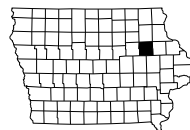


**NOT TO SCALE**



**Highway Division**

PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM  
**BUCHANAN COUNTY**  
 PIPE CULVERTS

Iowa 150  
 Benton County to Fayette County

SCALES: As Noted

Refer to the Proposal Form for list of applicable specifications.  
 Value Engineering Saves. Refer to Article 1105.15 of the Specifications.



REVISIONS

TOTAL

28

PROJECT IDENTIFICATION NUMBER

14-10-150-010

PROJECT NUMBER

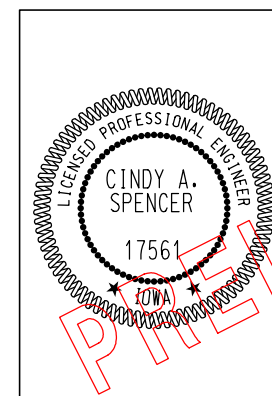
NHSN-150-3(72)--2R-10

R.O.W. PROJECT NUMBER

NHSN-150-3(73)--2R-10

**INDEX OF SHEETS**

| No.             | DESCRIPTION   |
|-----------------|---|
| <b>A Sheets</b> | <b>Title Sheets</b>                                   |
| * A.1           | Title Sheet with Location Map                         |
| <b>B Sheets</b> | <b>Typical Cross Sections and Details</b>             |
| B.1 - 2         | Typical Cross Sections and Details                    |
| <b>C Sheets</b> | <b>Quantities and General Information</b>             |
| C.1             | Tabulations   |
| <b>D Sheets</b> | <b>Mainline Plan and Profile Sheets</b>               |
| * D.1           | Plan and Profile Legend and Symbol Information Sheet  |
| * D.2 - 12      | Aerial and Background Sheets with Proposed Work Areas |
| <b>G Sheets</b> | <b>Survey Sheets</b>                                  |
| G.1             | Alignment Information                                 |
| G.2             | Reference Ties and Bench Marks                        |
| <b>J Sheets</b> | <b>Traffic Control and Staging Sheets</b>             |
| J.1             | Staging Notes and Tabulations                         |
| <b>M Sheets</b> | <b>Storm Sewer Sheets</b>                             |
| M.1             | Storm Sewer Tabulations                               |
| <b>U Sheets</b> | <b>500 Series, Mod.Stds. and Detail Sheets</b>        |
| U.1             | Special Details                                       |
| <b>V Sheets</b> | <b>Bridge and Culvert Situation Plans</b>             |
| * V.1 - 7       | Bridge and Culvert Situation Plans                    |
|                 | * Color Plan Sheets                                   |



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.

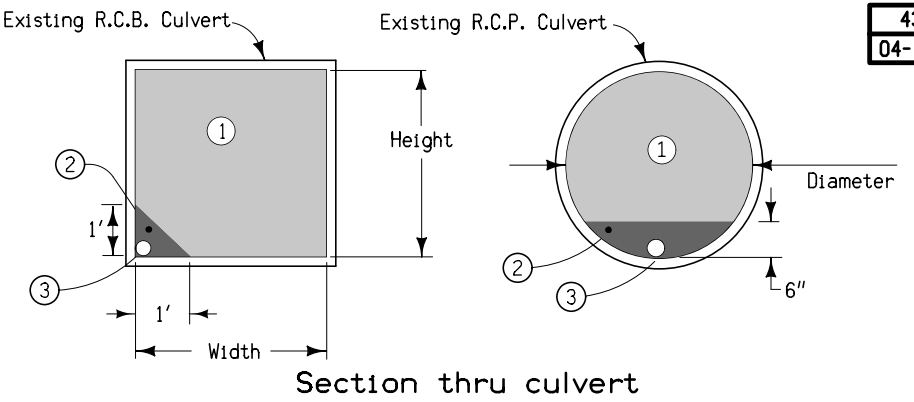
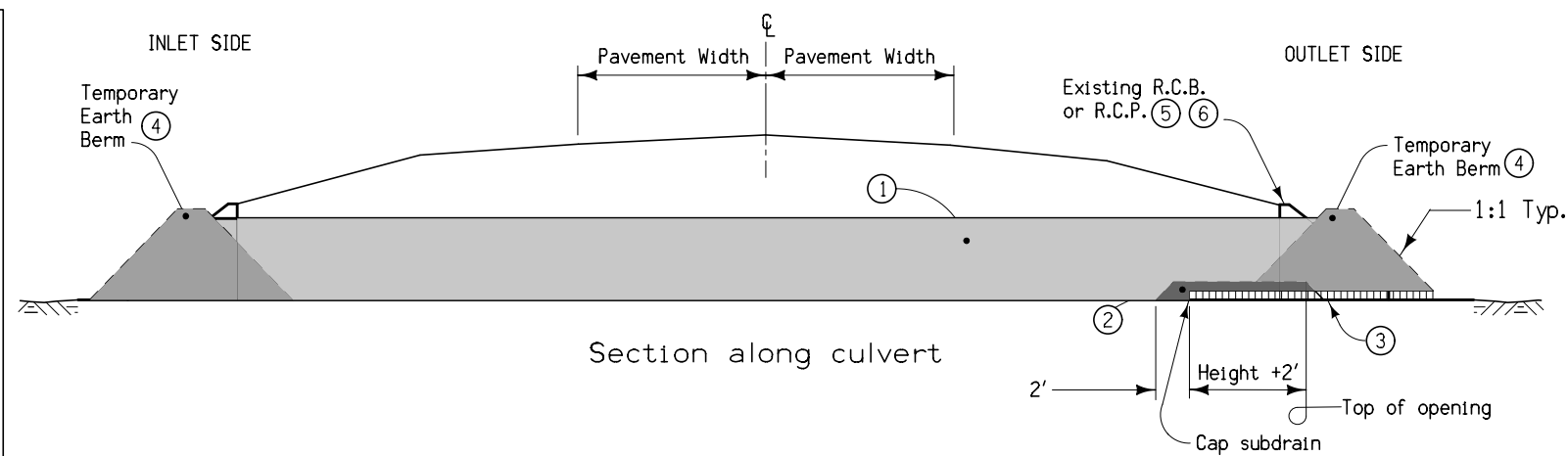
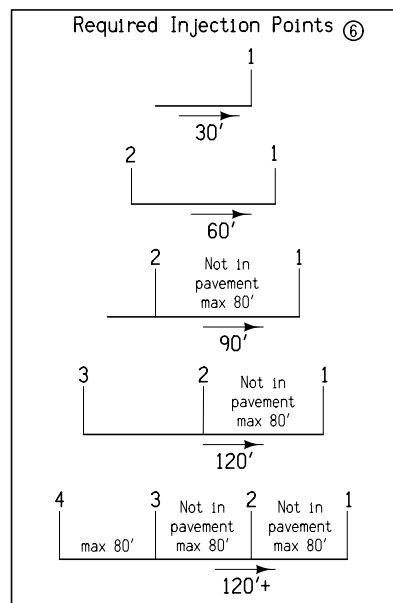
Cindy A. Spencer, P.E. Date \_\_\_\_\_

License Number 17561

My License Renewal Date is December 31, 2018

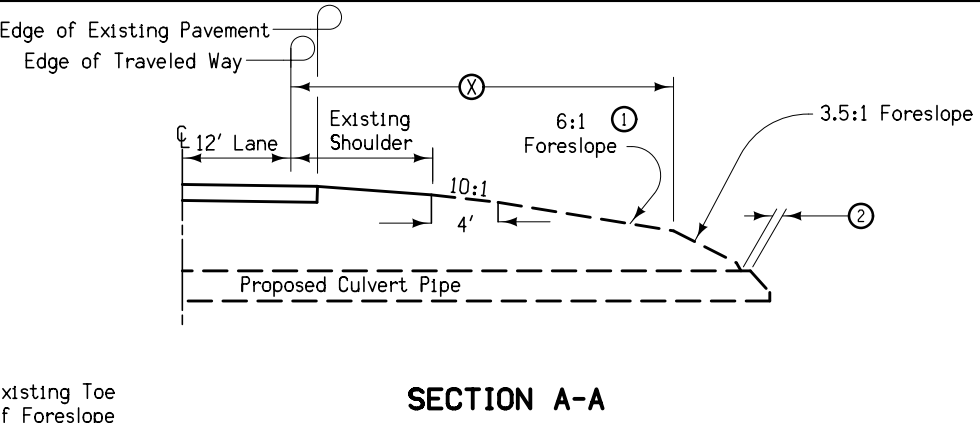
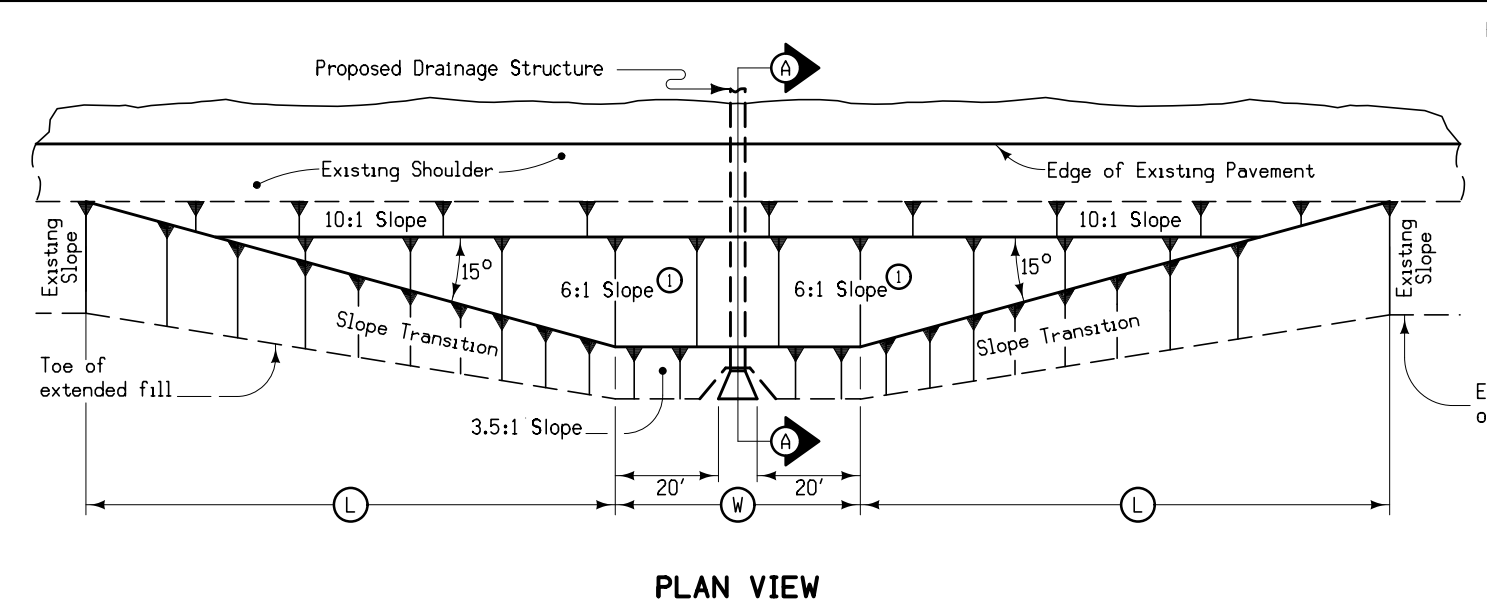
Pages or sheets covered by this seal:

