016	DD74 Main Open Ditch Repair construction completed
February 5, 2020	Petition filed for DD74 Main Tile and Branch 1 tile improvements
April 8, 2020	Preliminary engineering analysis filed
June 23, 2020	Informal hearing regarding petition and preliminary engineering analysis

II. INVESTIGATION

A survey was made of the existing Drainage District No. 74 tile system and open ditch in the fall of 2020. In addition to the survey, review of Engineer’s reports and plans on file with the district was conducted.

A. Main Open Ditch

The DD74 Main Open Ditch was originally designed with a 5 foot bottom width and 0.05% grade for the entire length, which ended in Section 27. A natural and very meandering channel then carried the water another approximately 1 mile to Cedar Creek. In the mid-1950’s when Joint Drainage District No. 181 (JDD 181) was established, an extension named Branch 255 was constructed to connect the Main Open Ditch of DD74 to the Main Open Ditch of JDD 181. The extension straightened the natural channel significantly and was designed to a 6 foot bottom width and grade of 0.20 – 0.40%. At the mouth, the DD74 Main Open Ditch has a drainage area of approximately 8.6 square miles.

In the same timeframe as Branch 255 of JDD 181 was constructed, ditch repairs were completed on the Main Open Ditch of DD74. The profile of the ditch cleanout shows completely different grades than the original design plus the extension. The minimum grade of the ditch in the 1955 repair plans is 0.10%. As compared to the survey data we gathered, the bottom of the Main Open Ditch of DD74 as it exists today does not match any of the old design and repair profiles, except for the uppermost 5,000 feet of the ditch upstream from 560th St. in Section 22.

We have a few other observations with the ditch:

1. There are currently two 72" diameter culverts under the 140th Ave crossing, the north culvert is about 0.25 feet above the design ditch bottom, the south culvert is about 2.6 feet above the design ditch bottom. From our analysis it appears as though a single 72" culvert can handle the flow from a 5-year storm, so the south culvert is not a major concern. The north culvert would create a negligible backwater effect. We do not recommend any action be taken to modify these culverts.

2. On the north side of the 570th St (C49) crossing there is a weir wall built into the box culvert that backs up water about 2 feet. We presume this is a grade control structure installed during the 1955 ditch project, to reduce erosion along the lower end of the ditch. The weir has little impact on upstream drainage and we do not recommend removing it as part of this project.

3. The ditch restricts flow from the Main Tile system. See discussion below.

   The design flow capacities of the existing Drainage District No. 74 tile systems combined total approximately 41 cubic feet per second (cfs), or 18,400 gallons per minute (gpm). At this flow the water in the Main Open Ditch is estimated to be approximately 40 inches deep. Based on the ditch and tile elevations shown in the original design plans, at this elevation the water would be nearly two-thirds (2/3) of the way up the 34” diameter Main Tile pipe. This condition would cause a “backwater effect”, reducing the flow of water through a tile that is already inadequately sized and aging. The backwater effect would be worse with any additional tile or surface water flow. Sedimentation in the ditch has also historically contributed to the problem.

Main Tile Outlet

Main Tile Outlet Underwater

Branch 1 outlets to the existing Main Open Ditch over 4 feet above the ditch bottom, so little to no backwater effect is occurring except perhaps for a short duration directly following a large storm event.

4. There are several high spots along the ditch that back up water 1 – 2 feet, despite the recent cleanout, completed in 2016, on the upper 2 miles of the ditch. However, we do not believe another ditch cleanout would be in the best interest of the district at this time.

B. Tile System

The size and coefficient of the existing district tile has been analyzed, and the data is shown in the tables on the following pages. The coefficient represents the depth of excess water removed from the surface of the watershed in a 24-hour period. The modern standard of ½” of water removed from the surface area of the watershed in 24 hours (½” Dc) has been in use since the 1950s. This standard is intended for lands without adequate surface drainage.

Existing Main Tile System							
Starting Station	Dia. (in)	Grade (%)	Ex Cap (cfs)	Approx. Length (ft)	Acres Drained	Ex DC (in/day)	Percent Std
83+60	34	0.17%	28.0	4,300	2,945	0.22	45%
126+60	32	0.14%	21.6	4,440	2,544	0.20	40%
171+00	30	0.14%	18.2	1,100	1,934	0.22	45%
182+00	26	0.14%	12.4	500	1,093	0.27	54%
187+00	24	0.19%	11.7	1,200	965	0.29	58%
199+00	22	0.19%	9.3	500	941	0.23	47%
204+00	20	0.19%	7.2	800	757	0.23	45%
212+00	18	0.19%	5.4	3,600	585	0.22	44%
248+00	18	0.145%	4.7	500	360	0.31	63%
253+00	16	0.145%	3.5	1,400	300	0.27	55%
267+00	15	0.145%	2.9	1,100	174	0.40	80%
278+00	14	0.145%	2.4	1,000	126	0.46	92%

Branch 1: Existing Tile System							
Starting Station	Dia. (in)	Grade (%)	Ex Cap (cfs)	Approx. Length (ft)	Acres Drained	Ex DC (in/day)	Percent Std
0+00	20	0.20%	7.4	300	650	0.27	54%
3+00	20	0.70%	13.8	200	639	0.51	103%
5+00	20	0.30%	9.0	2,000	639	0.34	67%
25+00	16	0.30%	5.0	2,100	584	0.20	41%
46+00	16	0.16%	3.6	2,800	435	0.20	40%
74+00	12	0.50%	3.0	900	255	0.28	56%

Branch 2: Existing Tile System							
Starting Station	Dia. (in)	Grade (%)	Ex Cap (cfs)	Approx. Length (ft)	Acres Drained	Ex DC (in/day)	Percent Std
0+00	20	0.10%	5.2	2,100	439	0.28	57%
21+00	18	0.10%	3.9	1,000	387	0.24	48%
31+00	16	0.10%	2.9	900	327	0.21	42%
40+00	12	2.00%	12.9	300	327	0.94	187%
43+00	12	0.30%	2.3	870	177	0.31	62%
51+70	8	0.20%	0.6	430	62	0.25	49%

	Branches 3 – 13: Existing Tile Systems							
Branch	**Starting Station**	**Dia. (in)**	**Grade (%)**	**Ex Cap (cfs)**	**Approx. Length (ft)**	**Acres Drained**	**Ex DC (in/day)**	**Percent Std**
3	0+00	10	1.50%	3.2	600	112	0.68	135%
4	0+00	10	0.30%	1.4	560	102	0.33	67%
5	0+00	14	0.10%	2.0	1000	172	0.28	56%
6	0+00	20	0.22%	7.7	600	639	0.29	58%
	6+00	20	0.18%	7.0	3,000	635	0.26	52%
	36+00	18	0.18%	5.3	800	554	0.23	45%
	43+00	14	0.42%	4.1	700	235	0.42	84%
7	0+00	12	0.20%	1.9	240	258	0.17	35%
8	0+00	12	0.32%	2.4	1,800	74	0.77	153%
8	18+00	10	0.32%	1.5	600	55	0.64	128%
9	0+00	12	1.00%	4.2	220	15	6.53	1305%
10	0+00	10	0.80%	2.3	460	120	0.46	92%
11	0+00	12	1.50%	5.2	300	6.3	19.54	3907%
12	0+00	8	0.40%	0.9	650	60	0.36	72%
13	0+00	12	0.60%	3.3	1,110	66	1.17	234%

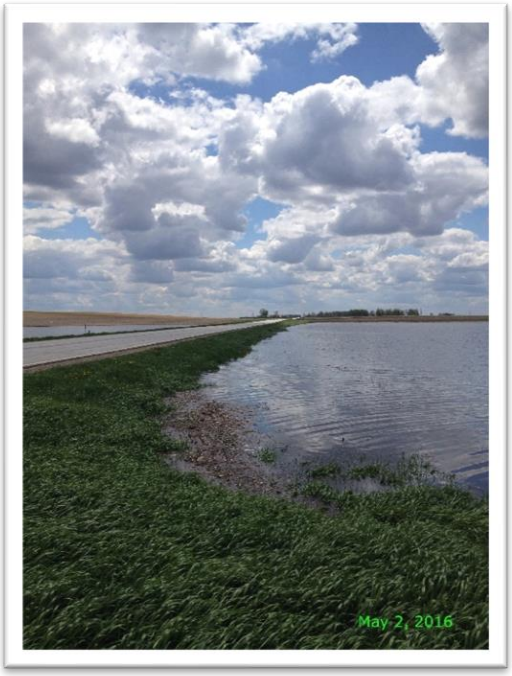
The coefficients and percent of modern capacity shown above assume the tile is clean, straight and unrestricted. However, due to the age of this system it is likely that the actual capacity of the existing system is roughly 80-90% or less of that shown in the tables. Supplementing and paralleling the existing system and using the capacity of the old tile is not recommended because the desired function of the system would rely upon a century old tile. Engineers of that era placed a 50-year life on the clay and concrete tile drains installed at that time.

It appears that most of the tile in DD74 was originally designed with a drainage coefficient between 1/5” and 1/4"/day, or 40-50% of the recommended minimum modern design of 1/2"/day. The Main Tile and Branch 1 are less than half (45%) of this modern standard. Similarly, Branches 5, 6, & 7 all are all less than 60% of the modern standard and would benefit the lands of the district if improved.

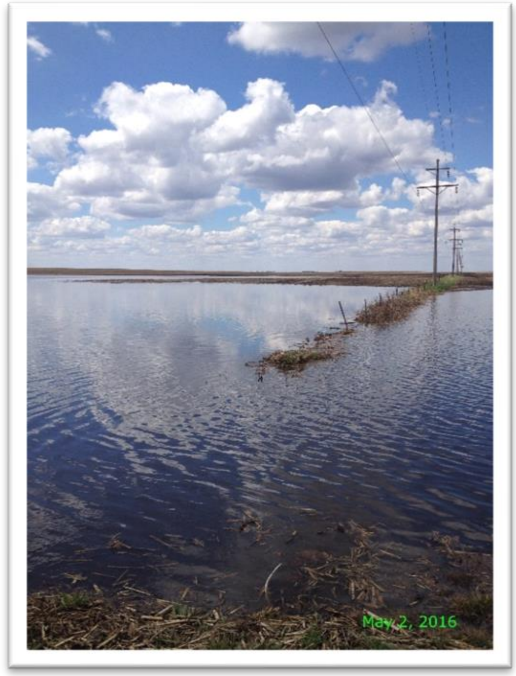
Branches 10, and 12 are designed at approximately 70-90% of the modern standard and depending on the condition of the existing tile and degree of existing surface drainage may not need improvement at this time. They may have better performance if the Main Tile and Branch 1 are improved, as the outlet will be improved.

Branches 8, 9, 11, and 13 meet the minimum modern design standard drainage coefficient of ½”/day. These branches rely on an adequate downstream outlet to flow at their full design capacity. Since these branches flow into tile (Main Tile, Branch 1) with a much lower drainage coefficient they are unable to utilize their full design capacity. It is also our judgement with the data available to us, that Branches 9 and 11 are of little overall value to the district as they serve small areas (15.4 and 6.3 acres, respectively), and they could either be tied into a new improvement, replaced with smaller or same sized tile, or be left to be done privately. In Branch 11’s case, if the existing tile is still in good condition, it is nearly 40 times more capable than required for its small drainage area.

The following photos further illustrate the need for drainage improvements. The photos were taken ½ mile north of 550th St on County Rd N28, which is about 3,000 feet from the outlet of the existing Main Tile.



Looking South East



Looking South West

The investigation of capacities indicates that the several portions of the DD74 tile system have struggled to effectively serve the drainage needs of the landowners for many years and would greatly benefit from improvements.

III. FARM PROGRAM COMPLIANCE

A. Farm Program Wetland Conservation Rules

The farm program wetland conservation rules are administered by the USDA Farm Service Agency. The USDA Natural Resources Conservation Service provides technical assistance. This technical assistance includes policing for program violations and making certified wetland determinations. We have made written requests of landowners receiving benefits from the proposed improvements to secure certified wetland determinations from the USDA/NRCS and to provide them to the district. Only landowners or their authorized agents may request the determinations. Several have not yet provided this information.

The USDA has recently adopted a few new interpretations of the farm program wetland conservation rules which are applicable here.

For any improvements constructed by a drainage district, the NRCS will make a rebuttable assumption that every farmed wetland in the drainage district will be converted. (This assumption can be appealed by the impacted landowners, but not by the drainage district.)

Mitigation of converted farmed wetland must compensate for all lost wetland functions and must also be made at a minimum acre for acre basis.

A plan for the mitigation of all converted farmed wetland in the drainage district must be approved by the NRCS prior to the beginning of the construction of the improvements. After all opportunities for appeals are exhausted, the farmed wetland not covered by that mitigation plan would be found converted and the landowner and tenant would be in technical violation of the farm program. Penalties can be avoided when a drainage district causes the conversion but only at the price of abandoning farming of the converted farmed wetlands or ceasing to participate in the farm program.

The planned mitigation must be in place and functioning no later than the completion of the project which converts the farmed wetlands.

If a landowner does not request a certified wetland determination and he happens to end up with a converted farmed wetland, he will find himself in technical violation of the farm program rules and be subject to a USDA claim for the forfeiture and possibly refund of farm program payments when the work commences.

The Board of Supervisors may approve and authorize construction of the proposed improvements without accruing risk to the district from farm program wetland conservation rules violations. Obviously, the board will want to know the wetlands status of all landowners and to help to keep them all in farm program compliance, but the board cannot allow the failure of an individual landowner to share wetland information to influence the very important decisions it is charged to make for all of the benefitted landowners. However, by the rules, the program penalties will fall solely to the owners of the converted farmed wetlands for which compensatory mitigation is not secured. It is fully up to the landowner to cooperate with the district toward keeping himself/herself in farm program compliance.

1. Converted Wetland Mitigation Alternatives

   Since 1987, the USDA has assumed jurisdiction over the conversion (or improved drainage of) what has become commonly termed "farmed wetland". It being the rebuttable assumption of the current USDA policies that all farmed wetlands will be converted and that acre-for-acre mitigation will be necessary to put the converted farmed wetlands back into production, the decision process is actually made a little easier—although mitigation is made more costly.

   Mitigation options include the purchase of wetland credits in a mitigation bank. Mitigation banks are not common and their credits are not cheap. There is currently one agricultural mitigation bank serving this area with available credits. The current fee is $15,000 per acre. New sites for mitigation are currently being sought by the Iowa Agriculture Mitigation Bank, Inc. and it is possible that an eligible bank may be established nearby within the next few years. Another alternative is for the district to self-mitigate, wherein a mitigation plan to use a suitable site inside or outside the district on which to create wetlands for mitigation of impacted wetlands is developed for review and approval by the NRCS.

   A third alternative is to have the district pay the owner of a converted farmed wetland a portion of the cost for mitigation. The landowner may then either purchase mitigation on his own or let the land lay idle until mitigation is acquired.

   Farm program rules clearly provide that when a farmed wetland is converted by a drainage district the conversion act is attributed to the owner of the farmed wetland. However, the farm program rules also clearly provide that the owner of the converted farmed wetland may remain eligible for farm program benefits by opting to not farm the converted farmed wetland. If for some reason mitigation is delayed, this can be a temporary solution for the farmed wetland owners in a drainage district. It is also an option for those who choose not to report certified farmed wetland determinations and for which mitigation will not be provided.

2. Mitigation Policy of the Pocahontas County Board of Supervisors

   How drainage districts address mitigation is relatively new and a statewide standard practice has not yet evolved. This includes how the costs of the mitigation are paid. In several counties the mitigation costs have often been shared between the district and the owners of the converted farmed wetlands, when wetland mitigation credits were available. In other counties mitigation has been left entirely to the owners of the converted farmed wetlands. Each drainage district's circumstances are different and the Board of Supervisors need the flexibility to address mitigation on a case by case basis.

The justification for the sharing of the costs is that although the owner of a farmed wetland directly benefits from the mitigation needed to make his wet property more productive; the district's project cannot be permitted and proceed until mitigation is addressed. Even if a farmed wetland owner must pay all of the cost of mitigation, passing it through his drainage district enables him to pay for it over the period of installment payments set by the Board of Supervisors.

The Pocahontas County Board of Supervisors has adopted a resolution which spells out how farmed wetlands will be dealt with for drainage districts under their supervision when drainage improvements are considered. The resolution for Pocahontas County is provided in Appendix A.

The resolutions provide that if an improvement project is authorized the drainage district will exercise the third mitigation alternative described above. The owners of all farmed wetlands known at the time of the hearing and which the USDA eventually determines will be converted by the drainage district project will be credited or paid up to $7,500 per acre of converted farmed wetland. This is intended to offset a part of the cost of mitigation.

Until mitigation is secured, in order to retain farm program eligibility the converted farmed wetland owner will need to forego cropping of the converted farmed wetland. If mitigation is available in a bank the landowner could purchase mitigation and resume farming of the converted farmed wetland, or opt to leave the converted wetland site permanently idle.

3. Farmed Wetlands in Benefitted Area

   As of the date of this report we have not received certified wetland determinations from several landowners in the impacted watershed. A map showing which wetland determinations have been received is included in Appendix A. It will be important for any owners of farmed wetland to provide their certified wetland determination before the public hearing is closed.

   Of the received wetland determinations, which make up over 50% of the benefited watershed, none have farmed wetlands. For this report an assumed farmed wetland area of 5 acres will be used to estimate the cost of mitigation. We have assumed mitigation costs of $15,000 per acre. Using the board's mitigation policy, the estimated cost to the district for mitigation will be $37,500.

   These acres and cost estimate could vary substantially as more could be reported or a landowner could forego qualifying for mitigation assistance. Substantial changes should be reflected in a revised cost estimate which should be made at the time of the public hearing, after all determinations to be provided are in. It will be important for owners of farmed wetlands to provide their certified wetland determination before the public hearing is closed.

4. Probable Erroneous Wetland Determinations

   Recent changes in technology and in NRCS policies have presented an opportunity to appeal from and reduce or eliminate farmed wetland acres. It took the NRCS eighteen years to recognize the 8th Circuit Court of Appeals decision in Barthel v. USDA. The court required that farmed wetland determinations be based upon the best historic level of drainage. This forces a mathematical modeling of wetland hydrology and has resulted in dramatic reductions in farmed wetland acres in drainage districts in recent years. Forty acres were eliminated by appeal in 2017 in a district near Fonda. Forty acres were also eliminated in a Worth County district the year before.

We recommend that the board authorize Bolton & Menk to assist the landowners in appealing their determinations. It requires landowner cooperation but the cost is justified in that for every acre of wetland reduced, the district saves $7,500 acres in mitigation assistance.

B. Buffer Strips & Conservation Reserve Program (CRP) Disturbances

We note that there may be buffer strips in place along the open ditch. There are some manageable drawbacks that must be addressed by the owners of impacted buffer strips and CRP tracts.

The destruction of buffer strip or CRP vegetation by construction activities places the landowner in violation of Farm Program conservation rules. The relatively severe penalties can include loss of the CRP contract or forfeiture of back CRP payments and penalties. To avoid these, landowners must request a waiver from the USDA Farm Service Agency County Committee. The county committee will grant waivers for ditch maintenance if seeding restoration, in compliance with NRCS requirements, is done. If the project is authorized, all farm program buffer strip and CRP owners in the path of construction must independently seek the FSA County Committee waivers. This process should be initiated immediately if the project is authorized.

The CRP rules include not disturbing it during the primary nesting season of May 15 to August 1. However there is a drainage district ditch maintenance exception that would be applicable.

The widened ditch could also take out some CRP. USDA rules allow for CRP to be removed without penalty under threat of condemnation or we assume the buffer could be widened to offset the loss without penalty.

IV. CLEAN WATER ACT COMPLIANCE

Dredging and filling of water of the United States (WOTUS) is regulated under Section 404 of the Clean Water Act. In the 1990's the USEPA & USACE adopted rules to extend section 404 jurisdiction to isolated wetlands, including farmed wetlands. For a few years it became necessary to get CWA Sec 404 permits for drainage district improvements where farmed wetland conversions were expected. Drainage districts were helped at the time with the issuance of a memorandum of understanding entered into by 4 regulatory agencies. This agreement gave the NRCS primacy in mapping and regulating wetlands on agricultural land. Great relief came in 2001 when the U.S. Supreme Court ruled that isolated wetlands were not subject to CWA Sec 404 jurisdiction.

However, in 2012 the USEPA launched an aggressive rulemaking procedure to reestablish jurisdiction of isolated wetlands by revising the definition of "waters of the United States" (WOTUS) to include isolated wetlands. This massive rule change became effective on August 28, 2015. The 2015 WOTUS rule 1) expanded CWA Sec 404 jurisdiction to include all isolated farmed wetlands and even drained prairie potholes, 2) identified more jurisdictional wetland than has the USDA has identified under the farm program and 3) demanded more stringent and costly mitigation for the conversion of farmed wetland.

Under the previous administration, the 2015 WOTUS Rule was repealed, and subsequently replaced on January 23, 2020. The rule was not perfect but a step in the right direction. However, under the new administration it has recently been announced that the WOTUS Rule will yet again be re-written. It is likely intended to go back towards something similar to the 2015 WOTUS Rule, which is concerning. This is a reminder that environmental regulations tend to get tougher over time and that consideration should be made in light when the opportunity for improvements is presented.

V. PROPOSED WORK

The investigation has confirmed the need for drainage relief in the district. Modern farming practices rely upon well drained soils to achieve maximum productivity. A ½" Dc standard applies to land with surface relief and limited ponding. This standard is contained in the Iowa Drainage Guide and has been in place since the 1950's. The ½" Dc is adequate for virtually all of the drainage districts in Pocahontas County and is a cost effective design to maximize the productivity of today's farming practices.

A. Tile Improvements

We recommend replacement of the existing Drainage District No. 74 Main Tile, and Branches 1, 5, 6, 7, 10, & 12 with a system designed according to modern standards. We also recommend construction of a new Branch 14 tile.

The proposed Main Tile would begin in the SW ¼ NW ¼ Section 22 of Dover Township at the upper end of the DD74 Main Open Ditch. The Main Tile would parallel the existing tile for nearly 4 miles, passing through Sections 15, 16, 9, 10, and 3 with tile ranging in size from 48" at the outlet to 15" at the upper end.

The proposed Branch 1 tile would begin in the NW ¼ SE ¼ Section 22 of Dover Township and parallel the existing tile for approximately 8,600 feet in Sections 22, 15, and 14 with tile ranging in size from 30" at the outlet to the ditch to 15" at the upper end.

The proposed Branch 5 tile would begin in the NE ¼ SE ¼ Section 16 of Dover Township and parallel the existing tile for approximately 1,200 feet in Sections 16 and 15, with tile ranging in size from 21" at the connection to the Main Tile to 18" at the upper end.

The proposed Branch 6 tile would begin in the SE ¼ SE ¼ Section 9 of Dover Township where it would parallel the existing Branch 6 tile for approximately 5,200 feet in Section 9, with tile ranging in size from 27" at the connection to the Main Tile to 15" at the upper end.

The proposed Branch 7 tile would replace and extend the existing Branch 7 tile and begin in the NE ¼ NE ¼ Section 9 of Dover Township where it would connect to the new Main Tile. It would extend approximately 1,900 feet with 18" tile. Additionally, a 15" tile would cross over to the north side 530th St to provide an outlet to the lands north of the road.

The proposed Branch 10 tile would begin in the NE ¼ SW ¼ Section 10 of Dover Township for approximately 500 feet with 12" tile. The tentative plan would be to crush the existing Branch 10 tile in place, and run the new tile directly underneath it. This tile is a branch of the Main Tile.

The proposed Branch 12 tile would begin in the NW ¼ SE ¼ Section 3 of Dover Township for approximately 620 feet with 12" tile. The tentative plan would be to crush the existing Branch 12 tile in place, and run the new tile directly underneath it. This tile is a branch of the Main Tile.

The proposed Branch 14 tile would begin in the NW ¼ NE ¼ Section 10 of Dover Township where it would connect to the new Main Tile. It is a newly proposed tile that would serve the lands east of 140th Ave, in Section 11. It would run straight east approximately 1,500 feet with 12" tile.

Where the existing tile is connected to the proposed tile, the upstream end will be connected to the proposed tile and the downstream end will be capped to allow the tile to continue functioning as a collector to bring private tile systems to the new main drains. The function of the existing tile will be replaced by the new system and it is recommended that the surviving reaches of the Main Tile and Branches 1, 5, 6, & 7 be abandoned as district facilities (Branches 10 & 12 are planned to be crushed in place). Maintenance responsibilities for these tiles should be turned over to the landowners following the completion of the project. However, if a reach of the old tile is found to be in poor repair during construction, it can be uncovered and broken down in place.

We recommend the proposed new drains be constructed using reinforced concrete pipe, RCP. For the RCP capacity design we have used a Manning's n flow resistance factor of 0.011 as recommended by the Iowa Drainage Guide. A dual-wall HDPE tile would have a materially higher Manning's n factor, due to re-corrugation, and a markedly shorter design life. If installed as per the plastic pipe industry standards for a public facility the cost would be as much as or more than the cost of the recommended RCP system. When the life cycle costs are compared the RCP advantage over HDPE is even greater.

B. Main Open Ditch

In order to accommodate the larger Main Tile outlet proposed, without backwater impacts, we recommend the following modifications to the upper 5,000 feet of the Main Open Ditch, upstream from the 560th St. crossing (STA 33+00 to 83+18)

- Flatten the ditch grade from 0.10% to 0.06%
- Widen the bottom from 5 feet to 8 feet

Downstream from the improved ditch reach the channel will return to a 5 foot bottom at 0.10% grade with 1.5:1 side slopes. There will be negligible backwater effects from the narrowing of the ditch, because of the steeper grade downstream. The main purpose of improving the ditch is to lower the upper end to provide a better outlet for the Main Tile system. The deepened ditch is not needed for the Branch 1 tile.

C. Right of way

The right-of-way of the existing Main Open Ditch ranges from 50 feet to 120 feet wide (centered on the ditch) from the upper extent of the ditch to the outlet into Joint Drainage District No. 181 Main Open Ditch, and is shown in the table below.

Main Open Ditch Existing Right-of-Way		
Start Station	**End Station**	**Width of ROW, feet**
-46+23	-34+78	120
-34+78	0+00	100
0+00	33+70	50
33+70	56+50	66
56+50	62+97	90
62+97	83+18	100

Open ditch right-of-way in the early 1900's generally encompassed the width of the ditch, from top of bank to top of bank, plus the unleveled spoil piles. Lands within drainage ditch right-of-way are not subject to real estate taxes or drainage district assessments, but are not eligible for damage reimbursement if crops within the right-of-way are destroyed in the process of making repairs or improvements. Repairs for open ditches are typically needed about every 30 years, and often can be done outside the cropping season, so additional width of right-of-way outside the top of ditch bank may not always be practical. However, at a minimum, right-of-way should be as wide as the top width of the ditch.

Both the existing and improved ditch cross sections are and will be contained within the existing right-of-way. If right-of-way along the ditch is desired to provide an access route, we recommend increasing the reaches of 50 ft and 66 ft widths to 90 ft, which would total approximately 4.35 acres of right-of-way acquisition. The remainder of the ditch has adequate right-of-way.

D. Estimated Costs

A detailed opinion of probable cost is included in Appendix C of this report. Construction costs are in a volatile state and have increased dramatically over the past year due to inflation, labor shortages, and supply chain issues, among other things. We are hopeful that the prices will stabilize soon. Our cost estimate is a reflection of what we believe to be a reasonable price increase considering the current environment but is quite possibly lower than what the project would bid for at the time of filing this report. If the project moves forward and the bids come in excessively high, the Board may opt to reject all bids and re-bid at a later date.

A summary of the total estimated construction costs for the proposed improvements is shown below.

Estimated Construction Costs for DD74 Tile System Improvements			
Facility	**Acres Served**	**Estimated Construction Cost**	**Average Construction Cost per Benefited Acre**
Lower Main Tile	2,985 acres	$1,327,000	$445
Upper Main Tile	1,064 acres	$767,000	$721
Branch 1	650 acres	$509,000	$783
Branch 5	262 acres	$67,000	$256
Branch 6	639 acres	$361,000	$565
Branch 7	258 acres	$88,000	$341
Branch 10	120 acres	$18,000	$150
Branch 12	60 acres	$22,000	$367
Branch 14	66 acres	$49,000	$742

We do acknowledge that the estimated cost of this project is high, and thus several lower cost alternatives are shown below for landowner and Board consideration.

Reduced Scope Alternative Estimated Assessable Project Cost		
Alternative	**Estimated Cost**	**Average Cost Per Benefited Acre**
Full Proposed Project	$3,985,000	$1,096
Eliminate Br 10 & 12	$3,938,000	$1,083
Lower & Upper Main, Br 1, Br 6 only	$3,698,000	$1,017
Lower Main, Br 1, Br 6 only	$2,795,000	$769
Lower Main, Br 5, 6, & 7 only	$2,379,000	$797
Lower Main only	$1,771,000	$593
Branch 1 only	$611,000	$940

The district will need an area within which to perform the proposed work. The work limits will typically be set out to 50 feet from the tile on each side and 150 feet from the open ditch on each side. Landowners will be entitled to compensation for damages within the work area that are not within right-of-way of the open ditch. It is recommended that whenever possible, a landowner not crop the work area and instead accept fair rent for the land. Compensation for use of and damages within the temporary work area is normally determined at the project completion hearing. This is included in the cost estimate.

E. Road Crossings

Twelve county road crossings will be required as a part of the proposed work. Iowa Code Chapter 468 requires that all costs of primary and secondary road crossings be paid from funds available to the entity that controls the road. The table below summarizes the road crossings that are a part of the proposed tile improvement project. It is assumed that the gravel crossings will be open cut and the paved road crossings will be bored.

Summary of Road Crossings

Facility	Road	Surface	Station	Type	Diameter
Main Tile	550th St	Gravel	22+48	Open Cut	48”
	130th Ave (N28)	Paved	33+79	Bored	48”
	540th St	Gravel	86+99	Open Cut	48”
	130th Ave (N28)	Paved	100+43	Bored	44”
	530th St	Gravel	167+95	Open Cut	27”
Branch 1	550th St	Gravel	43+45	Open Cut	24”
	140th Ave	Gravel	60+35	Open Cut	21”
	140th Ave	Gravel	84+49	Open Cut	15”
Branch 5	130th Ave (N28)	Paved	7+65	Bored	20”
Branch 6	530th St	Gravel	50+89	Open Cut	15”
Branch 7	530th St	Gravel	9+00	Open Cut	15”
Branch 14	140th Ave	Gravel	14+15	Open Cut	12”

We estimate the total cost to the County Secondary Roads for the recommended improvement to be $288,000.

VI. ASSESSMENT SCHEDULE REVIEW

A. Benefited Lands not now Assessed

There are currently 5,347.14 acres on the existing assessment schedule of Drainage District No. 74. It appears as though there are approximately 322 acres within parcels benefited by the district facilities that are not currently on the assessment schedule. A separate Annexation Report and hearing would be required to further analyze the lands and give final recommendations. It would be cost effective to do this annexation for the entire watershed as part of the proposed project. Most landowners now in the district would likely support the annexation; those being annexed would likely be opposed. It should be emphasized to the owners of the annexed lands that assessments are based upon relative benefits and that if the benefit is small, the assessment is also relatively small.

B. Existing Assessment Schedule Review

Drainage District No. 74 is still under its original assessment schedule from when the district was established in the early 1900's. A total of 317 acres was annexed in the 1950's. All district facilities are included in this single assessment schedule. Appendix B contains the existing assessment schedule. It has become common practice with reclassification to separate all facilities within a district into individual schedules to prevent landowners who receive no benefit from a particular named facility from having to pay to maintain that facility. It is recommended that the proposed district be divided into separate maintenance schedules to make the cost of future repairs more equitable.

We have been directed by the Board to develop a pre-classification, which is similar to what the Benefit Commission would consider at the end of the project. Please be reminded that the pre-classification is an estimate only. The final approved distribution would still be subject to a recommendation of the Commission appointed by the Board, and to the final adjustments made by the Board at the reclassification public hearing at the end of the project. Work on the pre-classification can be reused as part of the final reclassification. The pre-classification is included in a separate report.

We recommend that the several district facilities be divided and reclassified to give each facility an appropriate schedule upon which to spread the costs of this project as applicable and any future maintenance.

C. General Reclassification Methodology

The process of reclassification uses several factors to equitably spread project costs based upon benefits received. The four common factors are: Benefited Area, Facility Use, Proximity to Outlet, and Soil Wetness.

The Use Factor takes into account how much of the facility is required to bring an outlet to a particular location. The more of a facility used by any given property, the higher the use factor on that property. A parcel using one mile of a facility would have a lower use factor than a parcel using five 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 Proximity Factor 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 or also pay for a lateral to reach the tile.

The Soil Wetness Factor accounts for the soil types' varying natural wetness and need for drainage. Wet soils in a pothole are assigned higher wet factors because the soils have more need for drainage than drier soils on the hill tops.

Many other considerations may be necessary to achieve equitable benefit classifications and fair assessments.

VII. DISCUSSIONS & RECOMMENDATIONS

This report confirms the need to improve the drainage efficiency and capacity of the DD 74 drainage system. The work described herein can accomplish that improvement. The improvements proposed will provide the drainage capacity needed for modern farming practices. The estimated assessable cost of the recommended improvement is $3,985,000. We find that the proposed project will be practicable, feasible, and beneficial to the public. We recommend that these improvements be constructed.

Annexation Recommended. Approximately 6% of the lands now served by DD74 appear to benefit from district facilities, but have not been assessed for 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 the DD74 benefited area.

Annexation is expected to cost approximately $5,000 - $10,000. For the proposed improvement, the annexed lands should bring more dollars into the district than it will cost to annex them. In order for these lands to be assessed to help pay for the proposed improvements and for future maintenance there would be no better time to bring them into the district. It is recommended that procedures to annex lands outside of DD74 which benefit from district facilities be initiated.

Reclassification Recommended. With the replacement of a portion of the existing Branch Main Tile with open ditch, the existing assessment schedule will be obsolete and should be updated. Reclassification is expected to cost approximately $3-4 per acre for each schedule developed.

Installment Payments. Iowa drainage district law provides that large improvement assessments may be paid in no less than ten nor more than twenty annual installments at the discretion of the Board of Supervisors. We anticipate that the board will spread assessments of the magnitude contemplated in this report over twenty years. If we assume that the board will allow twenty annual installments at 5% interest, the recommended improvement costs for benefited lands would average about $84 per acre per year. Please be reminded that assessments are based upon benefits and that following reclassification some highly benefited parcels will bear up to 2 to 2 ½ times the average assessments.

Included in Appendix C is a financial analysis of the probable costs and the likely payback period for different assessment thresholds at different yield increases resulting from this project. The financial analysis uses current commodity prices and average yields from the Agricultural Decision Maker website. Varying yield increases have been used to estimate pay back periods for a range of possible assessments. Iowa State University and University of Minnesota research indicates a likely average yield increase of 10 – 20% or more for an improvement of this type. Conservatively assuming corn averages $3.00/bushel over the next 20 years and using only the increase in revenue from an assumed 10% yield increase, an average assessment for the recommended improvements could be repaid in approximately twenty years. If corn averages $5.00/bushel over the next 20 years with a 10% yield increase, the payback period would be approximately twelve years.

These improvements would likely continue to function well for another century plus, bringing continued benefit to future generations of owners. The market value of the land should also increase.

It is recommended that the Board of Supervisors of Pocahontas County, acting as trustees for DD74, take appropriate action with legal guidance to accomplish the following:

- Tentatively approve this engineer's report.
- Direct the engineer to contact owners of reported farmed wetlands and to assist with appeals where judged likely beneficial to the district.
- Schedule and conduct a public hearing on the proposed improvements.
- Adopt the recommended improvement plan, modified as deemed appropriate to satisfy the needs of the district.
- Direct the engineer to prepare the necessary plans and specifications and to proceed toward a bid letting.
- Initiate procedures to annex benefited lands.
- Initiate procedures for reclassification.

Respectfully submitted,

Bolton & Menk, Inc.

Collin Klingbeil

Collin J. Klingbeil, P.E.
Project Engineer

Appendix A: Petition
Wetland Determinations Received
Mitigation Policy of Pocahontas County Board of Supervisors

RECEIVED

FEB 05 2020

COUNTY AUDITOR & COMMISSIONER OF ELECTIONS

DRAINAGE PETITION

TO: THE BOARD OF SUPERVISORS OF POCAHONTAS COUNTY, IOWA, ACTING ON BEHALF OF DRAINAGE DISTRICT NO. 74 MAIN TILE AND BRANCH 1 TILE WHICH BENEFITS LANDS SOLEY IN POCAHONTAS COUNTY, IOWA.

COMES NOW, the undersigned Petitioners, being owners of the real estate in this established branch of the drainage district and in making this petition for drainage relief for the drainage of said lands respectfully state to the Board of Supervisors of Pocahontas County, Iowa:

1. That the lands of these petitioners are a part of and are included in Drainage District No. 74 Main Tile and Branch 1 Tile in Pocahontas County, Iowa, and that said lands are assessed for drainage tax by virtue of the improvements in said branch of the district.
2. That the drainage facilities of Drainage District No. 74 Main Tile and Branch 1 Tile in their present condition in section 22, 15, 16, 10, 9, & 3-93-34 are not sufficient to properly drain the water from the lands of these petitioners as well as other lands; that such lands are too wet for timely cultivation, too wet to support good crop production, and are subject to erosion and flood danger; that if the original improvements in said drainage district were properly improved to correct the current situation, the public benefit, utility, health and welfare would be promoted.
3. That these petitioners do not have exact knowledge or information as to the exact nature of the work to be done to correct the situation, but that these petitioners are of the belief that an investigation of the situation by a qualified engineer would determine the exact nature of the work required to provide adequate drainage for the lands of these petitioners and adjoining lands.
4. That these petitioners, being the owners of lands which are part of the benefited area of Drainage District No. 74 Main Tile and Branch 1 Tile, are entitled to adequate drainage from improvements of the drainage district.
5. That these petitioners are signing this petition pursuant to Section 468.126 of the Code of Iowa.

WHEREFORE, these petitioners respectfully request that the Board of Supervisors of Pocahontas County, Iowa, acting on behalf of the owners of lands benefited by Drainage District No. 41 appoint an qualified engineer to investigate the drainage situation herein referred to with respect to petitioners land and other lands; and that the board order that district facilities be improved, to provide adequate drainage relief for the lands of these petitioners and adjoining lands as described above.

Dated this 5 day of February, 2020

LANDOWNERS	DESCRIPTION OF LAND
Vegors Land & Livestock Co	Sec 3, 9, 11, & 14-91-34
Donald Sievers, CEO	
Donald Sievers CEO 2/5/20	

Drainage District No. 74

Pocahontas County, Iowa

Wetland Determinations Received

October 2021

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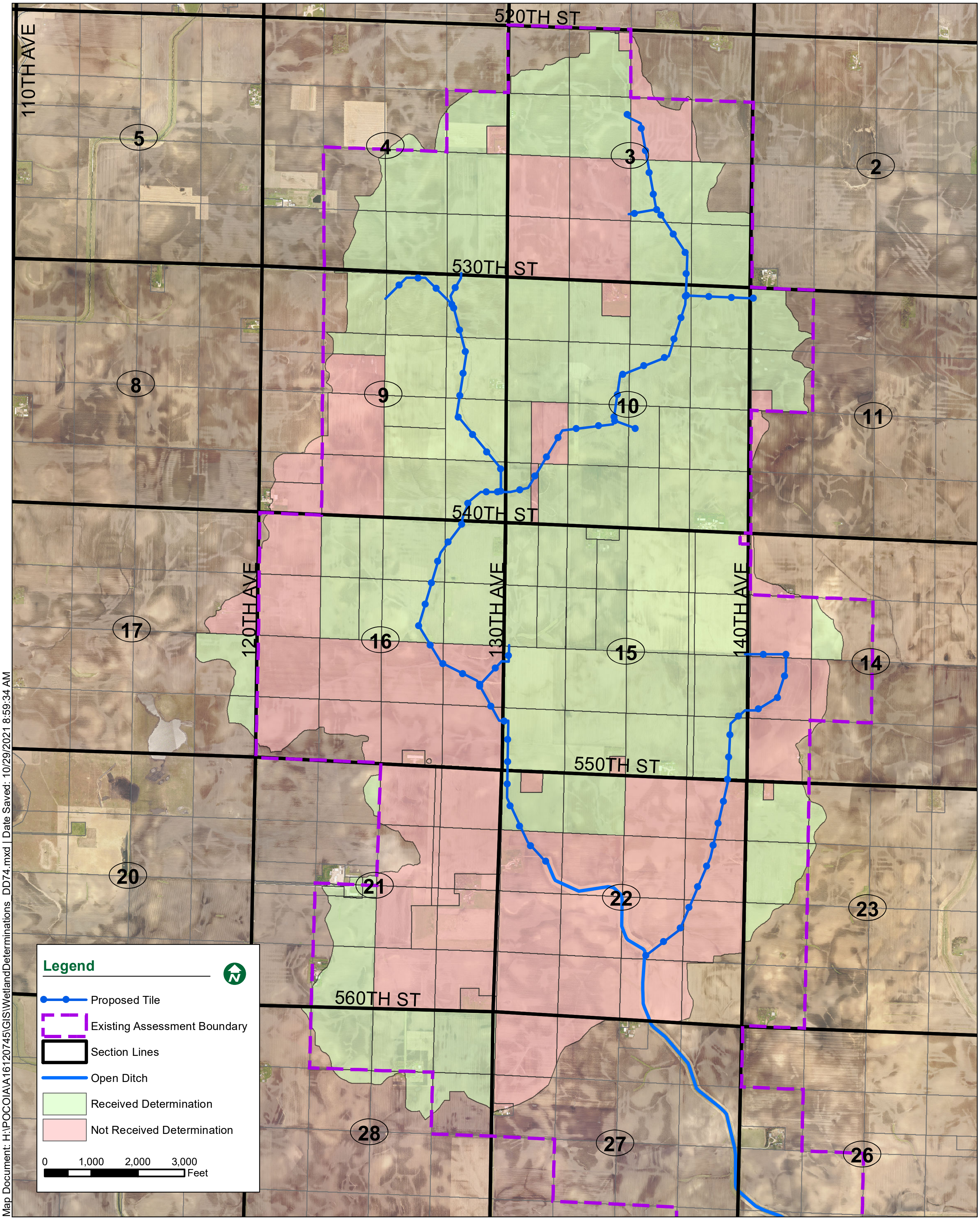

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Resolution - 12-2014 # 10

Policy for the Mitigation of Converted Farmed Wetlands in Benefited Areas of Drainage District Improvement Projects in Pocahontas County.