A.1, B.1-B.2, C.1, D.1-D.12, G.1-G.2, J.1, M.1, U.1, V.1-V.7



- ① Flowable Mortar.
- ② Granular Backfill.
- ③ 4" subdrain at flowline elevation of culvert shall be extended into the culvert a distance of 2' plus the height of the culvert. Granular Backfill covers subdrain and extends an additional 2'. Subdrain and granular backfill are incidental to flowable mortar.
- ④ Ends of culvert shall be plugged sufficiently to retain flowable mortar. Temporary earth berms are incidental to flowable mortar.
- ⑤ Removal of headwalls may be required.
- ⑥ Outlet shall be filled first. See injection point detail for additional information.

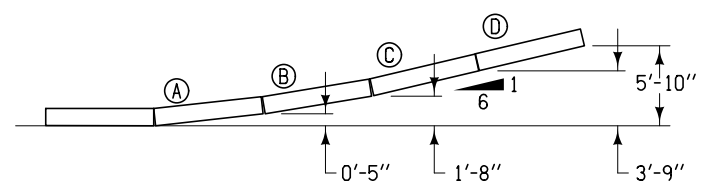
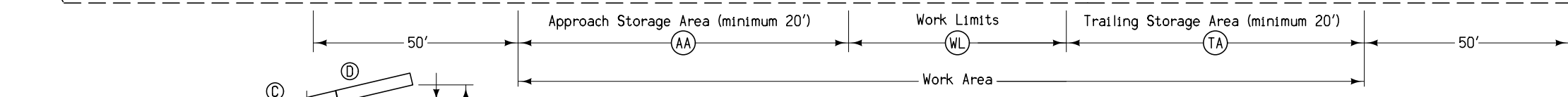
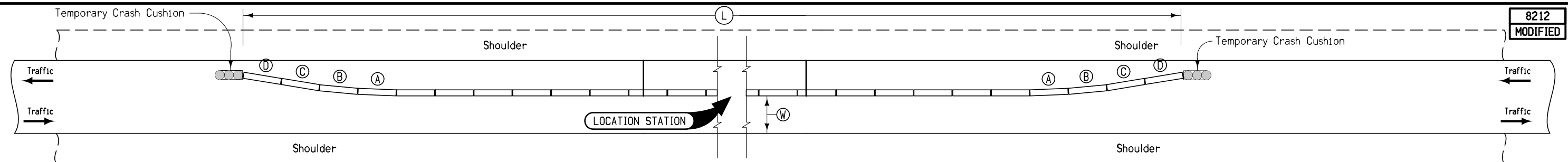
**DETAILS OF CULVERT ABANDONMENT WITH FLOWABLE MORTAR**  
**(Rectangular structures less than 8' in either height or width.**  
**Circular structures less than 10' Dia.)**



- Notes:
- At locations where newly constructed drainage structure extends beyond the normal foreslope cover, flatten the foreslope as indicated so as to cover the structure. Minimum earth cover is 6".
  - ① Slope may be flatter than 6:1.
  - ② 6" Minimum for pipe installations or to top of headwall on R.C.B.
  - ③ North side: carry full barnroof to side road embankment.
  - W = Pipe or R.C.B. width plus 20 feet each side.

| STRUCTURE LOCATION |      | W    | L    | X    | FS   |
|--------------------|------|------|------|------|------|
| STATION            | SIDE | Feet | Feet | Feet | Feet |
| 232+45.25          | B    | 47.8 | 81   | 26   | 3.5  |
| 286+15.50          | B    | 45.0 | 80   | 26   | 3.5  |
| 365+11.13          | B    | 54.5 | 79   | 26   | 3.5  |
| 375+05.90          | B    | 45.6 | 81   | 26   | 3.5  |
| 382+25.90          | B    | 45.6 | 81   | 26   | 3.5  |
| 397+13.70          | B    | 48.9 | 80   | 26   | 3.5  |
| 319+92.00          | B    | 45.7 | 73   | 26   | 3.5  |

**BARNROOF FORESLOPE AT DRAINAGE STRUCTURE**



**BARRIER OFFSETS FOR FLARE SECTIONS**

- ① Place TBR 3 feet left of center line.
- Ⓜ Lane width

**TEMPORARY CONCRETE BARRIER LAYOUT  
for Two-Way Traffic**

| Station   | Side | ⓂⓂ   | ⓂⓁ   | Ⓜⓐ   | Ⓜ     | Anchored<br>X | Ⓜ         | Remarks |
|-----------|------|------|------|------|-------|---------------|-----------|---------|
|           |      | Feet | Feet | Feet | Feet  |               | Ft-Inches |         |
| 17+15.00  | L    | 25   | 25   | 25   | 175   |               | 12'-0"    | ①       |
| 67+03.70  | L    | 25   | 25   | 25   | 175   |               | 12'-0"    | ①       |
| 286+15.50 | L    | 25   | 25   | 25   | 175   | X             | 12'-0"    |         |
| 286+15.50 | R    | 25   | 25   | 25   | 175   | X             | 12'-0"    |         |
| 365+11.13 | L    | 25   | 37.5 | 25   | 187.5 | X             | 12'-0"    |         |
| 365+11.13 | R    | 25   | 37.5 | 25   | 187.5 | X             | 12'-0"    |         |
| 319+92.00 | L    | 25   | 25   | 25   | 175   | X             | 12'-0"    |         |
| 319+92.00 | R    | 25   | 25   | 25   | 175   | X             | 12'-0"    |         |

### ROCK EROSION CONTROL

Refer to EC-301

| Location            |               |             | Rock Erosion Control (REC) |    |    |                  |            | Material Bid Quantities |                   |                       | Remarks |               |                   |             |
|---------------------|---------------|-------------|----------------------------|----|----|------------------|------------|-------------------------|-------------------|-----------------------|---------|---------------|-------------------|-------------|
| Road Identification | Begin Station | End Station | Side                       | L  | W  | Type 1           | Type 2     | Type 3                  | Type 4            | Type 5                |         | Erosion Stone | Class E Revetment | Eng. Fabric |
|                     |               |             |                            |    |    | Rock Ditch Check | Rock Ditch | Rock Flume              | Rock Splash Basin | Rock Slope Protection |         | TON           | TON               | SY          |
| Iowa 150            | 232+45.25     |             | LT                         | 14 | 14 |                  |            |                         | X                 |                       | 23.6    | 34.3          | at pipe outlet    |             |
| Iowa 150            | 286+16.00     |             | LT                         | 10 | 10 |                  |            |                         | X                 |                       | 12.0    | 20.0          | at pipe outlet    |             |
| Iowa 150            | 365+11.13     |             | RT                         | 24 | 15 |                  |            |                         | X                 |                       | 43.2    | 57.4          | at pipe outlet    |             |
| Iowa 150            | 375+05.90     |             | RT                         | 12 | 12 |                  |            |                         | X                 |                       | 17.3    | 26.7          | at pipe outlet    |             |
| Iowa 150            | 382+25.90     |             | RT                         | 12 | 14 |                  |            |                         | X                 |                       | 20.2    | 30.3          | at pipe outlet    |             |
| Iowa 150            | 397+13.70     |             | RT                         | 15 | 10 |                  |            |                         | X                 |                       | 18.0    | 27.8          | at pipe outlet    |             |
| Iowa 150            | 586+25.00     |             | RT                         | 35 | 47 |                  |            |                         | X                 |                       | 197.4   | 219.3         | Settling Basin    |             |
| Iowa 150            | 319+92.00     |             | LT                         | 14 | 10 |                  |            |                         | X                 |                       | 16.8    | 26.3          | at pipe outlet    |             |

### DRAINAGE STRUCTURE BY ROAD CONTRACTOR

Length of unclassified pipe calculated is based on using Reinforced Concrete Pipe.