WHEREAS the Board of Supervisors is charged under the law to conduct studies and to consider at public hearing, together with the owners of the benefited lands, the adoption of drainage improvements by and for drainage districts in the county.

WHEREAS drainage districts improvements may be found by the USDA to cause the conversion of farmed wetlands subject to wetland conservation rules of the federal farm program and thereby cause the owners of the converted wetlands to be subjected to heavy penalties for violations of the program rules.

WHEREAS the Board has historically and consistently supported the inclusion of mitigation for converted farmed wetlands in drainage district projects and to have drainage districts share the costs of mitigation with the owners of the converted farmed wetlands.

WHEREAS the Board anticipates that several drainage districts will in 2015 consider improvements which will, if approved at public hearing, result in the conversion of farmed wetlands in the benefited areas and the Board has learned that there is no affordable converted wetland mitigation currently available, but that mitigation is also anticipated to be available in the future.

WHEREAS farm program rules allow the owners and tenants of farmed wetland converted by drainage districts to avoid program penalties and retain eligibility if they do not crop the area of the converted farmed wetland.

WHEREAS the Board believes it is important for drainage districts to continue to support mitigation of farmed wetlands converted by drainage district improvement projects when affordable mitigation is not available so that the projects may be considered for approval and, if approved, be constructed all in a timely manner.

IT IS HEREBY RESOLVED that for all proposed drainage district improvements projects in the county that will hereafter be considered for adoption at public hearing in the county and which are under the sole jurisdiction of the Board, and subject to the following conditions, the drainage district will credit or pay up to $7,500 per farmed wetland acre to each owner of farmed wetland that will be converted by the drainage district project, the funds then to be used toward the owners' independent pursuit of compensatory mitigation if desired.

- Condition 1. The drainage district determines either through a jurisdictional determination of the Corps of Engineers or by the opinion of the drainage district's appointed engineer that the farmed wetland is not subject to regulation under Section 404 of the federal Clean Water Act. If it is subject to Clean Water Act jurisdiction then no mitigation offset will be provided and the drainage district will need to apply for a permit and deal with mitigation directly.

- Condition 2. An owner of a farmed wetland that may be converted by the proposed project must timely provide to the drainage district a copy of a USDA issued or approved certified wetland determination for land in the benefited area. So that the added cost of the mitigation offset may be included in the board's considerations, this documentation must be placed on file with the county before the time that the board finalizes its decision at public hearing to approve the construction of drainage improvements in the district. If the farmed wetland documentation is not timely provided then no mitigation offset credits or payments will be provided by the drainage district.

- Condition 3. The owner of a farmed wetland must exhaust all reasonable options available through the local or area USDA staff to minimize the size of the farmed wetland as may be available to them at or after the time of their receipt of the notice of the public hearing. If this is not done the Board reserves the option to adjust down the credit or payment that it would otherwise approve to be provided for the mitigation offset.

- Condition 4. Before credits or payments for a mitigation offset will be released to a farmed wetland owner the owner must provide a statement in writing from the USDA that the farmed wetland will be converted by the drainage district project and that continued cropping of the farmed wetland after it is converted will affect the owner's farm program eligibility. (This statement is required even if the landowner is not a farm program participant.)

- Condition 5. If federal or state laws or associated implementing regulations thereof change prior to the completion of the credit or payment for the mitigation offset so that the drainage district may no longer transfer compensatory mitigation responsibilities to the farmed wetland owners in this way then no mitigation offset will be provided to landowners for the affected farmed wetlands and the drainage district will need to apply for a permit and deal with mitigation directly.

The Board may alter this policy separately at each public hearing as may be needed to accomplish the intent of the resolution, to account for unusual circumstances, to comply with changing laws and regulations, and to promote fairness.

Adopted and approved this 23rd day of December 2014.

Vincent Triggs

Vincent L. Triggs, Chairman
Board of Supervisors
Pocahontas County

ATTEST:

Margene A. Bunda

Margene A. Bunda, County Auditor

Appendix B: Existing Schedule Map
Existing Assessment Schedule

Drainage District No. 74

Pocahontas County, Iowa

Existing Assessment Schedule

October 2021

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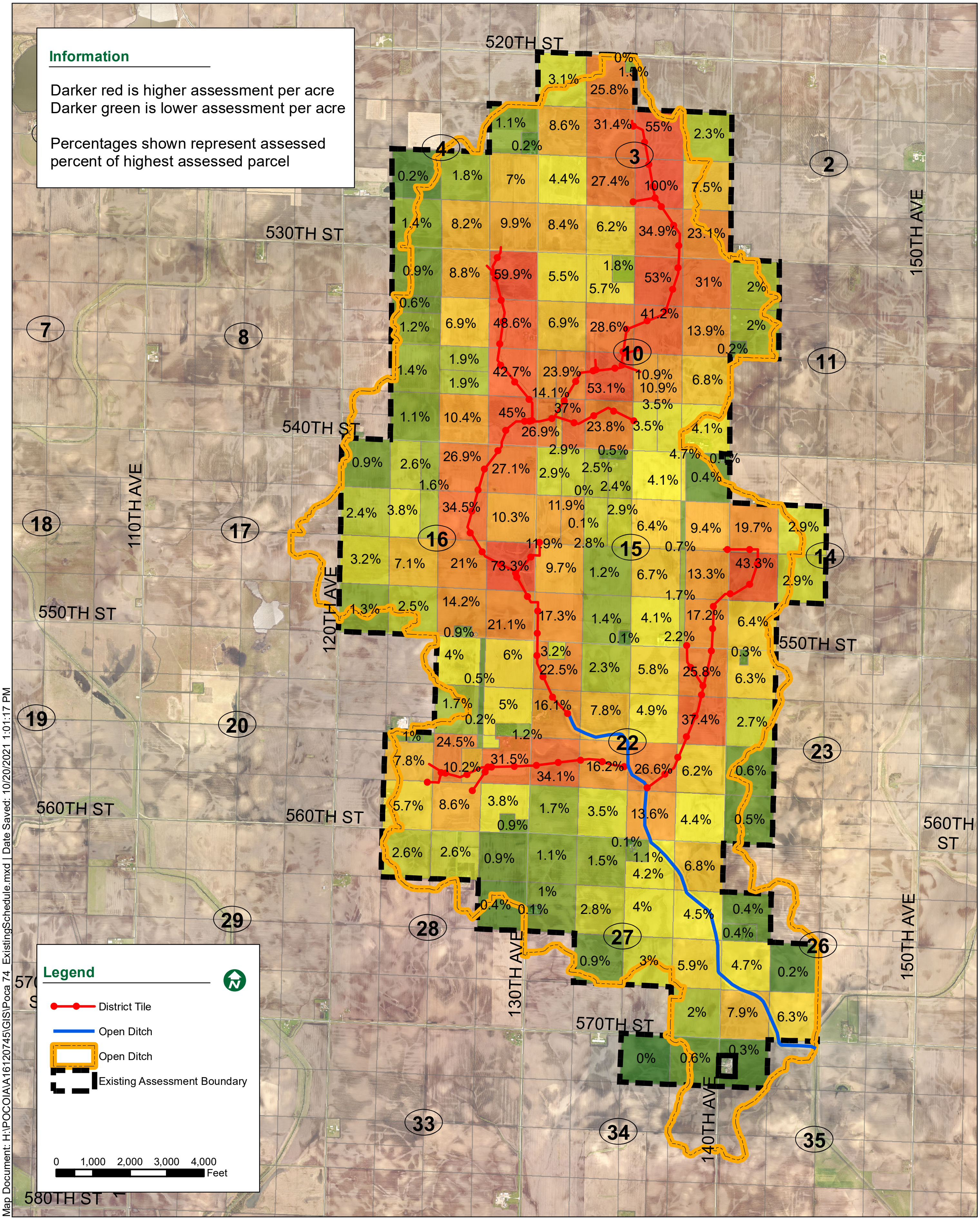

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District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
.5	260 000	09 03 100 001 003 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	NW NW 3-91-34	40.120	3.7000	77.630
1.0	260 000	09 03 100 006 003 091 034	Spud Farms, LLC 824 Brooks Rd Iowa Falls, IA 50126	PARCEL A NE NW RD .30	2.350	1.5400	39.000
1.1	260 000	09 03 100 007 003 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	NE NW(EXC PARCELS A & C) RD 1.57	39.320	25.8100	652.510
1.2	260 000	09 03 100 008 003 091 034	Spud Farms, LLC 824 Brooks Rd Iowa Falls, IA 50126	PARCEL C NE NW RD .09	.070	.0500	1.160
1.5	260 000	09 03 100 003 003 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	SW NW 3-91-34	38.590	8.5000	218.400
2.0	260 000	09 03 100 004 003 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	SE NW 3-91-34	40.000	31.4000	794.530
2.5	260 000	09 03 200 003 003 091 034	Rebhuhn Farms Inc 14155 510th St Pocahontas, IA 50574-0000	SW NE 3-91-34	40.000	55.0000	1,392.420
3.0	260 000	09 03 200 004 003 091 034	Rebhuhn Farms Inc 14155 510th St Pocahontas, IA 50574-0000	SE NE 3-91-34	39.000	2.3000	59.230
3.5	260 000	09 03 300 001 003 091 034	Schwanz Revocable Trust, Janet L 301 E 12th St Storm Lake, IA 50588	NW SW 3-91-34	38.490	4.4000	111.660
4.0	260 000	09 03 300 002 003 091 034	Schwanz Revocable Trust, Janet L 301 E 12th St	NE SW 3-91-34	40.000	27.4000	693.440

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal		Acres	% Benefit	Units Assessed
			Storm Lake, IA 50588					
4.5	260 000	09 03 300 003 003 091 034	Schwanz Revocable Trust, Janet L 301 E 12th St Storm Lake, IA 50588	SW SW	3-91-34	37.150	8.4000	213.680
5.0	260 000	09 03 300 004 003 091 034	Schwanz Revocable Trust, Janet L 301 E 12th St Storm Lake, IA 50588	SE SW	3-91-34	38.640	6.2000	155.720
5.5	260 000	09 03 400 001 003 091 034	Seehusen, Norma Jean 51086 160th Ave Pocahontas, IA 50574	NW SE	3-91-34	40.000	100.0000	2,530.630
6.0	260 000	09 03 400 002 003 091 034	Seehusen, Norma Jean 51086 160th Ave Pocahontas, IA 50574	NE SE	3-91-34	39.000	7.5000	190.530
6.5	260 000	09 03 400 003 003 091 034	Seehusen, Norma Jean 51086 160th Ave Pocahontas, IA 50574	SW SE	3-91-34	38.630	35.1000	883.280
7.0	260 000	09 03 400 004 003 091 034	Seehusen, Norma Jean 51086 160th Ave Pocahontas, IA 50574	SE SE	3-91-34	37.650	23.1000	584.910
7.5	260 000	09 04 200 005 004 091 034	Pudenz Trust, Ronald H 52455 130th Ave Pocahontas, IA 50574	LOT IN SE NE	4-91-34	5.060	1.3000	4.770
8.0	260 000	09 04 200 004 004 091 034	Johnson, Robert J Trust Johnson, Peggy Ann Trust 1208 4th Ave NW PO Box 208 Pocahontas, IA 50574	BAL SE NE	4-91-34	33.470	1.3000	28.440
8.5	250 000	09 04 300 002 004 091 034	Johnson, Robert J Trust Johnson, Peggy Ann Trust 1208 4th Ave NW PO Box 208 Pocahontas, IA 50574	NE SW	4-91-34	40.000	.0200	4.560
9.0	250 000	09 04 300 004	Johnson Trust, Robert J	SE SW		39.000	1.3000	34.350

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal		Acres	% Benefit	Units Assessed
		004 091 034	Johnson Trust, Peggy Ann 1208 4th Ave NW PO Box 208 Pocahontas, IA 50574		4-91-34			
9.5	250 000	09 04 400 001 004 091 034	Johnson Trust, Robert J Johnson Trust, Peggy Ann 1208 4th Ave NW PO Box 208 Pocahontas, IA 50574	NW SE	4-91-34	40.000	1.4000	44.940
10.0	260 000	09 04 400 002 004 091 034	Kinkade, Brian Dean 12364 510th St Laurens, IA 50554	NE SE	4-91-34	38.490	7.3000	178.260
10.5	250 000	09 04 400 003 004 091 034	Johnson Trust, Robert J Johnson Trust, Peggy Ann 1208 4th Ave NW PO Box 208 Pocahontas, IA 50574	SW SE	4-91-34	39.000	8.0000	207.020
11.0	260 000	09 04 400 004 004 091 034	Kinkade, Brian Dean 12364 510th St Laurens, IA 50554	SE SE	4-91-34	37.500	9.8000	249.900
11.5	250 000	09 09 100 002 009 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	NE NW	9-91-34	39.000	.9000	22.560
12.0	250 000	09 09 100 007 009 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	N 1/3 SE NW		13.330	.5695	14.360
12.1	250 000	09 09 100 008 009 091 034	Schumann, Joanne 12117 540th St Albert City, IA 50510-8604	S 2/3 SE NW		26.670	1.1305	29.150
12.5	250 000	09 09 200 001 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	NW NE	9-91-34	39.000	8.9000	223.890
13.0	250 000	09 09 200 002 009 091 034	FT Nielsen Farms LLC	NE NE	9-91-34	37.570	59.9000	1,514.660

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal		Acres	% Benefit	Units Assessed
			13637 550th St Fonda, IA 50540					
13.6	250 000	09 09 200 007 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	SW NE		40.000	6.9000	174.090
14.0	250 000	09 09 200 004 009 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St Fonda, IA 50540	SE NE	9-91-34	38.530	48.6000	1,230.930
14.5	250 000	09 09 300 002 009 091 034	Schumann, Joanne 12117 540th St Albert City, IA 50510-8604	NE SW	9-91-34	40.000	1.4000	35.500
15.0	250 000	09 09 300 004 009 091 034	Schumann, Joanne 12117 540th St Albert City, IA 50510-8604	SE SW	9-91-34	39.000	1.1000	28.630
15.6	250 000	09 09 400 005 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	N 1/2 NW SE		20.000	1.9000	48.430
15.7	250 000	09 09 400 006 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	S 1/2 NW SE		20.000	1.9000	48.430
16.0	250 000	09 09 400 002 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	NE SE	9-91-34	38.500	42.7000	1,080.230
16.5	250 000	09 09 400 003 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	SW SE	9-91-34	39.000	10.4000	262.840
17.0	250 000	09 09 400 004 009 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	SE SE	9-91-34	37.510	45.0000	1,138.460
17.5	250 000	09 10 100 001	Seehusen, Raymond K	NW NW		37.140	5.5000	138.450

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
		010 091 034	Seehusen, Donna S 50382 160th Ave Pocahontas, IA 50574	10-91-34			
18.0	250 000	09 10 100 006 010 091 034	Kulp, Jonathan R 13446 530th St Pocahontas, IA 50574	E 600' N 726' NE NW RD .62	9.380	1.8000	45.960
18.1	250 000	09 10 100 005 010 091 034	Landgraf, Roger 50600 120th Ave Laurens, IA 50554-8514	NE NW(EX E600'N726') RD .74	29.260	5.7000	143.350
18.5	250 000	09 10 100 003 010 091 034	Seehusen, Raymond K Seehusen, Donna S 50382 160th Ave Pocahontas, IA 50574	SW NW 10-91-34	38.580	8.0000	175.490
19.0	250 000	09 10 100 004 010 091 034	Landgraf, Roger 50600 120th Ave Laurens, IA 50554-8514	SE NW 10-91-34	40.000	28.6000	725.020
19.5	250 000	09 10 200 001 010 091 034	Pudenz Trust, Ronald H 52455 130th Ave Pocahontas, IA 50574	NW NE 10-91-34	38.640	45.1000	1,341.220
20.0	250 000	09 10 200 002 010 091 034	Pudenz, Cynthia J 930 Leona Circle Storm Lake, IA 50588	NE NE 10-91-34	37.650	31.0000	785.180
20.5	250 000	09 10 200 003 010 091 034	Pudenz Trust, Ronald H 52455 130th Ave Pocahontas, IA 50574	SW NE 10-91-34	40.000	41.2000	1,043.120
21.0	250 000	09 10 200 004 010 091 034	Pudenz, Cynthia J 930 Leona Circle Storm Lake, IA 50588	SE NE 10-91-34	39.000	13.8000	351.070
21.6	250 000	09 10 300 007 010 091 034	Carlson, Jane A 5420 20th Alta, IA 51002	PARCEL A NW SW RD 1.51	14.060	14.0700	356.640
21.7	250 000	09 10 300 008	Vosika, Kathy	PARCEL B NW SW	23.820	23.8300	604.200

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
		010 091 034	7463 Twin Lakes Rd Manson, IA 50563				
22.0	250 000	09 10 300 002 010 091 034	Landgraf, Roger 50600 120th Ave Laurens, IA 50554-8514	NE SW 10-91-34	40.000	53.9000	1,343.620
22.6	250 000	09 10 300 006 010 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	E 1/2 SW SW RD .63	19.370	37.1800	935.570
22.7	250 000	09 10 300 009 010 091 034	Carlson, Jane A 5420 20th Alta, IA 51002	PARCEL A SW SW RD 1.87	13.700	26.6500	680.090
22.8	250 000	09 10 300 010 010 091 034	Vosika, Kathy 7463 Twin Lakes Rd Manson, IA 50563	PARCEL B SW SW RD .10	3.940	7.6700	195.590
23.0	250 000	09 10 300 004 010 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	SE SW 10-91-34	39.000	29.1000	602.690
23.5	250 000	09 10 400 005 010 091 034	Wile, Marita H 118 N 7th St Adel, IA 50003	W 1/2 NW SE	20.000	10.9000	276.110
23.6	250 000	09 10 400 006 010 091 034	Hollman, Karl E 30384 249th Ave PO Box 86 Burnside, IA 50521	E 1/2 NW SE	20.000	10.9000	276.110
24.0	250 000	09 10 400 002 010 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	NE SE 10-91-34	39.000	6.8000	171.600
24.5	250 000	09 10 400 007 010 091 034	Wile, Marita H 118 N 7th St Adel, IA 50003	W 1/2 SW SE RD .50	19.500	2.5250	89.050

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
24.6	250 000	09 10 400 008 010 091 034	Hollman, Karl E 30384 249th Ave PO Box 86 Burnside, IA 50521	E 1/2 SW SE RD .50	19.500	2.5250	89.050
25.0	250 000	09 10 400 004 010 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	SE SE 10-91-34	38.000	6.1000	104.750
25.5	250 000	09 11 100 001 011 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	NW NW 11-91-34	38.000	2.0000	50.070
26.0	250 000	09 11 100 005 011 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	SW NW(EXC PARCEL A) RD .68	34.940	1.9700	49.480
26.1	250 000	09 11 100 006 011 091 034	Spud Farms, LLC 824 Brooks Rd Iowa Falls, IA 50126	SW NW(EXC PARCEL A) RD .32	4.060	.2300	5.750
26.5	250 000	09 14 100 003 014 091 034	Kordik Family Trust, James C Kordik & De 4131 Orchard St Lincoln, NE 68503	SW NW 14-91-34	39.000	19.7000	498.660
27.0	250 000	09 14 100 004 014 091 034	Hansen Farms Inc Attn Ronald Hansen PO Box 50 Greenwich, NY 12834	SE NW 14-91-34	40.000	2.9000	72.260
27.5	250 000	09 14 300 001 014 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	NW SW 14-91-34	39.000	43.3000	1,096.420
28.0	250 000	09 14 300 002 014 091 034	Vegors Land & Livestock Co 50905 340th St Polk City, IA 50226-7536	NE SW 14-91-34	40.000	2.9000	72.260
28.5	250 000	09 14 300 003 014 091 034	Vegors Land & Livestock Co	SW SW 14-91-34	38.000	6.4000	161.210

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
			50905 340th St Polk City, IA 50226-7536				
29.1	250 000	09 15 100 007 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL A NW NW RD 1.97	18.230	2.9000	73.100
29.2	250 000	09 15 100 008 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL B NW NW RD .47	18.220	2.8900	73.060
29.3	250 000	09 15 100 009 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL C NW NW	.020	.0100	.090
29.4	250 000	09 15 100 015 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL B NE NW	.010	.0100	.030
29.6	250 000	09 15 100 006 015 091 034	Garcia, Carlos 13404 540th St Pocahontas, IA 50574	TR 702.79'X255.21'- 180.70' W NE COR NE NW RD .53	3.580	.5000	12.680
29.7	250 000	09 15 100 016 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL C NE NW RD .31	17.600	2.5500	63.990
29.8	250 000	09 15 100 017 015 091 034	Carlson, Jane 5420 20th Alta, IA 51002	PARCEL D NE NW RD .14	16.890	2.4400	61.410
30.1	250 000	09 15 100 010 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL A SW NW RD 1.50	18.700	11.9600	302.360
30.2	250 000	09 15 100 011 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL B SW NW	18.700	11.9500	302.360
30.3	250 000	09 15 100 012	Hotovec, Darrel F	PARCEL C SW NW	.140	.0900	2.260

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
		015 091 034	309 NW 13th St Pocahontas, IA 50574				
30.6	250 000	09 15 100 013 015 091 034	Hotovec, Darrel F 309 NW 13th St Pocahontas, IA 50574	PARCEL C SE NW	19.160	2.7400	69.980
30.7	250 000	09 15 100 014 015 091 034	Carlson, Jane 5420 20th Alta, IA 51002	PARCEL D SE NW	20.030	2.8600	73.160
31.0	250 000	09 15 200 001 015 091 034	Nielsen 5 Partnership 13637 550th St Fonda, IA 50540	NW NE 15-91-34	39.000	4.1000	104.960
31.5	250 000	09 15 200 006 015 091 034	Nielsen 5 Partnership 13637 550th St Fonda, IA 50540	W 3.92 NE NE RD .11	35.080	4.7000	117.970
31.6	250 000	09 15 200 007 015 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	NE NE(EXC W 3.92 AC & EXC 1 AC TR) RD 1.57	2.240	.3000	9.770
32.0	250 000	09 15 200 003 015 091 034	Corn Belt Power Coop Highberger, J P Hwy 169 PO Box 508 Humboldt, IA 50548	E 241' N 241' NE NE ASSESSED BY DEPT OF REVENUE RD .32		5.0000	3.220
32.5	250 000	09 15 200 004 015 091 034	Nielsen 5 Partnership 13637 550th St Fonda, IA 50540	SW NE 15-91-34	40.000	6.4000	162.680
33.0	250 000	09 15 200 008 015 091 034	Nielsen 5 Partnership 13637 550th St Fonda, IA 50540	W 3.91 AC SE NE	2.730	.7600	17.870
33.1	250 000	09 15 200 009 015 091 034	FT Nielsen Farms LLC 13637 550th St Fonda, IA 50540	SE NE(EXC W 3.91 AC) RD 1.00	36.270	10.0400	237.350

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
33.5	250 000	09 15 300 001 015 091 034	Veit, Thomas J 13433 550th St Fonda, IA 50540	NW SW 15-91-34	38.490	9.7000	245.990
34.0	250 000	09 15 300 002 015 091 034	Veit, Thomas J 13433 550th St Fonda, IA 50540	NE SW 15-91-34	40.000	1.2000	30.940
34.5	250 000	09 15 300 003 015 091 034	Veit, Thomas J 13433 550th St Fonda, IA 50540	SW SW 15-91-34	37.490	17.3000	438.380
35.0	250 000	09 15 300 005 015 091 034	Veit, Thomas J 13433 550th St Fonda, IA 50540	SE SW(EXC E 325' S 400') RD .75	36.270	1.4900	35.730
35.1	250 000	09 15 300 006 015 091 034	Veit, Thomas J Veit, Kathleen 13433 550th St Fonda, IA 50540	E 325' S 400' SE SW RD .25	2.730	.1100	2.690
35.5	250 000	09 15 400 001 015 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St Fonda, IA 50540	NW SE 15-91-34	40.000	6.7000	169.540
36.0	250 000	09 15 400 005 015 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St Fonda, IA 50540	NE SE (EXC W 4.41 AC TR)	4.410	1.6500	42.780
36.1	250 000	09 15 400 006 015 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St Fonda, IA 50540	E 35.59 AC NE SE RD 1.00	34.590	13.3500	335.520
36.5	250 000	09 15 400 003 015 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St Fonda, IA 50540	SW SE 15-91-34	39.000	4.1000	104.860
37.0	250 000	09 15 400 007 015 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St	SE SE (EXC W 4.40 AC TR) RD .11	4.290	2.1780	55.340

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
			Fonda, IA 50540				
37.1	250 000	09 15 400 008 015 091 034	Nielsen, Dennis A Nielsen, Betty 13637 550th St Fonda, IA 50540	E 35.60 AC SE SE RD 1.89	33.710	17.6220	434.820
37.5	250 000	09 16 100 001 016 091 034	Schumann, Scott M 12204 540th St Albert City, IA 50510	NW NW 16-91-34	37.650	.9000	22.560
38.0	250 000	09 16 100 005 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	W 25 AC NE NW RD .63	24.370	2.5625	65.800
38.1	250 000	09 16 100 006 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	E 15 AC NE NW RD .37	14.630	4.5375	39.500
38.5	250 000	09 16 100 003 016 091 034	Schumann, Scott M 12204 540th St Albert City, IA 50510	SW NW 16-91-34	38.640	2.4000	59.790
39.0	250 000	09 16 100 007 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	W 25 AC SE NW	25.000	3.7800	95.320
39.1	250 000	09 16 100 008 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	E 15 AC SE NW	15.000	2.2200	57.190
39.5	250 000	09 16 200 001 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	NW NE 16-91-34	39.000	27.0000	680.940
40.0	250 000	09 16 200 002 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	NE NE 16-91-34	37.610	27.1000	686.110
40.5	250 000	09 16 200 003 016 091 034	Pudenz Revocable Trust, Ralph L	SW NE 16-91-34	40.000	42.4000	873.790

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal		Acres	% Benefit	Units Assessed
			13775 540th St Pocahontas, IA 50574					
41.0	250 000	09 16 200 004 016 091 034	Pudenz Revocable Trust, Ralph L 13775 540th St Pocahontas, IA 50574	SE NE	16-91-34	38.480	10.3000	261.530
41.5	250 000	09 16 300 001 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	NW SW	16-91-34	39.000	3.2000	81.300
42.0	250 000	09 16 300 002 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	NE SW	16-91-34	40.000	7.1000	180.240
42.5	250 000	09 16 300 003 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	SW SW	16-91-34	38.000	1.4000	34.010
43.0	250 000	09 16 300 004 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	SE SW	16-91-34	39.000	2.6000	64.370
43.5	250 000	09 16 400 001 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	NW SE	16-91-34	40.000	21.0000	531.220
44.0	250 000	09 16 400 002 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	NE SE	16-91-34	38.490	73.4000	1,855.930
44.5	250 000	09 16 400 005 016 091 034	Tweedie, John C Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	SW SE(EX TR 482'X251 -486.77'EOF SW COR RD .63		36.590	14.1360	360.140
44.6	250 000	09 16 400 006 016 091 034	N Holdings LLC 824 Brooks Rd Iowa Falls, IA 50126	TR 482'X251'-486.77' E OF SW COR SW SE RD .37		2.410	1.0640	23.720
45.0	250 000	09 16 400 004	Tweedie, John C	SE SE		37.490	21.0000	532.930

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
		016 091 034	Testamentary Decedent's Trust 617 NW 10th Ct Boca Raton, FL 33486	16-91-34			
45.5	250 000 INVALID TAX DIST	09 21 200 001 000 000 000	,	* Invalid Parcel *	39.000	4.5000	114.500
46.0	250 000	09 21 200 016 021 091 034	Friedrichsen, Linda S Et Al , 00000-	NE NE RD 2.45	37.500	6.0000	152.270
46.5	250 000 INVALID TAX DIST	09 21 200 015 000 000 000	,	* Invalid Parcel *	40.000	1.9000	49.110
47.0	250 000	09 21 200 017 021 091 034	Nielsen, Dennis 13637 550th St Fonda, IA 50540	SE NE(EXC 7.62 AC TR SE COR) RD 1.11	30.990	5.0400	127.230
47.2	250 000	09 21 200 012 021 091 034	Hatteberg, Carl A Hatteberg, Roanna K 55511 130th Ave Fonda, IA 50540	7.62 AC TR IN SE COR SE NE RD .39	7.510	1.2600	30.830
47.6	250 000	09 21 300 014 021 091 034	Hansen Farms Inc Attn Ronald Hansen PO Box 50 Greenwich, NY 12834	NE SW(EXC N 7.66 AC & EXC .45 AC TR)	31.520	8.1000	198.620
47.7	250 000	09 21 300 015 021 091 034	Maneman, Robert A Maneman, Carol J 55522 120th Ave Fonda, IA 50540	N 7.66 AC NE SW(EXC TRACTS IN N CENT PT)	4.510	1.2000	28.420
47.9	250 000	09 21 300 017 021 091 034	Hansen Farms Inc Attn Ronald Hansen PO Box 50 Greenwich, NY 12834	.45 AC TR N CENT PT NE SW	.640	.1000	4.030
48.1	250 000	09 21 300 018 021 091 034	Maneman, Robert A Maneman, Carol J 55522 120th Ave	3.15 AC TR IN NW PT NE SW	3.150	10.6000	25.130

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
			Fonda, IA 50540				
48.5	250 000	09 21 300 007 021 091 034	Huegerich, Rita E 12233 560th St Fonda, IA 50540	SE SW 21-91-34	39.000	5.7000	144.230
49.0	250 000 INVALID TAX DIST	09 21 400 006 000 000 000	 ,	* Invalid Parcel *	28.530	25.4180	643.100
49.1	250 000	09 21 400 007 021 091 034	Hatteberg, Carl A Hatteberg, Roanna K 55511 130th Ave Fonda, IA 50540	11.47 AC TR IN SE COR NW SE	11.470	10.3820	258.550
49.5	250 000	09 21 400 011 021 091 034	Nielsen, Dennis 13637 550th St Fonda, IA 50540	TR NW PT NE SE	3.870	3.5700	92.750
49.7	250 000	09 21 400 010 021 091 034	Hatteberg, Carl A Hatteberg, Roanna K 55511 130th Ave Fonda, IA 50540	NE SE(EX TRACTS IN NW PT) RD 1.43	34.640	32.1300	798.250
50.0	250 000	09 21 400 002 021 091 034	Murphy, Esther F 101 NE 5th St Apt 209 Pocahontas, IA 50574-1408	SW SE 21-91-34	39.000	8.6000	216.800
50.5	250 000	09 21 400 004 021 091 034	Murphy, Esther F 101 NE 5th St Apt 209 Pocahontas, IA 50574-1408	BAL SE SE 21-91-34	30.680	4.8000	97.030
51.0	250 000	09 21 400 005 021 091 034	Nieland, Benjamin 11271 630th St Fonda, IA 50540	LOT IN SE SE 21-91-34	6.800	6.8000	23.510
51.5	250 000	09 22 100 002 022 091 034	Huegerich, Rita E 12233 560th St Fonda, IA 50540	NW NW EXCEPT 22-91-34	32.510	25.7000	569.890

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
52.0	250 000	09 22 100 001 022 091 034	Dover Township Cemetery , 00000-0000	5.00 AC IN N PT NW N 22-91-34		25.7000	81.410
52.5	250 000	09 22 100 004 022 091 034	Huegerich, Eugene Life Estate Et Al 12233 560th St Fonda, IA 50540	NE NW 22-91-34	39.000	2.3000	57.460
53.0	250 000	09 22 100 003 022 091 034	Murphy, Esther F 101 NE 5th St Apt 209 Pocahontas, IA 50574-1408	SW NW 22-91-34	36.790	16.1000	408.140
53.5	250 000	09 22 100 005 022 091 034	Murphy, Esther F 101 NE 5th St Apt 209 Pocahontas, IA 50574-1408	SE NW 22-91-34	37.180	7.8000	197.200
54.0	250 000	09 22 200 001 022 091 034	Williams Revocable Trust, Ursula H PO Box 128 Middle Amana, IA 52307	NW NE 22-91-34	39.000	5.8000	147.900
54.5	250 000	09 22 200 002 022 091 034	Williams Revocable Trust, Ursula H PO Box 128 Middle Amana, IA 52307	NE NE 22-91-34	38.000	25.8000	653.120
55.0	250 000	09 22 200 003 022 091 034	Williams Revocable Trust, Ursula H PO Box 128 Middle Amana, IA 52307	SW NE 22-91-34	40.000	4.9000	122.960
55.5	250 000	09 22 200 004 022 091 034	Williams Revocable Trust, Ursula H PO Box 128 Middle Amana, IA 52307	SE NE 22-91-34	39.000	37.4000	947.240
56.0	250 000	09 22 300 001 022 091 034	Betz Revocable Trust, Richard W 10471 NW 62nd Ave Johnston, IA 50131	NW SW 22-91-34	38.490	34.1000	863.110
56.5	250 000	09 22 300 002	Betz Revocable Trust, Richard W	NE SW	39.510	16.1000	408.730

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
		022 091 034	10471 NW 62nd Ave Johnston, IA 50131	22-91-34			
57.0	250 000	09 22 300 003 022 091 034	Betz Revocable Trust, Richard W 10471 NW 62nd Ave Johnston, IA 50131	SW SW 22-91-34	37.500	1.7000	42.840
57.5	250 000	09 22 300 004 022 091 034	Betz Revocable Trust, Richard W 10471 NW 62nd Ave Johnston, IA 50131	SE SW 22-91-34	39.000	3.5000	88.400
58.0	250 000	09 22 400 001 022 091 034	Williams Revocable Trust, Ursula H PO Box 128 Middle Amana, IA 52307	NW SE 22-91-34	37.800	26.6000	673.420
58.5	250 000	09 22 400 002 022 091 034	Williams Revocable Trust, Ursula H PO Box 128 Middle Amana, IA 52307	NE SE 22-91-34	39.000	6.3000	157.640
59.0	250 000	09 22 400 003 022 091 034	Holm, Gretchen V 9016 Kimbro Ave S Cottage Grove, MN 55016	SW SE 22-91-34	37.070	13.6000	344.760
59.5	250 000	09 22 400 004 022 091 034	Holm, Gretchen V 9016 Kimbro Ave S Cottage Grove, MN 55016	SE SE 22-91-34	38.000	4.4000	112.200
60.0	250 000	09 23 100 005 023 091 034	Lamoureux, Craig Leo 508 Swallum Dr Storm Lake, IA 50588	NW NW(EXC TR 410' X 213'-334' E NW COR) RD 1.84	36.000	6.3650	160.550
60.1	250 000	09 23 100 006 023 091 034	Bennigsdorf, Kurtis 14100 550th St Fonda, IA 50540	TR 410'X213'-334' E NW COR NW NW RD .16	2.000	.3350	8.170
60.5	250 000	09 23 100 003 023 091 034	Pudenz, Ronald Henry Et Al 52455 130th Ave Pocahontas, IA 50574	SW NW 23-91-34	39.000	2.7000	67.900
61.0	250 000	09 23 300 001	Evangelical Covenant	NW SW	39.000	.0600	14.140

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Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal		Acres	% Benefit	Units Assessed
		023 091 034	Church 21822 600th St Pomeroy, IA 50575		23-91-34			
61.5	250 000	09 23 300 003 023 091 034	Evangelical Covenant Church 21822 600th St Pomeroy, IA 50575	SW SW	23-91-34	39.000	.0500	11.900
62.0	250 000	09 26 100 002 026 091 034	Gruntorad, Joseph 204 Franklin St PO BOX 393 Fonda, IA 50540	BAL SW NW	26-91-34	5.500	5.5000	10.000
62.5	250 000	09 26 100 003 026 091 034	Gruntorad, Joseph W 204 Franklin St PO BOX 393 Fonda, IA 50540	10.63 AC SW COR	26-91-34	10.260	5.5000	10.000
63.0	250 000	09 26 300 001 026 091 034	Sebben, Laurie 7401 S 169th St Omaha, NE 68136	NW SW	26-91-34	36.950	30.0000	120.000
63.5	250 000	09 26 300 002 026 091 034	Sebben, Laurie 7401 S 169th St Omaha, NE 68136	NE SW	26-91-34	40.000	1.0000	4.000
64.0	250 000	09 26 300 003 026 091 034	Sebben, Laurie 7401 S 169th St Omaha, NE 68136	SW SW	26-91-34	33.700	35.0000	200.000
64.5	250 000	09 26 300 004 026 091 034	Sebben, Laurie 7401 S 169th St Omaha, NE 68136	SE SW	26-91-34	36.700	18.0000	160.000
65.0	250 000	09 27 100 001 027 091 034	Hammen, Elizabeth PO Box 187 Fonda, IA 50540	NW NW	27-91-34	37.490	1.1000	28.560
65.5	250 000	09 27 100 002 027 091 034	Lenz, Maryrose 2081 210th	NE NW	27-91-34	39.000	1.5000	36.720

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
			Early, IA 50535				
66.0	250 000	09 27 100 003 027 091 034	Bauer, Nicholas 56386 130th St Fonda, IA 50540	LOT 258 X 422.09 IN 27-91-34	2.220	1.0000	1.620
66.5	250 000	09 27 100 004 027 091 034	Hammen, Elizabeth PO Box 187 Fonda, IA 50540	BAL SW NW 27-91-34	36.260	1.0000	24.220
67.0	250 000	09 27 100 005 027 091 034	Hammen, Elizabeth PO Box 187 Fonda, IA 50540	SE NW 27-91-34	40.000	37.0000	70.000
67.5	250 000	09 27 200 002 027 091 034	Wolters, Kathryn Ann 1911 S 30th St Quincy, IL 62301	BAL NW NE 27-91-34	28.970	5.4000	107.230
68.0	250 000	09 27 200 006 027 091 034	Tastad, Dan 13500 560th St Fonda, IA 50540	W 200' N 166' NW NE RD .15	.610	.4320	2.200
68.1	250 000	09 27 200 007 027 091 034	Juilfs, Dennis L 805 N Queen St Fonda, IA 50540	W 620' N 600' (EXC W 200' N 166')NW NE RD .32	7.460	4.9680	26.910
68.5	250 000	09 27 200 003 027 091 034	Wolters, Kathryn Ann 1911 S 30th St Quincy, IL 62301	NE NE 27-91-34	36.010	6.8000	172.040
69.0	250 000	09 27 200 004 027 091 034	Wolters, Kathryn Ann 1911 S 30th St Quincy, IL 62301	SW NE 27-91-34	40.000		100.000
69.5	250 000	09 27 200 005 027 091 034	Wolters, Kathryn Ann 1911 S 30th St Quincy, IL 62301	SE NE 27-91-34	35.190	4.0000	114.030
70.0	250 000	09 27 300 002 027 091 034	Fulcher, William C	NE SW 27-91-34	11.000		22.000

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal		Acres	% Benefit	Units Assessed
			5764 40th Ave Alta, IA 51002					
70.5	250 000	09 27 400 001 027 091 034	Sandy, Dean Family Limited Partnership 1560 SE Golden Harvest Dr Waukee, IA 50263	NW SE	27-91-34	34.000		75.000
71.0	250 000	09 27 400 002 027 091 034	Sandy Family Trust, Dean C c/o Kenneth Sandy 670 SE Pleasantview Dr Waukee, IA 50263	NE SE	27-91-34	36.000		150.000
71.5	250 000	09 27 400 004 027 091 034	Sandy Family Trust, Dean C c/o Kenneth Sandy 670 SE Pleasantview Dr Waukee, IA 50263	SE SE	27-91-34	27.000		50.000
72.0	250 000	09 28 100 002 028 091 034	Huegerich, Rita E 12233 560th St Fonda, IA 50540	NE NW	28-91-34	39.000	2.5000	65.290
72.6	250 000	09 28 200 009 028 091 034	Bass Family Limited Partnership No 1 PO Box 244 Fonda, IA 50540	NW NE RD 1.00		39.000	5.2000	66.080
73.5	250 000	09 28 200 002 028 091 034	Bass Family Limited Partnership No 1 PO Box 244 Fonda, IA 50540	NE NE	28-91-34	37.490	.9000	22.780
74.0	250 000	09 28 200 004 028 091 034	Bass Family Limited Partnership No 1 PO Box 244 Fonda, IA 50540	SE NE	28-91-34	38.480	.0400	9.860
74.5	250 000	09 34 200 001 034 091 034	Sandy Family Trust, Dean C c/o Kenneth Sandy 670 SE Pleasantview Dr Waukee, IA 50263	NW NE	34-91-34	10.000	1.0000	1.000
75.0	250 000	09 34 200 002 034 091 034	Sandy Family Trust, Dean C c/o Kenneth Sandy 670 SE Pleasantview Dr Waukee, IA 50263	NE NE	34-91-34		4.0000	14.000
75.5	250 000	09 35 100 005	Gruntorad, Robert J	NW NW		37.500	4.0000	8.000