- \* Not a bid item
- ① Diameter or equivalent diameter
- ② UNCL = Unclassified Pipe    CMP = Corrugated Metal Pipe    RCP = Reinforced Concrete Pipe    LCP = Arch or Elliptical Low Clearance Pipe    SARC = Steel Arch Pipe

| Drainage Area | Location                              | Type  | Size ①         | Kind Of Pipe ②    | Length New Const. | Bedding Class | Design Cover (H) | Camber* (DR-102) | Apron No. |     | Apron Guard* (DR-213) | Elbow* (DR-141) | Diaphragm* (DR-501) | Tee Section* (DR-142) | "D" Section* (DR-141) | Reducer* | Type 'C' Connections* (DR-122) | Connected Pipe Joint* (DR-121) | 4" Perforated Subdrain* | Tie Joints | Flow Line Elevations |     |       |       | Dimensions Lin. Ft. |     |     |     | Skew Ahead Degrees |     | Dike |     |     | Class 20 | Flowable Mortar | Floodable* Backfill | Porous* Backfill | Flooded Backfill                    | Remarks |
|---------------|---------------------------------------|-------|----------------|-------------------|-------------------|---------------|------------------|------------------|-----------|-----|-----------------------|-----------------|---------------------|-----------------------|-----------------------|----------|--------------------------------|--------------------------------|-------------------------|------------|----------------------|-----|-------|-------|---------------------|-----|-----|-----|--------------------|-----|------|-----|-----|----------|-----------------|---------------------|------------------|-------------------------------------|---------|
|               |                                       |       |                |                   |                   |               |                  |                  | Lt.       | Rt. |                       |                 |                     |                       |                       |          |                                |                                |                         |            | Lt.                  | Rt. | Other | Other | Lt.                 | Rt. | Lt. | Rt. | Lt.                | Rt. | Lt.  | Rt. | Lt. |          |                 |                     |                  |                                     |         |
| 67.0          | 17+15.00<br>67+03.70<br>232+45.25     | 2000D | 42<br>36<br>48 | RCP<br>RCP<br>RCP | 80                | B             |                  |                  | 1         | 1   | 2                     |                 |                     |                       |                       |          | C-2<br>C-2                     | 1<br>1                         |                         |            | 1                    |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     |                  | NOTE 1<br>NOTE 1<br>Jack pipe       |         |
| 32.0          | 262+90.00<br>279+18.70<br>286+16.00   | 2000D | 30<br>36<br>42 | RCP<br>RCP<br>LCP | 74                | B             |                  |                  | 1         | 1   | 2                     | 1               |                     |                       |                       |          |                                |                                |                         | 1          | 1                    |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     | 20 degree elbow  |                                     |         |
| 80.0          | 292+37.40<br>365+07.50<br>365+14.76   | 2000D | 30<br>42<br>42 | RCP<br>LCP<br>LCP | 70                | B             |                  |                  | 1         | 1   | 2                     |                 |                     |                       |                       |          |                                |                                |                         | 1          | 1                    |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     |                  |                                     |         |
| 9.0           | 375+05.90                             | 2000D | 42             | LCP               | 70                | B             |                  |                  | 1         | 1   | 2                     |                 |                     |                       |                       |          |                                |                                |                         | 1          | 1                    |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     |                  |                                     |         |
| 10.0          | 382+25.90                             | 2000D | 30             | RCP               | 74                | B             |                  |                  | 1         | 1   | 2                     |                 |                     |                       |                       |          |                                |                                |                         | 1          | 1                    |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     |                  | Jack pipe                           |         |
| 140.0         | 397+13.70                             | 2000D | 66             | RCP               | 72                | B             |                  |                  | 1         | 1   | 2                     |                 |                     |                       |                       |          |                                |                                |                         | 1          | 1                    |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     | Jack pipe        |                                     |         |
| 47.0          | 1458+99.00<br>1470+16.00<br>319+92.00 | 2000D | 24<br>24<br>48 | RCP<br>RCP<br>LCP | 106<br>70         | B             |                  |                  | 1         | 1   | 2                     |                 |                     |                       |                       |          |                                |                                |                         |            | 2                    | 1   |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     |                  | Jack pipe<br>Jack pipe<br>Line Pipe |         |
|               |                                       |       |                |                   |                   |               |                  |                  |           |     |                       |                 |                     |                       |                       |          |                                |                                |                         |            |                      |     |       |       |                     |     |     |     |                    |     |      |     |     |          |                 |                     |                  |                                     |         |

NOTE 1: Replace connection on between pipe and existing RCB on the left side of the roadway. Class 20 quantity for exposing and re-covering pipe.

### ACCESS POINTS AND SAFETY RAMPS

Refer to Cross-Sections

Length of unclassified pipe calculated is based on using Reinforced Concrete Pipe.

- ① Refer to MI-210
- ② Refer to EW-501.
- ③ Refer to EW-501 or EW-502.
- \*Predetermined for access point not constructed with this project.

| Location  |      | Type                                    | Length of Opening ① |                     |                 | W  | ①  | ②  | Pipe Culvert ③ |      |             |     |     | Aprons | Driveway Surface Area |     | Driveway Surfacing Material | Remarks                                    |
|-----------|------|---|---------------------|---------------------|-----------------|----|----|----|----------------|------|-------------|-----|-----|--------|-----------------------|-----|-----------------------------|--|
| Station   | Side | A, B, C, Safety Ramp, or Predetermined* | Case                | 1 1/2" Dropped Curb | 3" Dropped Curb |    |    |    | H              | Size | Pipe Length | Lt. | Rt. |        | No.                   | HMA |                             |  |
| 582+13.80 | RT   |   | 1 or 2              | LF                  | LF              | FT | FT | FT | FT             | LF   | LF          | LF  |     |        |                       |     |                             | Refer to M sheets for drainage information |
| 584+00.00 | RT   |   |                     |                     |                 |    |    |    |                |      |             |     |     |        |                       |     |                             |  |
| 584+61.00 | RT   |   |                     |                     |                 |    |    |    |                |      |             |     |     |        |                       |     |                             |  |

### SURVEY SYMBOLS

- SAA Sanitary Sewer Line Co. 1
- TLA Underground Telephone Line Co. 1
- ELA Underground Electric Line Co. 1
- TLB Underground Telephone Line Co. 2
- TVA Underground TV Cable Co. 1
- GLA Underground Gas Line Co. 1
- FOA Underground Fiber Optic Co. 1
- TLC Underground Telephone Line Co. 3
- FOB Underground Fiber Optic Co. 2
- ELB Underground Electric Line Co. 2
- FOC Underground Fiber Optic Co. 3
- GLB Underground Gas Line Co. 2
- STA Storm Sewer Line Co. 1
- FOD Underground Fiber Optic Co. 4
- GLC Underground Gas Line Co. 3
- DU Centerline Draw or Stream (Up)
- D Centerline Draw or Stream (Down)
- EP Edge of Paved Roads (ML or SR)
- SNP Unpaved Shoulder
- CU Back of Curb
- DIK Centerline of Dike or Dam
- RIP Rip-Rap
- GU Gutter In Front of Curb
- SWK Sidewalk
- CON Concrete or A/C Slab
- ENP Edge Paved Entrance & Park Lot
- ENT Centerline BL of Entrance
- ENU Edge Unpaved Entrance & Parking
- BNK Stream Bank
- EG Edge of Gravel Road
- EW Edge of Water
- SH Paved Shoulder
- SNK Sink Hole
- TPD Telephone Pedestal
- PPA Power Pole Co. 1
- SI Sign
- PIP Pipe Culvert
- FW Wire Fence
- PLG Location of General Photo
- TLNR Tree Line Right
- IN Storm Sewer Intake
- MIS Miscellaneous
- LUM Luminaire
- TDC Tree Deciduous
- BLD Building or Foundation
- PR Electric Riser Pole
- UB Utility Box
- SL Speed Limit Sign
- MH Utility Access (Manhole)
- FHD Fire Hydrants
- WV Water Valve
- RET Retaining Walls
- FCL Chain Link and Security Fence
- CUL Culvert
- EB Electrical Box
- SHR Shrub
- SEP Septic Tank
- TEV Evergreen Tree
- TLNL Tree Line Left
- BIN Grain Bin
- LP L.P. Tank
- FWD Wood Fence
- GV Gas Valve
- WEL Well
- GDL Guard Rail Steel
- FLG Flag Poles
- WHD Water Hydrant
- BB Billboard
- OUT Tile Outlet
- GP Guard Post (Less Than 4 Posts)
- TV Satellite TV Dish
- MM Mile Marker Post
- TVP TV Pedestal
- LC Lot Corner
- INB Storm Sewer Beehive Intake
- TFR Tree Fruit

### UTILITY LEGEND

- GL2B Gas Line Mid American
- TV2B TV Cable Century Link
- EL2B Electric Line
- TL3B Telephone Line City of Independence
- TV3B TV Cable Mediacom
- WL1B Water Line
- SA1B Sanitary Sewer
- FO1B Fiber Optic Windstream
- FO2B Fiber Optic Century Link
- TV4B TV Cable Windstream

### PLAN VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

| LINEWORK     |       | Design Color No. |  |
|--------------|-------|------------------|--|
| Green        | (2)   |                  | Existing Topographic Features and Labels                               |
| Blue         | (1)   |                  | Proposed Alignment, Stationing, Tic Marks, and Alignment Annotation    |
| Magenta      | (5)   |                  | Existing Utilities   |
| SHADING      |       | Design Color No. |  |
| Yellow       | (4)   |                  | Highlight for Critical Notes or Features                               |
| Red          | (3)   |                  | Delineates Restricted Areas  |
| Lavender     | (9)   |                  | Temporary Pavement Shading   |
| Gray, Light  | (48)  |                  | Proposed Pavement Shading  |
| Gray, Med    | (80)  |                  | Proposed Granular Shading  |
| Gray, Dark   | (112) |                  | Proposed Grade and Pave Shading "In conjunction with a paving project" |
| Brown, Light | (236) |                  | Grading Shading  |
| Tan          | (8)   |                  | Proposed Sidewalk Shading  |
| Blue, Light  | (230) |                  | Proposed Sidewalk Landing Shading                                      |
| Pink         | (11)  |                  | Proposed Sidewalk Ramp Shading   |

### PROFILE VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

| LINEWORK    |       | Design Color No. |                                 |
|-------------|-------|------------------|---------------------------------|
| Green       | (2)   |                  | Existing Ground Line Profile    |
| Blue        | (1)   |                  | Proposed Profile and Annotation |
| Magenta     | (5)   |                  | Existing Utilities              |
| Blue, Light | (230) |                  | Proposed Ditch Grades, Left     |
| Black       | (0)   |                  | Proposed Ditch Grades, Median   |
| Rust        | (14)  |                  | Proposed Ditch Grades, Right    |

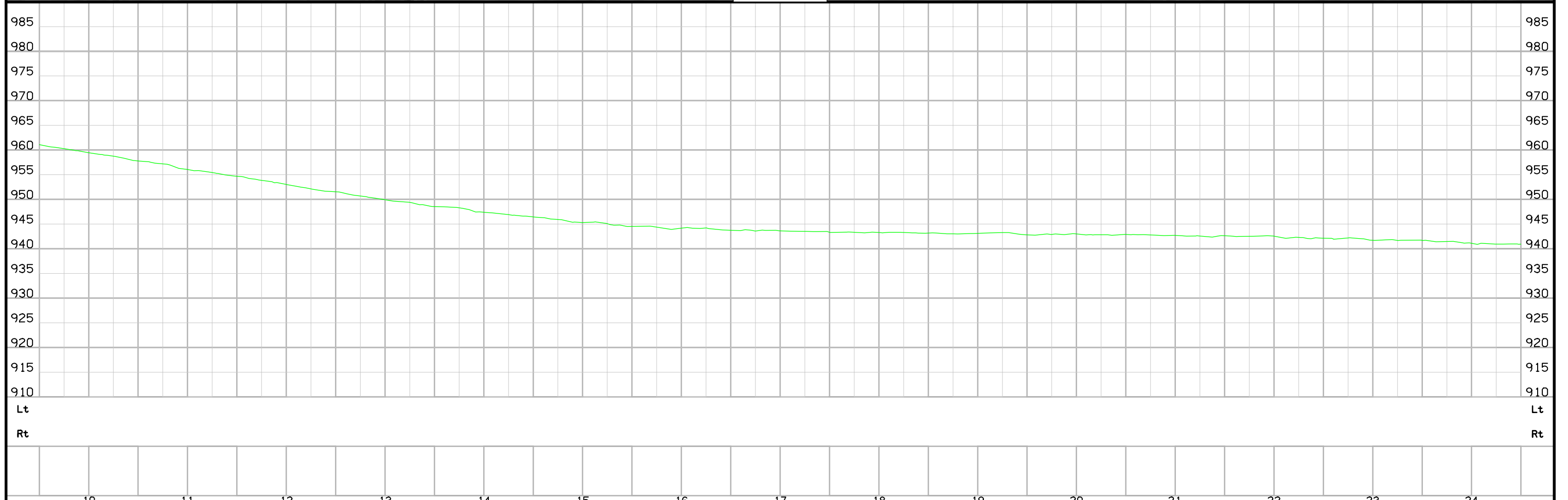
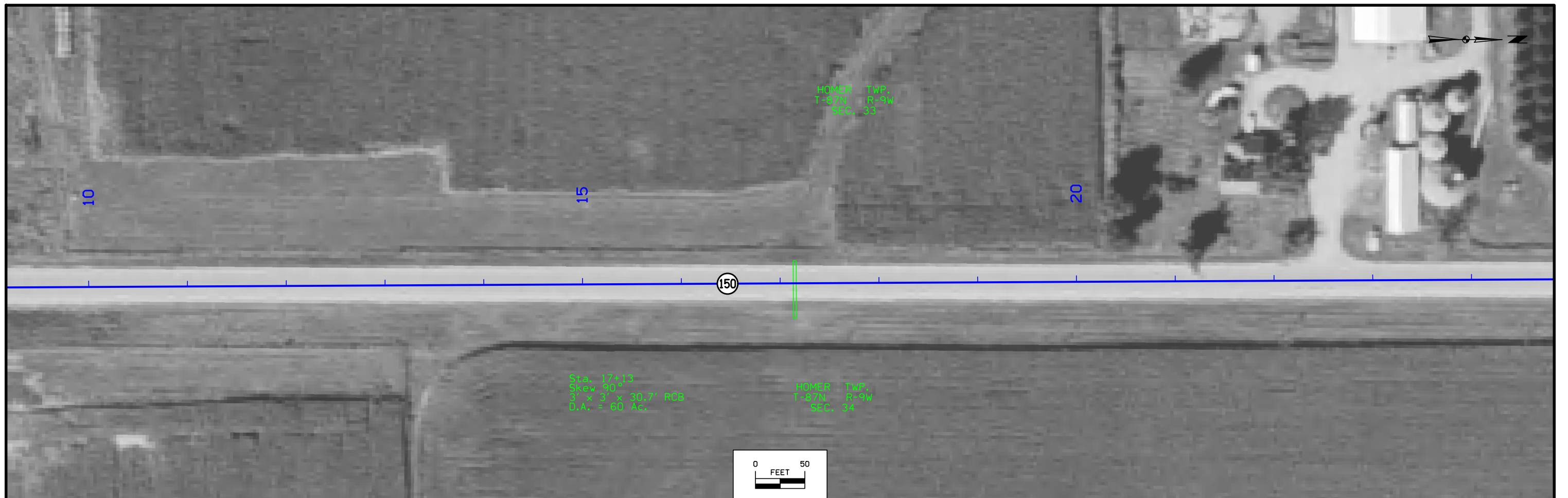
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- Station
- Survey Line
- Section Corner
- Ground Line Intercept
- Saw Cut
- Guardrail
- Trench Drain
- HighTension Cable Guardrail
- Sheet Pile
- Pavement Removal
- Clearing & Grubbing Area

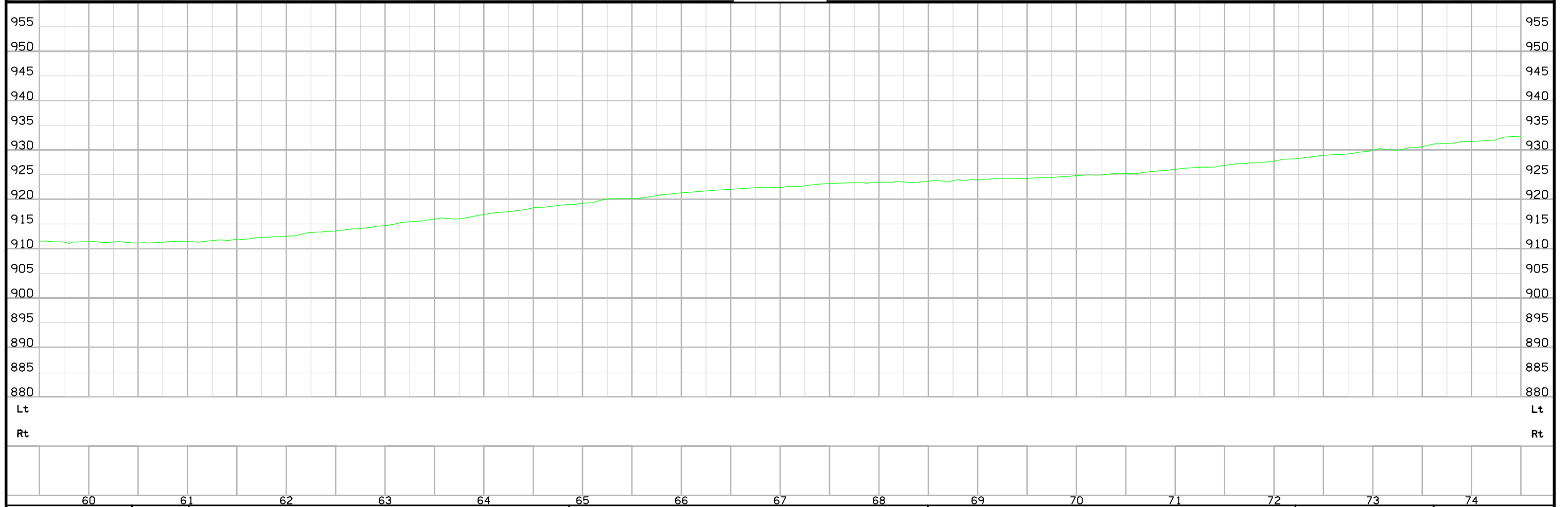
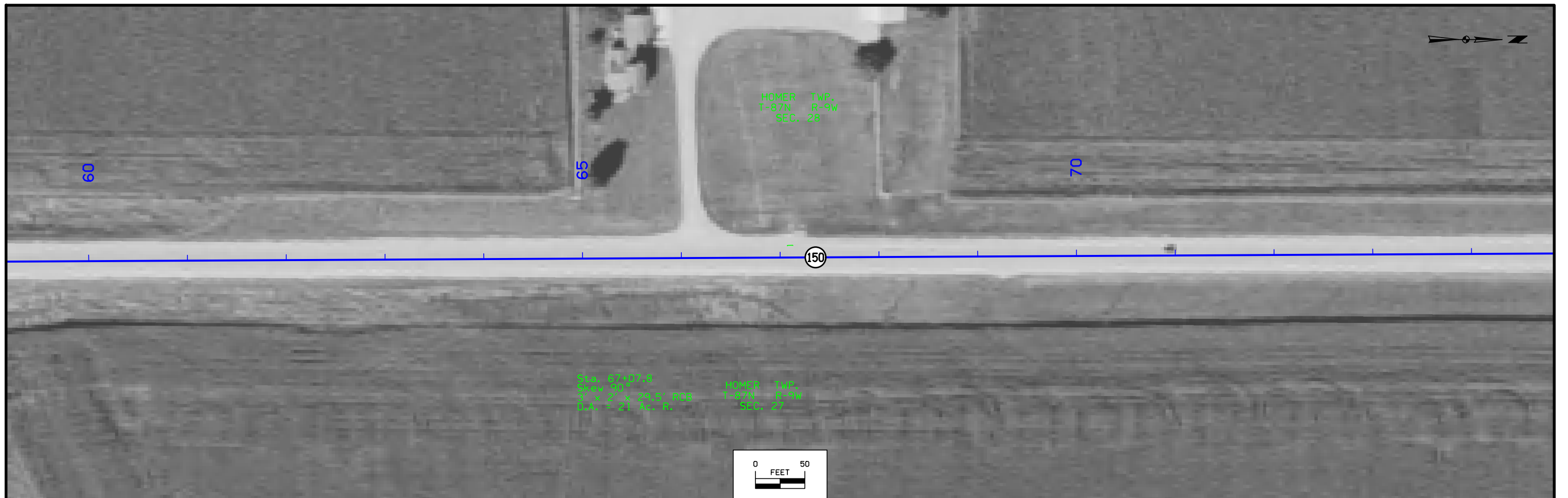
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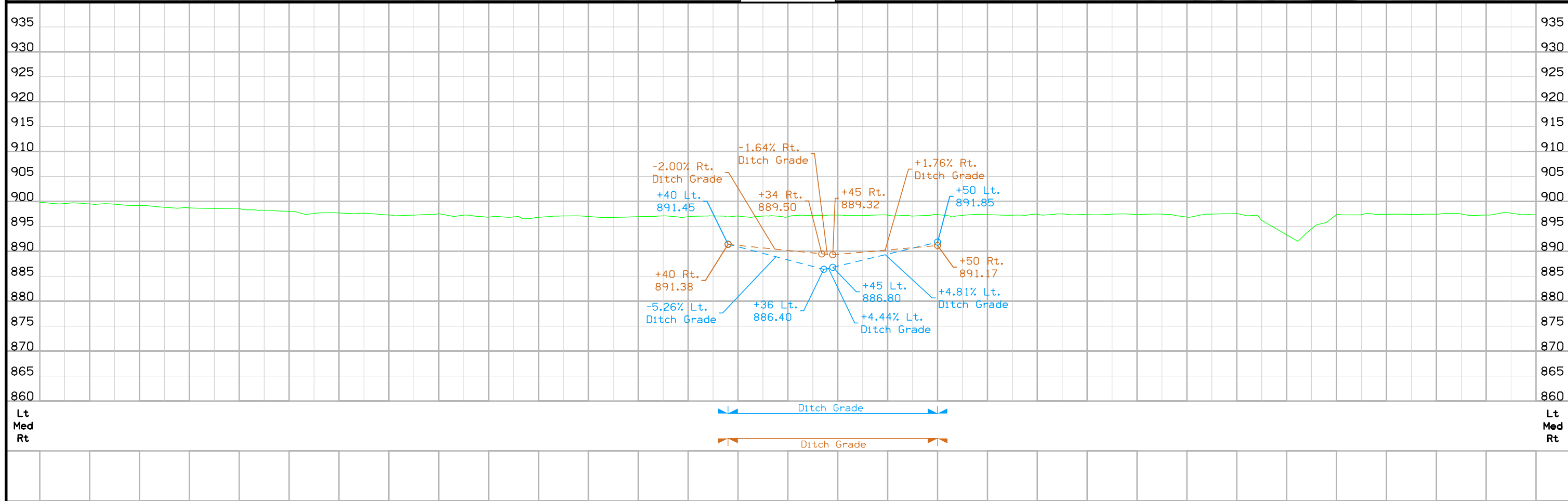
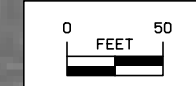
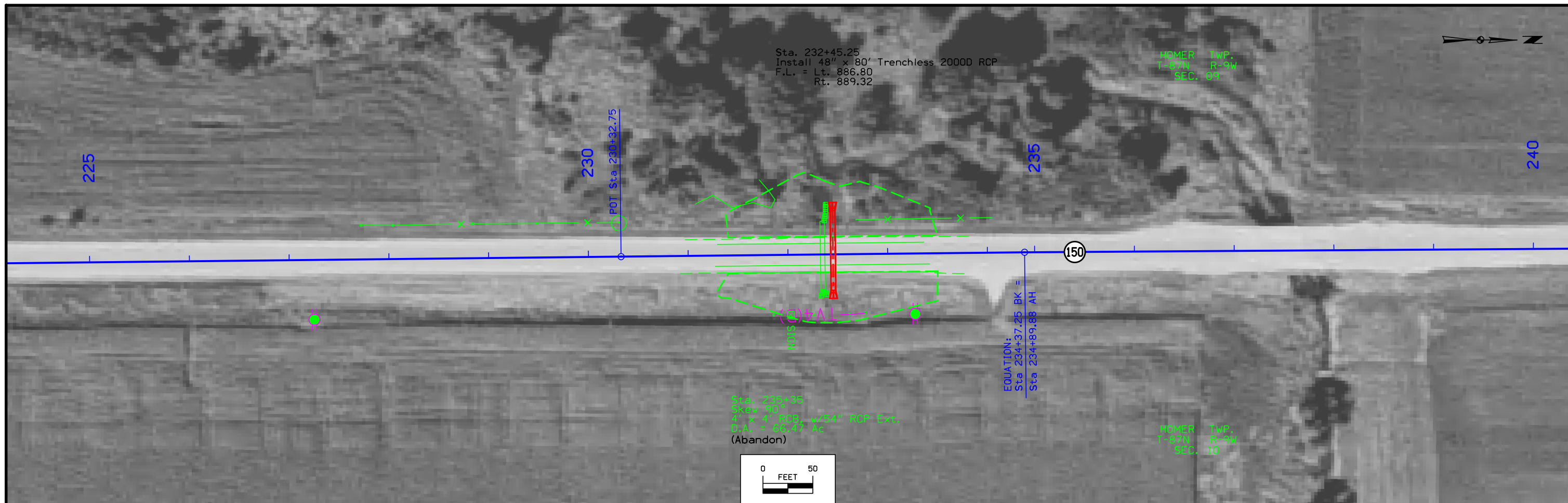
- Proposed Right-of-Way
- Existing Right of Way
- Existing and Proposed Right-of-Way
- Easement and Existing Right-of-Way
- Easement (Temporary)
- Easement
- Access Control
- Property Line