District / Lateral
234- - - / - -

Tract	Taxing Dist	Parcel Sec -Twp -Rng	Entity	Legal	Acres	% Benefit	Units Assessed
		035 091 034	57162 140th Ave Fonda, IA 50540	35-91-34			
9,128.0	000	00 00 000 034 000 000 000	Pocahontas County Secondary Roads Pocahontas, IA 50574-	ROAD R O W			2,600.000

234- - - / - - Count: 185 Totals: 5,348.570 51,189.430 *

Count: 185 Grand Totals: 5,348.570 51,189.430

Appendix C: Engineer's Opinion of Probable Costs

Economic Analysis

Drainage District No. 74

Proposed Drainage Improvements
Pocahontas County, Iowa
OPINION OF PROBABLE COSTS
Friday, October 29, 2021

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Construction Division 1--Open Ditch Work

Item	Description	Unit	Quantity	Unit Price	Total
101	Open Ditch Excavation	CY	15,967	$3.00	$47,901
102	Spoil Bank Leveling	STA	50	$150.00	$7,500
103	Seed and Fertilize Open Ditch	STA	50	$150.00	$7,500
104	Riprap, IDOT Class D	TN	40	$40.00	$1,600
105	Mobilization	LS	1	$3,200	$3,200
				Estimated Division 1 Subtotal	**$68,000**

Construction Division 2--Tile Work on Private Lands

Item	Description	Unit	Quantity	Unit Price	Total
201	1500D R.C.P., 48'' Dia.	LF	6,437	$118	$759,566
202	2000D R.C.P., 48'' Dia.	LF	2,135	$125	$266,875
203	1500D R.C.P., 42'' Dia.	LF	1,255	$110	$138,050
204	1500D R.C.P., 36'' Dia.	LF	1,489	$85	$126,565
205	2000D R.C.P., 36'' Dia.	LF	300	$91	$27,300
206	1500D R.C.P., 30'' Dia.	LF	1,710	$70	$119,700
207	2000D R.C.P., 30'' Dia.	LF	300	$75	$22,500
208	1500D R.C.P., 27'' Dia.	LF	620	$61	$37,820
209	2000D R.C.P., 27'' Dia.	LF	5,200	$64	$332,800
210	3000D R.C.P., 27'' Dia.	LF	830	$68	$56,440
211	1500D R.C.P., 24'' Dia.	LF	1,100	$54	$59,400
212	2000D R.C.P., 24'' Dia.	LF	3,934	$55	$216,370
213	3000D R.C.P., 24'' Dia.	LF	120	$65	$7,800
214	1500D R.C.P., 21'' Dia.	LF	3,224	$46	$148,304
215	2000D R.C.P., 21'' Dia.	LF	1,600	$50	$80,000
216	3000D R.C.P., 21'' Dia.	LF	1,150	$53	$60,950
217	1500D R.C.P., 18'' Dia.	LF	904	$40	$36,160
218	2000D R.C.P., 18'' Dia.	LF	1,892	$42	$79,464
219	1500D R.C.P., 15'' Dia.	LF	2,139	$36	$77,004
220	2000D R.C.P., 15'' Dia.	LF	586	$38	$22,268
221	1500D R.C.P., 12'' Dia.	LF	1,400	$32	$44,800
222	2000D R.C.P., 12'' Dia.	LF	2,835	$33	$93,555
223	27'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	1	$686	$686
224	24'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	1	$605	$605
225	21'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	1	$548	$548
226	18'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	3	$478	$1,434
227	15'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	3	$431	$1,293
228	12'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	74	$403	$29,822
229	48'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	18	$1,104	$19,872

Drainage District No. 74

Proposed Drainage Improvements
Pocahontas County, Iowa
OPINION OF PROBABLE COSTS

Friday, October 29, 2021

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Construction Division 2--Tile Work on Private Lands..Continued

Item	Description	Unit	Quantity	Unit Price	Total
230	42'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	4	$938	$3,752
231	36'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	4	$798	$3,192
232	30'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	3	$620	$1,860
233	27'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	9	$558	$5,022
234	24'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	4	$490	$1,960
235	21'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	33	$464	$15,312
236	18'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	11	$406	$4,466
237	15'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	10	$380	$3,800
238	12'' Dia., R.C.P. Elbow Section, Fabrication Only	EA	1	$370	$370
239	42'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	1	$2,271	$2,271
240	36'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	1	$1,929	$1,929
241	30'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	1	$1,650	$1,650
242	27'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	1	$1,491	$1,491
243	24'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	2	$1,188	$2,376
244	21'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	2	$1,125	$2,250
245	18'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	1	$988	$988
246	15'' to XX'' Dia. R.C.P. Reducer Section, Fabrication	EA	3	$921	$2,763
247	36'' Dia., R.C.P. Endcap	EA	4	$388	$1,552
248	33'' Dia., R.C.P. Endcap	EA	4	$327	$1,308
249	30'' Dia., R.C.P. Endcap	EA	2	$290	$580
250	27'' Dia., R.C.P. Endcap	EA	1	$288	$288
251	24'' Dia., R.C.P. Endcap	EA	1	$250	$250
252	21'' Dia., R.C.P. Endcap	EA	2	$210	$420
253	18'' Dia., R.C.P. Endcap	EA	21	$188	$3,948
254	15'' Dia., R.C.P. Endcap	EA	6	$150	$900
255	12'' Dia., R.C.P. Endcap	EA	38	$125	$4,750
256	Old to New Main Drains, All Sizes, Installation Only	EA	40	$500	$20,000
257	Lateral Tile Connections, 10" Dia. or Smaller	EA	135	$300	$40,500
258	Lateral Tile Connections, 12" Dia. or Larger	EA	26	$500	$13,000
259	Tile Trench Stabilization and Cradling Rock	TN	1,371	$32	$43,872
260	Topsoil Stripping	CY	5,841	$3	$17,523
261	Administration of Erosion Management Plan	LS	1	$5,000	$5,000
262	Silt Fence Install and Review	LF	2,010	$3	$6,030
263	Spot Tile Exploration	HR	41	$200	$8,200
264	Fence Cuts	EA	11	$150	$1,650
265	Mobilization	LS	1	$50,000	$50,000

Estimated Division 2 Subtotal **$3,143,000**

Drainage District No. 74

Proposed Drainage Improvements
Pocahontas County, Iowa
OPINION OF PROBABLE COSTS
Friday, October 29, 2021

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Construction Division 3--County Secondary Roads

Item	Description	Unit	Quantity	Unit Price	Total
301	Drain Tile, Trenchless, Steel, 11/32" wall, 48" Dia.	LF	96	$900	$86,400
302	Drain Tile, Trenchless, Steel, 11/32" wall, 44" Dia.	LF	96	$750	$72,000
303	Drain Tile, Trenchless, Steel, 1/4" wall, 20" Dia.	LF	96	$400	$38,400
304	2000D R.C.P., 48'' Dia.	LF	132	$135	$17,820
305	2000D R.C.P., 27'' Dia.	LF	90	$67	$6,030
306	2000D R.C.P., 24'' Dia.	LF	8	$58	$464
306	3000D R.C.P., 24'' Dia.	LF	66	$62	$4,092
307	2000D R.C.P., 21'' Dia.	LF	66	$53	$3,498
308	2000D R.C.P., 18'' Dia.	LF	80	$46	$3,680
309	2000D R.C.P., 15'' Dia.	LF	66	$42	$2,772
310	3000D R.C.P., 15'' Dia.	LF	72	$44	$3,168
311	2000D R.C.P., 12'' Dia.	LF	66	$39	$2,574
312	24'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	1	$630	$630
313	12'' on XX'' Dia. R.C.P. Tee, Fabrication Only	EA	12	$350	$4,200
314	Hickenbottom Intake, 12" Dia.	EA	12	$300	$3,600
311	Intake, 30", SW-512 Case 1, SW-604 Type 5 Casting	EA	1	$3,500	$3,500
312	Intake, 24", SW-512 Case 1, SW-604 Type 5 Casting	EA	1	$3,250	$3,250
312	Tile Trench Stabilization and Cradling Rock	TN	240	$35	$8,400
313	Seeding and Fertilizing (Rural)	LS	1	$3,000	$3,000
314	Traffic Control	LS	1	$5,000	$5,000
315	Silt Fence-Install and Remove	LF	450	$3	$1,350
316	Mobilization	LS	1	$13,700	$13,700

Estimated Division 3 Subtotal	**$288,000**
Subtotal of Construction Divisions 1 - 3	**$3,499,000**
Construction Contingency	**$175,000**
Total Estimated Construction Cost	**$3,674,000**
Estimated Secondary Roads Construction Costs Paid by Others	**$288,000**
Total Estimated Assessable Construction Cost	**$3,386,000**

Drainage District No. 74

Proposed Drainage Improvements
Pocahontas County, Iowa
OPINION OF PROBABLE COSTS
Friday, October 29, 2021

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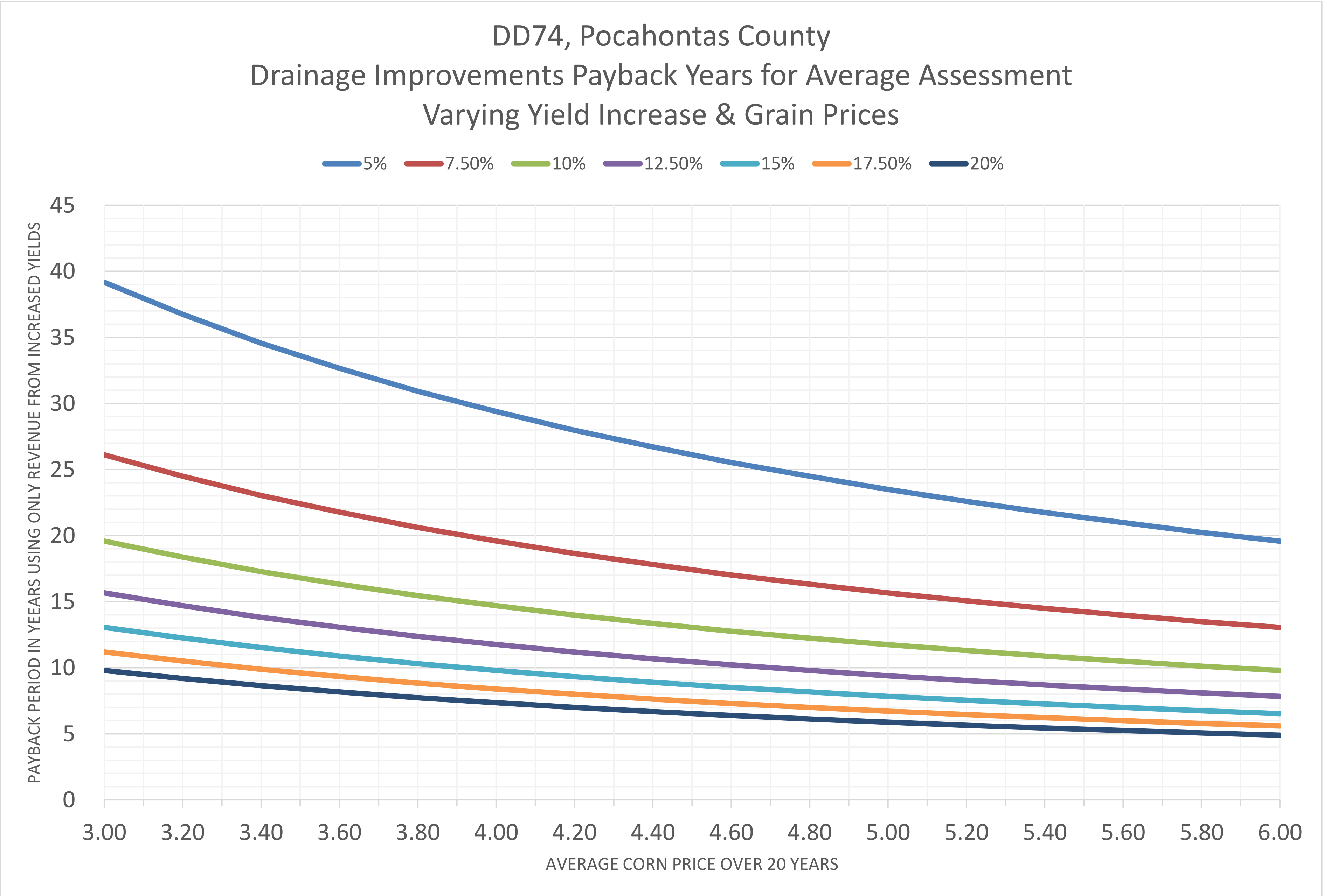
Non-Construction Costs

Construction Related Damages	
Work Area Rental (114.1 ac)	$46,000
Other Damages	$73,000
Basic Engineering Services	
Survey, Study & Report, Meetings & Hearing	$95,000
Wetland Regulations Administration	$5,000
Construction Plans, Specifications, & Bid Letting	$20,000
Construction Engineering Services	$130,000
Legal Services, Publications, Mailings, Etc.	$20,000
Farmed Wetland Mitigation Assistance (5 ac X $7,500/ac)	$37,500
Finance, Interest & Contingency	$172,000
Total Estimated Assessable Project Cost	**$3,985,000**
Estimated Average Cost Per Benefited Acre (3,635 ac)	$1,096
Estimated Average Cost Per Acre Per Year at 5% interest (10 years)	$140
Estimated Average Cost Per Acre Per Year at 5% interest (20 years)	$84

Estimated Assessable Project Cost for Alternatives

Alternatives	Est. Cost	$/ac
Eliminate Br 10 & 12	$3,938,000	$1,083
Ditch, Lower Main, Upper Main, Br 1, Br 6	$3,698,000	$1,017
Ditch, Lower Main, Br 1, Br 6	$2,795,000	$769
Ditch, Lower main, Br 5 - 7	$2,379,000	$797
Ditch and Lower Main	$1,771,000	$593
Branch 1	$611,000	$940

Appendix C - Payback Analysis of Drainage District System Replacement Costs



Assumed Rotation CCB: Soybean Price: 260% of Corn.

Appendix C - Payback Analysis of Drainage District System Replacement Costs

Drainage District: DD74

ACRES IN DD	Enter>	**3,635**	ac
% Corn Acreage	Enter>	**63**	%
% Soybeans Acreage	Enter>	**33**	%
% Other (Roads, Etc)		**4**	%
Base Corn Yield	Enter>	**183**	bu/a
Base Soybeans Yield	Enter>	**51**	bu/a

Average Yield Improvement Due to Better Drainage Outlet, %

		2.5	5	7.5	10	12.5	15	17.5	20
Total Increase in Yield, Corn	bu	10,477	20,954	31,431	41,908	52,385	62,862	73,339	83,816
Total Increase in Yield, Soybeans	bu	1,529	3,059	4,588	6,118	7,647	9,177	10,706	12,235

Enter Estimated Average Annual Yield Increase Over the Next 20 Years, % (See Footnote)	**1.5%**
Avg Price of Corn Next 20 Years	**$ 6.40**
Avg Price of Soybeans Next 20 Years	**$ 13.89**

<< The historic annual yield increase for corn in Iowa has been 2.1% since the 1930's, using less is a conservative assumption

Annual Increase in Revenue

	2.5	5	7.5	10	12.5	15	17.5	20
From Corn	$ 67,053	$ 134,105	$ 201,158	$ 268,211	$ 335,263	$ 402,316	$ 469,369	$ 536,421
From Soybean	$ 21,244	$ 42,487	$ 63,731	$ 84,975	$ 106,219	$ 127,462	$ 148,706	$ 169,950
Total	$ 88,296	$ 176,593	$ 264,889	$ 353,186	$ 441,482	$ 529,778	$ 618,075	$ 706,371
Increased Revenue/acre	$ 24	$ 49	$ 73	$ 97	$ 121	$ 146	$ 170	$ 194
reased Revenue/acre over the anticipated life of the facility (100 years)	$ 2,429	$ 4,858	$ 7,287	$ 9,716	$ 12,145	$ 14,574	$ 17,003	$ 19,432

Payback Period For Revenues From Only Yield Increase (Years)

Assessment			2.5	5	7.5	10	12.5	15	17.5	20
Very High Assessment **$2,741**	**per ac**	250% of Avg	112.8	56.4	37.6	28.2	22.6	18.8	16.1	14.1
High Assessment **$2,193**	**per ac**	200% of Avg	90.3	45.1	30.1	22.6	18.1	15.0	12.9	11.3
Above Average Assessment **$1,644**	**per ac**	150% of Avg	67.7	33.8	22.6	16.9	13.5	11.3	9.7	8.5
Average Assessment **$1,096**	**per ac**	100% of Avg	45.1	22.6	15.0	11.3	9.0	7.5	6.4	5.6
Low Assessment **$548**	**per ac**	50% of Avg	22.6	11.3	7.5	5.6	4.5	3.8	3.2	2.8
Very Low Assessment **$274**	**per ac**	25% of Avg	11.3	5.6	3.8	2.8	2.3	1.9	1.6	1.4
			2.5	**5**	**7.5**	**10**	**12.5**	**15**	**17.5**	**20**

Average Yield Improvement Due to Better Drainage Outlet, %

Appendix C
This worksheet is based upon one prepared by Dr. Stewart Melvin, ISU Extension Agricultural Engineer, Retired

Appendix C - Payback Analysis of Drainage District System Replacement Costs

Drainage District Law Allows For Payment of Assessments in 20 Annual Installments

Assuming a 1.5% annual yield improvement over 20 years for corn currently priced at $5.45 and soybeans at $11.84

A **very high** cost assessment (250% of average) would be be paid off in	18.8	years on a 15% average yield increase.
A **high cost** assessment (200% of average) would be paid off in	18.1	years on a 12.5% average yield increase.
An **above avg** cost assessment (150% of average) would be paid off in	16.9	years on a 10% average yield increase.
An **average** cost assessment (100% of average) would be paid off in	15.0	years on a 7.5% average yield increase.
A **low** cost assessment (50% of average) would be paid off in	11.3	years on a 5% average yield increase.
A **very low** cost assessment (25% of average) would be paid off in	11.3	years on a 2.5% average yield increase.

Yield Improvements on 40 acres if Drowned Areas

Percent Increase over Current Conditions

Drowned Area ac	Percent of Average Yield Achieved by Improvements: 50%	60%	70%	80%	90%	100%
1	1.3%	1.5%	1.8%	2.1%	2.3%	2.6%
2.5	3.3%	4.0%	4.7%	5.3%	6.0%	6.7%
5	7.1%	8.6%	10.0%	11.4%	12.9%	14.3%
7.5	11.5%	13.8%	16.2%	18.5%	20.8%	23.1%
10	16.7%	20.0%	23.3%	26.7%	30.0%	33.3%
15	30.0%	36.0%	42.0%	48.0%	54.0%	60.0%

Assumes Avg. Co. Yield on Non-Drowned Area

Future Prices to Reflect Annual Yield Change Trend

Corn Today	$5.45	Date
Beans Today	$11.84	10/28/2021

Price Adj. for Yield Change

Average Annual Yield Change	CORN 20-Year Avg. Price	SOYBEANS 20-Year Avg Price
0.0%	$5.45	$11.84
0.5%	$5.74	$12.46
1.0%	$6.05	$13.14
1.5%	$6.40	$13.89
2.0%	$6.77	$14.72
2.5%	$7.19	$15.62
3.0%	$7.65	$16.61
3.5%	$8.15	$17.70

Existing Farm Yield vs. Potential Farm Yield

Average Field Yield with Improvement bu/ac	Current Average Corn Yield over Entire Field bu/ac: 90	110	130	150	170	190
90	0.0%					
100	11.1%					
110	22.2%	0.0%				
120	33.3%	9.1%				
130	44.4%	18.2%	0.0%			
140	55.6%	27.3%	7.7%			
150	66.7%	36.4%	15.4%	0.0%		
160	77.8%	45.5%	23.1%	6.7%		
170	88.9%	54.5%	30.8%	13.3%	0.0%	
180	100.0%	63.6%	38.5%	20.0%	5.9%	
190	111.1%	72.7%	46.2%	26.7%	11.8%	0.0%
200	122.2%	81.8%	53.8%	33.3%	17.6%	5.3%

Appendix C - Payback Analysis of Drainage District System Replacement Costs

Payback Years for Average Yield Improvements for Range of Average Grain Prices
Proposed Drainage Improvements in Drainage District No. 74

Assumptions

Long-term Soybean/Corn price ratio is 2.6
Average assessment of $1,096/acre
1.5% average annual yield improvement due to causes other than better drainage.
A flat grain price is assumed in this analysis.

Average Current Grain Price Used Over Payback Period		**Average Yield Response Due to Drainage Improvements**						
Corn	Soybeans	5%	7.50%	10%	12.50%	15%	17.50%	20%
3.00	7.80	39.17	26.11	19.58	15.67	13.06	11.19	9.79
3.20	8.32	36.75	24.50	18.38	14.70	12.25	10.50	9.19
3.40	8.84	34.55	23.04	17.28	13.82	11.52	9.87	8.64
3.60	9.36	32.66	21.77	16.33	13.06	10.89	9.33	8.17
3.80	9.88	30.91	20.61	15.46	12.37	10.30	8.83	7.73
4.00	10.40	29.39	19.59	14.69	11.76	9.80	8.40	7.35
4.20	10.92	27.97	18.64	13.98	11.19	9.32	7.99	6.99
4.40	11.44	26.71	17.81	13.36	10.69	8.90	7.63	6.68
4.60	11.96	25.53	17.02	12.77	10.21	8.51	7.30	6.38
4.80	12.48	24.49	16.32	12.24	9.79	8.16	7.00	6.12
5.00	13.00	23.49	15.66	11.74	9.40	7.83	6.71	5.87
5.20	13.52	22.60	15.07	11.30	9.04	7.53	6.46	5.65
5.40	14.04	21.75	14.50	10.87	8.70	7.25	6.21	5.44
5.60	14.56	20.98	13.99	10.49	8.39	6.99	5.99	5.24
5.80	15.08	20.25	13.50	10.12	8.10	6.75	5.78	5.06
6.00	15.60	19.58	13.05	9.79	7.83	6.53	5.59	4.90

Footnotes:

It is important to note that after it is paid for, the drainage system will continue to foster improved crop yields for more than a century.

No credit is given in the above calculations for an immediate increase in land value resulting from the improved productivity.

The average annual yield increase is intended to reflect through price adjustment the long term historic yield increase trend rather than to predict future grain price changes. In effect this analysis uses a stagnant current grain price tied to a reliable yield improvement trend. An entry of 0% assumes no average yield improvement or price increase over the next twenty years.

Proposed Plans

PRELIMINARY PLANS FOR

DRAINAGE DISTRICT NO. 74
PROPOSED DRAINAGE IMPROVEMENTS

POCAHONTAS COUNTY, IOWA

2021

PLAN REVISIONS		
REV	ISSUED FOR	DATE
-	-	-

GOVERNING SPECIFICATIONS

THE 2021 EDITION OF THE "SUDAS SPECIFICATIONS FOR PUBLIC IMPROVEMENTS" SHALL GOVERN.

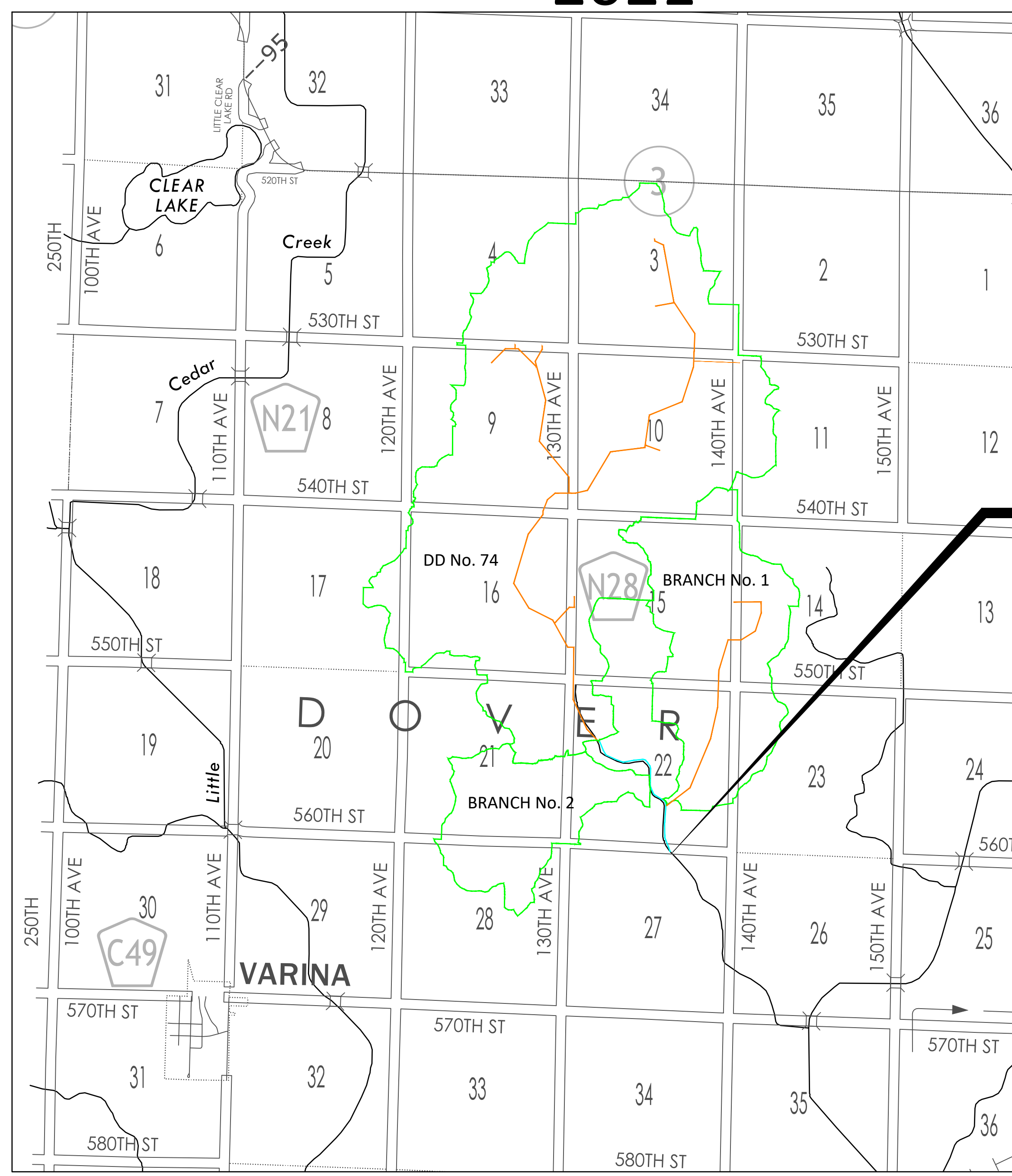
IOWA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION",
SERIES 2015 AND ALL CURRENT GENERAL SUPPLEMENTAL SPECIFICATIONS AND MATERIALS INSTRUCTIONAL MEMORANDUM
SHALL GOVERN AS REFERENCED.

ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND ORDINANCES WILL BE COMPLIED WITH IN THE CONSTRUCTION OF THIS PROJECT.

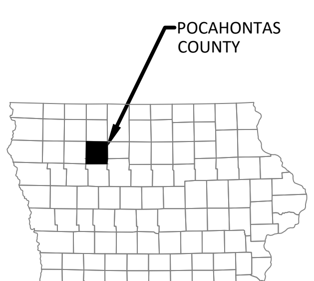
IOWA ONE CALL
1-800-292-8989
www.iowaonecall.com
811 Know what's below. Call before you dig.

NOTE: THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY IOWA ONE CALL, 811 OR 1-800-292-8989.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY 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."



PROJECT LOCATION



SHEET LIST TABLE	
SHEET NUMBER	SHEET TITLE
A.01	TITLE SHEET
A.02	LANDOWNER PLAT
B.01	RCP INSTALLATION
B.02	CPDT INSTALLATION
B.03	TILE CONNECTIONS
B.04-B.05	TYPICAL DITCH DETAIL
D.01 - D.05	PLAN & PROFILE - MAIN OPEN DITCH
G.01	ALIGNMENT GEOMETRY
M.01 - M.07	PLAN & PROFILE - MAIN TILE
M.08 - M.10	PLAN & PROFILE - BRANCH No. 1
M.11	PLAN & PROFILE - BRANCH No. 5
M.12 - M.13	PLAN & PROFILE - BRANCH No. 6
M.14	PLAN & PROFILE - BRANCH No. 7 & 7A
M.15	PLAN & PROFILE - BRANCHES No. 10 & 12
M.16	PLAN & PROFILE - BRANCH No. 14
X.01 - X.03	CROSS SECTIONS - MAIN OPEN DITCH

LICENSED PROFESSIONAL ENGINEER
COLLIN J., KLINGBEIL, 24741
IOWA

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.

Collin Klingbeil

COLLIN J. KLINGBEIL, P.E.

REG. NO. 24741 DATE: 11/1/21

MY LICENSE RENEWAL DATE IS DECEMBER 31, 2021

PAGES OR SHEETS COVERED BY THIS SEAL:

ALL SHEET

DATUM EQUATION

DRAINAGE DISTRICT No. 74

1955 DATUM + 1257.50 = 2021 DATUM

PROJECT DATUM: IOWA STATE PLANE - NORTH - US FEET

HORIZONTAL: NAD 83

VERTICAL: NAVD 1988

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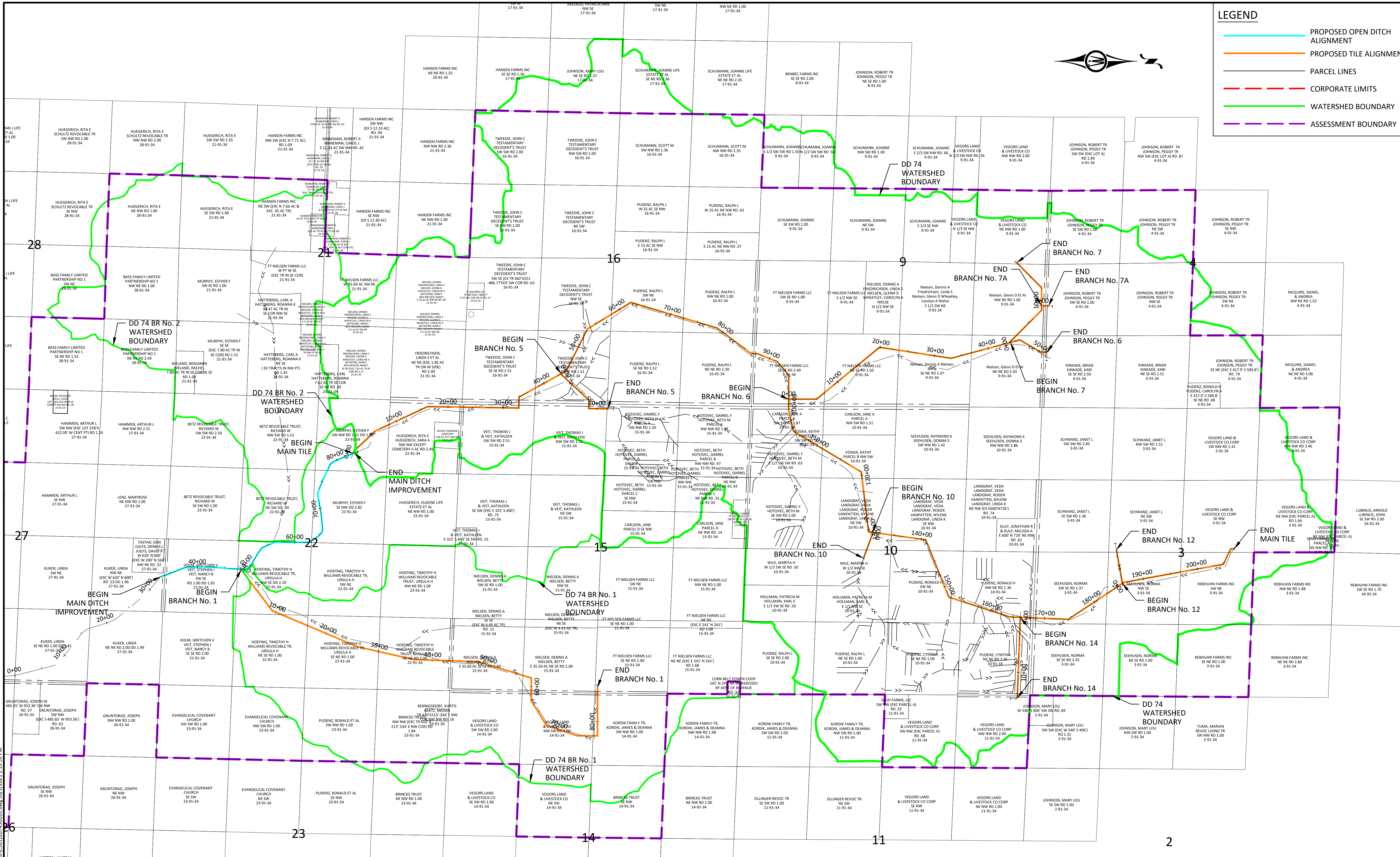
DD 74 DRAINAGE IMPROVEMENTS
POCAHONTAS COUNTY, IOWA
TITLE SHEET

SHEET A.01



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DD 74 DRAINAGE IMPROVEMENTS

POCAHONTAS COUNTY, IOWA

LANDOWNER PLAT

SHEET A.02

PIPE HAUNCH FILL AND COMPACTION METHOD
PLAN REQUIREMENTS COMPLIANCE VERIFICATION

THE CONTRACTOR IS SOLEY RESPONSIBLE FOR THE INSTALLATION OF ALL PIPE ACCORDING TO PLAN REQUIREMENTS. THE CONTRACTOR'S PARTICIPATION IN AND COMPLIANCE WITH THE FOLLOWING PROCEDURE IS REQUIRED AND WILL ALLOW FOR FEWER SOIL DENSITY TESTS TO ENSURE PROPER PIPE INSTALLATION.

STEP 1
BEFORE COMMENCING PIPE INSTALLATION, STANDARD SOIL PROCTOR DENSITY TEST RESULTS OF REPRESENTATIVE SAMPLE(S) OF PIPE HAUNCH FILL SHALL BE PROVIDED BY AN INDEPENDENT QUALIFIED SOILS TESTING LAB. THE SELECTION OF THE SAMPLE(S) WILL BE MADE BY THE ENGINEER AND CONTRACTOR (WHEN SPECIFIED).

STEP 2
CONTRACTOR MAY BEGIN EXCAVATING THE MODIFIED TYPE 4 TRENCH WITH THE REQUIRED SHAPED BOTTOM GROOVE AND PLACE SEVERAL PIPE SECTIONS ONLY WHEN BOTH ENGINEER AND TESTING LAB TECHNICIAN ARE PRESENT

CONTRACTOR SHALL DEMONSTRATE THE INTENDED METHODS FOR COMPACTING THE FILL FOR THE PIPE HAUNCH AREAS. SOIL DENSITY TESTS SHALL BE TAKEN AT LOCATIONS DESIGNATED BY THE ENGINEER TO CONFIRM THAT THE INTEDNED METHODS FOR FILL AND COMPACTION OF THE PIPE HAUNCH AREAS SATIFIES THE PLAN REQUIREMENTS. CONTRACTOR SHALL MODIFIY THE INSTALLATION METHODS AND REPEAT STEP 2 UNTIL ACCEPTABLE TESTS RESULTS ARE ACHIEVED.

STEP 3
CONTRACTOR MAY INSTALL THE NEXT SEVERAL HUNDRED FEET OF PIPE. ENGINEER SHALL DESIGNATE SEVERAL LOCATIONS (APPROXIMATELY 10% OF THE INSTALLED LENGTH) WHERE CONTRACTOR SHALL LEAVE THE PIPE UNBLINDED FOR FURTHER DENSITY TESTS OF THE HAUNCH FILL AREA. ALL DENSITY TESTS MUST MEET PLAN REQUIREMENTS BEFORE WORK MAY PROCEED FURTHER.

IF DENSITY TESTING DATA CONFIRMS TO THE SATISFACTION OF THE ENGINEER THAT THE CONTRACTOR'S INSTALLATION METHOD WILL PRODUCE CONSISTENT COMPLIANCE WITH PLAN REQUIREMENTS, CONTRACTOR MAY CONTINUE INSTALLATION OF THE PIPE WITH NO ADDITIONAL TESTING REQUIRED. IF NOT, STEPS 2 AND 3 SHALL BE REPEATED UNTIL A RELIABLE, SUCCESSFUL METHOD OF PIPE INSTALLATION THAT PRODUCES SATISFACTORY RESULTS IS ESTABLISHED.

CONTRACTOR IS REQUIRED TO PROPERLY AND ADEQUATELY INSTRUCT SUBCONTRACTORS AND/OR SUBSEQUENT PIPE INSTALLATION WORKERS ON THE PROPER INSTALLATION METHOD.

STEP 4A
SOIL OR TRENCH CONDITION CHANGES

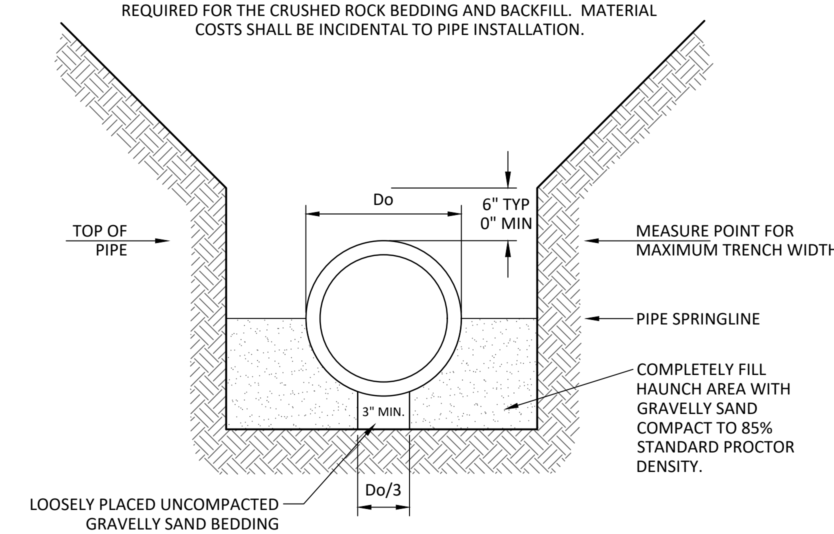
TO VERIFY CONTRACTOR'S COMPLIANCE WITH PLAN REQUIREMENTS UNDER THE CHANGED CONDITIONS, ENGINEER MAY STOP WORK AND REQUIRE ADDITIONAL SOIL PROCTOR TESTS AND/OR SOIL DENSITY TESTS SIMILAR TO STEPS 1 THROUGH 3. THE WORK AND COSTS OF THE FIRST TWO REVERIFICATIONS IS SUBSIDIARY TO THE PIPE INSTALLATION. SUBSEQUENT VERIFICATIONS WILL BE CONSIDERED EXTRA WORK.

STEP 4B
CONTRACTOR FAILS TO CONSISTENTLY PERFORM INSTALLATION METHOD OR INSTRUCT OTHER INSTALLERS

IF CONTRACTOR FAILS TO CONSISTENTLY PERFORM OR ADEQUATELY INSTRUCT SUBCONTRACTORS AND/OR SUBSEQUENT PIPE INSTALLATION WORKERS ON THE APPROVED INSTALLATION METHOD, ENGINEER MAY STOP WORK AND REQUIRE ADDITIONAL SOIL PROCTOR TESTS AND/OR SOIL DENSITY TESTS SIMILAR TO STEPS 1 THROUGH 3 TO VERIFY CONTRACTOR'S COMPLIANCE WITH PLAN REQUIREMENTS. THE WORK AND COSTS OF ALL VERIFICATIONS UNDER SUCH CONDITIONS IS SUBSIDIARY TO THE PIPE INSTALLATION.

EXCEPTION
IF CONTRACTOR ELECTS TO SHAPE THE TRENCH BOTTOM SUCH THAT A MINIMUM OF 45% OF THE OUTER CIRCUMFERENCE OF THE PIPE IS FIRMLY BEDDED IN AND CONSISTENTLY SUPPORTED BY UNDISTURBED SOIL, PIPE HAUNCH FILL COMPACTION TESTING WILL NOT BE REQUIRED. THE CONTRACTOR IS REQUIRED TO COMPLY WITH A PROPER INSTALLATION METHOD AND TO FULLY COMPLY WITH THE REQUIREMENTS OF THE VERIFICATION OUTLINED ABOVE FOR ALL SITUATIONS WHERE THIS EXCEPTION IS NOT MET.