# PLAN AND PROFILE LEGEND AND SYMBOL INFORMATION SHEET

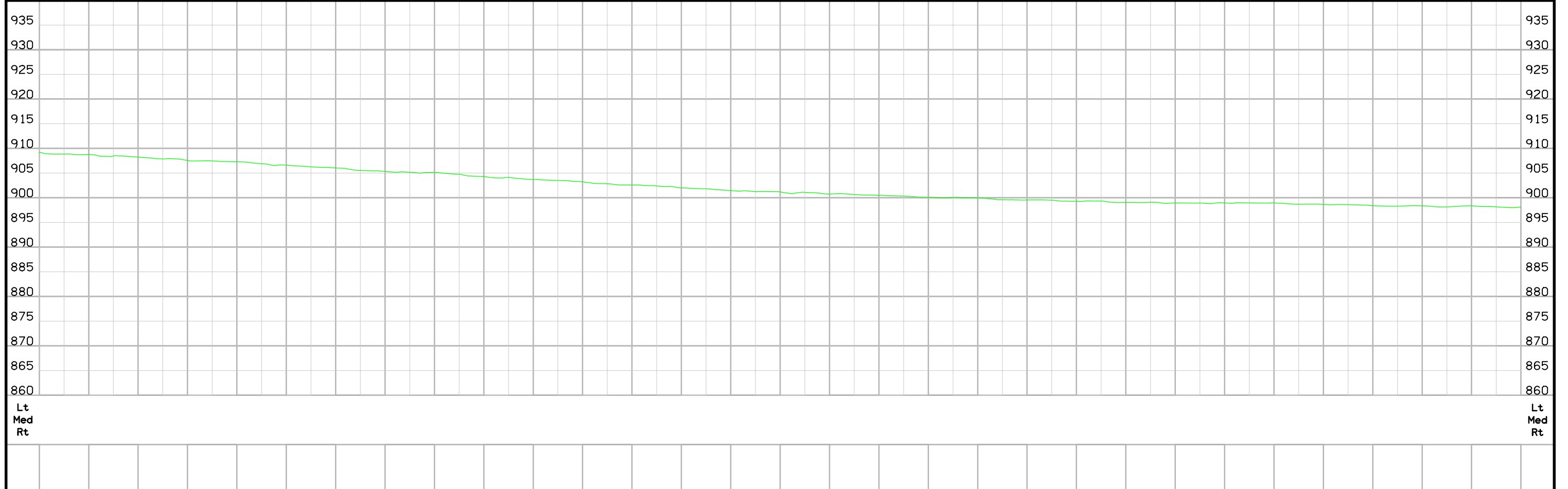
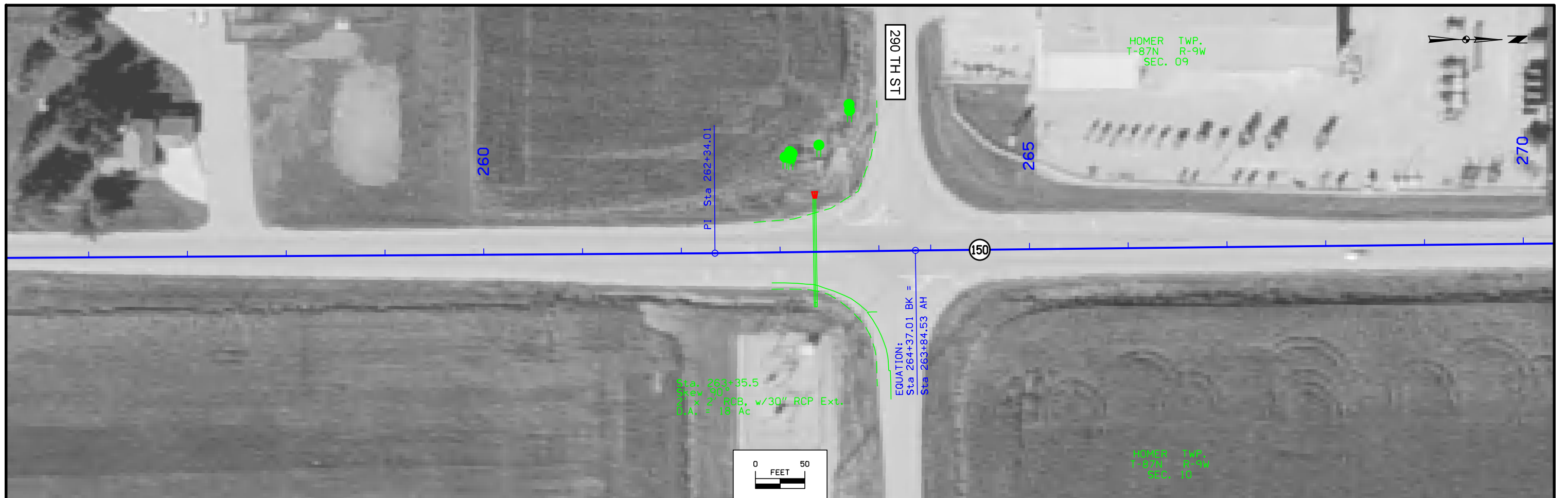
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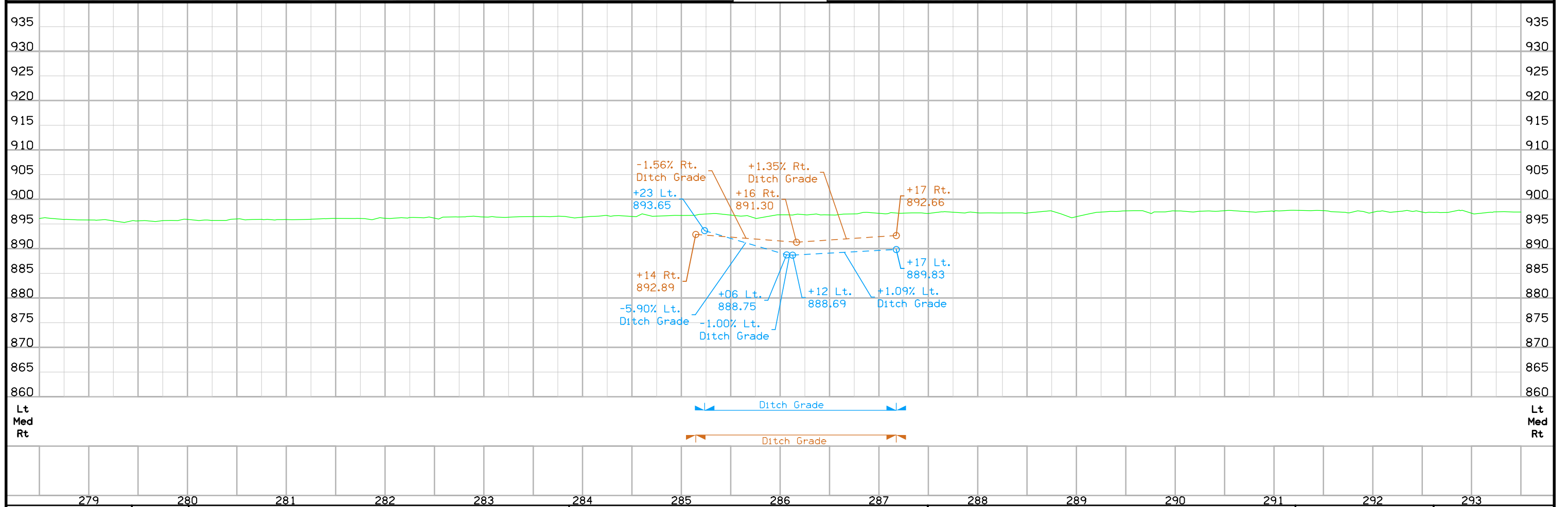
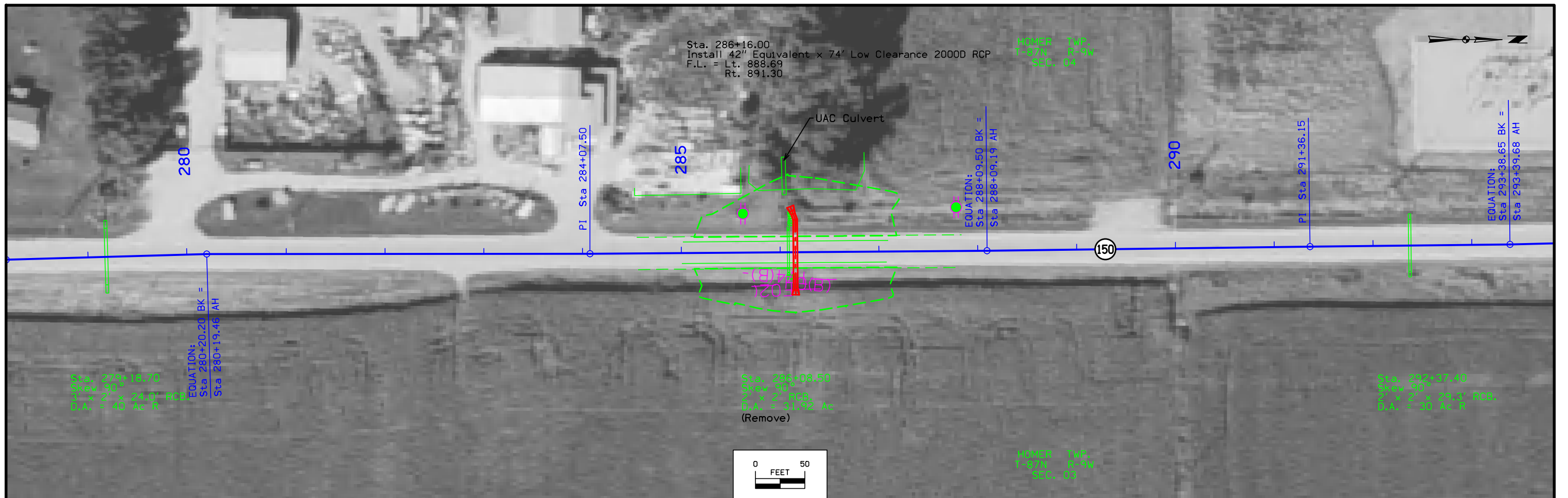