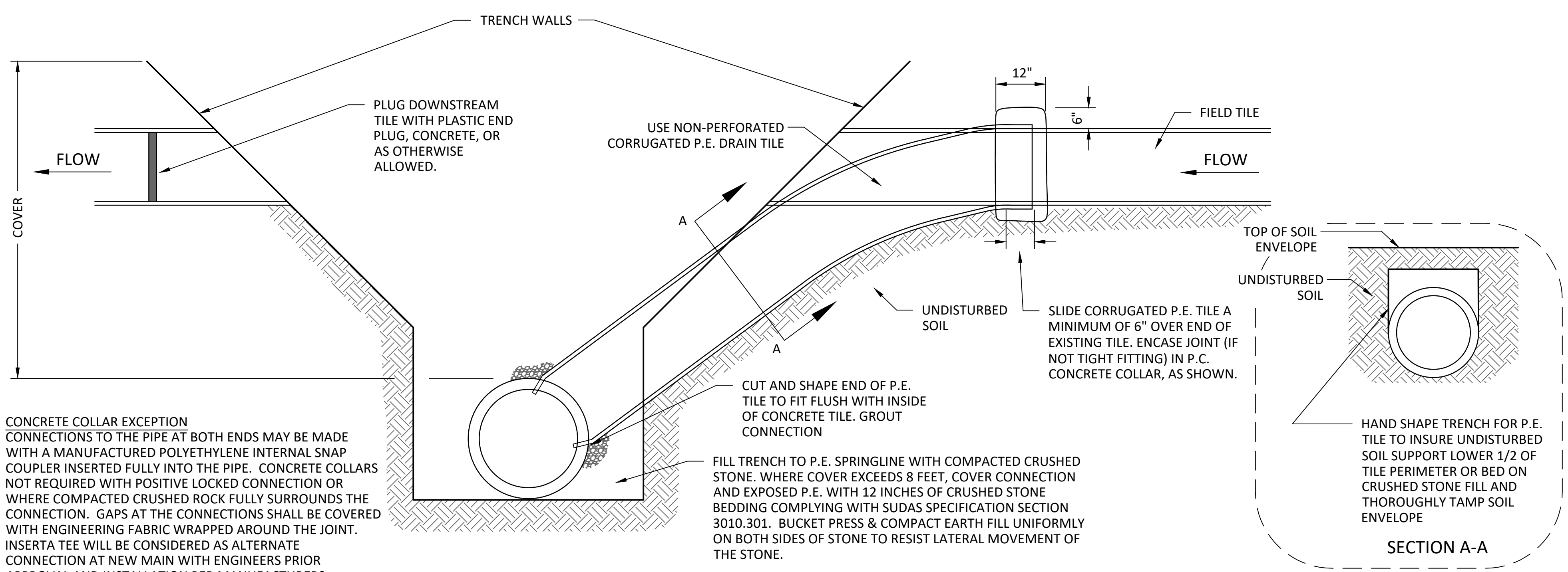
CRUSHED ROCK MEETING THE GRADATION OF SUDAS CLASS I BEDDING MATERAL, SPECIFICATION SECTION 3010.2.02.A, MAY BE SUBSTITUTED FOR THE SAND OR CLAY HAUNCH BACKFILL MATERIAL. NO COMPACTION WILL BE REQUIRED FOR THE CRUSHED ROCK BEDDING AND BACKFILL. MATERIAL COSTS SHALL BE INCIDENTAL TO PIPE INSTALLATION.



GRAVELLY SAND BEDDING SHALL BE CONSISTENT WITH THE GRADATION AND OTHER CHARACTERISTICS OF STANDARD AASHTO A1 OR A3 SOIL. A REPRESENTATIVE SAMPLE OF THE MATERIAL AND A GRADATION REPORT OR SUPPLIER'S CERTIFICATION OF COMPLIANCE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO DELIVERY TO SITE. SEE SOIL DATA IN APPENDIX OF SPECIFICATIONS BOOKLET.

TRENCH INSTALLATION TYPE 3

NOT TO SCALE
SOURCE: AMERICAN CONCRETE PIPE ASSOCIATION
CONCRETE PIPE DESIGN MANUAL

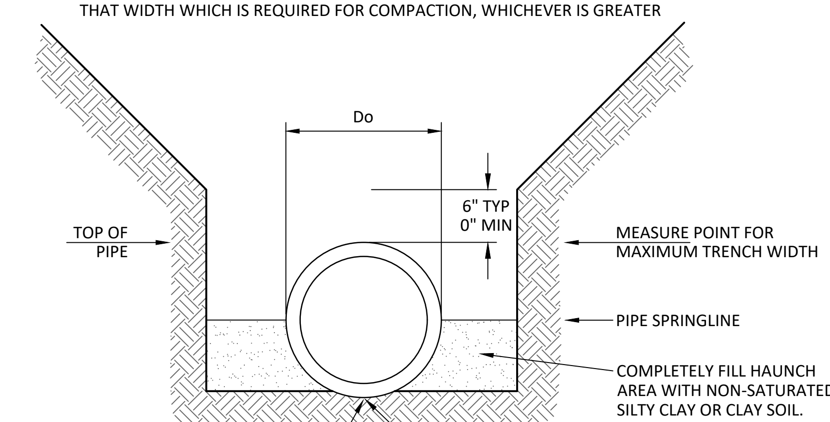


CONCRETE COLLAR EXCEPTION
CONNECTIONS TO THE PIPE AT BOTH ENDS MAY BE MADE WITH A MANUFACTURED POLYETHYLENE INTERNAL SNAP COUPLER INSERTED FULLY INTO THE PIPE. CONCRETE COLLARS NOT REQUIRED WITH POSITIVE LOCKED CONNECTION OR WHERE COMPACTED CRUSHED ROCK FULLY SURROUNDS THE CONNECTION. GAPS AT THE CONNECTIONS SHALL BE COVERED WITH ENGINEERING FABRIC WRAPPED AROUND THE JOINT. INSERTA TEE WILL BE CONSIDERED AS ALTERNATE CONNECTION AT NEW MAIN WITH ENGINEERS PRIOR APPROVAL AND INSTALLATION PER MANUFACTURERS RECOMMENDATION.

TYPICAL FIELD TILE CONNECTION

FOR FIELD TILE UP TO 10" DIAMETER

MINIMUM TRENCH WIDTH SHALL BE OUTSIDE DIAMETER OF PIPE PLUS 12" OR THAT WIDTH WHICH IS REQUIRED FOR COMPACTION, WHICHEVER IS GREATER



WHERE TRENCH BOTTOM IN FIRM UNDISTURBED SOIL, SHAPE TRENCH BASE GROOVE TO MATCH MINIMUM 1/6 OF THE OUTER CIRCUMFERENCE OF THE PIPE. WHERE THE SHAPED GROOVE CANNOT BE CONSTRUCTED INTO UNDISTURBED GROUND OR WHERE EXCESS CUT OCCURS OVER EXCAVATE AND PLACE MINIMUM 3-INCH THICK COMPACTED GRAVELLY SAND BEDDING TO RESTORE GRADE SUCH THAT 1/6 OR MORE OF THE OUTER CIRCUMFERENCE OF THE PIPE IS BEDDED. THIS MATERIAL AND WORK IS SUBSIDIARY TO THE INSTALLATION OF THE PIPE. CONTRACTOR MAY SUBSTITUTE PIPE BEDDING ROCK AS THE BEDDING MATERIAL. IT ALSO IS SUBSIDIARY.

WHERE FIRM BASE IS NOT ENCOUNTERED. OVER EXCAVATE AS DIRECTED BY ENGINEER. PLACE CRADLING ROCK AND BED PIPE IN IT SUCH THAT 1/6 OR MORE OF THE OUTER CIRCUMFERENCE OF THE PIPE IS SUPPORTED. THIS ROCK IS PAID FOR UNDER A SEPARATE BID ITEM.

MODIFIED TRENCH INSTALLATION TYPE 4

NOT TO SCALE
SOURCE: AMERICAN CONCRETE PIPE ASSOCIATION
CONCRETE PIPE DESIGN MANUAL

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DD 74 DRAINAGE IMPROVEMENTS
POCAHONTAS COUNTY, IOWA
RCP INSTALLATION

CORRUGATED POLYETHYLENE DRAINAGE TUBING MATERIAL & INSTALLATION NOTES

1. ALL CPDT AND CONNECTORS FURNISHED SHALL BE IN COMPLIANCE WITH MATERIAL STANDARDS ASTM F405 AND F667, AS APPLICABLE, AND SHALL BE CLASSIFIED AS HEAVY-DUTY UNDER THOSE STANDARDS.
2. EXCEPT MODIFIED HEREIN OR OTHERWISE APPROVED BY ENGINEER, ALL CPDT SHALL BE INSTALLED IN COMPLIANCE WITH THE ASTM 449 STANDARD PRACTICE.
3. FOR PIPES 6" DIAMETER AND SMALLER A 90° V GROOVE BOTTOM MAY BE USED, FOR ALL LARGER PIPE A TRAPEZOIDAL BOTTOM OR A CIRCULAR BOTTOM CONFORMING TO THE OUTSIDE DIAMETER OF THE PIPE SHALL BE USED. PRIOR TO THE INSTALLATION OF CPDT, CONTRACTOR MUST PROVE TO ENGINEER THAT THE INSTALLATION REQUIREMENTS, INCLUDING THE SHAPE OF THE TRENCH BOTTOM, WILL BE ACCOMPLISHED.
4. WHERE TRENCH BOTTOM IS IN FIRM UNDISTURBED SOIL, SHAPE TRENCH BASE GROOVE. WHERE EXCESS CUT OCCURS, OVEREXCAVATE AND PLACE MINIMUM THREE (3) INCH THICK, GRAVELLY SAND BEDDING TO RESTORE GRADE. THIS BEDDING SHALL MEET THAT REQUIRED FOR TRENCH INSTALLATION TYPE 3 ON PLAN SHEET C.02. IF DUE TO CONTRACTOR ERROR THIS MATERIAL AND WORK IS SUBSIDIARY TO THE INSTALLATION OF THE PIPE. CONTRACTOR MAY SUBSTITUTE PIPE BEDDING ROCK AS THE BEDDING MATERIAL.
5. NATIVE SOILS MAY BE USED AS BACKFILL MATERIAL UNLESS UNSTABLE TRENCH CONDITIONS PREVENT THE TRENCH BOTTOM HOLDING THE SHAPED GROOVE. IF TRENCH BOTTOM WILL NOT HOLD GROOVE SHAPE CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY. A FLAT BOTTOM TRENCH INSTALLATION WILL THEN BE ASSUMED. THE REQUIRED BEDDING MATERIAL WILL BE PAID UNDER THE TILE TRENCH STABILIZATION AND CRADLING ROCK BID ITEM.
6. MINIMUM TRENCH WIDTH IS PIPE OUTSIDE DIAMETER PLUS FOUR (4) INCHES FOR PLOWED INSTALLATION AND PIPE OUTSIDE DIAMETER PLUS TWELVE (12) INCHES FOR OPEN TRENCH INSTALLATION.
7. ALL LATERAL CONNECTIONS, ELBOWS, TEES, ALIGNMENT CURVES, START HOLES AND ALL PORTIONS OF THE TRENCH NOT MEETING THE GROOVED TRENCH INSTALLATION REQUIREMENTS SHALL BE FILLED TO A MINIMUM OF SIX (6) INCH COVER OVER THE PIPE WITH GRADED CRUSHED STONE OR GRAVEL AS SHOWN ON TABLE 2 OF THIS SHEET. UNLESS DUE TO CONTRACTOR ERROR THIS BEDDING MATERIAL WILL BE PAID UNDER THE TILE TRENCH STABILIZATION AND CRADLING ROCK BID ITEM.
8. MANUFACTURER'S ENDCAPS SHALL BE INSTALLED AT THE TERMINATION OF EACH LINE UNLESS A CONNECTION TO AN EXISTING DRAIN IS MADE.
9. WITH THE INSTALLATION OF THE FIRST REACH OF CPDT ON THE PROJECT, CONTRACTOR IS REQUIRED TO WORK WITH THE ENGINEER TO CHECK AND CONFIRM THAT THE PIPE STRETCH, IF ANY, DOES NOT EXCEED 5%.
10. ALIGNMENT TURNS MAYBE MADE USING EITHER A MANUFACTURED FITTING OR CURVING THE LINE WITH A 25' MINIMUM RADIUS.

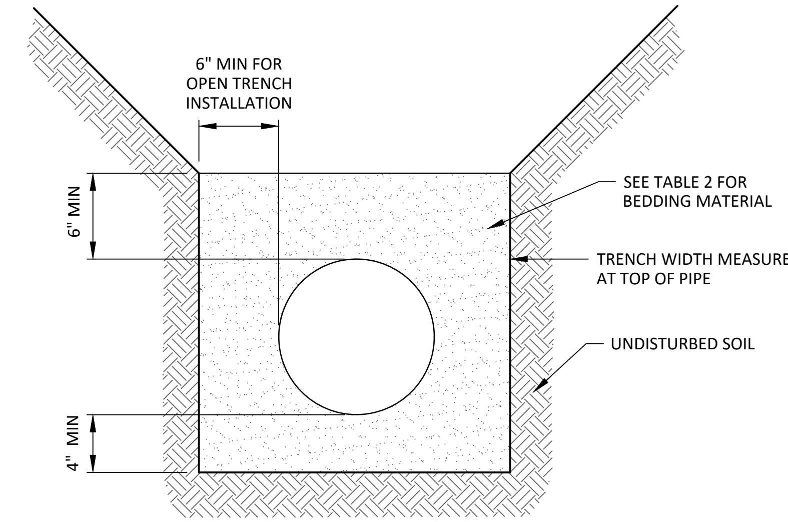
Table 1
Maximum Allowable Buried Depth to Flowline of CPDT

Nominal Pipe Diameter (IN)	Pipe Quality (ASTM)	Trench Width at Top of the Pipe (FT)			
		12"	18"	24"	30" or Greater
4	Standard	13	7	5.5	5
	Heavy-duty	Any	10	7	6
6	Standard	10	7	5.5	5
	Heavy-duty	Any	9.5	6.5	6
8	Standard	10	7	5.5	5
	Heavy-duty	Any	10	7	6
10	Heavy-duty	...	9	7	6
12	Heavy-duty	...	9	7	6
15	Heavy-duty	...	...	7	6

Table 2
Acceptable Bedding Material and Compaction Requirements

Description	Percentage Passing Sieve Sizes			Minimum Standard Density (%)	Maximum Compaction Layer Height (IN.)
	1"	3/4"	No. 4		
Crushed Stone Crushed Gravel*	100%	> 95%	< 5%	Dumped	18

* Class 1 Bedding Material Per SUDAS 3010.202A is an Allowable Substitute

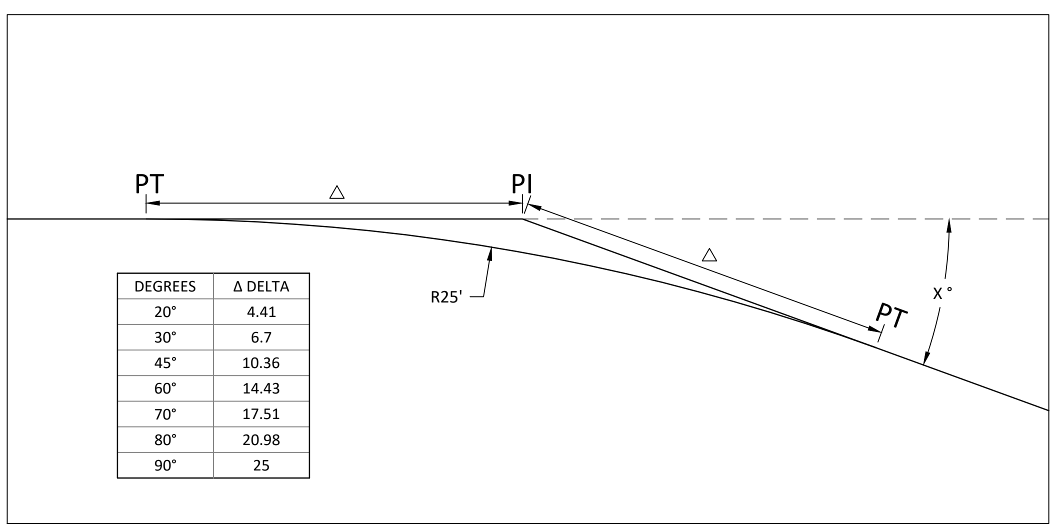


FILL TRENCH TO 6" ABOVE TOP OF PIPE WITH CRUSHED STONE OR GRAVEL MEETING THE REQUIREMENTS IN TABLE 2. BEDDING MATERIAL SHALL BE INCIDENTAL TO THE PIPE INSTALLATION.

FLAT BOTTOM TRENCH INSTALLATION

NOT TO SCALE
SOURCE: ASTM F449

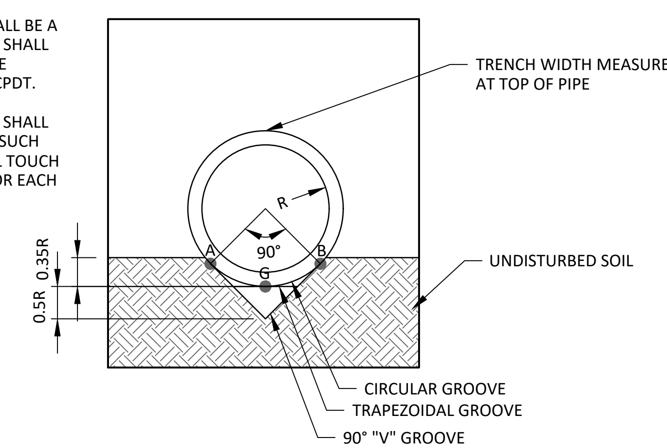
NOTE: THIS IS AN ALLOWED ALTERNATIVE INSTALLATION FOR CPDT



DEGREES	Δ DELTA
20°	4.41
30°	6.7
45°	10.36
60°	14.43
70°	17.51
80°	20.98
90°	25

THE CIRCULAR GROOVE SHALL BE A MINIMUM 0.35R DEEP AND SHALL MATCH THE OUTSIDE CURVE SHAPE OF THE DEFLECTED CPDT.

THE TRAPEZOIDAL GROOVE SHALL BE SHAPED AND ADJUSTED SUCH THAT POINTS A, B, & C WILL TOUCH THE UNDEFLECTED CPDT FOR EACH SIZE INSTALLED.



PREFFERED TRENCH INSTALLATION BOTTOM

TRAPEZOIDAL GROOVE, "V" GROOVE, & CIRCULAR GROOVE
NOT TO SCALE
SOURCE: ASTM F449

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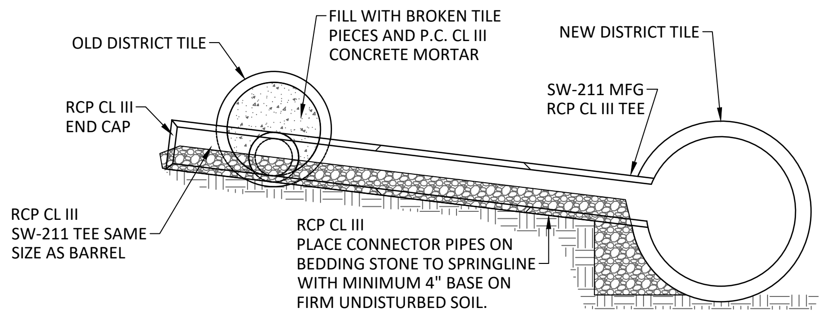
DD 74 DRAINAGE IMPROVEMENTS
POCAHONTAS COUNTY, IOWA
CPDT INSTALLATION

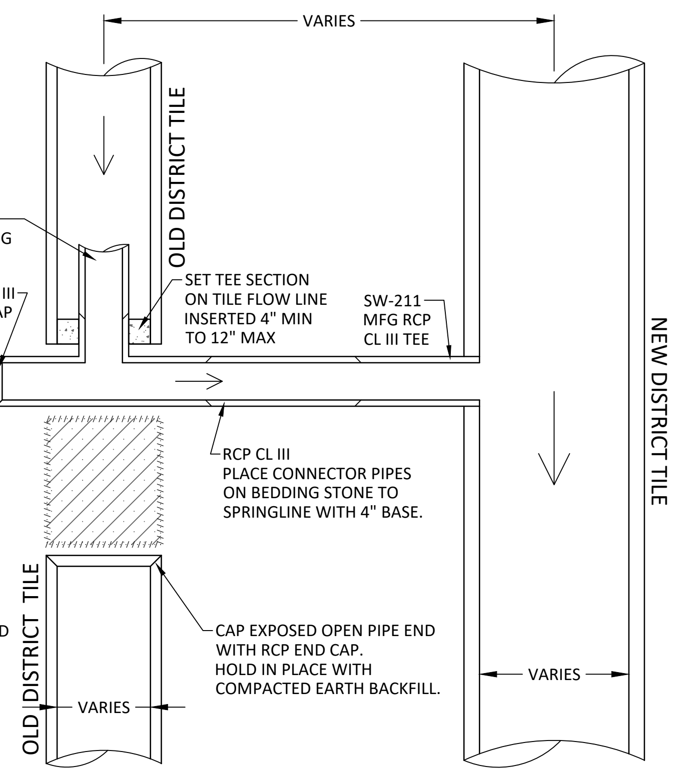
SHEET
B.02

STANDARD DETAIL

OLD TO NEW MAIN DRAINS CONNECTION

(WHERE FLOW IS NOT CONTINUED IN OLD DRAIN)





NOTES:

1. UNLESS OTHERWISE DIRECTED THIS DETAIL APPLIES ONLY TO CONNECTIONS BETWEEN OLD & NEW DISTRICT DRAINS OR PRIVATE MAINS THAT ARE NOTED ON THE PLANS OR ADDED BY THE ENGINEER DURING CONSTRUCTION.
2. THE CONNECTOR PIPE DIAMETER IS NOTED ON PLAN AND IS CONSTANT IN EACH INSTALLATION.
3. ALL CONNECTING PIPES AND FITTINGS SHALL BE RCP CLASS III.
4. THIS DETAIL DOES NOT APPLY TO MISCELLANEOUS LATERAL CONNECTIONS PAID UNDER SEPARATE BID ITEMS.
5. FIELD FABRICATE RCP ELBOWS, MAXIMUM 30° TURNS, WHERE NECESSARY. PRIOR APPROVAL OF ENGINEER REQUIRED.

WORK PAID UNDER SEPARATE BID ITEMS

- TEE FABRICATION
- RCP PIPE, TEES, END CAPS
- BEDDING STONE
- TOPSOIL WORK, WHERE APPLICABLE
- MOBILIZATION
- REMOVE & DISPOSED DRAIN TILE
- TILE SEARCH

WORK INCLUDED IN OLD TO NEW MAIN DRAINS BID ITEM

- ADDITIONAL HANDLING AND WORK BEYOND THAT INCLUDED IN SEPARATE BID ITEMS.
- PIPE CUTTING, WORKING OF JOINTS, NECESSARY CONCRETE COLLARS WHERE NOT FULLY SEATED PIPE JOINTS.
- CONNECTING RCP TEE TO OLD TILE AND FILLING PIPE OPENING.

DATA TABLE FOR OLD TO NEW MAIN DRAIN CONNECTIONS

TILE	STA.	NEW DRAIN DIA.	EX MAIN DIA.	CROSS CONNECT DIA.	LEN CROSS CONNECT	END CAPS
MAIN	10+00	48"	34''	12''	64 LF, CL III	1 -12" , 1 -36"
MAIN	18+00	48''	34''	12''	48 LF, CL III	1 -12" , 1 -36"
MAIN	25+50	48''	34''	12''	8 LF, CL III	1 -12" , 1 -36"
MAIN	34+20	48"	34"	12"	8 LF	1 -36"
MAIN	58+50	48''	32''	12''	56 LF, CL III	1 -12" , 1 -33"
MAIN	66+00	48"	32"	12"	32 LF, CL III	1 -12" , 1 -33"
MAIN	74+00	48"	32"	12"	32 LF, CL III	1 -12" , 1 -33"
MAIN	81+00	48''	32''	12''	32 LF, CL III	1 -12" , 1 -33"
MAIN	87+51	48"	30"	18"	24 LF, CL III	1 -30"
MAIN	105+60	36''	26''	12"	8 LF, CL III	1 - 27"
MAIN	112+00	36''	24''	12"	96 LF, CL III	1 - 12" , 1 - 24"
MAIN	123+00	30"	12"	12"	0 LF	1 - 12"
MAIN	135+09	27''	18''	12"	88 LF, CL III	1 - 12" , 1 - 18"
MAIN	142+00	27"	18"	12"	24 LF, CL III	1 -12", 1 -18"
MAIN	149+09	27''	18''	12"	16 LF, CL III	1 - 12" , 1 - 18"
MAIN	160+00	27''	18''	12"	24 LF, CL III	1 - 12" , 1 - 18"
MAIN	167+00	27"	18"	12"	8 LF, CL III	1 - 12", 1 - 18"
MAIN	174+50	21"	16"	12"	24 LF, CL III	1 - 12", 1 - 18"
MAIN	181+00	21"	16"	12"	8 LF, CL III	1 - 12", 1 - 18"
MAIN	185+65	21"	16"	12"	8 LF, CL III	1 - 12", 1 - 18"
MAIN	193+00	21"	15"	12"	80 LF, CL III	1 - 12", 1 - 15"
MAIN	197+50	15''	14''	12"	64 LF, CL III	1 - 12" , 1 - 15"
MAIN	207+87	15"	14"	12"	64 LF, CL III	1 - 12", 1 - 15"
BRANCH 1	8+00	24''	20''	12"	88 LF, CL III	1 - 12", 1-21"
BRANCH 1	18+00	24''	20''	12"	98 LF, CL III	1 - 12", 1-21"
BRANCH 1	25+00	24''	16''	12"	88 LF, CL III	1 - 12", 1-18"
BRANCH 1	34+00	24''	16''	12"	120 LF, CL III	1 - 12", 1-18"
BRANCH 1	42+00	24"	16"	12"	8 LF, CL III	1 - 12", 1 - 18"
BRANCH 1	44+00	24"	16"	12"	32 LF, CL III	1 - 12", 1 - 18"
BRANCH 1	62+17	21"	16"	12"	8 LF, CL III	1 - 12", 1 - 18"
BRANCH 1	74+92	21"	12"	12"	8 LF, CL III	2 - 12"
BRANCH 1	85+50	15"	12"	12"	24 LF, CL III	2 - 12"
BRANCH 5	1+78	21''	34"	12"	8 LF, CL III	1- 12"
BRANCH 5	12+00	18''	14''	12"	24 LF, CL III	1- 12", 1-18"
BRANCH 6	0+16	27"	30"	12"	0 LF	1 - 30"
BRANCH 6	14+00	27''	18''	12"	96 LF, CL III	1 - 12", 1-18"
BRANCH 6	24+00	27''	18''	12"	104 LF, CL III	1 - 12", 1-18"
BRANCH 6	37+50	24''	18''	12"	112 LF, CL III	1 - 12", 1-18"
BRANCH 6	44+00	24"	18"	12"	32 LF, CL III	1 - 12", 1 - 18"
BRANCH 6	51+46	15"	14"	15"	80 LF, CL III	2 - 15"

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DD 74 DRAINAGE IMPROVEMENTS

POCAHONTAS COUNTY, IOWA

TILE CONNECTIONS

EXCAVATION AND BANK

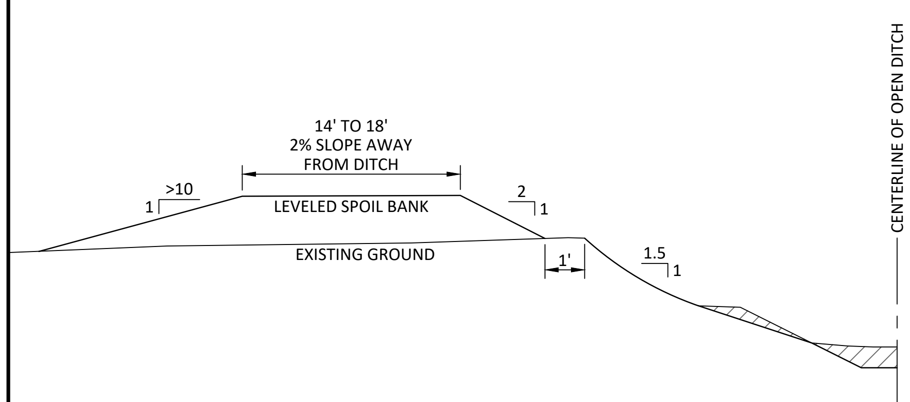
SHAPING IS REQUIRED TO BE CARRIED OUT FROM BOTH SIDES OF THE OPEN DITCH, UNLESS OTHERWISE SPECIFIED ON PLANS. APPROXIMATELY EQUAL AMOUNTS OF SPOIL ARE TO BE PLACED ON BOTH SIDES OF THE DITCH, UNLESS OTHERWISE SPECIFIED ON PLANS.

CONTRACTOR SHALL LIMIT, AS MUCH AS PRACTICAL, DISTURBANCE OF STABLE VEGETATED BANKS WHICH LIE OUTSIDE THE DESIGN CROSS SECTION. WHERE THE DITCH IS WIDER THAN THE DESIGN CROSS SECTION, CONTRACTOR SHALL EXCAVATE AS REQUIRED TO SHAPE BOTTOM TO BASE OF SIDE SLOPES.

SPOIL BANK LEVELING

THE TOP 8 INCHES OF ALL LEVELED AND SHAPED SPOIL, OLD AND NEW, SHALL BE THOROUGHLY TILLED BY CONTRACTOR WITH A CHISEL PLOW OR SIMILAR IMPLEMENT. DISPOSE OF ROCKS AND OTHER DEBRIS EXPOSED BY THIS OPERATION. ENTIRE SOIL SURFACE SHALL BE SHAPED TO DRAIN AWAY FROM THE DITCH AND SHALL BE GENERALLY LEVEL WITH GENTLE UNDULATIONS ON A LINE PARALLEL TO DITCH. CHISELING AND FINISH GRADING ARE INCIDENTAL TO THE SPOIL BANK LEVELING BID ITEM.

MINOR SURFACE GRADING TO DRAIN SMALL IMPOUNDED AREAS AND THE CONSTRUCTION OF TEMPORARY FIELD ENTRANCES OR SURFACE WATER CONTROL DIKES IN THE PUBLIC ROAD DITCHES ARE INCIDENTAL TO THE SPOIL BANK LEVELING BID ITEM.



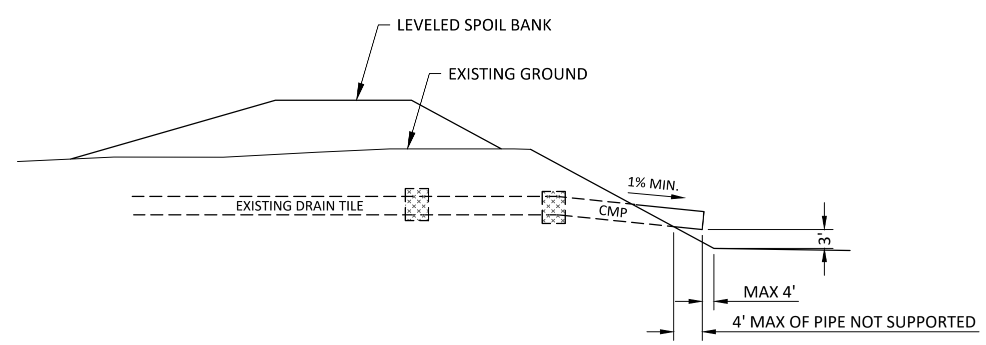
TYPICAL OPEN DITCH EXCAVATION & SPOIL LEVELING

WHERE IT IS NECESSARY TO EXTEND OR RELAY TILE LINES. 12" OR LARGER IN DIAMETER TO REACH TILE EXTENSION PIPES, THE EXTENSION SHALL BE WITH CONCRETE OR SITE-SALVAGED DRAIN TILE SECTIONS IN A TRENCH WITH A MAXIMUM WIDTH 12" WIDER THAN THE TILE SECTIONS. USE NEW CLASS III CONCRETE DRAIN TILE WITH CLASS R-2 BEDDING. EXTEND ALL SMALLER TILE LINES WITH 10" DIAMETER SDR-35 PVC SEWER PIPE FITTED OVER TILE AND INTO OUTLET PIPE. NECESSARY EXTENSIONS OR RELAYS LESS THAN 20 FEET IN LENGTH MAY BE COMPLETED WHEN DISCOVERED. LONGER EXTENSIONS MUST BE FIRST APPROVED BY ENGINEER. CORRUGATED PLASTIC DRAIN TILE IS NOT PERMITTED.

WHEN A TILE LINE IS FOUND TO BE CRUSHED, CRACKED, OR FILLED WITH SEDIMENT, CONTRACTOR IS TO NOTIFY ENGINEER PRIOR TO DOING ADDITIONAL WORK. ENGINEER WILL DETERMINE IF REPLACEMENT OR ABANDONMENT IS WARRANTED. TILE REPLACEMENT WILL NOT EXTEND BEYOND THE WORK LIMITS.

CONTRACTOR IS REQUIRED TO MAINTAIN AND PROVIDE A LOG OF ALL DRAIN TILE LINE EXTENSION AND REPLACEMENT WORK RECORDING LOCATION, EXISTING TILE MATERIAL, SIZE, STRENGTH & LENGTH OF MATERIALS INSTALLED, OTHER WORK PERFORMED AND MACHINE AND LABOR TIME. LOG KEEPING IS SUBSIDIARY TO THE CONTRACT. ALL APPROVED DRAIN TILE WORK WILL BE CONSIDERED EXTRA WORK IF NOT COVERED BY A BID ITEM. FAILURE TO MAINTAIN AN ACCURATE LOG WILL RESULT IN CONTRACTOR HAVING TO UNCOVER HIS WORK FOR VERIFICATION AT HIS COST.

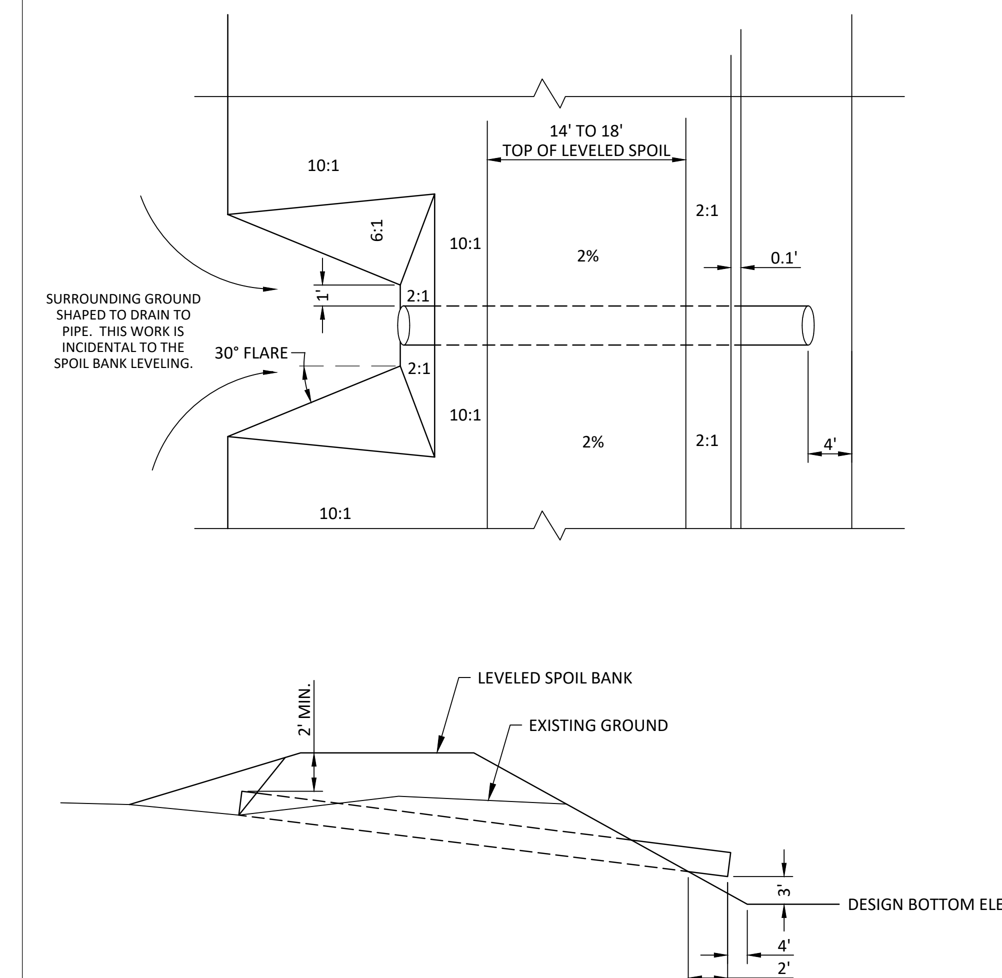
ALL CONNECTIONS OF DRAIN TILE TO EXTENSION PIPES OR TO SDR-35 PVC SEWER PIPES ARE TO BE ENCASED IN A PORTLAND CEMENT CONCRETE COLLAR AT LEAST 12" WIDE AND 6" THICK CONTINUOUS AROUND THE JOINT. THIS WORK IS INCIDENTAL TO THE DRAIN TILE EXTENSION PIPE BID ITEMS.



TYPICAL TILE TILE EXTENSION INSTALLATION

Standard Pipe Work Abbreviations

UAC = Use As Constructed	RS&R = Remove, Salvage, & Reinstall
TE = Tile Extension	SD = Surface Drain
AG = Animal Guard	CMP = Corrugated Metal Pipe
FG = Flood Gate	RCP = Reinforced Concrete Pipe



TYPICAL SURFACE DRAIN INSTALLATION

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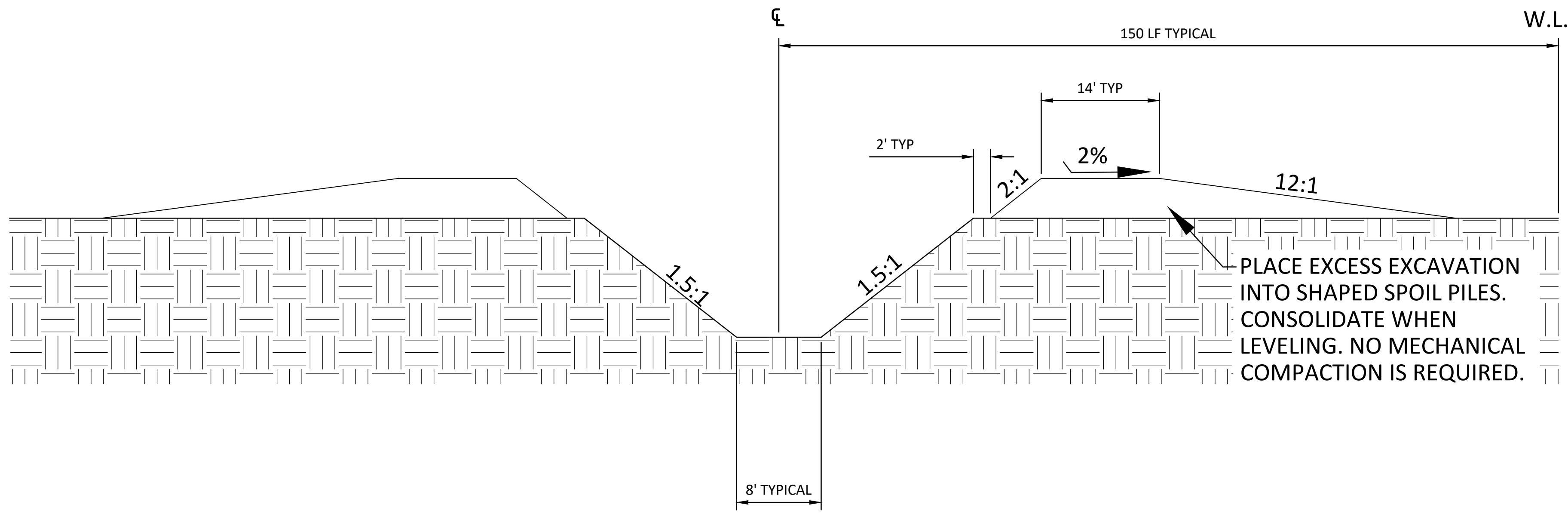
DD 74 DRAINAGE IMPROVEMENTS
POCAHONTAS COUNTY, IOWA
TYPICAL DITCH DETAIL

TYPICAL OPEN DITCH EARTHWORK CROSS SECTION

(STA 33+00 - 83+14)



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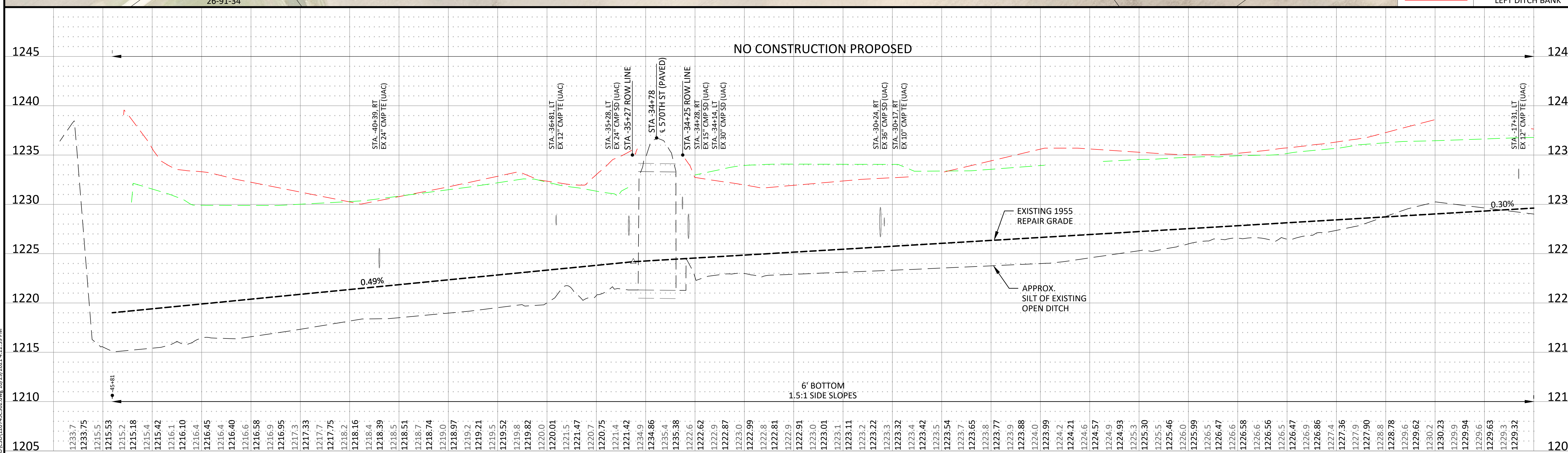
DD 74 DRAINAGE IMPROVEMENTS
POCAHONTAS COUNTY, IOWA
TYPICAL DITCH DETAIL

SHEET
B.05



HORZ. SCALE 0 100 200 FEET

VERT. SCALE 0 5 10 FEET

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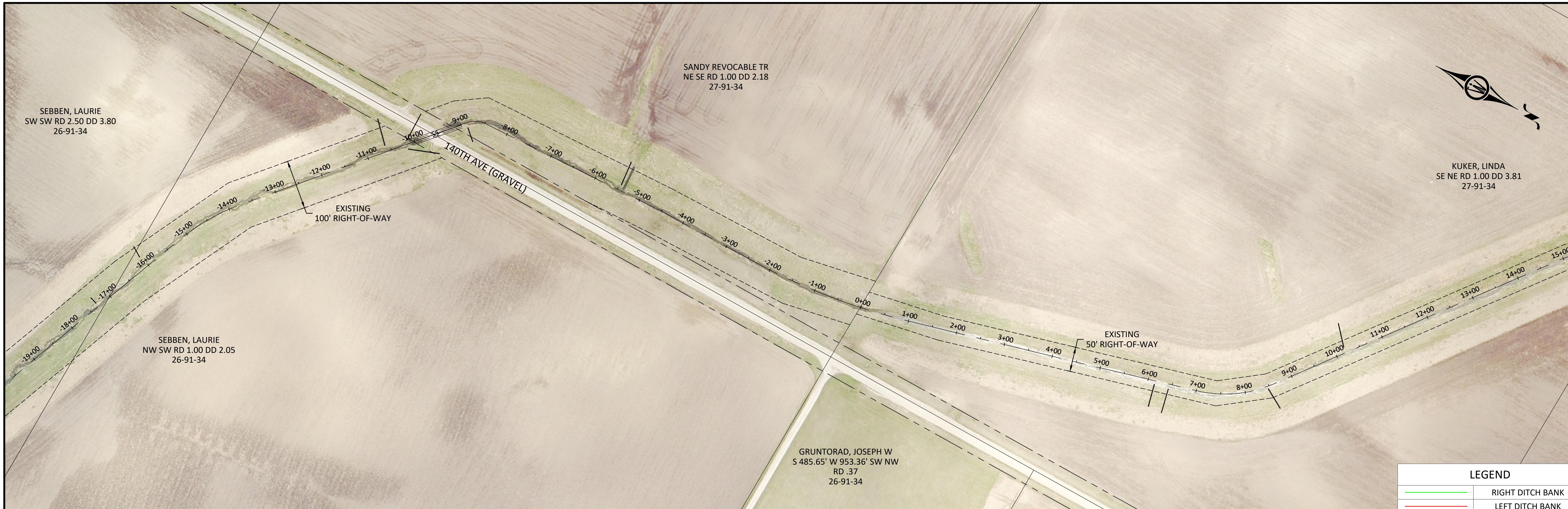
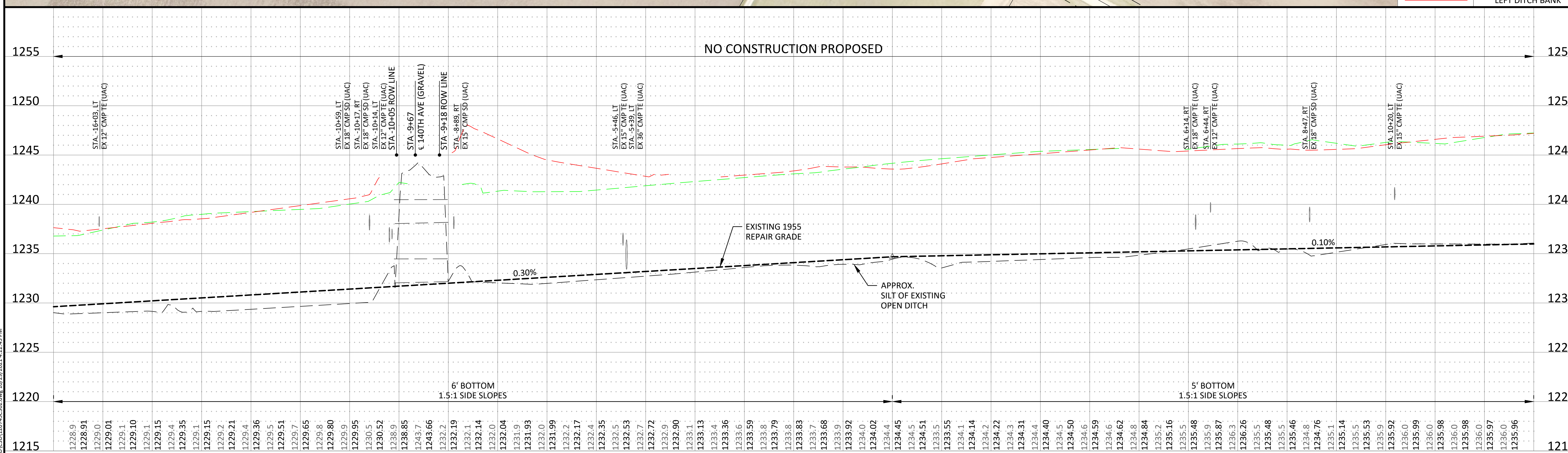
DD 74 DRAINAGE IMPROVEMENTS

POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - MAIN OPEN DITCH

SHEET D.01





HORZ. SCALE 0 100 200 FEET
VERT. SCALE 0 5 10 FEET

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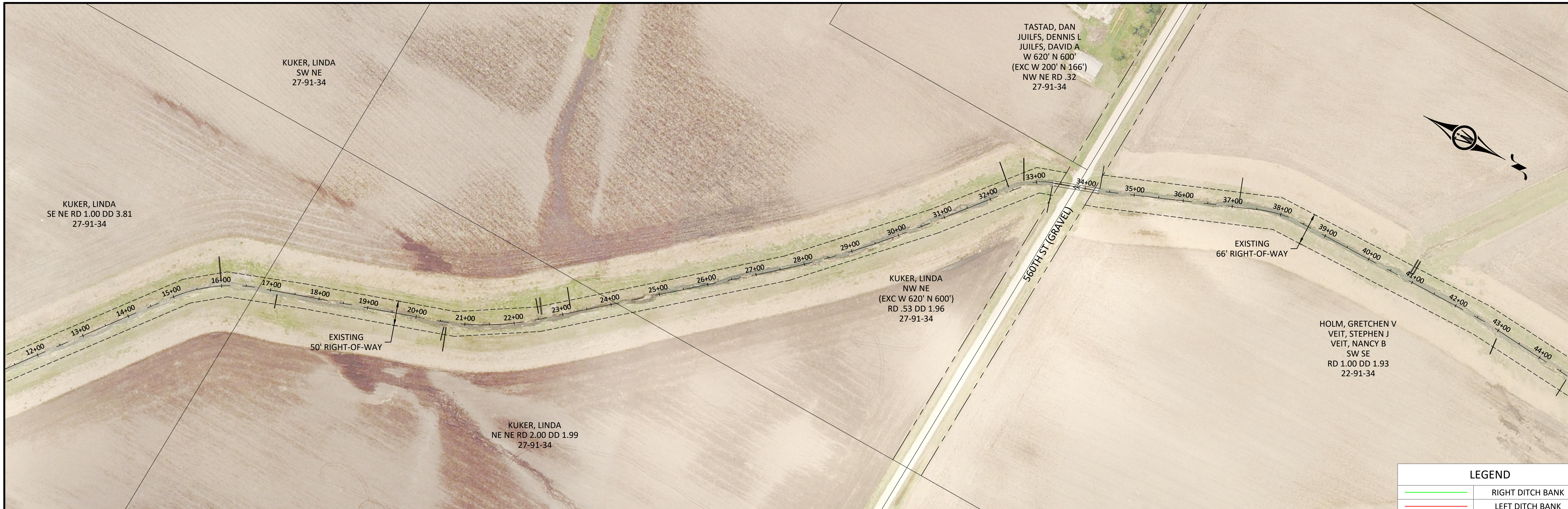
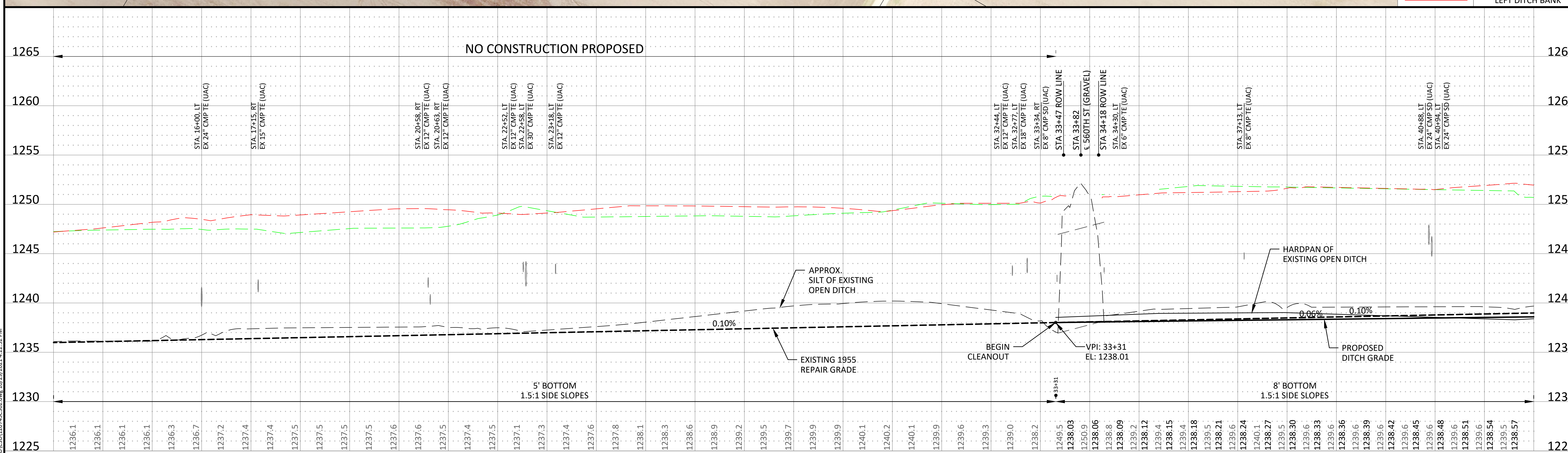
POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - MAIN OPEN DITCH

SHEET D.02





HORZ. 0 100 200 SCALE FEET

VERT. 0 5 10 SCALE FEET

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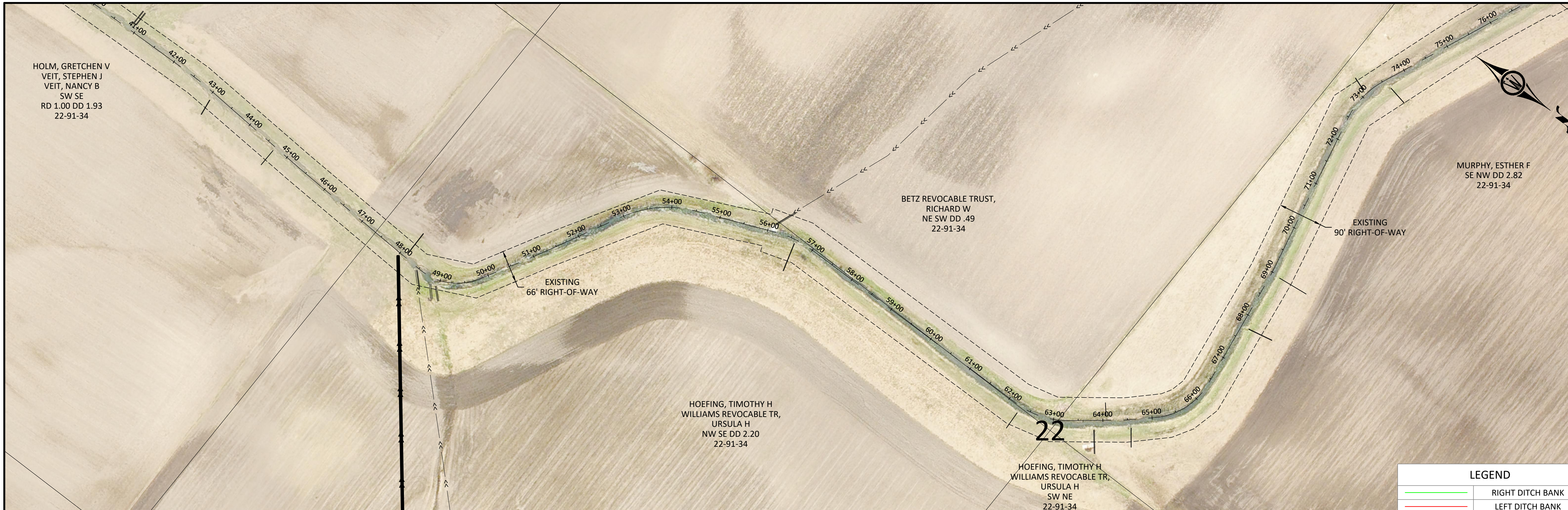
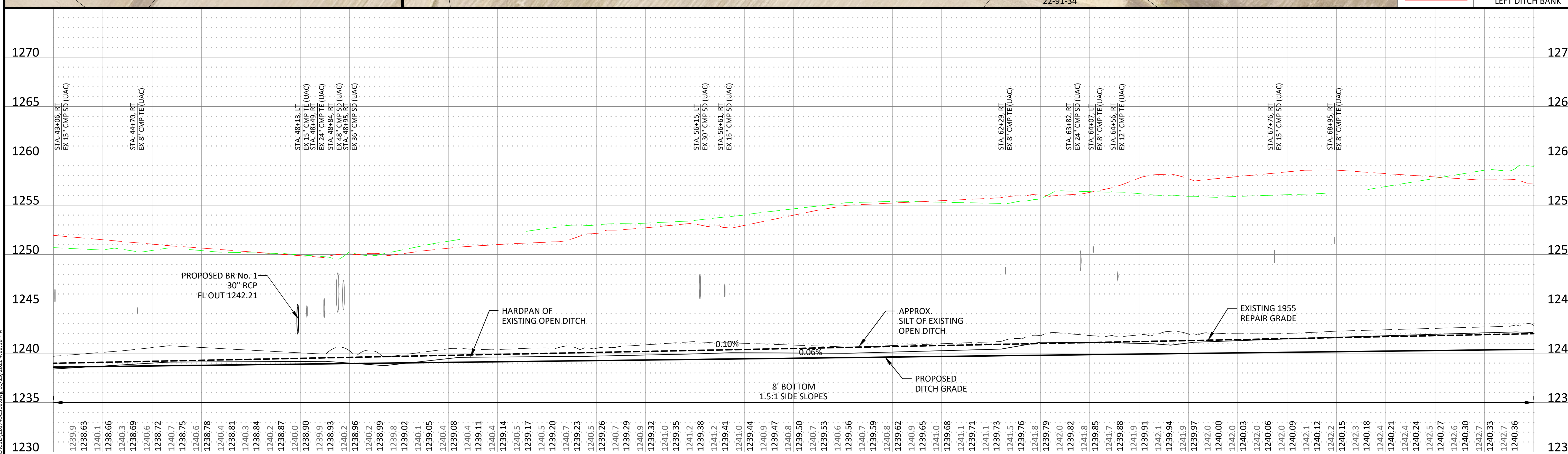
POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - MAIN OPEN DITCH

SHEET D.03





HORZ. 0 100 200 SCALE FEET

VERT. 0 5 10 SCALE FEET

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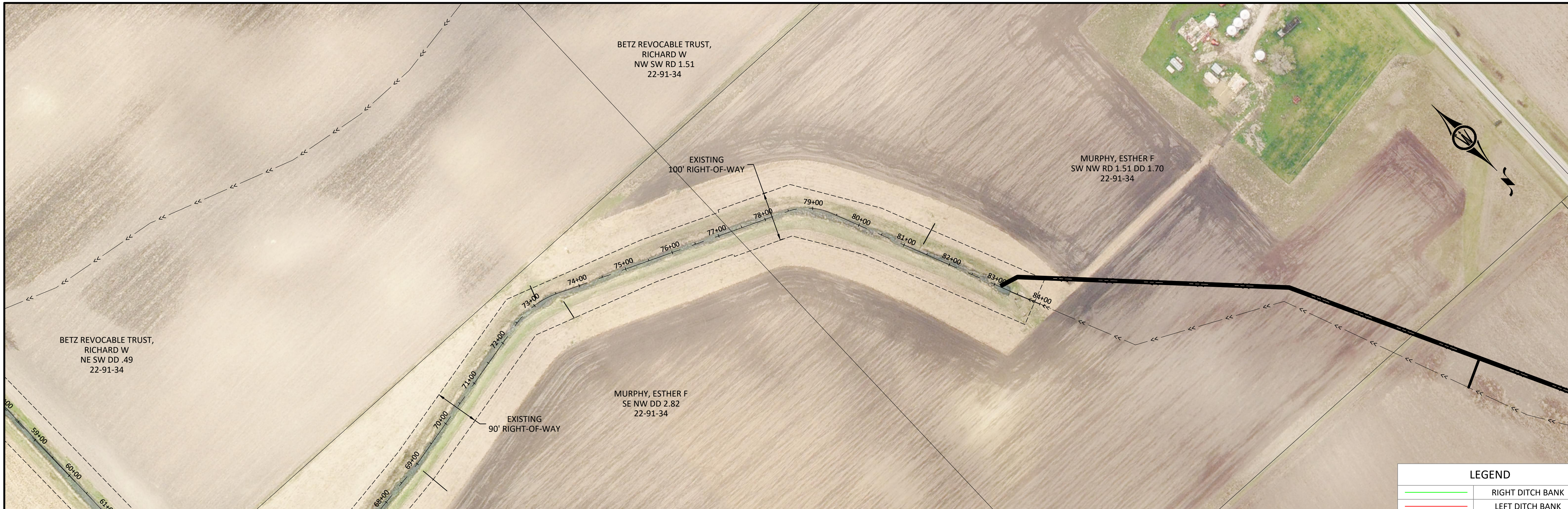
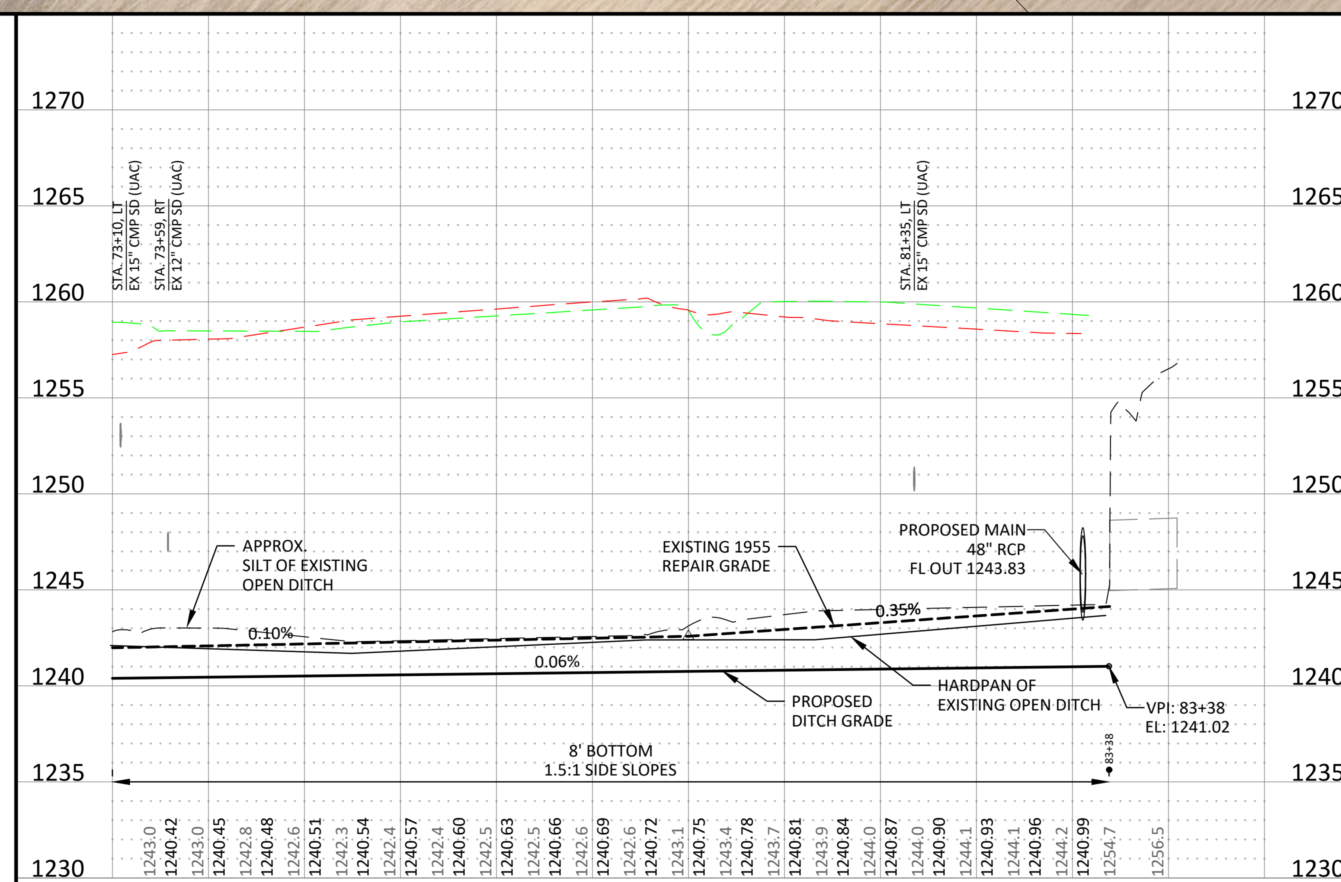
DD 74 DRAINAGE IMPROVEMENTS

POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - MAIN OPEN DITCH

SHEET D.04





HORZ. SCALE 0 100 200 FEET

VERT. SCALE 0 5 10 FEET

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DD 74 DRAINAGE IMPROVEMENTS

POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - MAIN OPEN DITCH

SHEET D.05

POCAHONTAS DD 74 OPEN DITCH ALIGNMENT GEOMETRY

No.	Type	Length	Radius	Start Station	End Station	Start E-N	End E-N	PASS THROUGH PT E-N
1	Line	24.46'		33+00'	33+24.46'	E4560189.47',N3711862.24'	E4560180.71',N3711885.08'	
2	Line	94.66'		33+24.46'	34+19.12'	E4560180.71',N3711885.08'	E4560150.13',N3711974.67'	
3	Line	363.08'		34+19.12'	37+82.21'	E4560150.13',N3711974.67'	E4560018.63',N3712313.10'	
4	Line	467.96'		37+82.21'	42+50.17'	E4560018.63',N3712313.10'	E4560013.42',N3712781.04'	
5	Line	272.80'		42+50.17'	45+22.97'	E4560013.42',N3712781.04'	E4560036.46',N3713052.86'	
6	Line	317.30'		45+22.97'	48+40.27'	E4560036.46',N3713052.86'	E4560059.09',N3713369.35'	
7	Line	114.42'		48+40.27'	49+54.69'	E4560059.09',N3713369.35'	E4560012.34',N3713473.78'	
8	Line	152.57'		49+54.69'	51+07.26'	E4560012.34',N3713473.78'	E4559881.34',N3713551.99'	
9	Line	254.72'		51+07.26'	53+61.98'	E4559881.34',N3713551.99'	E4559667.54',N3713690.45'	
10	Line	218.97'		53+61.98'	55+80.95'	E4559667.54',N3713690.45'	E4559580.07',N3713891.19'	
11	Line	75.89'		55+80.95'	56+56.84'	E4559580.07',N3713891.19'	E4559557.92',N3713963.77'	
12	Line	546.02'		56+56.84'	62+02.85'	E4559557.92',N3713963.77'	E4559565.54',N3714509.74'	
13	Line	79.27'		62+02.85'	62+82.13'	E4559565.54',N3714509.74'	E4559547.84',N3714587.01'	
14	Line	145.56'		62+82.13'	64+27.68'	E4559547.84',N3714587.01'	E4559463.35',N3714705.54'	
15	Line	83.66'		64+27.68'	65+11.34'	E4559463.35',N3714705.54'	E4559407.14',N3714767.50'	
16	Line	34.79'		65+11.34'	65+46.13'	E4559407.14',N3714767.50'	E4559377.30',N3714785.39'	
17	Line	46.29'		65+46.13'	65+92.43'	E4559377.30',N3714785.39'	E4559333.08',N3714799.08'	
18	Line	284.87'		65+92.43'	68+77.30'	E4559333.08',N3714799.08'	E4559049.69',N3714769.98'	
19	Line	369.33'		68+77.30'	72+46.63'	E4559049.69',N3714769.98'	E4558685.82',N3714706.70'	
20	Line	282.31'		72+46.63'	75+28.94'	E4558685.82',N3714706.70'	E4558421.99',N3714807.16'	
21	Line	306.06'		75+28.94'	78+35.01'	E4558421.99',N3714807.16'	E4558144.93',N3714937.20'	
22	Line	171.87'		78+35.01'	80+06.88'	E4558144.93',N3714937.20'	E4558058.16',N3715085.56'	
23	Line	307.14'		80+06.88'	83+14.02'	E4558058.16',N3715085.56'	E4557943.52',N3715370.51'	

POCAHONTAS DD 74 BRANCH 6 ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	505.66'	0+00'	5+05.66'	E4556963.20',N3723262.41'	E4556963.20',N3723768.07'
2	Line	1483.64'	5+05.66'	19+89.30'	E4556963.20',N3723768.07'	E4556019.43',N3724912.83'
3	Line	1314.01'	19+89.30'	33+03.31'	E4556019.43',N3724912.83'	E4556220.38',N3726211.39'
4	Line	1292.25'	33+03.31'	45+95.56'	E4556220.38',N3726211.39'	E4555886.72',N3727459.82'
5	Line	439.16'	45+95.56'	50+34.72'	E4555886.72',N3727459.82'	E4556106.62',N3727839.96'
6	Line	111.28'	50+34.72'	51+46'	E4556106.62',N3727839.96'	E4556110.59',N3727951.17'

POCAHONTAS DD 74 BRANCH 7 ALIGNMENT GEOMETRY

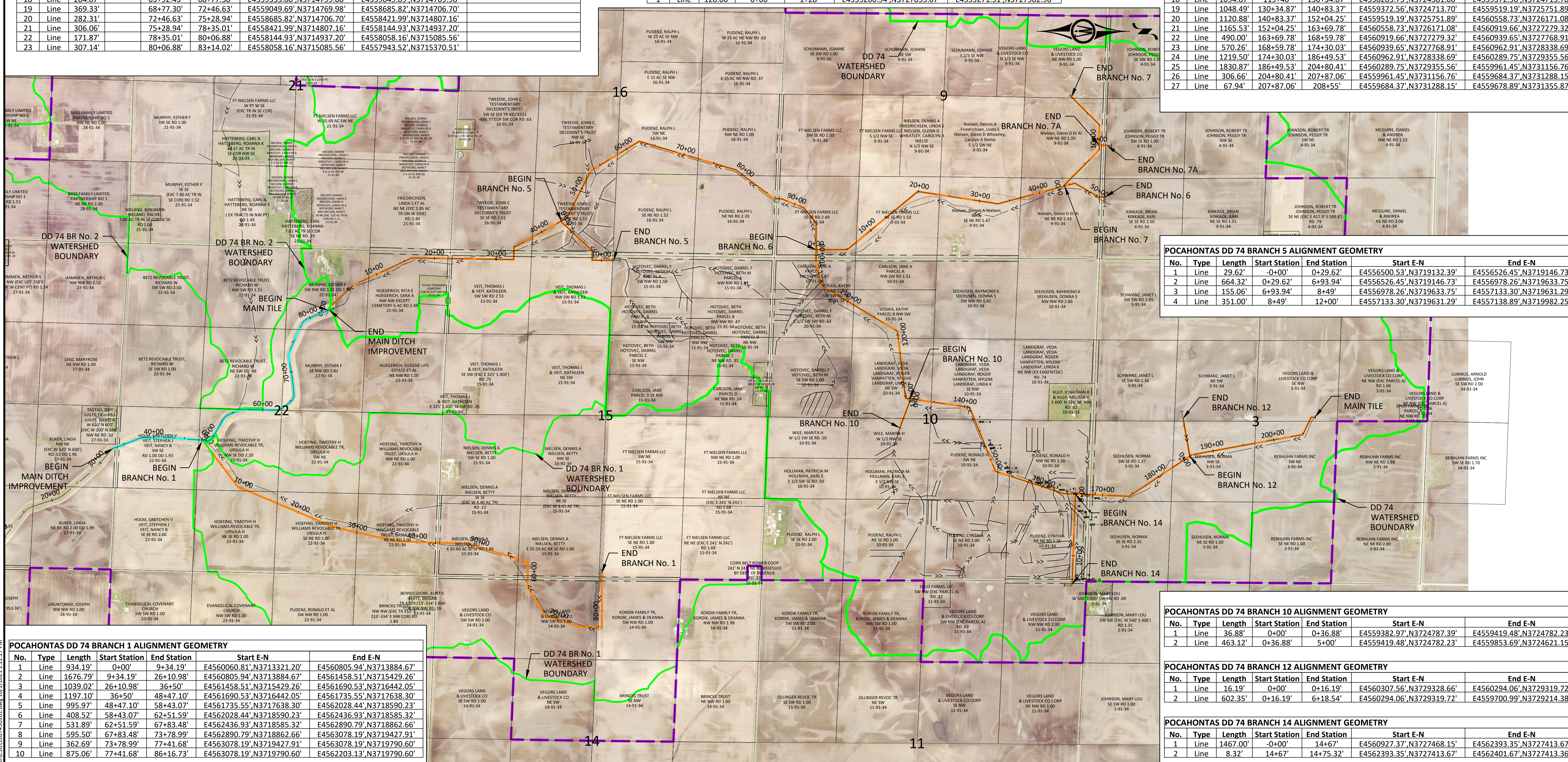
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	17.95'	0+00'	0+17.95'	E4555931.34',N3727292.85'	E4555914.00',N3727288.22'
2	Line	801.06'	0+17.95'	8+19.01'	E4555914.00',N3727288.22'	E4555347.93',N3727855.01'
3	Line	410.51'	8+19.01'	12+29.52'	E4555347.93',N3727855.01'	E4554937.42',N3727855.28'
4	Line	638.48'	12+29.52'	18+68'	E4554937.42',N3727855.28'	E4554485.66',N3727404.10'

POCAHONTAS DD 74 BRANCH 7A ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	128.00'	0+00'	1+28'	E4555266.94',N3727855.07'	E4555271.51',N3727982.98'

POCAHONTAS DD 74 MAIN ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	37.51'	0+00'	0+37.51'	E4557948.09',N3715348.44'	E4557912.21',N3715359.38'
2	Line	551.00'	0+37.51'	5+88.51'	E4557912.21',N3715359.38'	E4557536.12',N3715762.06'
3	Line	1041.17'	5+88.51'	16+29.67'	E4557536.12',N3715762.06'	E4557097.97',N3716706.55'
4	Line	1655.31'	16+29.67'	32+84.98'	E4557097.97',N3716706.55'	E4557124.16',N3718361.65'
5	Line	198.81'	32+84.98'	34+83.79'	E4557124.16',N3718361.65'	E4556925.38',N3718364.79'
6	Line	978.34'	34+83.79'	44+62.13'	E4556925.38',N3718364.79'	E4556451.62',N3719220.77'
7	Line	859.53'	44+62.13'	53+21.66'	E4556451.62',N3719220.77'	E4555685.21',N3719609.89'
8	Line	922.05'	53+21.66'	62+43.71'	E4555685.21',N3719609.89'	E4555205.66',N3720397.43'
9	Line	1634.99'	62+43.71'	78+78.70'	E4555205.66',N3720397.43'	E4555671.11',N3721964.76'
10	Line	766.56'	78+78.70'	86+45.26'	E4555671.11',N3721964.76'	E4556133.84',N3722575.91'
11	Line	126.00'	86+45.26'	87+71.26'	E4556133.84',N3722575.91'	E4556139.61',N3722701.77'
12	Line	384.19'	87+71.26'	91+55.44'	E4556139.61',N3722701.77'	E4556282.13',N3723058.55'
13	Line	319.12'	91+55.44'	94+74.56'	E4556282.13',N3723058.55'	E4556526.97',N3723263.23'
14	Line	501.43'	94+74.56'	99+76'	E4556526.97',N3723263.23'	E4557028.40',N3723262.29'
15	Line	136.00'	99+76'	101+12'	E4557028.40',N3723262.29'	E4557164.40',N3723262.04'
16	Line	391.51'	101+12'	105+03.50'	E4557164.40',N3723262.04'	E4557545.97',N3723349.70'
17	Line	1436.50'	105+03.50'	119+40'	E4557545.97',N3723349.70'	E4558285.75',N3724581.06'
18	Line	1094.87'	119+40'	130+34.87'	E4558285.75',N3724581.06'	E4559372.56',N3724713.70'
19	Line	1048.49'	130+34.87'	140+83.37'	E4559372.56',N3724713.70'	E4559519.19',N3725751.89'
20	Line	1120.88'	140+83.37'	152+04.25'	E4559519.19',N3725751.89'	E4560558.73',N3726171.08'
21	Line	1165.53'	152+04.25'	163+69.78'	E4560558.73',N3726171.08'	E4560919.66',N3727279.32'
22	Line	490.00'	163+69.78'	168+59.78'	E4560919.66',N3727279.32'	E4560939.65',N3727768.91'
23	Line	570.26'	168+59.78'	174+30.03'	E4560939.65',N3727768.91'	E4560962.91',N3728338.69'
24	Line	1219.50'	174+30.03'	186+49.53'	E4560962.91',N3728338.69'	E4560289.75',N3729355.56'
25	Line	1830.87'	186+49.53'	204+80.41'	E4560289.75',N3729355.56'	E4559961.45',N3731156.76'
26	Line	306.66'	204+80.41'	207+87.06'	E4559961.45',N3731156.76'	E4559684.37',N3731288.15'
27	Line	67.94'	207+87.06'	208+55'	E4559684.37',N3731288.15'	E4559678.89',N3731355.87'



POCAHONTAS DD 74 BRANCH 5 ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	29.62'	-0+00'	0+29.62'	E4556500.53',N3719132.39'	E4556526.45',N3719146.73'
2	Line	664.32'	0+29.62'	6+93.94'	E4556526.45',N3719146.73'	E4556978.26',N3719633.75'
3	Line	155.06'	6+93.94'	8+49'	E4556978.26',N3719633.75'	E4557133.30',N3719631.29'
4	Line	351.00'	8+49'	12+00'	E4557133.30',N3719631.29'	E4557138.89',N3719982.25'

POCAHONTAS DD 74 BRANCH 10 ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	36.88'	0+00'	0+36.88'	E4559382.97',N3724787.39'	E4559419.48',N3724782.23'
2	Line	463.12'	0+36.88'	5+00'	E4559419.48',N3724782.23'	E4559853.69',N3724621.15'

POCAHONTAS DD 74 BRANCH 12 ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	16.19'	0+00'	0+16.19'	E4560307.56',N3729328.66'	E4560294.06',N3729319.72'
2	Line	602.35'	0+16.19'	6+18.54'	E4560294.06',N3729319.72'	E4559700.99',N3729214.38'

POCAHONTAS DD 74 BRANCH 14 ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	1467.00'	-0+00'	14+67'	E4560927.37',N3727468.15'	E4562393.35',N3727413.67'
2	Line	8.32'	14+67'	14+75.32'	E4562393.35',N3727413.67'	E4562401.67',N3727413.36'

POCAHONTAS DD 74 BRANCH 1 ALIGNMENT GEOMETRY

No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	934.19'	0+00'	9+34.19'	E4560060.81',N3713321.20'	E4560805.94',N3713884.67'
2	Line	1676.79'	9+34.19'	26+10.98'	E4560805.94',N3713884.67'	E4561458.51',N3715429.26'
3	Line	1039.02'	26+10.98'	36+50'	E4561458.51',N3715429.26'	E4561690.53',N3716442.05'
4	Line	1197.10'	36+50'	48+47.10'	E4561690.53',N3716442.05'	E4561735.55',N3717638.30'
5	Line	995.97'	48+47.10'	58+43.07'	E4561735.55',N3717638.30'	E4562028.44',N3718590.23'
6	Line	408.52'	58+43.07'	62+51.59'	E4562028.44',N3718590.23'	E4562436.93',N3718585.32'
7	Line	531.89'	62+51.59'	67+83.48'	E4562436.93',N3718585.32'	E4562890.79',N3718862.66'
8	Line	595.50'	67+83.48'	73+78.99'	E4562890.79',N3718862.66'	E4563078.19',N3719427.91'
9	Line	362.69'	73+78.99'	77+41.68'	E4563078.19',N3719427.91'	E4563078.19',N3719790.60'
10	Line	875.06'	77+41.68'	86+16.73'	E4563078.19',N3719790.60'	E4562203.13',N3719790.60'

HORZ. 0 800 1600
SCALE FEET

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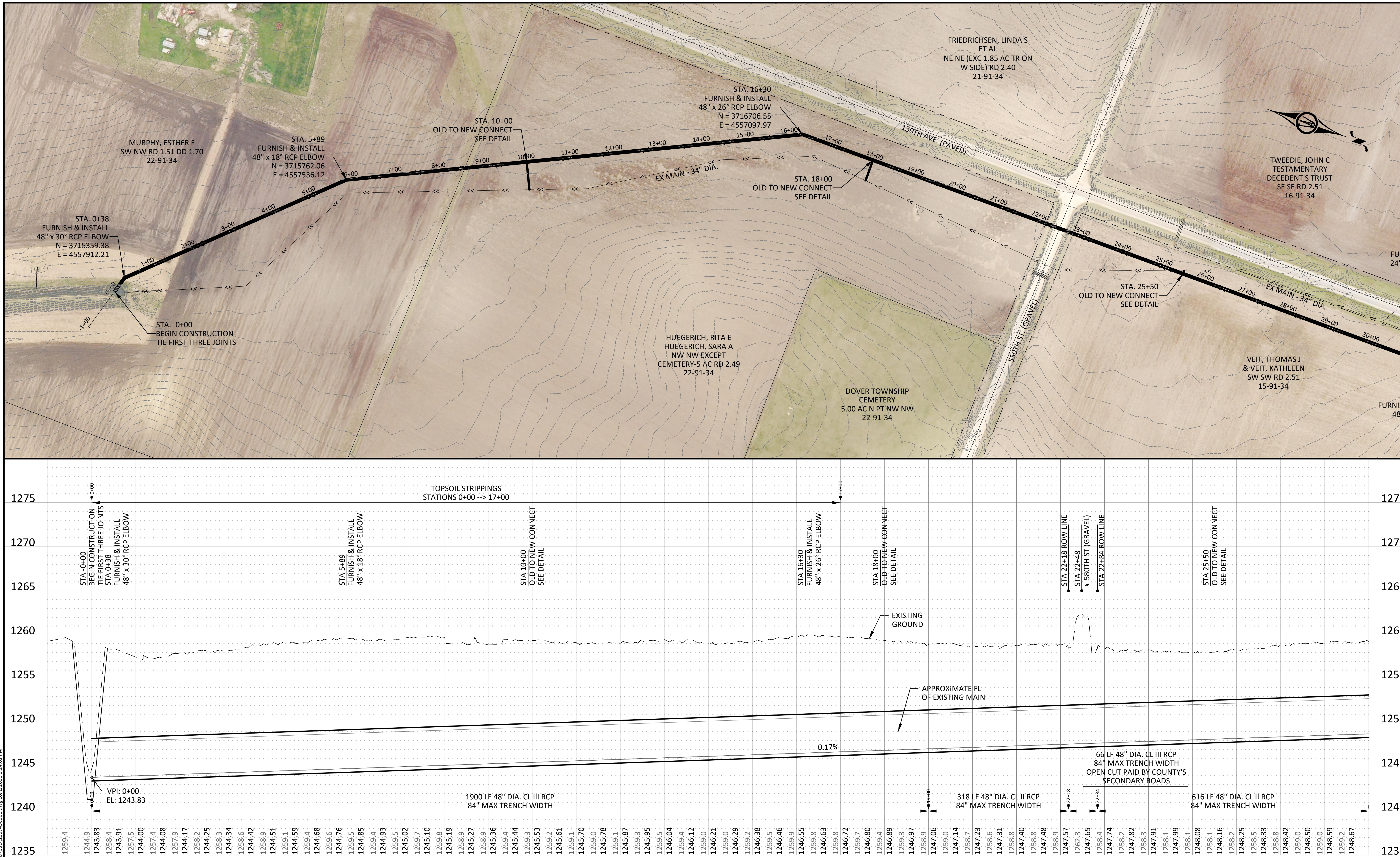
ALIGNMENT GEOMETRY