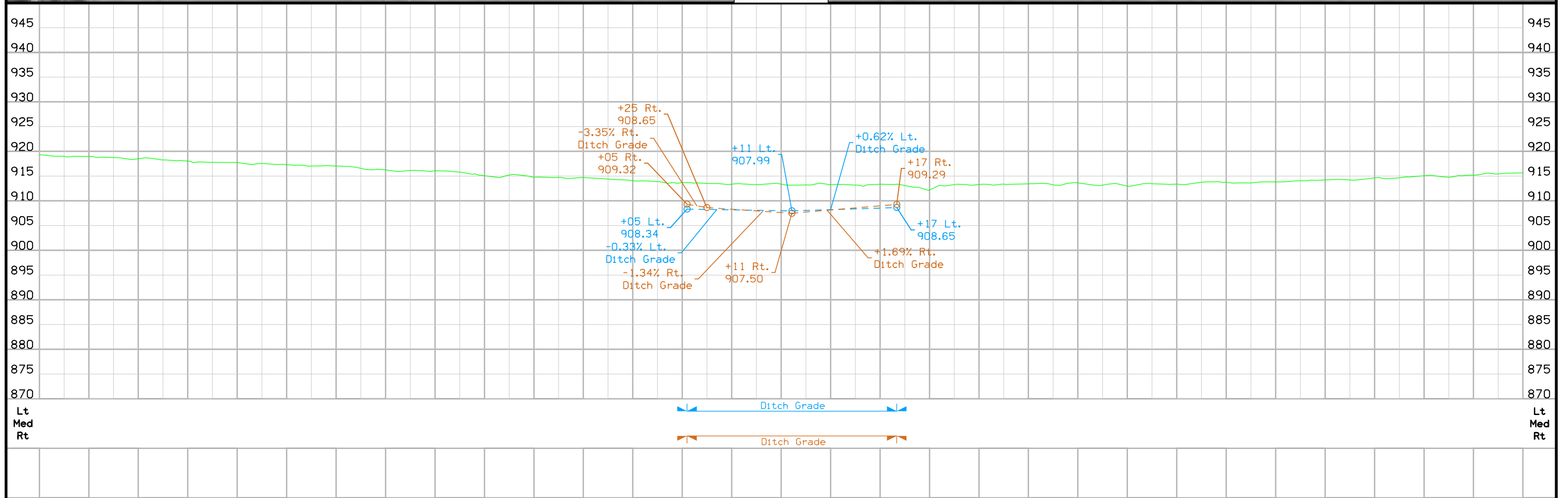
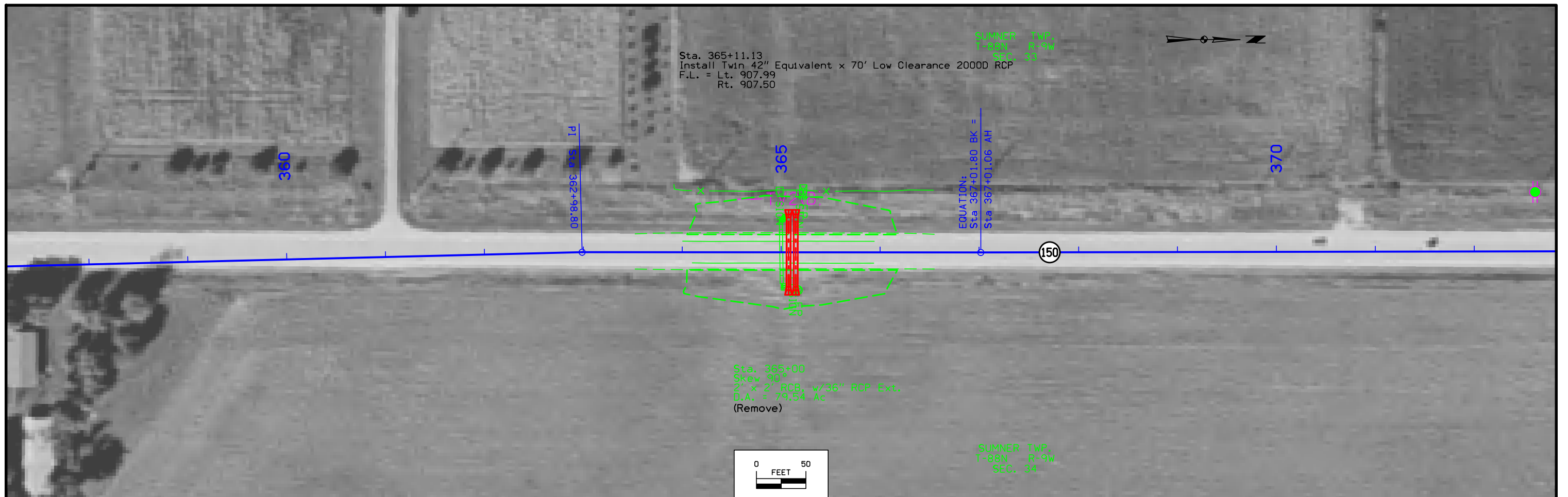