SHEET G.01



HORZ. 0 100 200 SCALE FEET

VERT. 0 5 10 SCALE FEET

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POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - MAIN TILE

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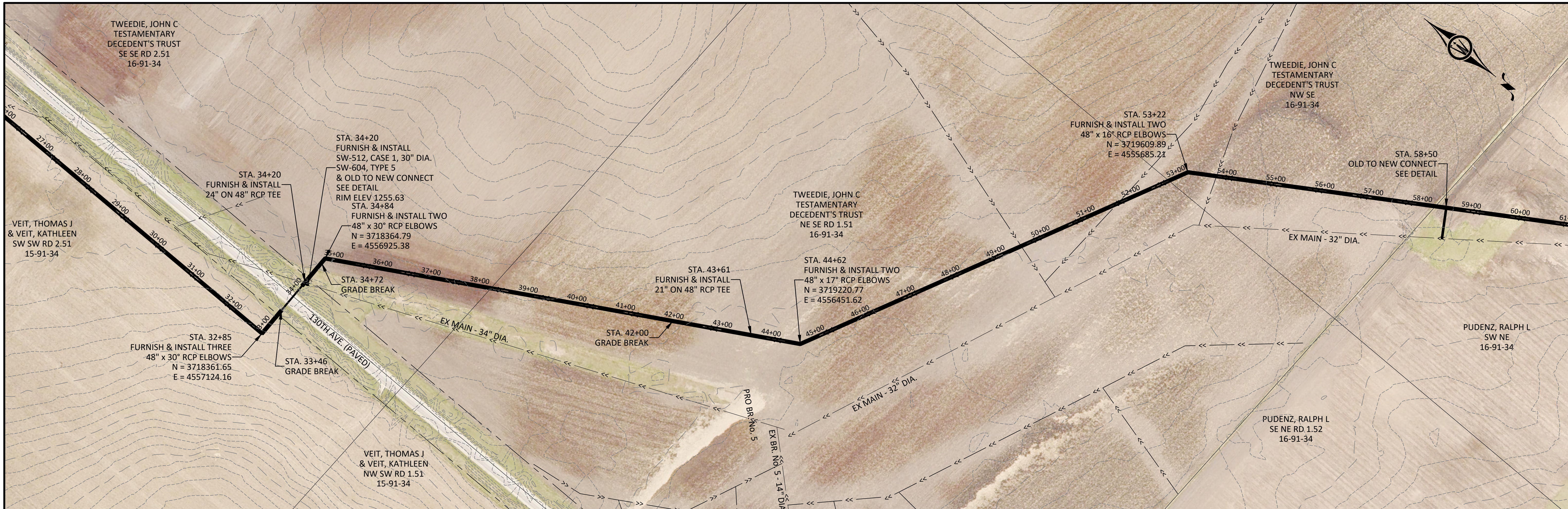

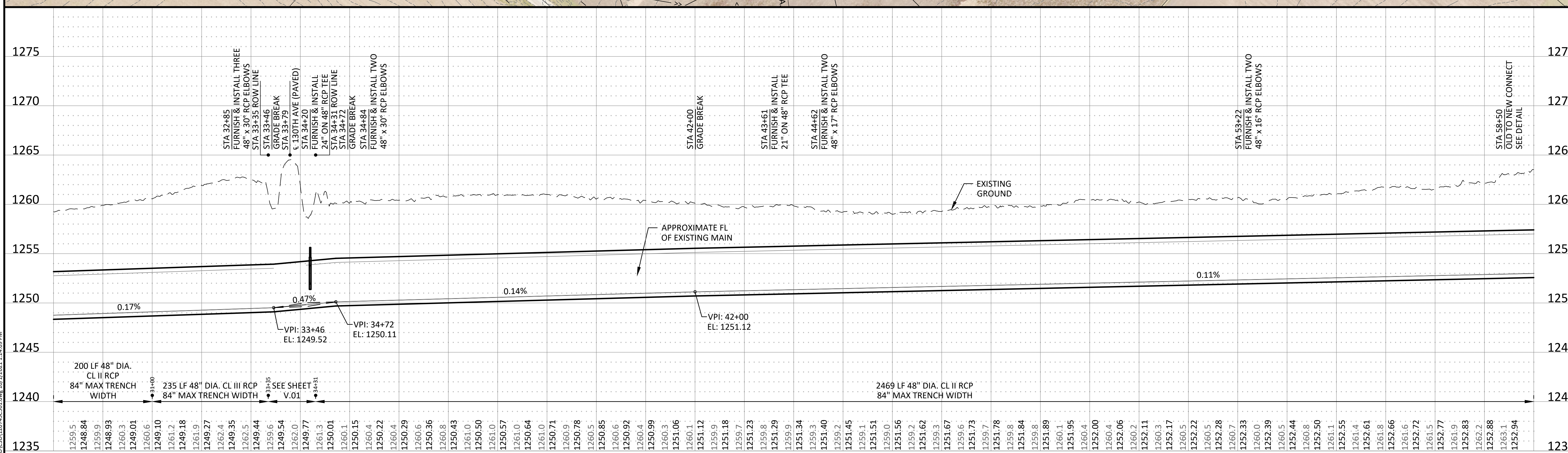

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PLAN & PROFILE - MAIN TILE

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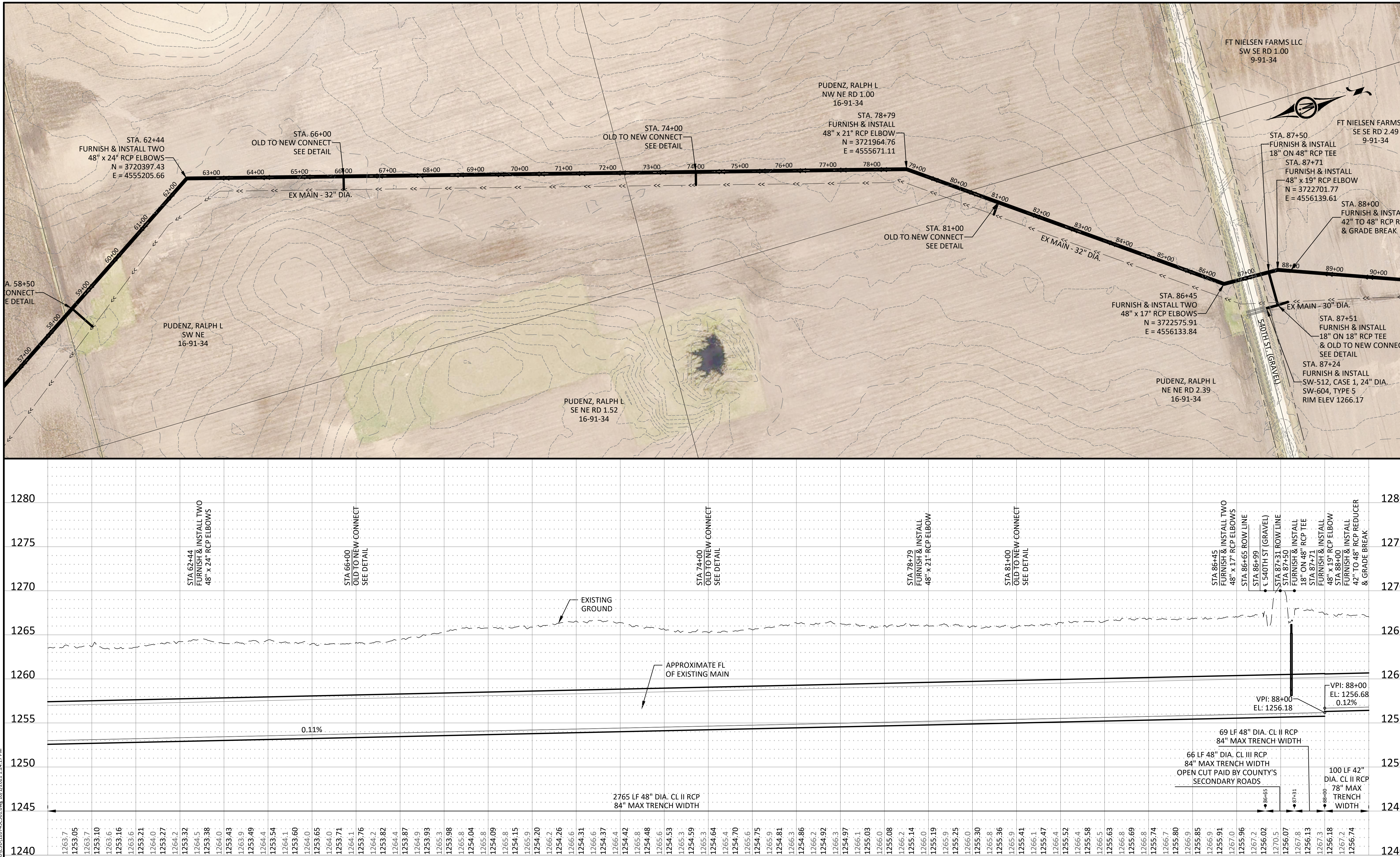

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VERT. 0 5 10 SCALE FEET

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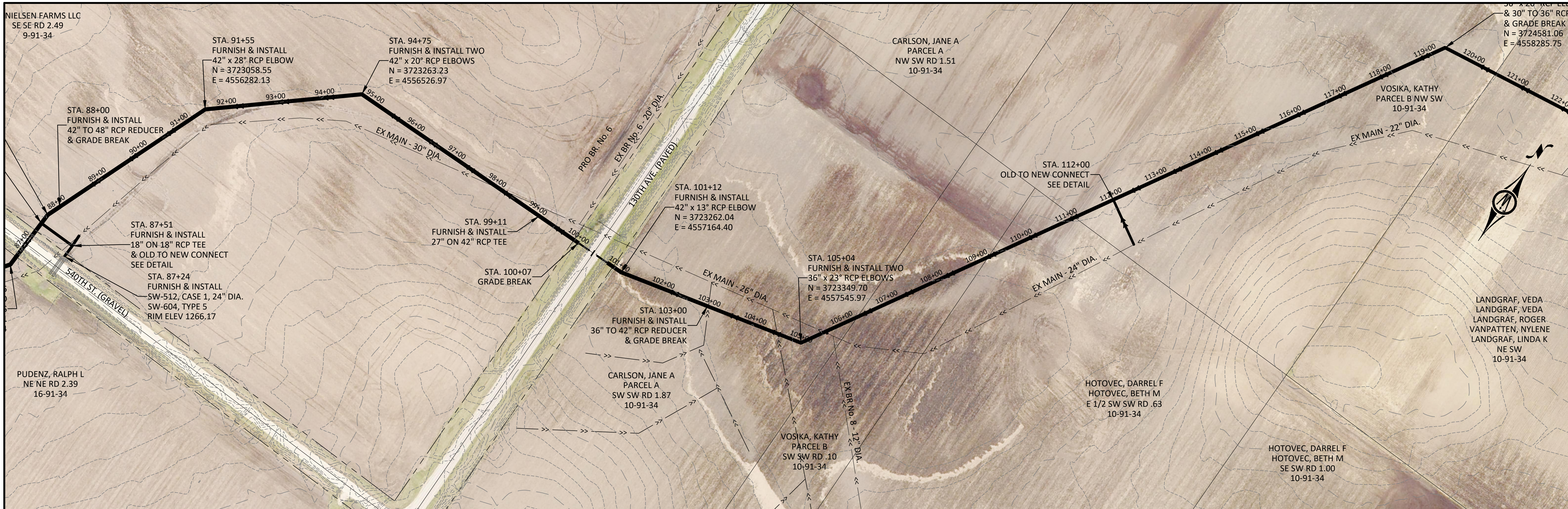

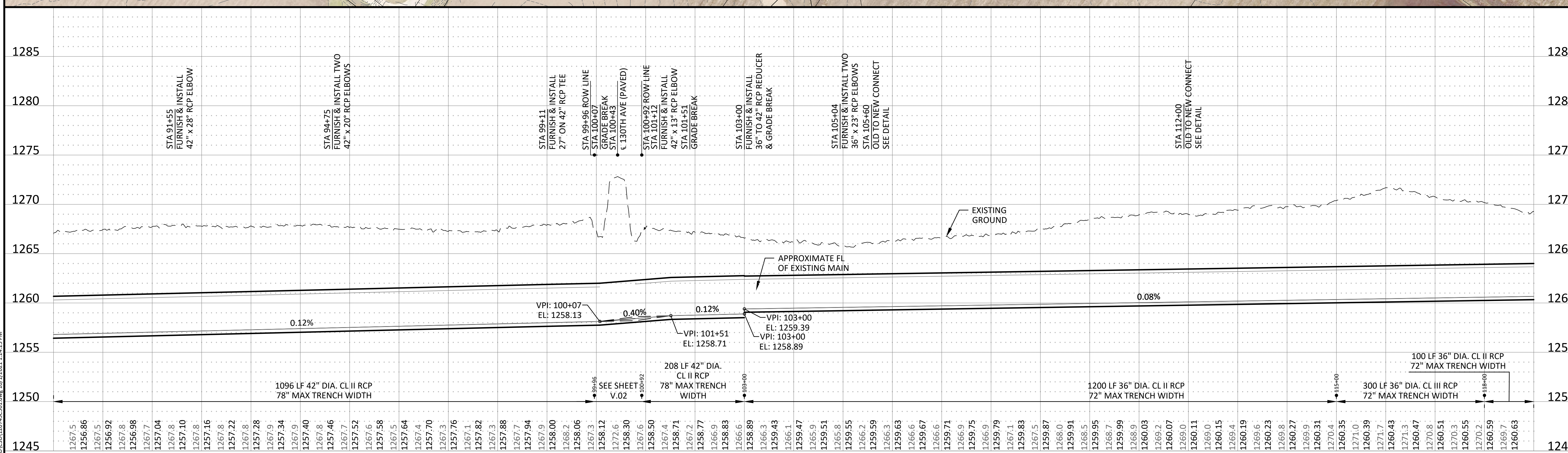

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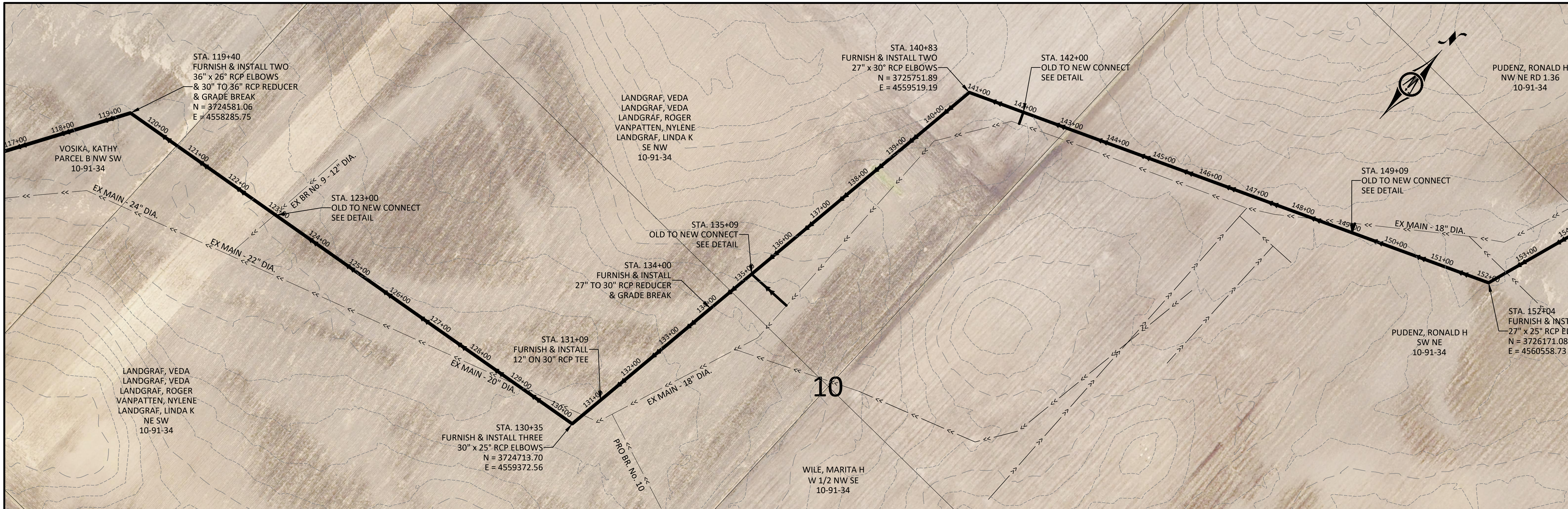

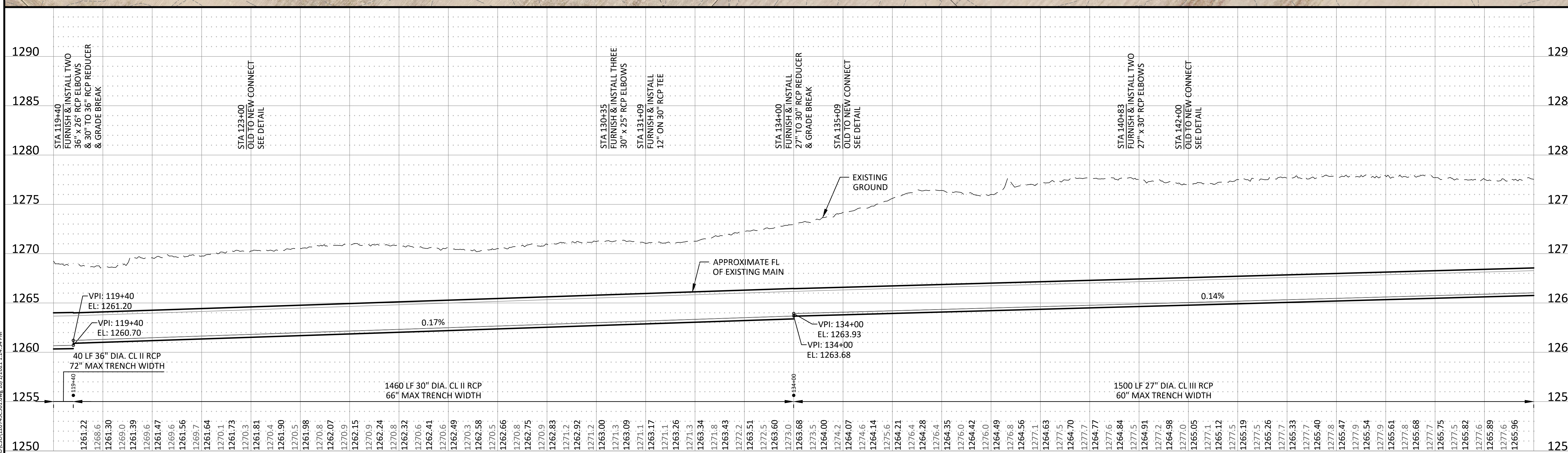

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VERT. 0 5 10 SCALE FEET

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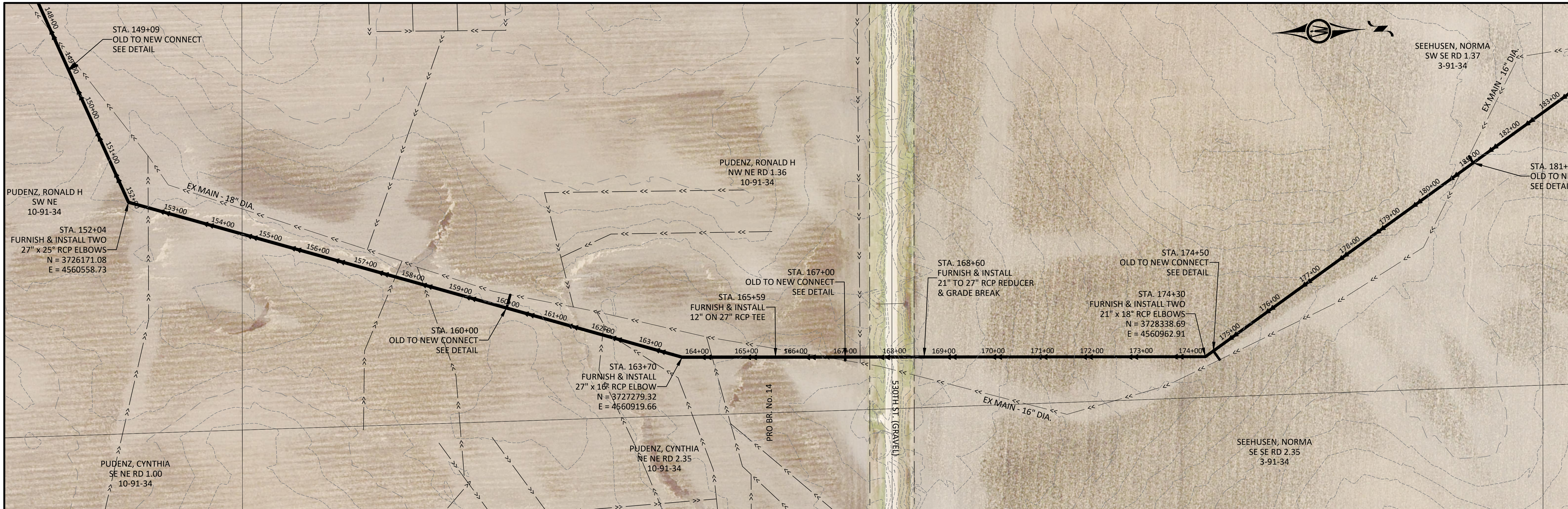

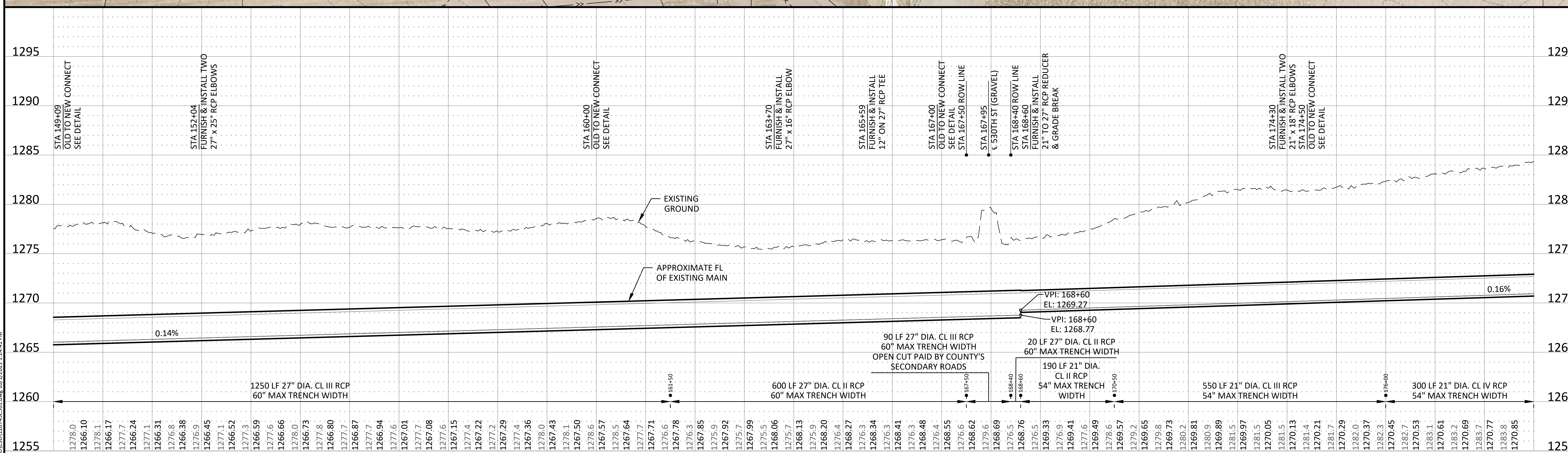

HORZ. 0 100 200 SCALE FEET
VERT. 0 5 10 SCALE FEET

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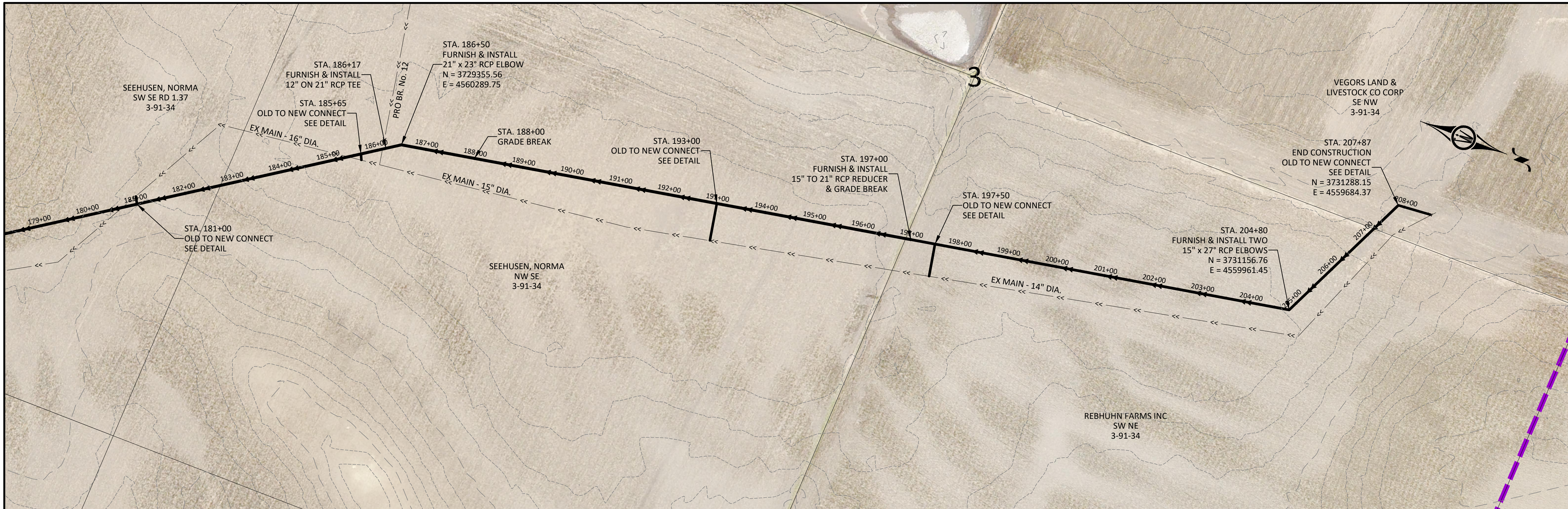

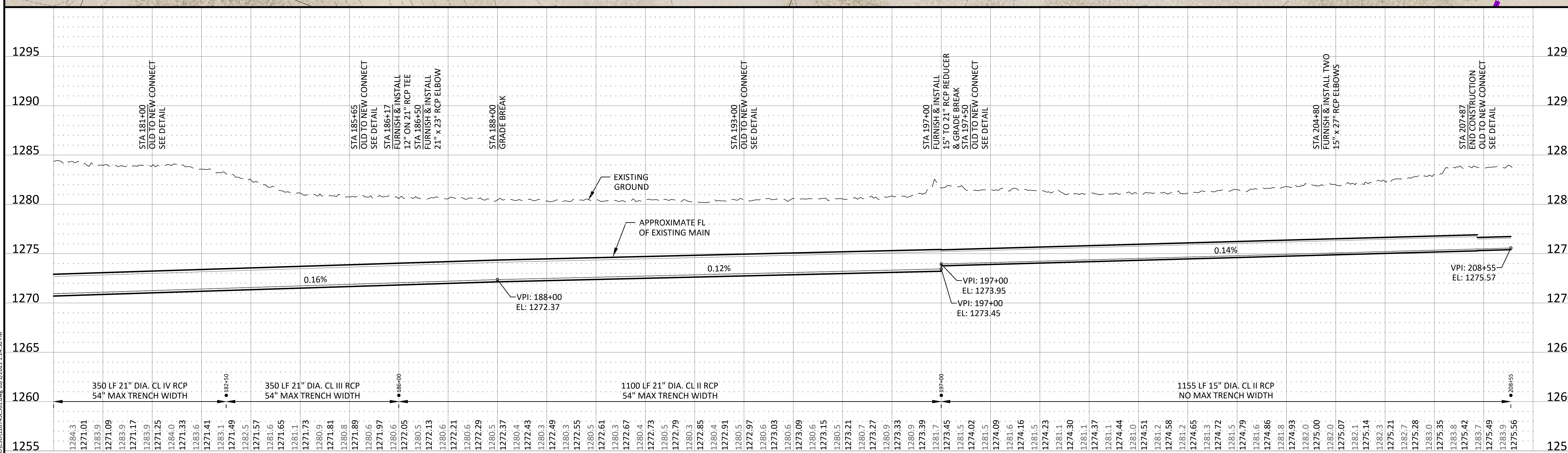

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VERT. 0 5 10 SCALE FEET

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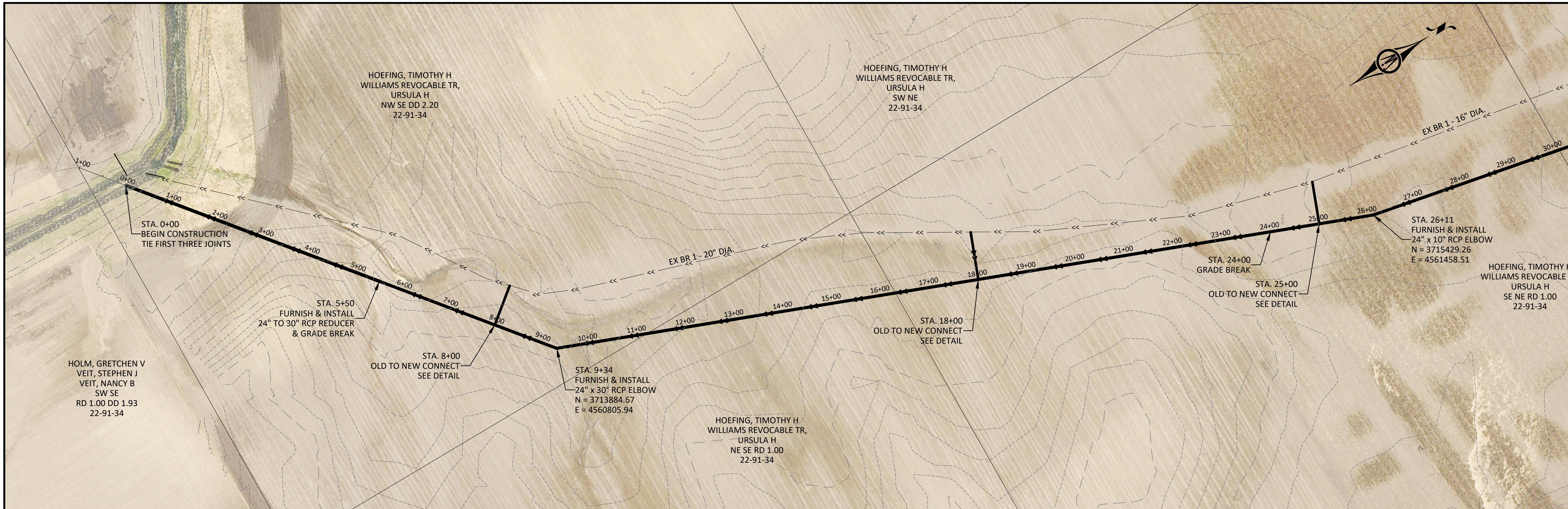

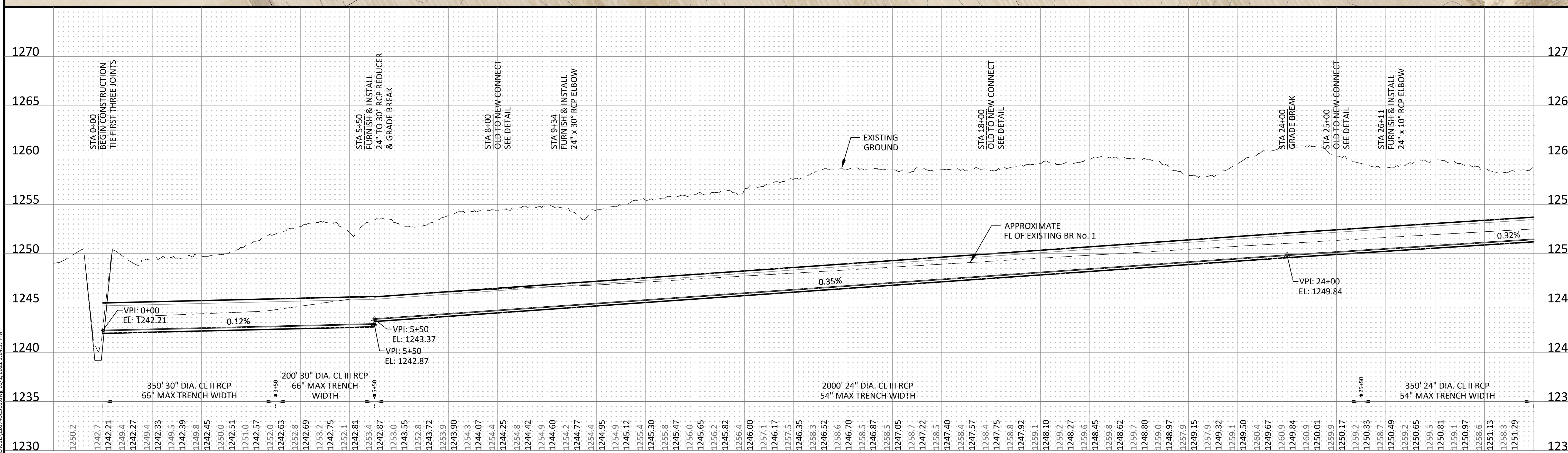

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PLAN & PROFILE - BRANCH NO. 1

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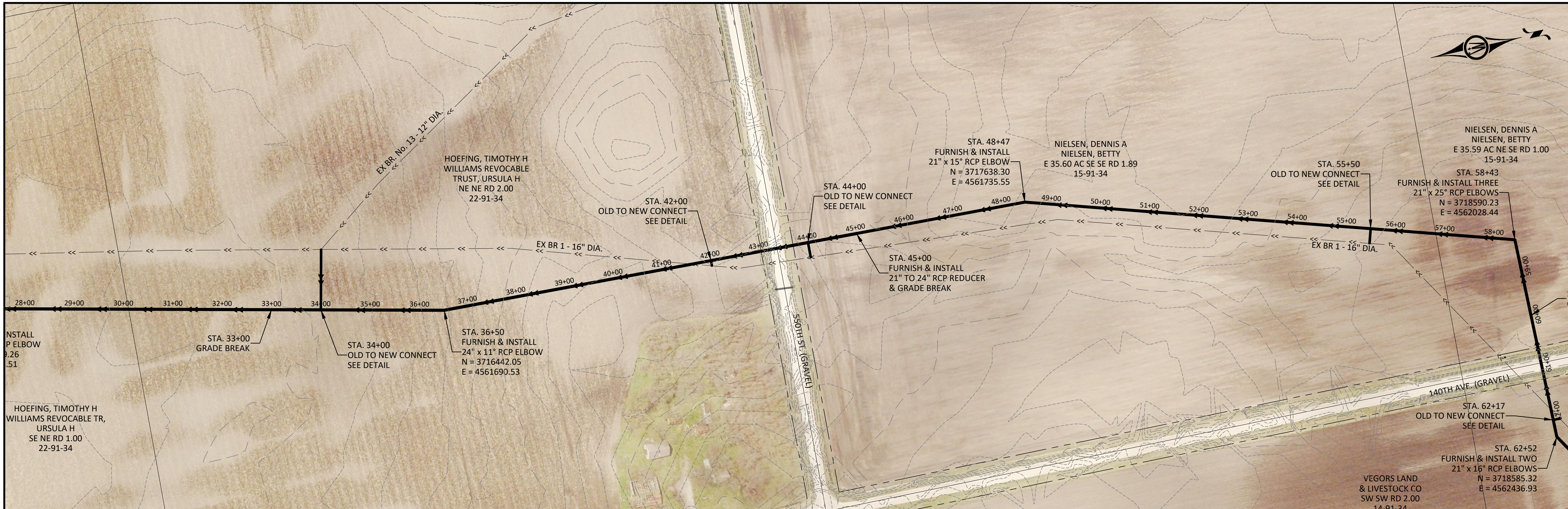

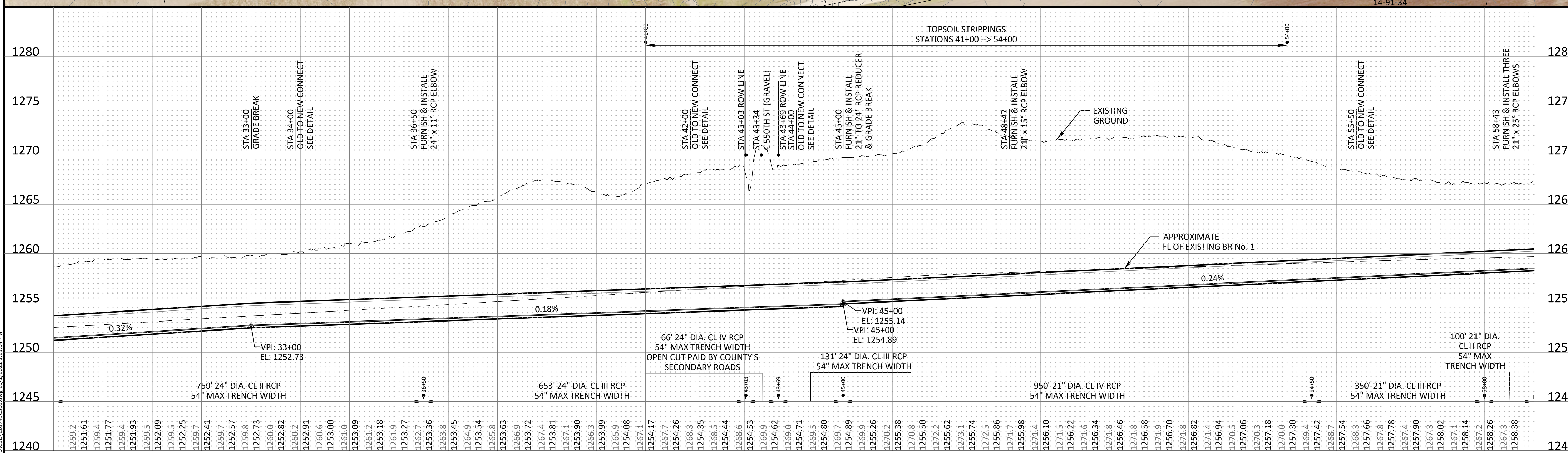

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VERT. 0 5 10 SCALE FEET

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PLAN & PROFILE - BRANCH NO. 1

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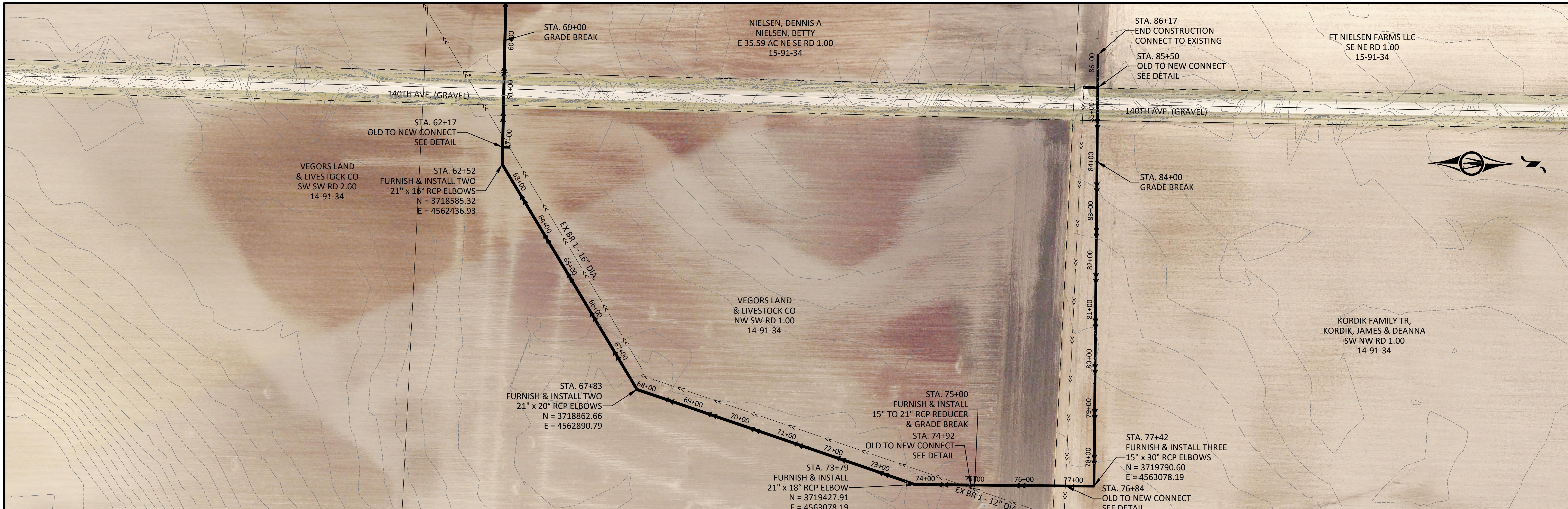

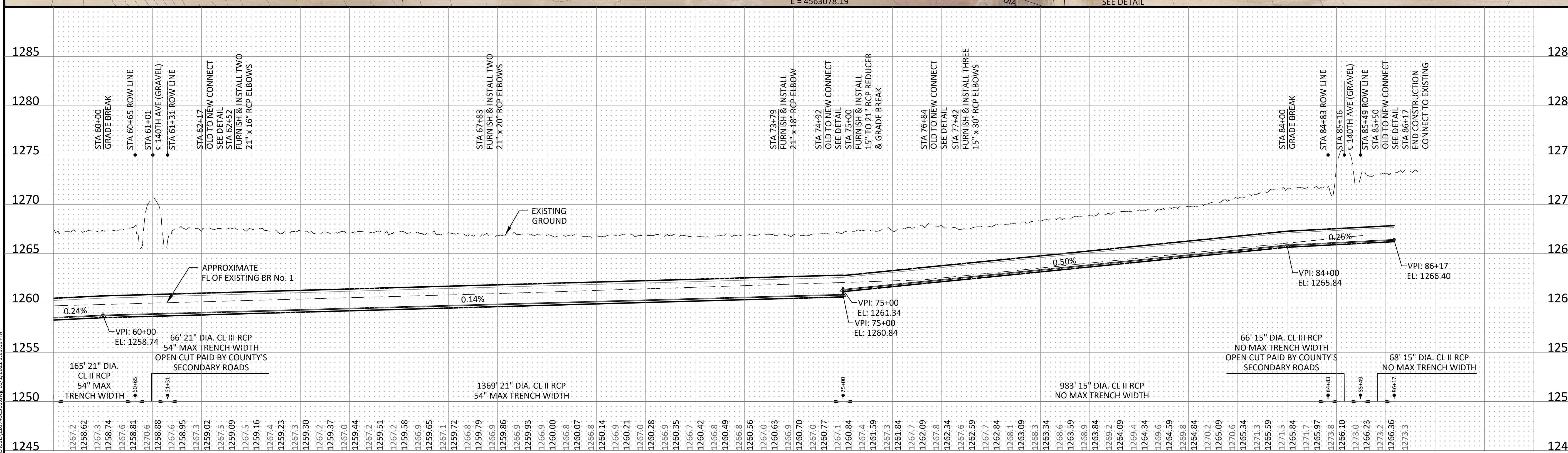

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VERT. 0 5 10 SCALE FEET

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PLAN & PROFILE - BRANCH NO. 1

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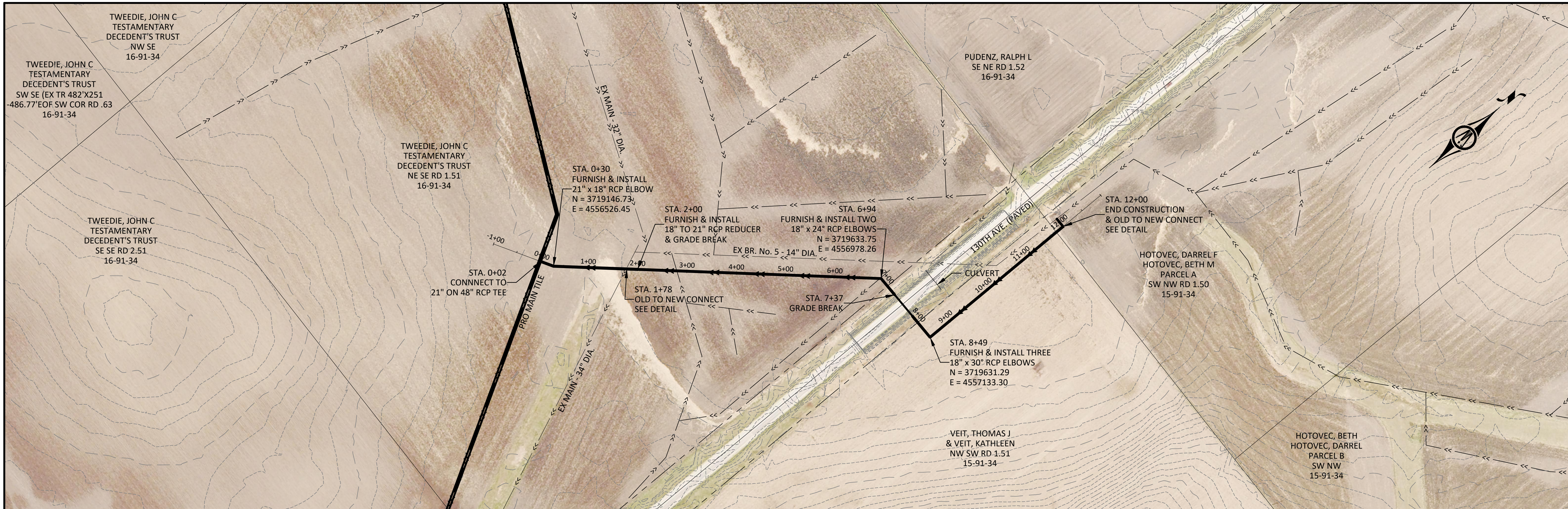

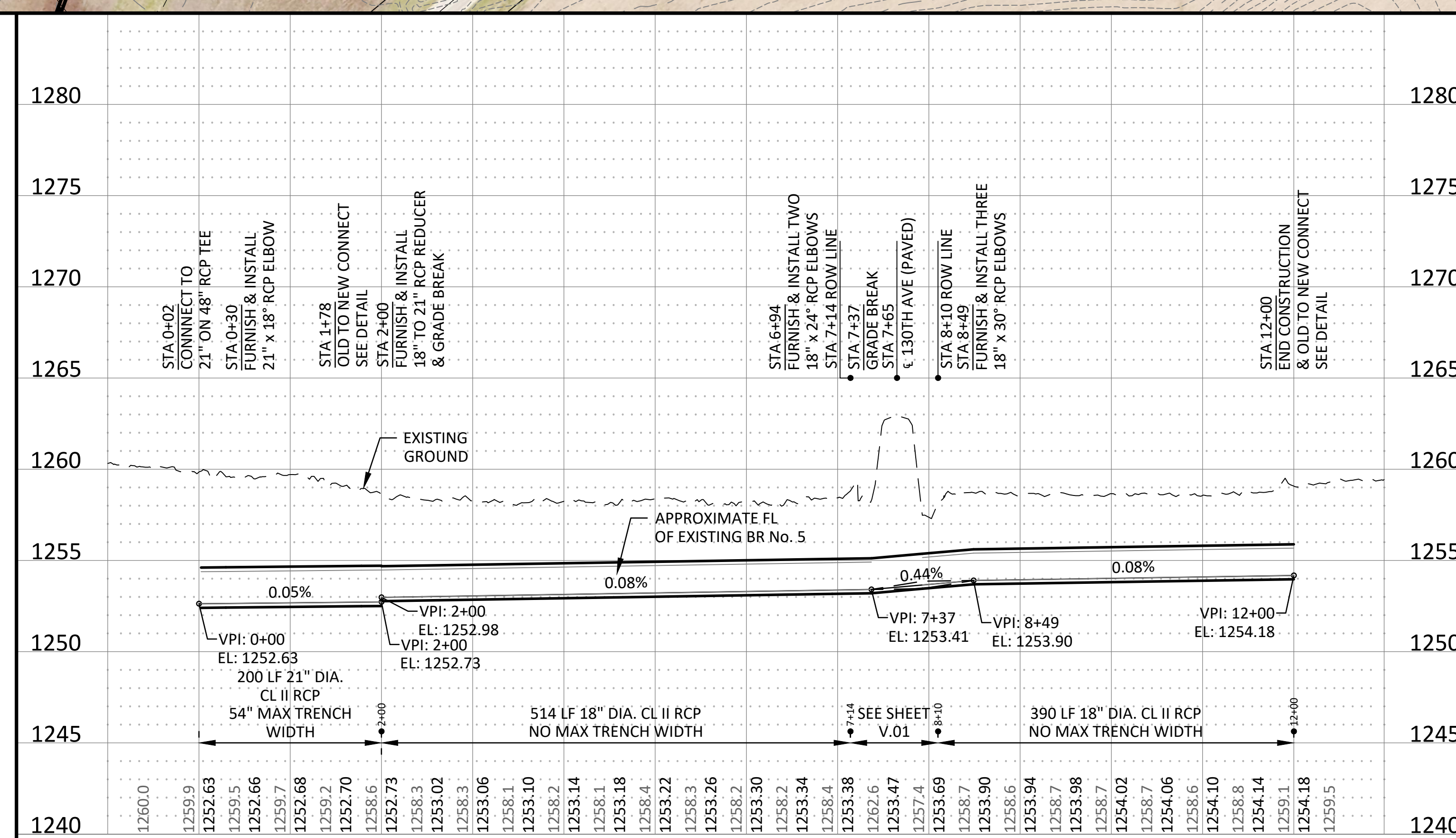

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POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - BRANCH NO. 5

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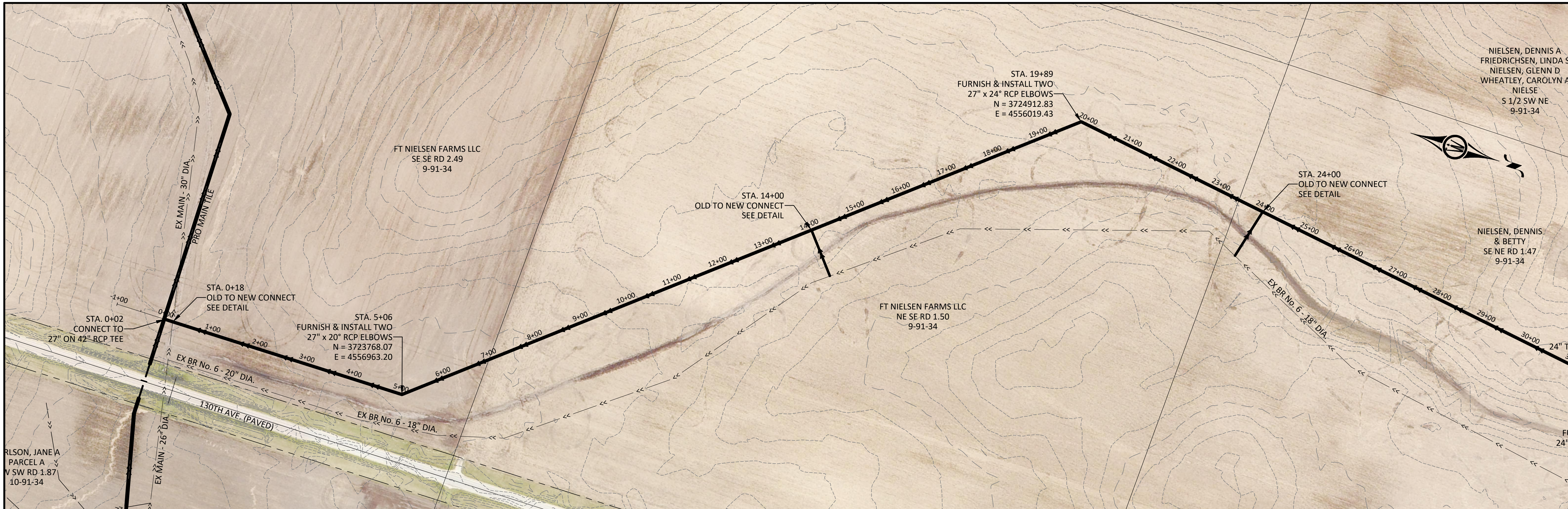

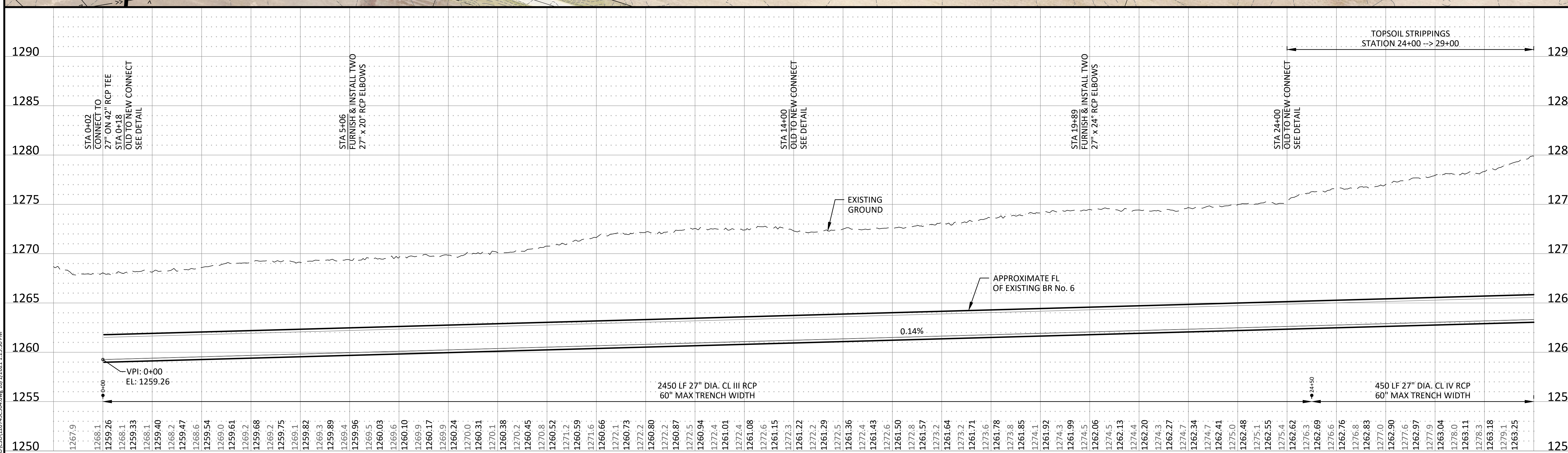

HORZ. 0 100 200 SCALE FEET

VERT. 0 5 10 SCALE FEET

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POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - BRANCH NO. 6

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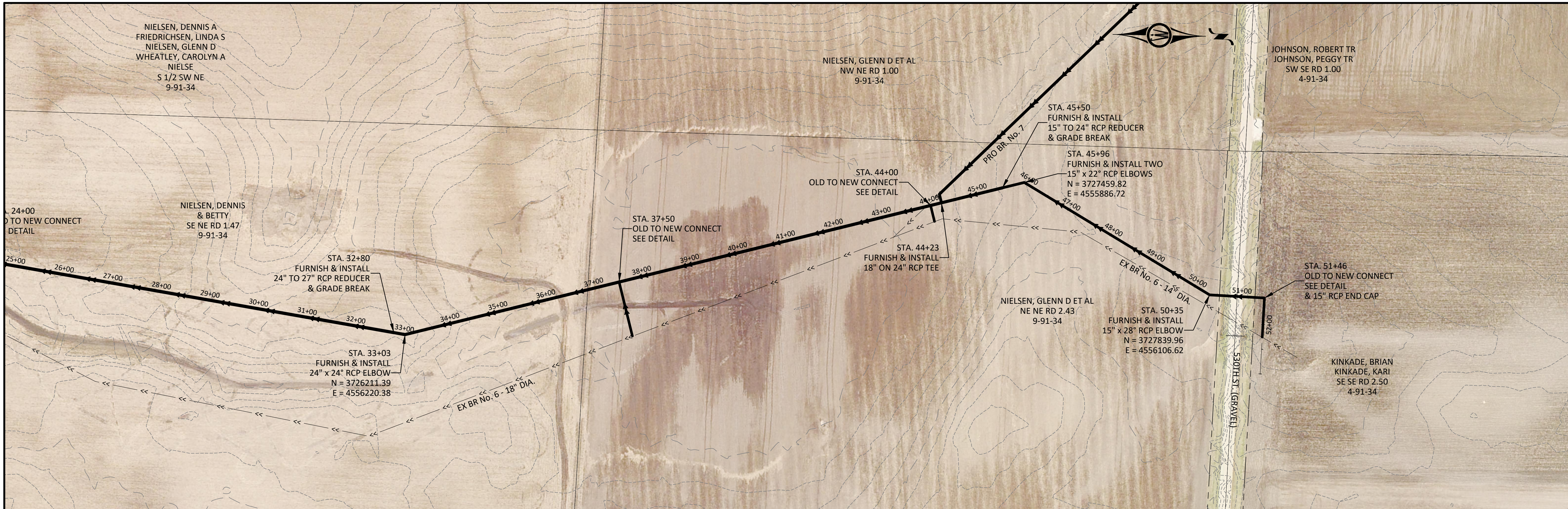

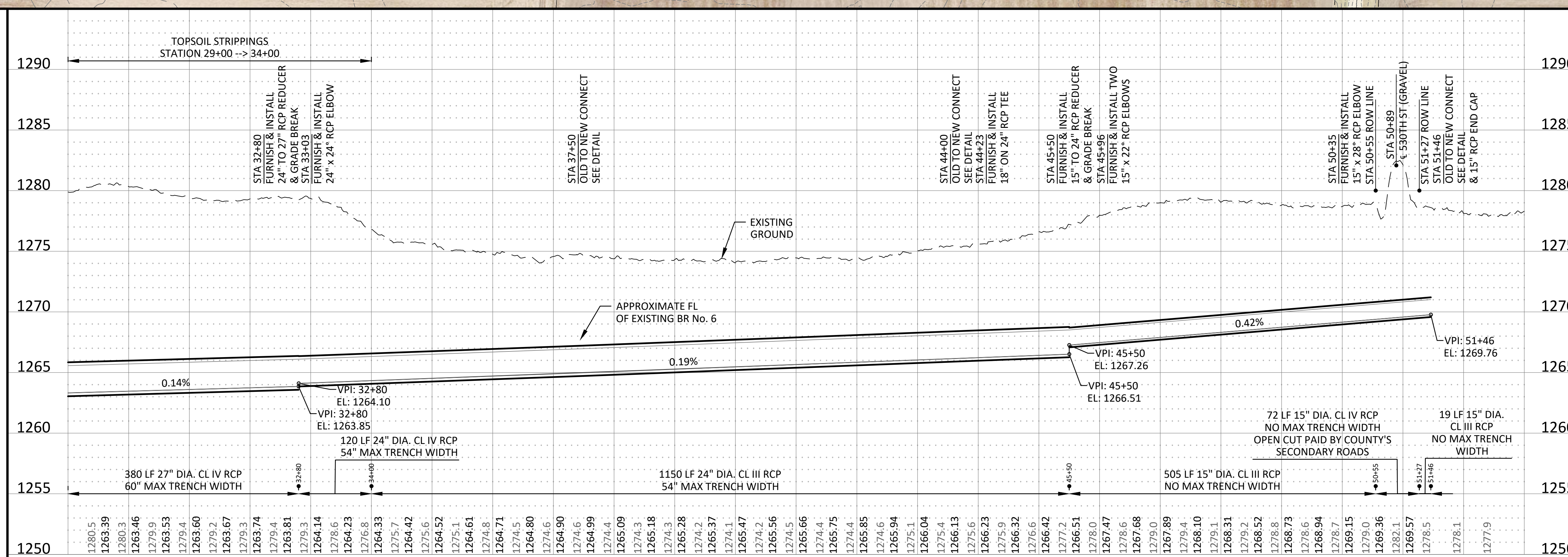

HORZ. 0 100 200 SCALE FEET

VERT. 0 5 10 SCALE FEET

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POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - BRANCH NO. 6

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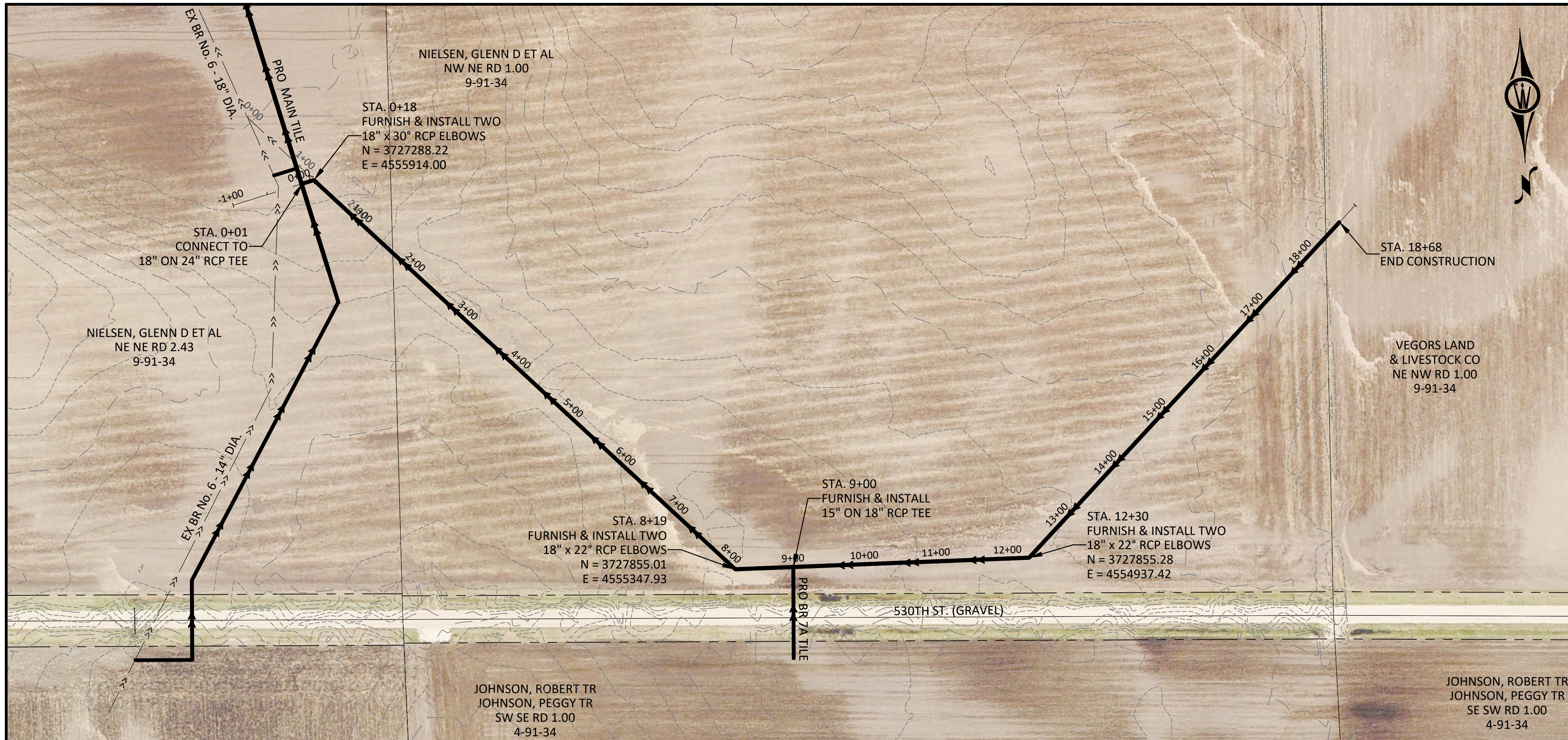

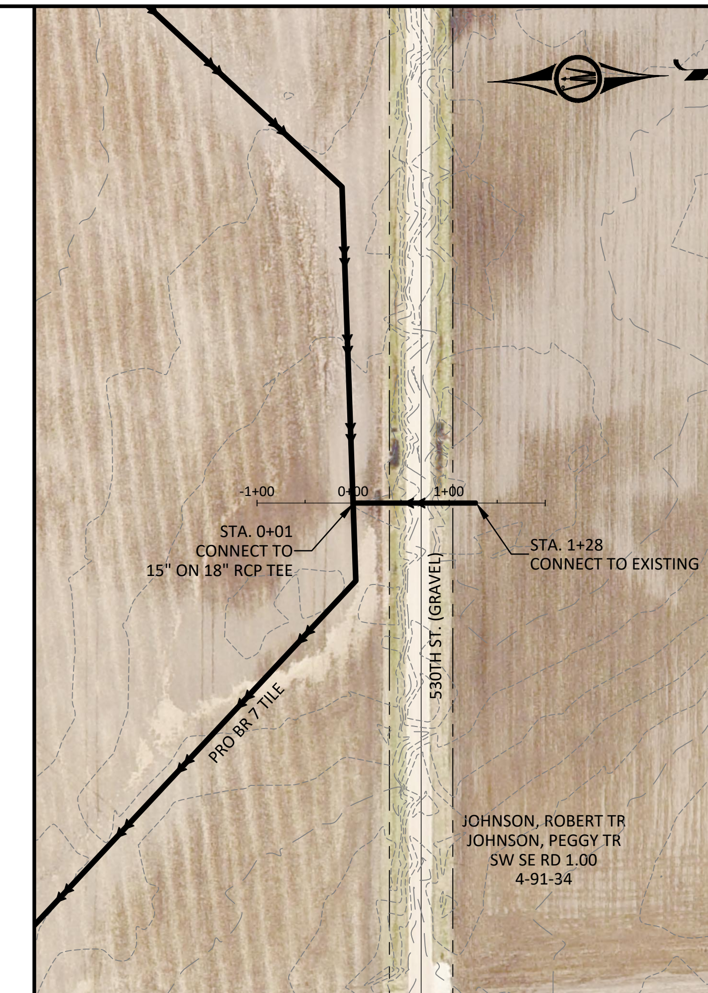

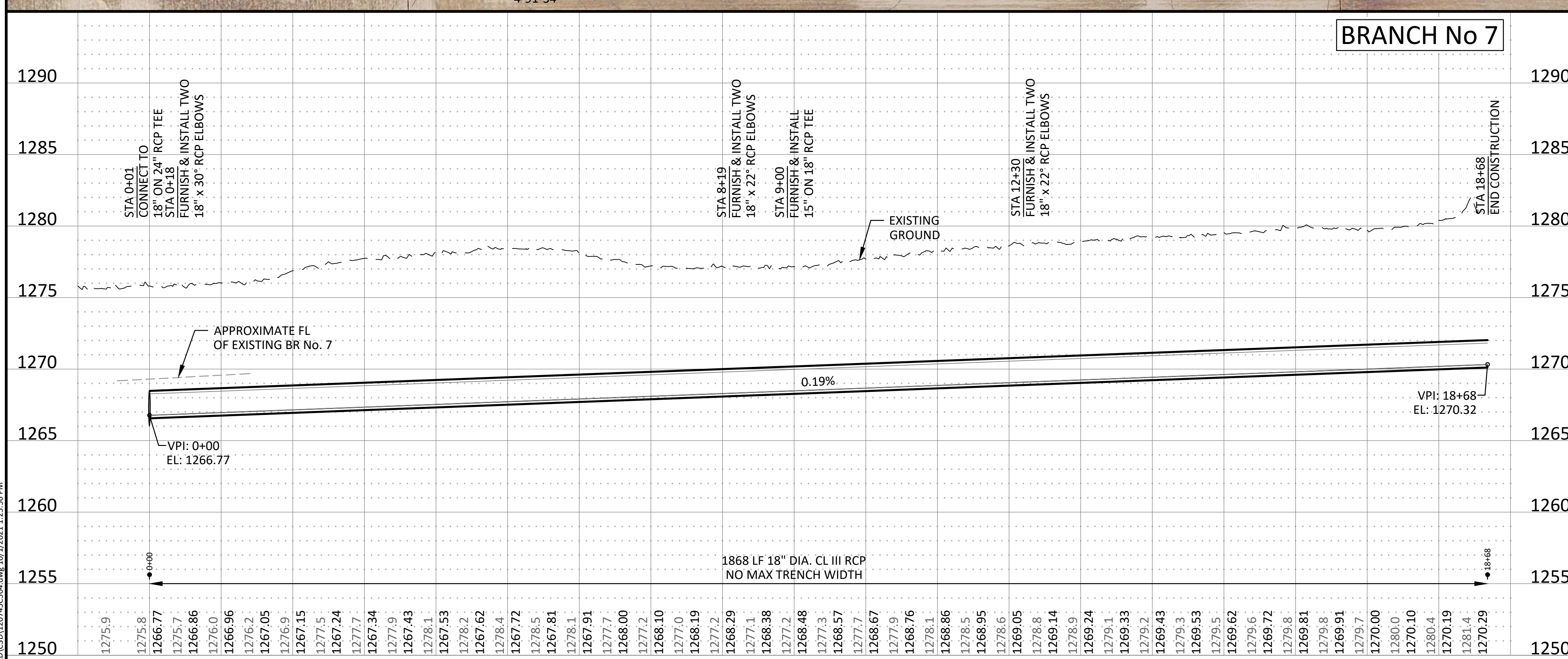

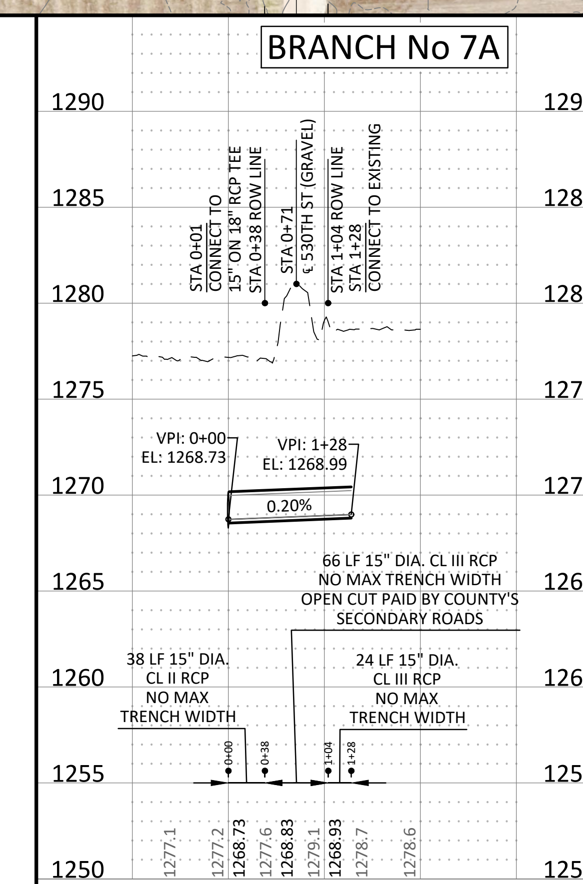

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POCAHONTAS COUNTY, IOWA

PLAN & PROFILE - BRANCH NO. 7 & 7A

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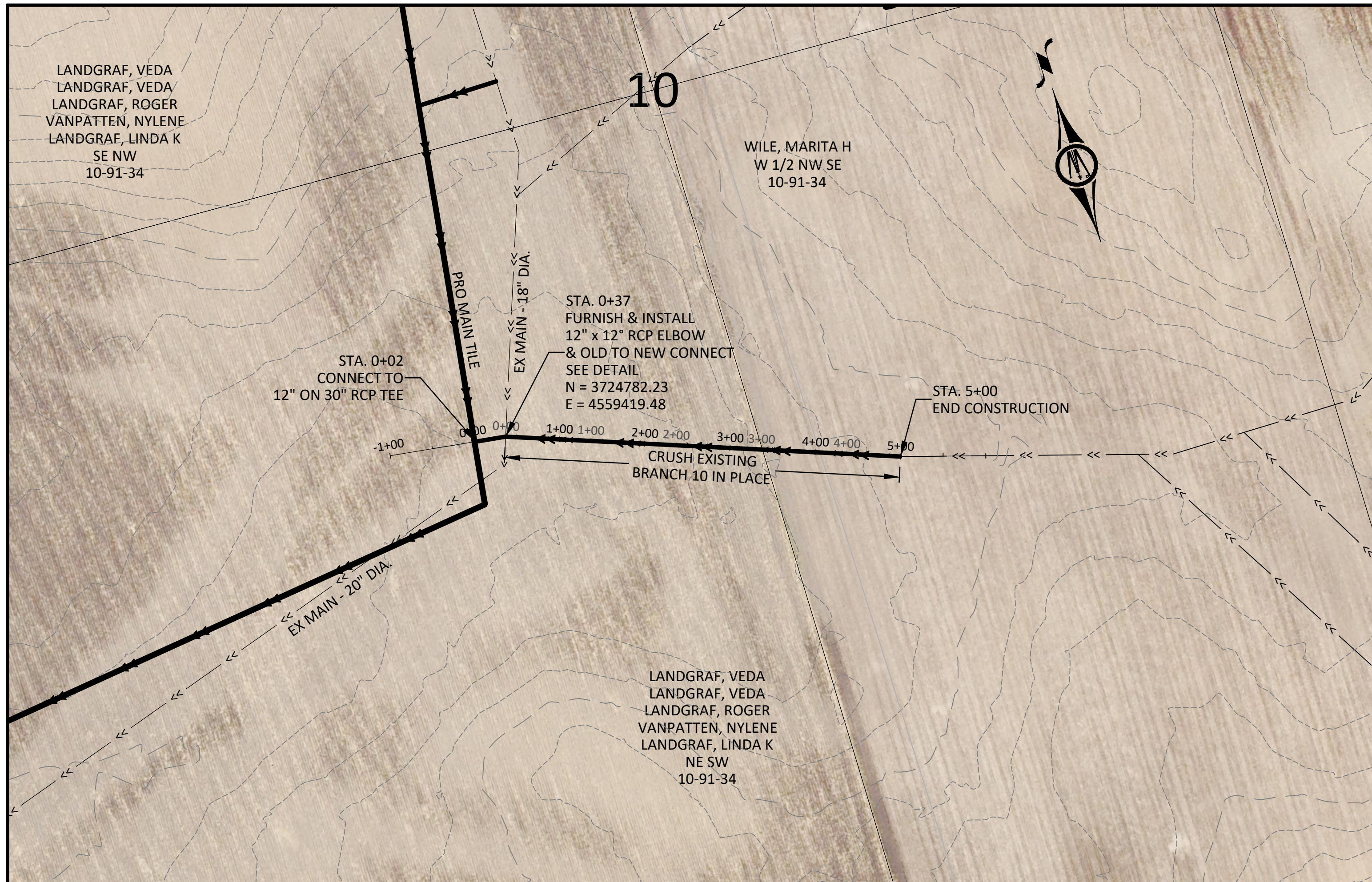

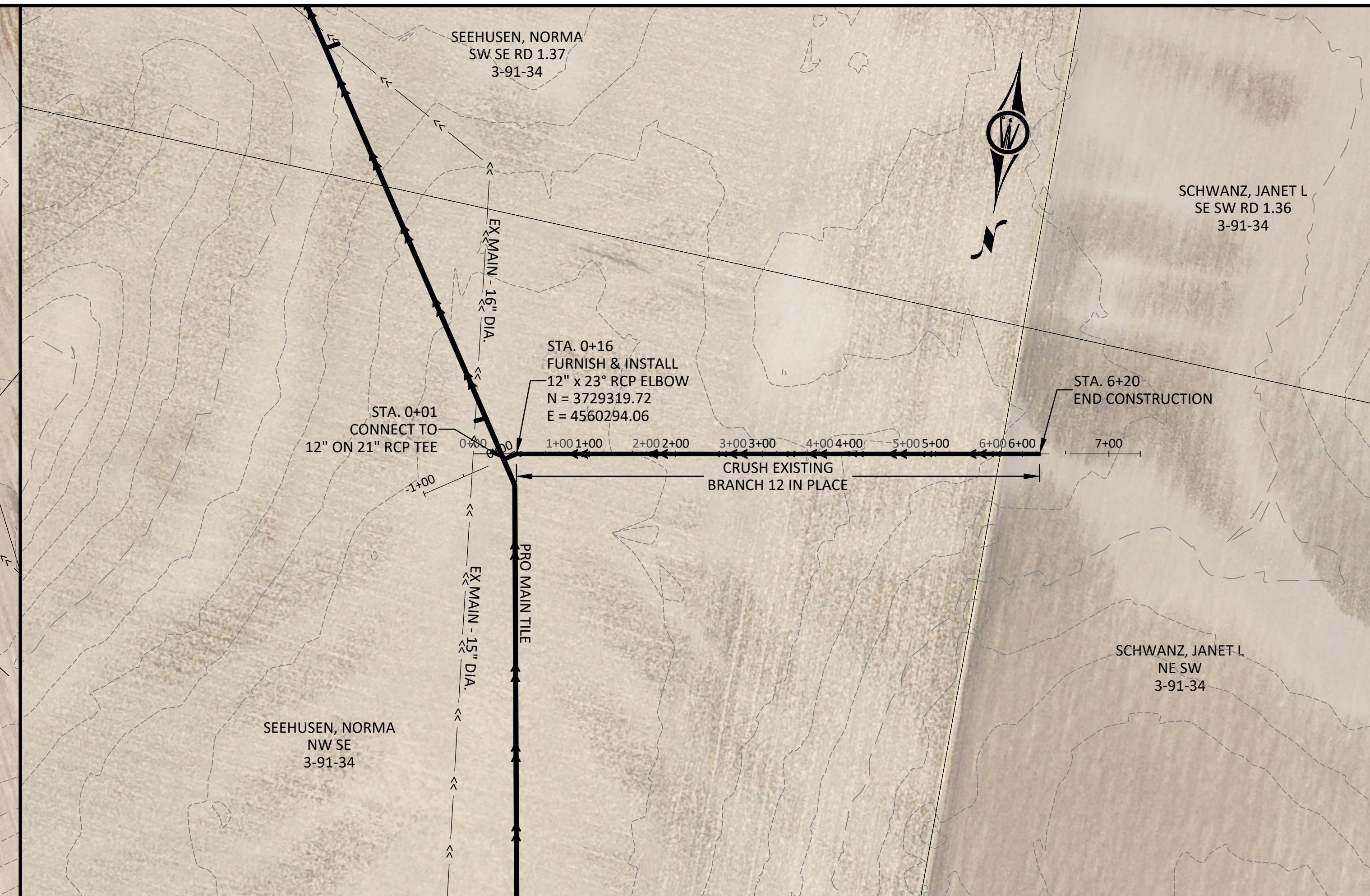

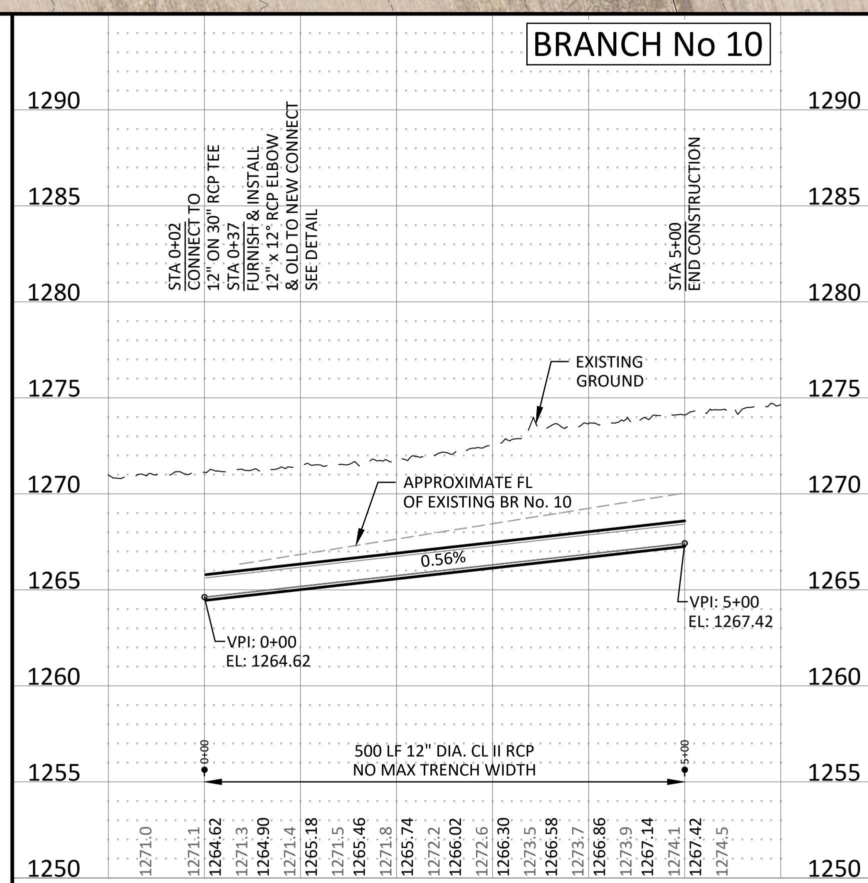

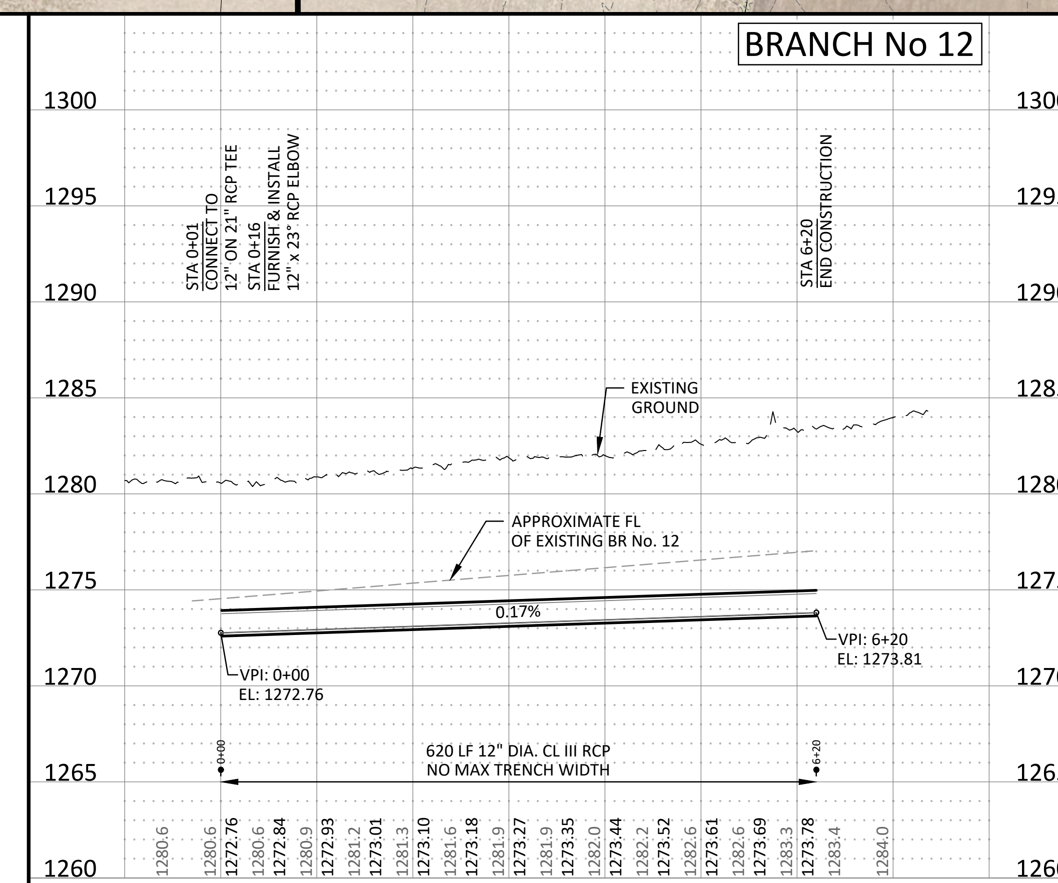

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PLAN & PROFILE - BRANCHES NO. 10 & 12