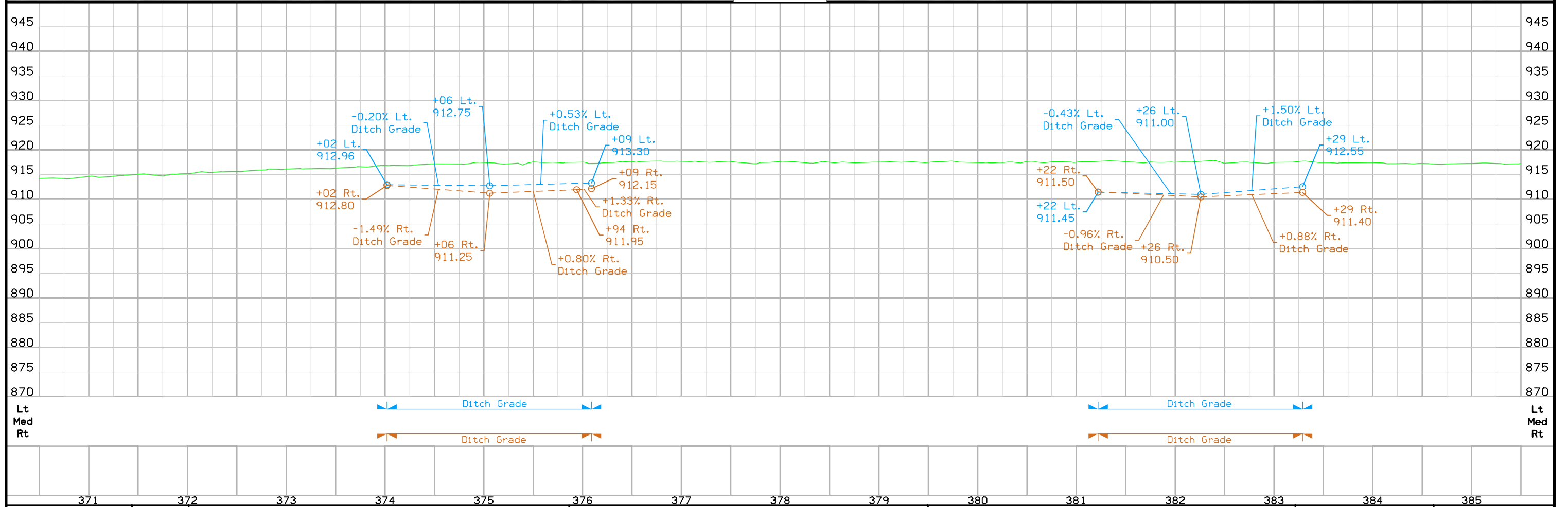


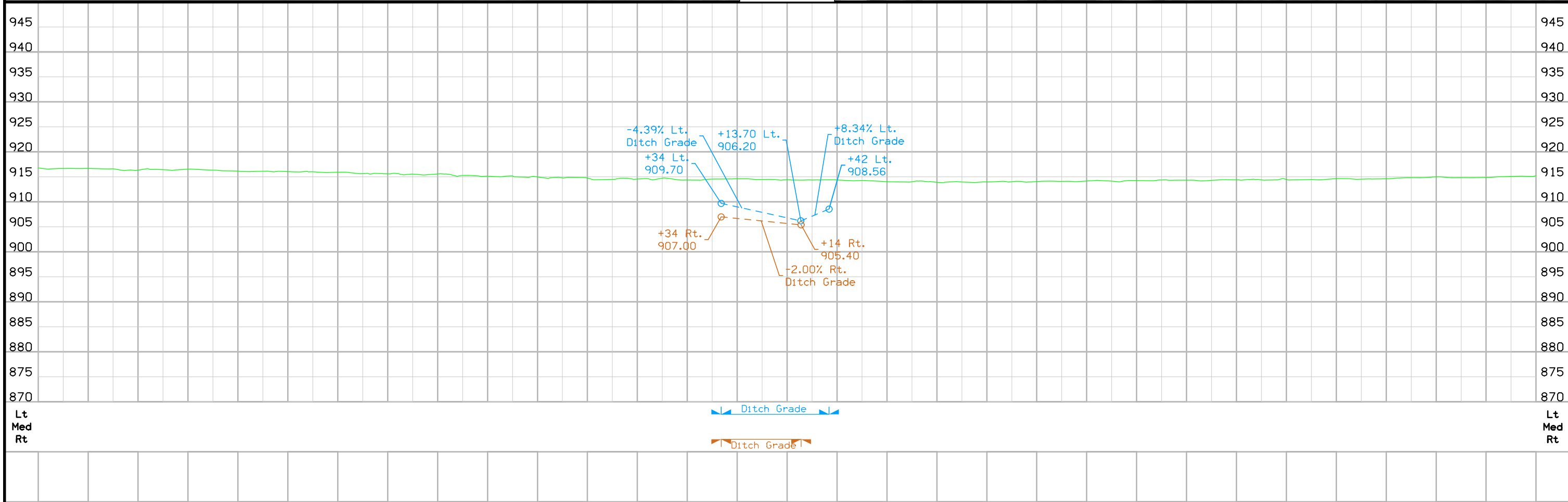
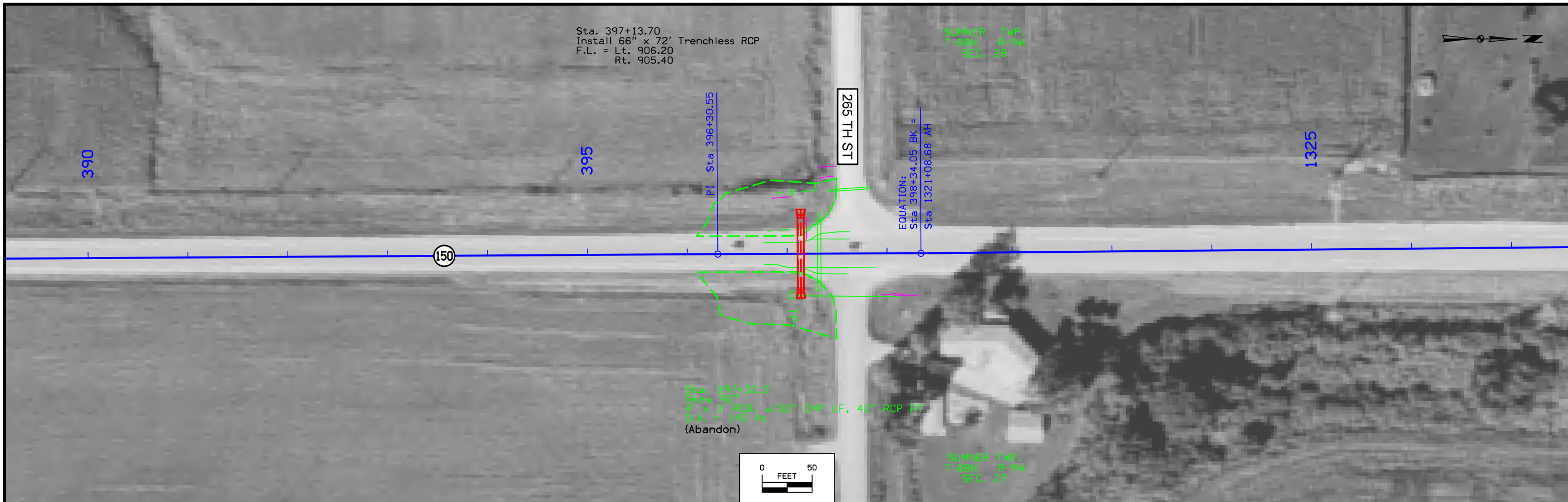


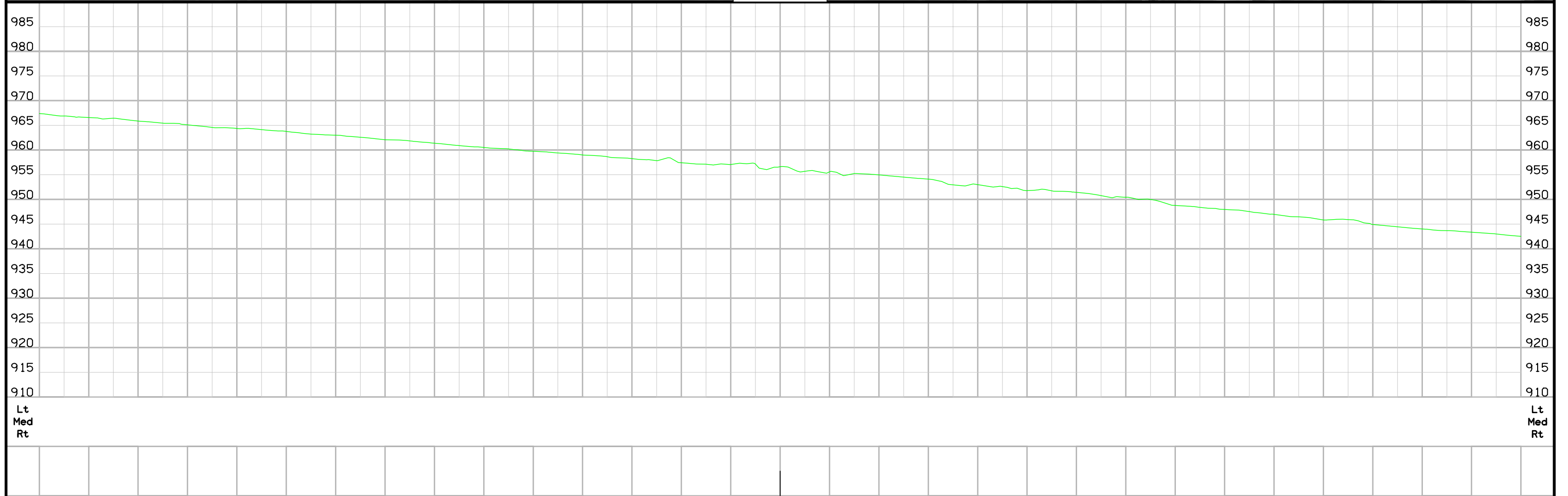
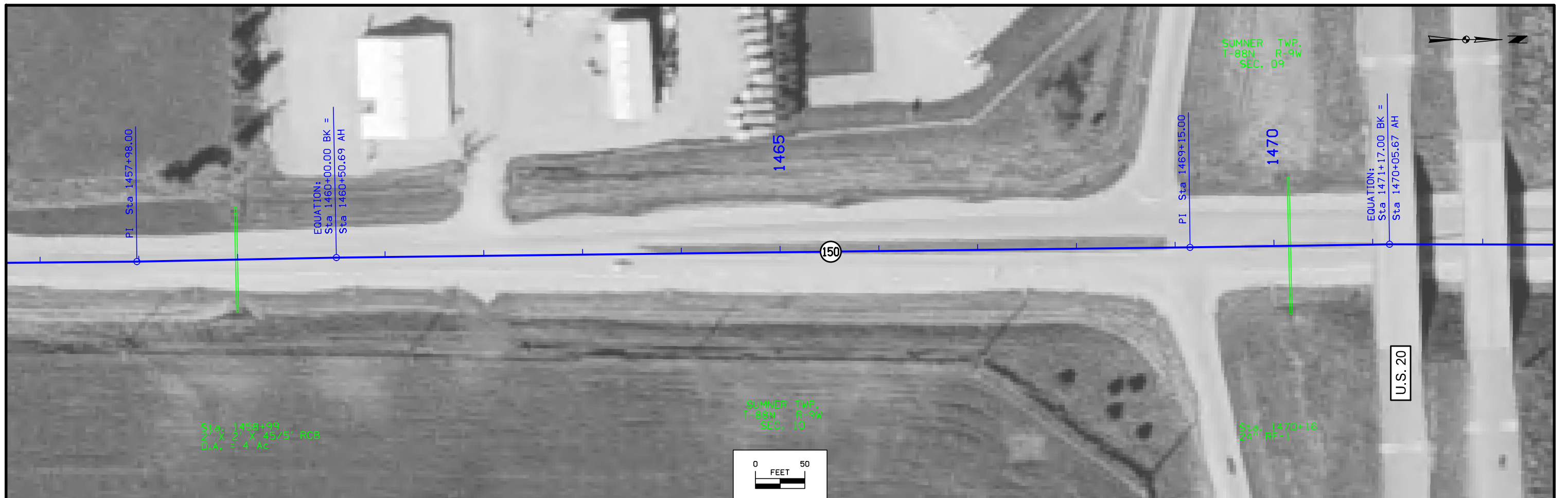
|          |         |             |                             |                 |                |                       |              |     |
|----------|---------|-------------|-----------------------------|-----------------|----------------|-----------------------|--------------|-----|
| FILE NO. | ENGLISH | DESIGN TEAM | SNYDER AND ASSOCIATES, INC. | BUCHANAN COUNTY | PROJECT NUMBER | NHSN-150-3(72)--2R-10 | SHEET NUMBER | D.5 |
|----------|---------|-------------|-----------------------------|-----------------|----------------|-----------------------|--------------|-----|