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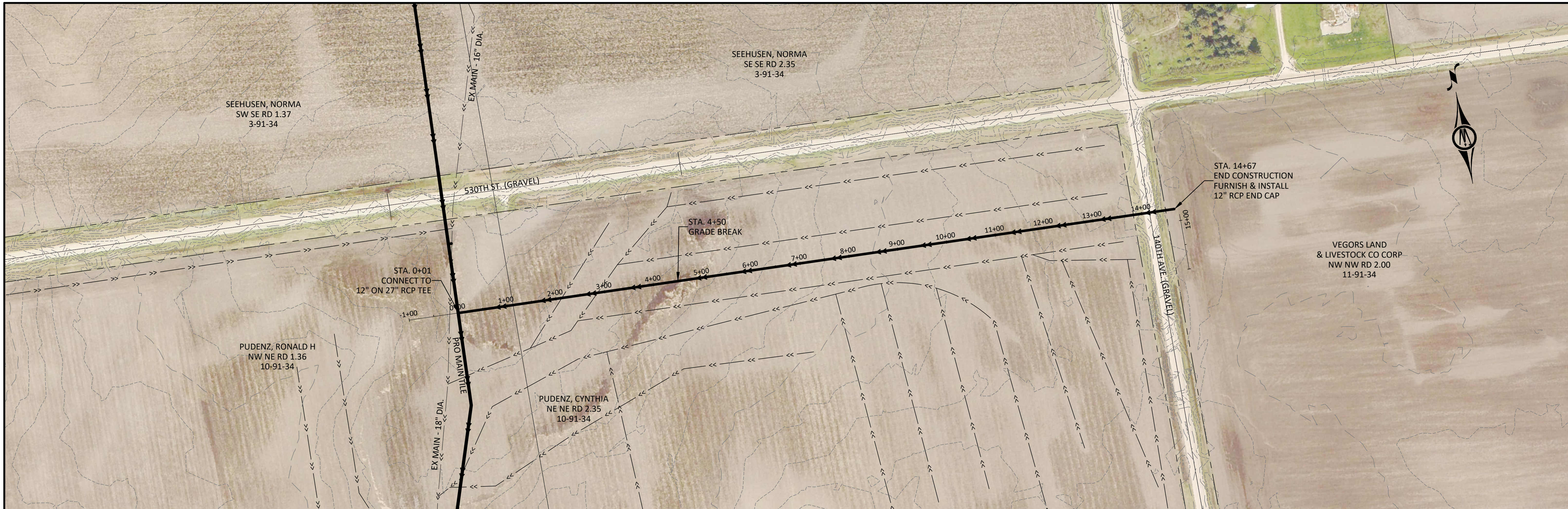

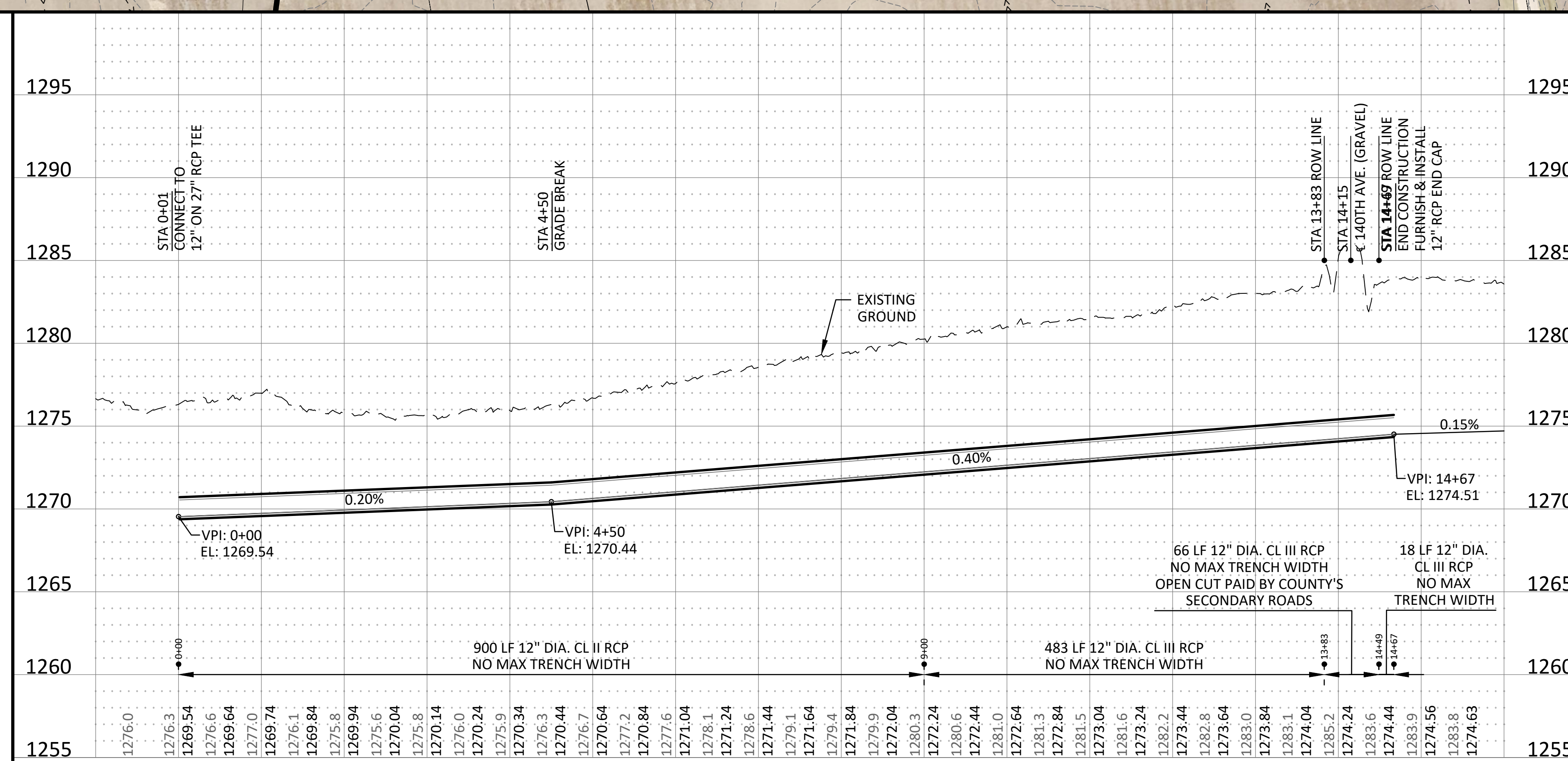

HORZ. 0 100 200 SCALE FEET

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PLAN & PROFILE - BRANCH NO. 14

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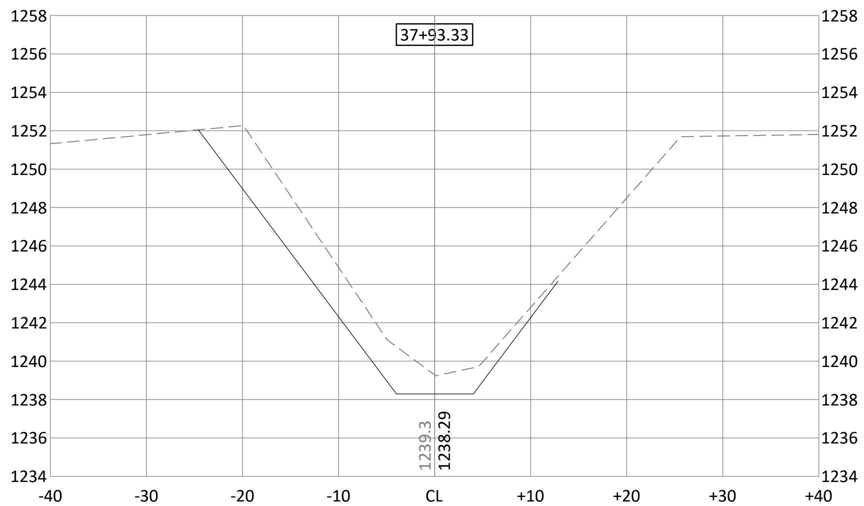

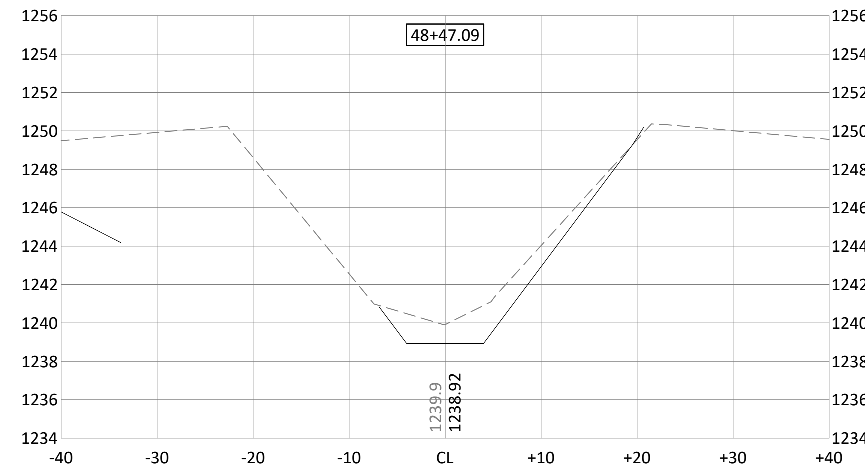

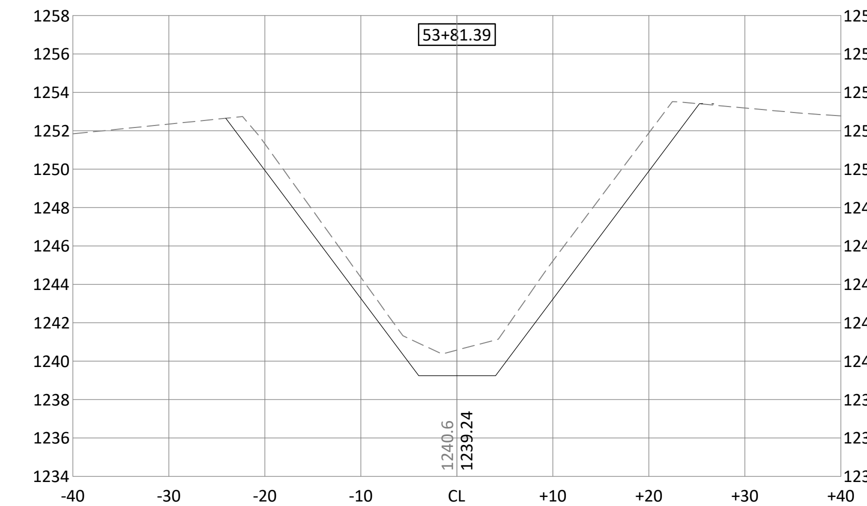

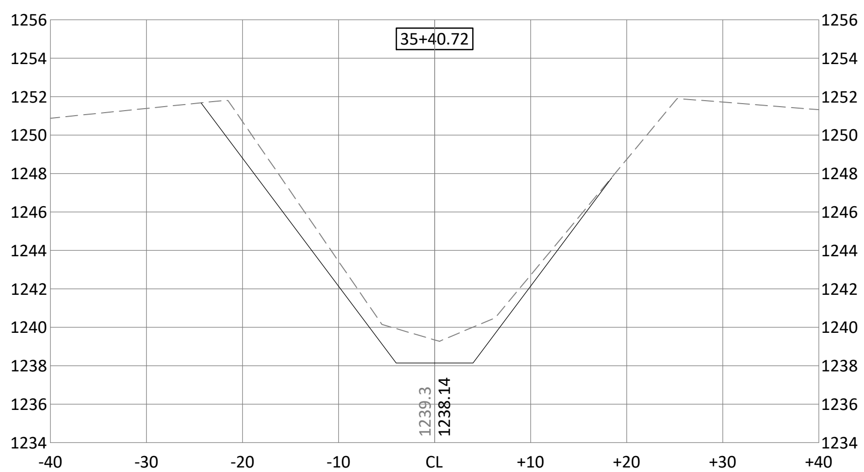

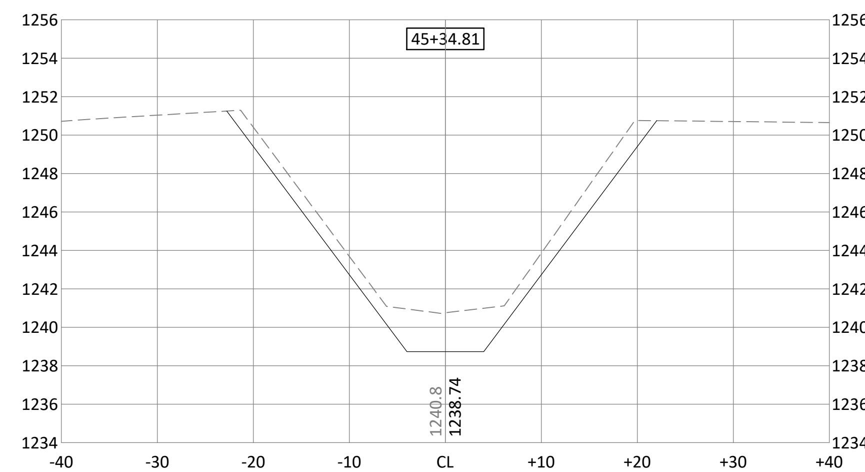

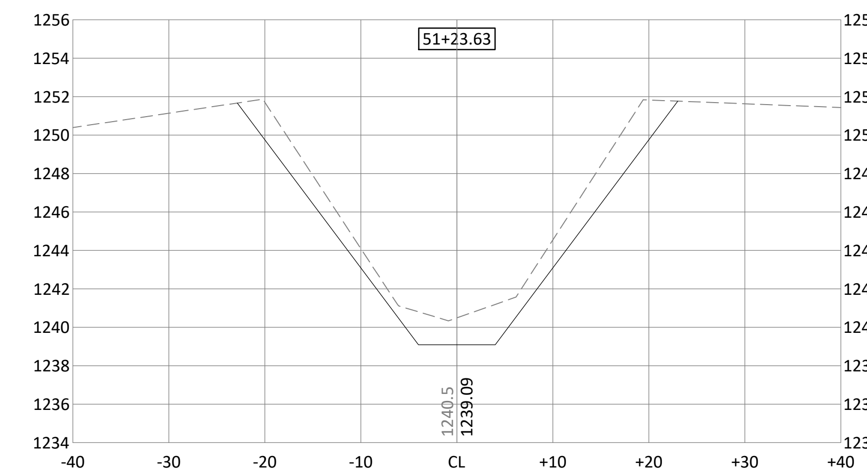

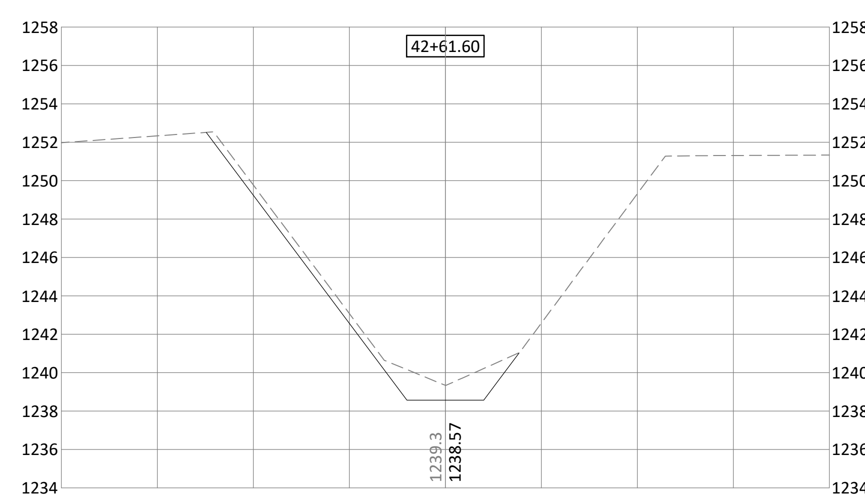

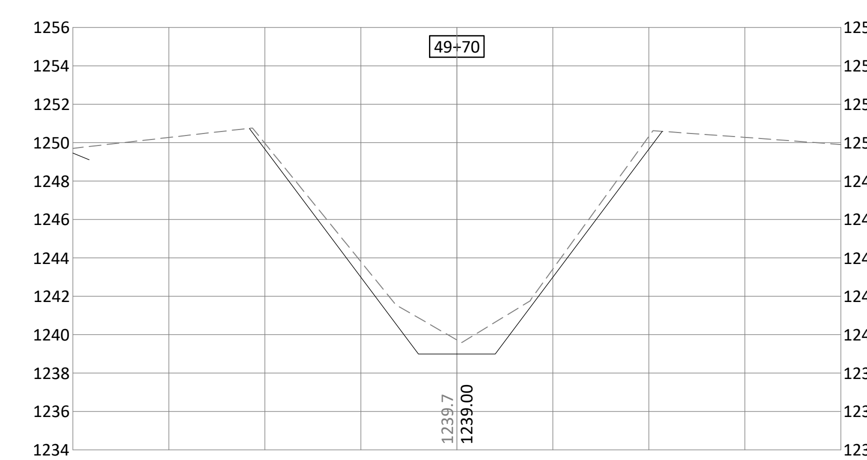

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VERT. SCALE 0 5 10 FEET

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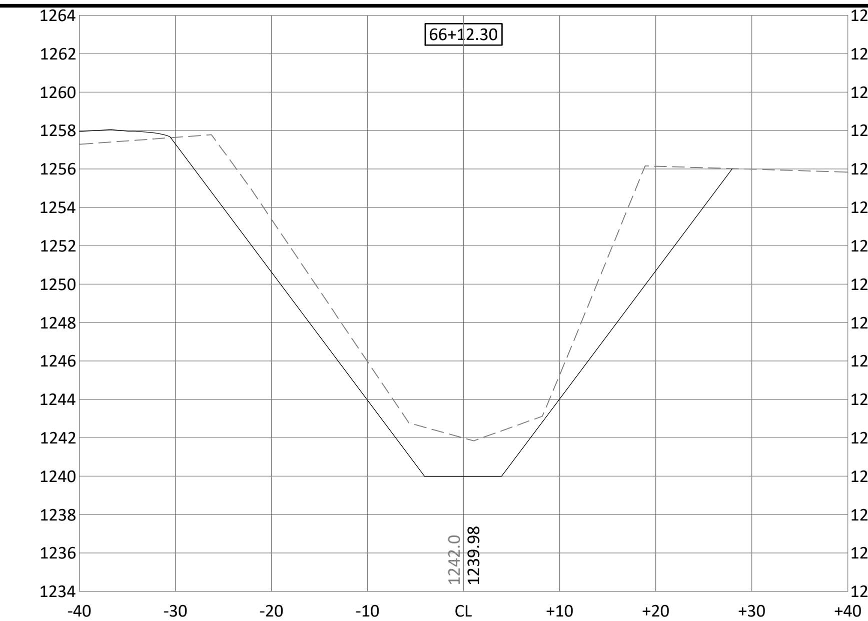

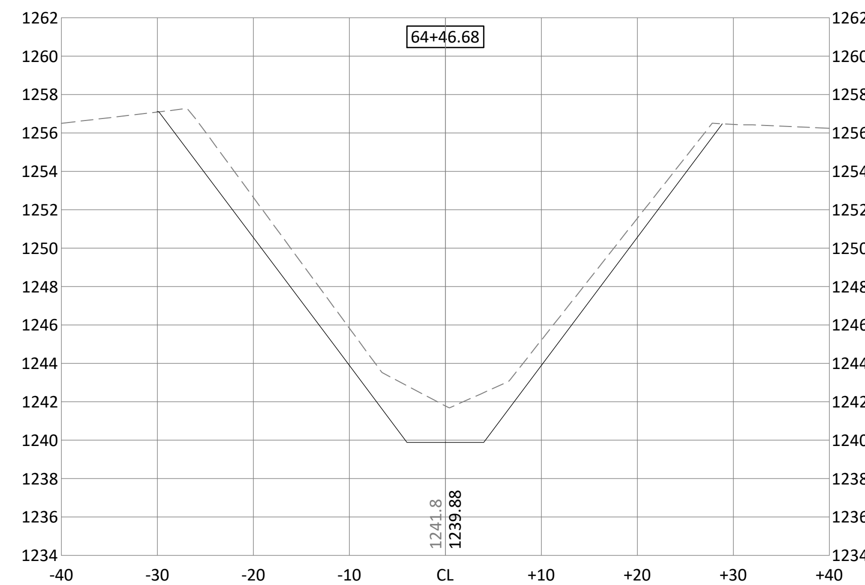

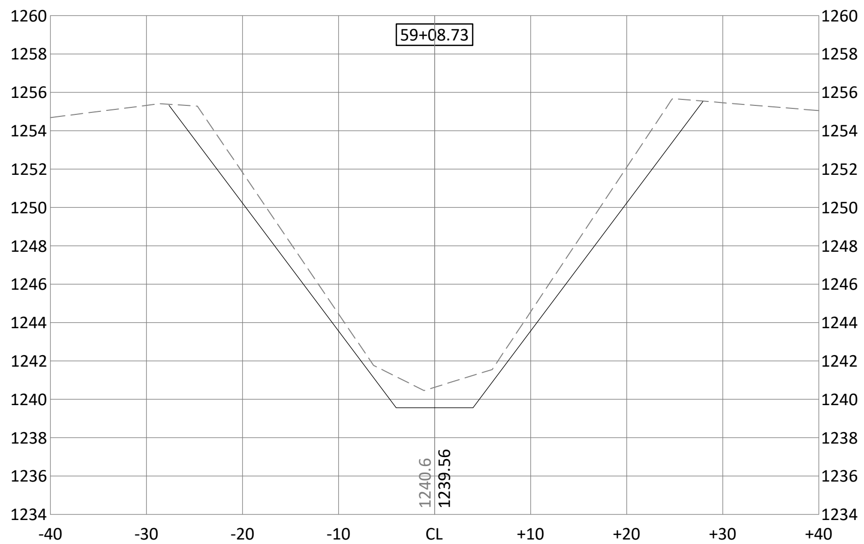

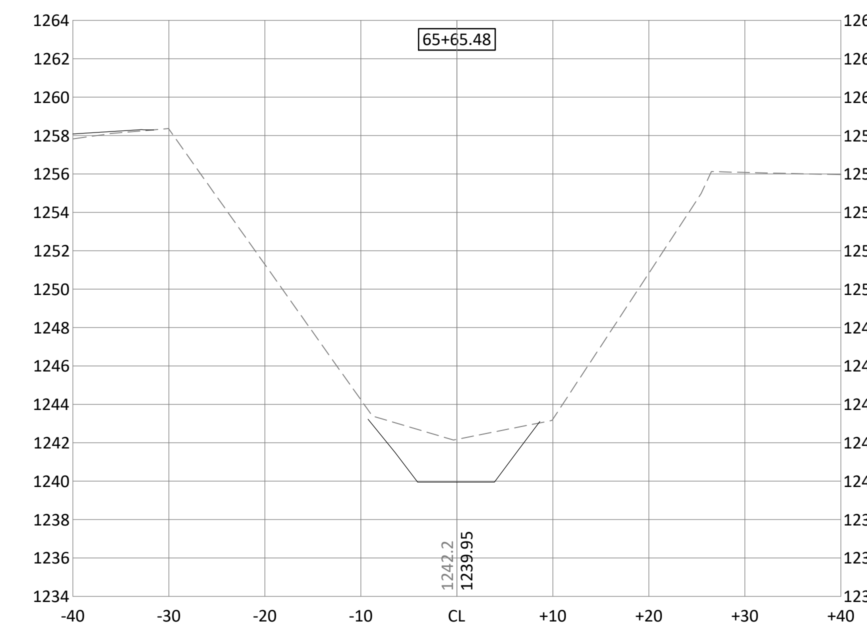

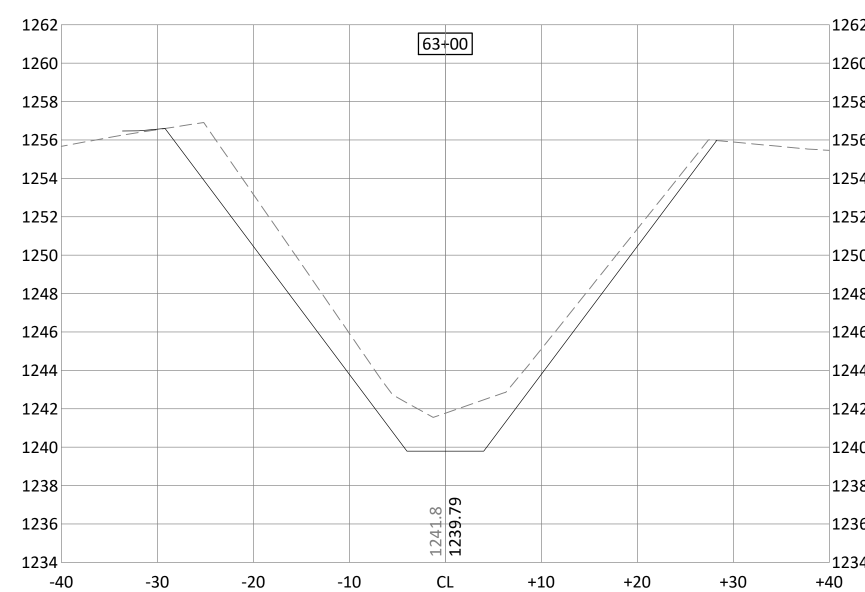

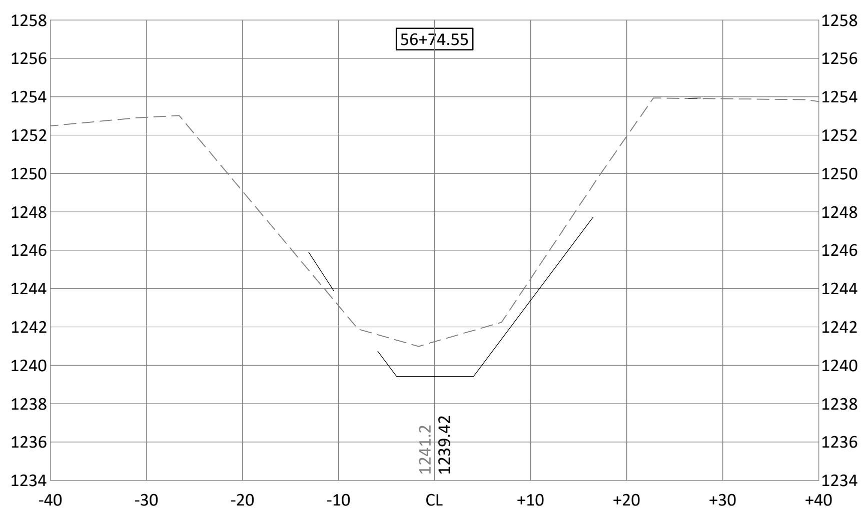

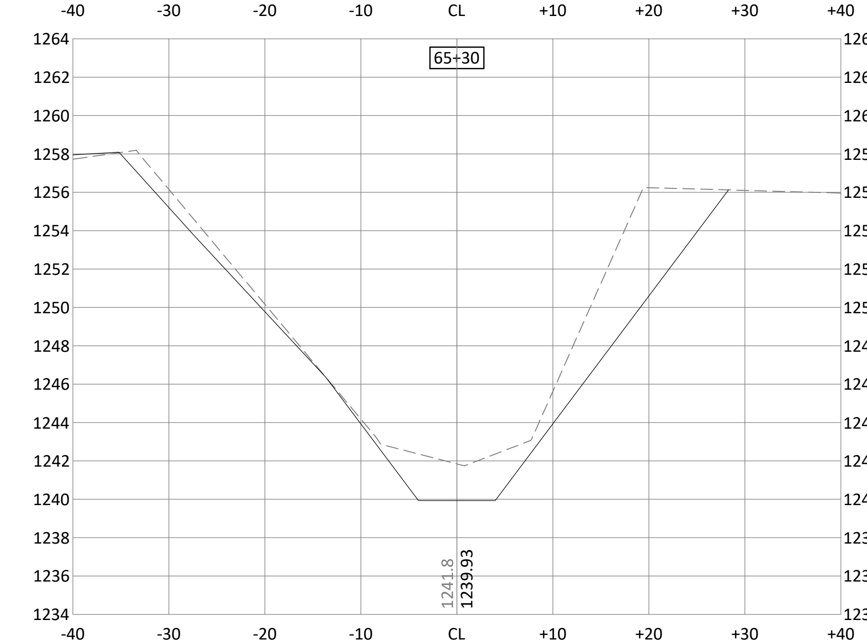

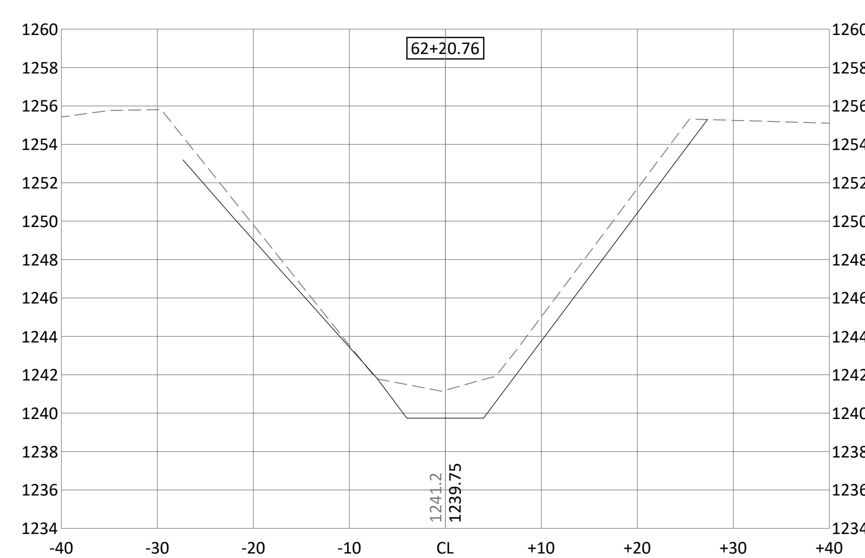

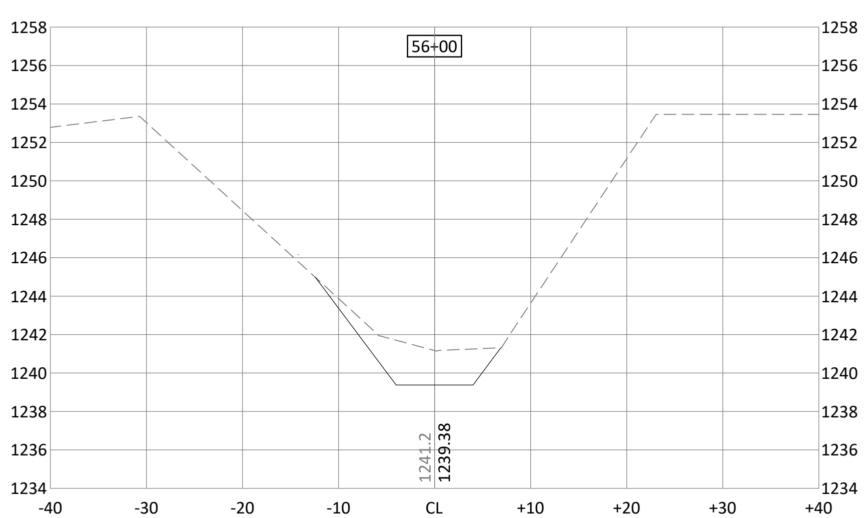

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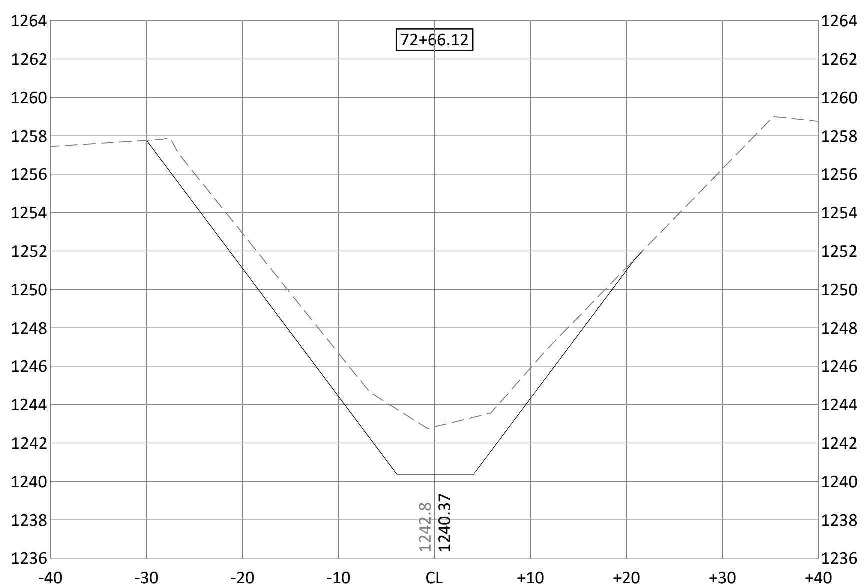

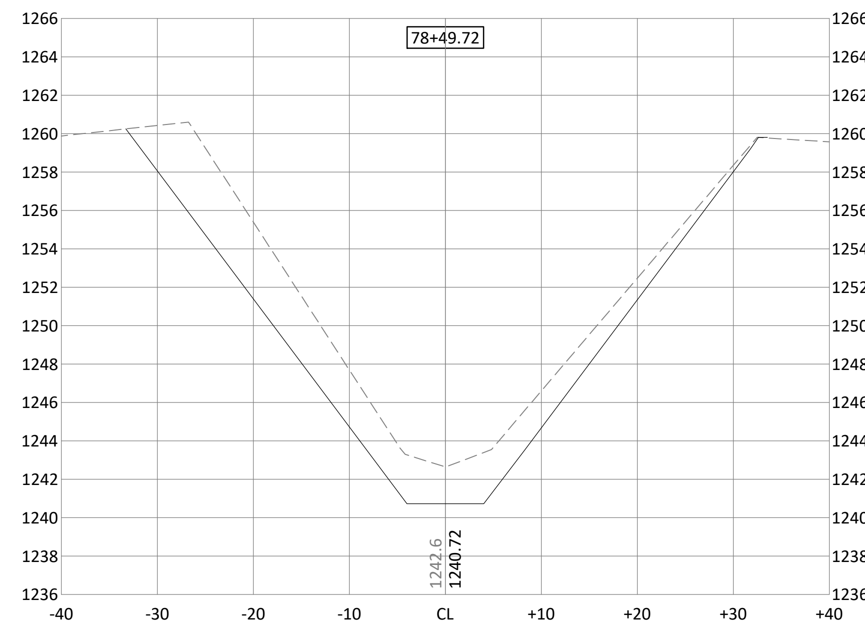

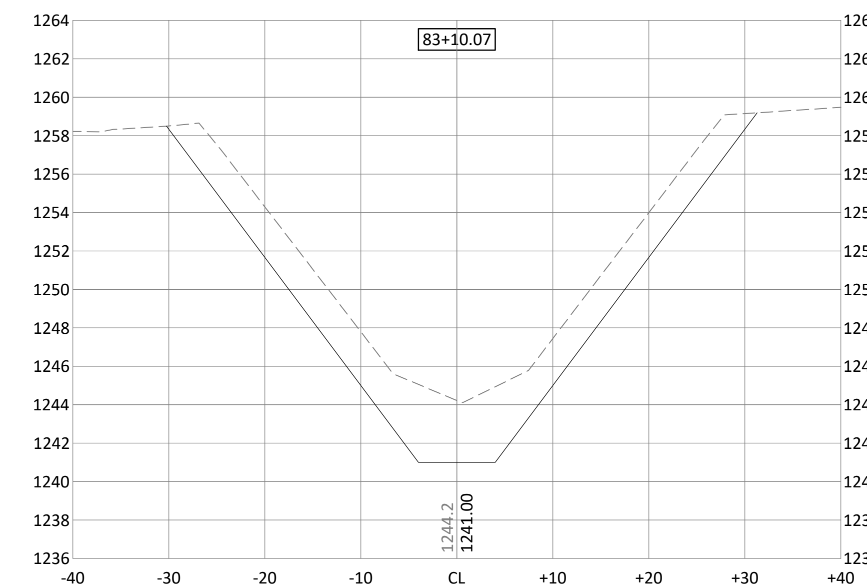

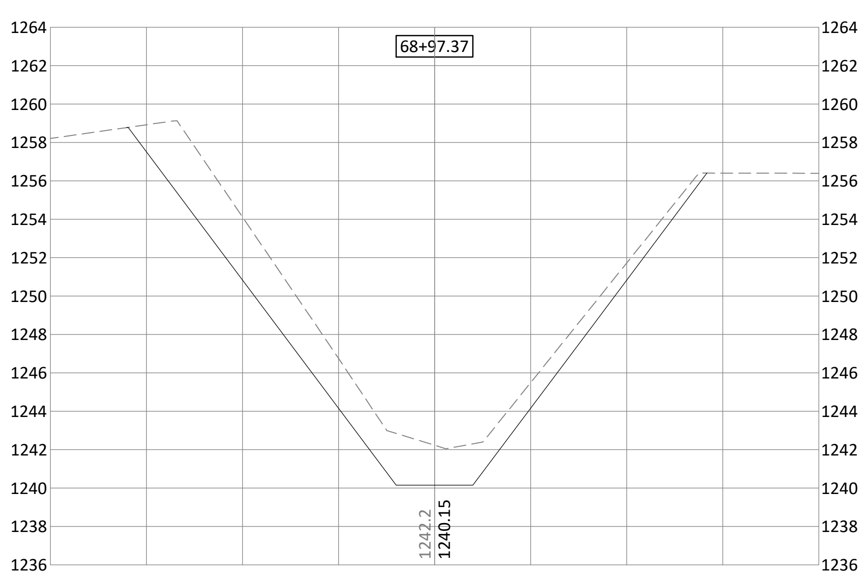

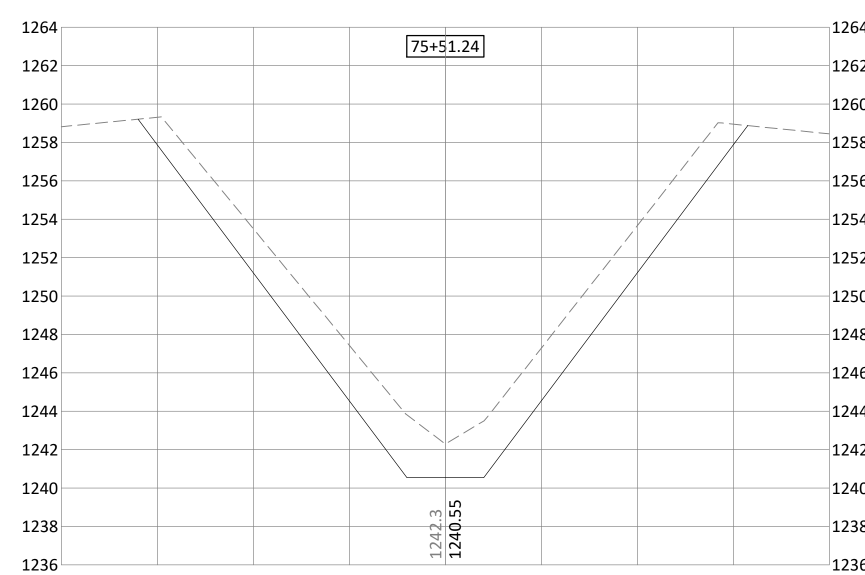

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