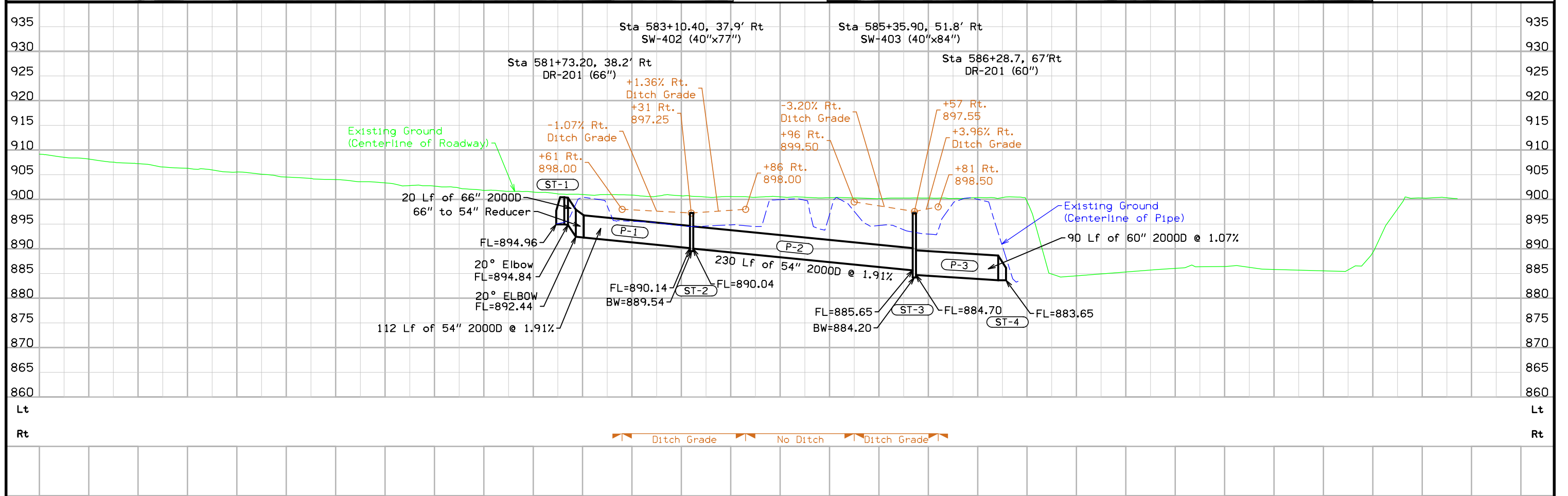
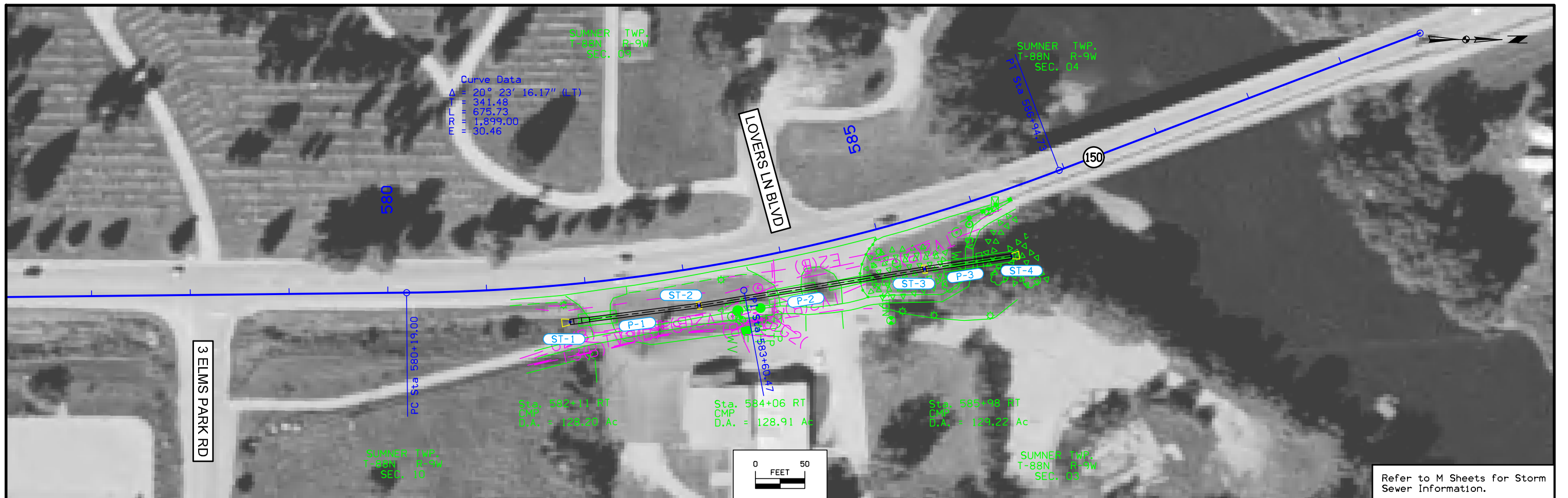




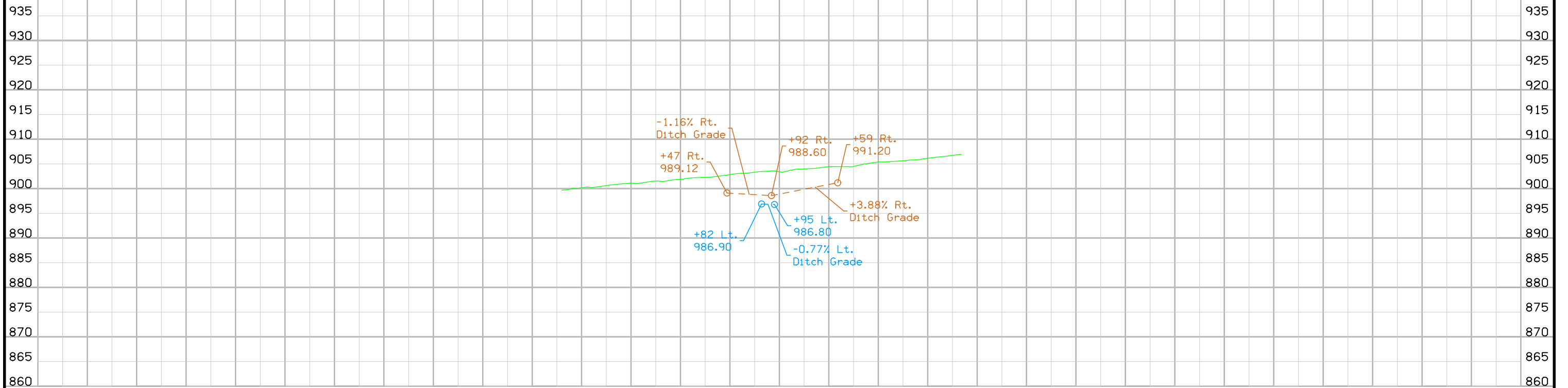
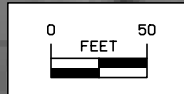
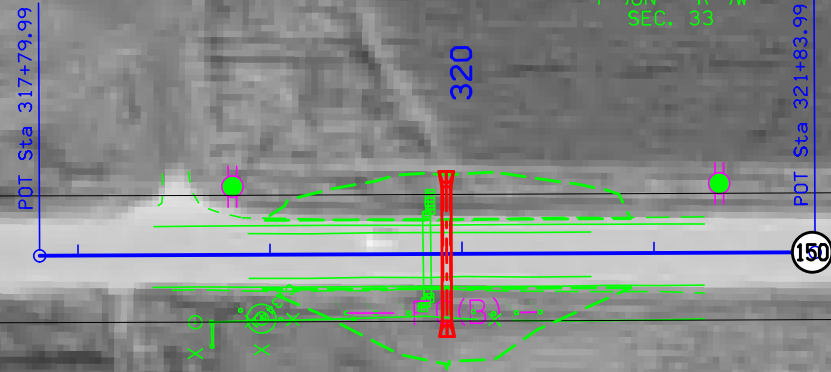




|          |         |             |                                    |                        |      |                       |      |                              |      |                     |      |             |
|----------|---------|-------------|------------------------------------|------------------------|------|-----------------------|------|------------------------------|------|---------------------|------|-------------|
| FILE NO. | ENGLISH | DESIGN TEAM | <b>SNYDER AND ASSOCIATES, INC.</b> | 1465                   | 1466 | 1467                  | 1468 | 1469                         | 1470 | 1471                | 1472 |             |
|          |         |             |                                    | <b>BUCHANAN COUNTY</b> |      | <b>PROJECT NUMBER</b> |      | <b>NHSN-150-3(72)--2R-10</b> |      | <b>SHEET NUMBER</b> |      | <b>D.10</b> |



Sta. 319+92.00  
 Install 48" Equivalent x 70' Lowclearance RCP  
 F.L. = L.t. 986.90  
       R.t. 988.60



Lt  
 Med  
 Rt

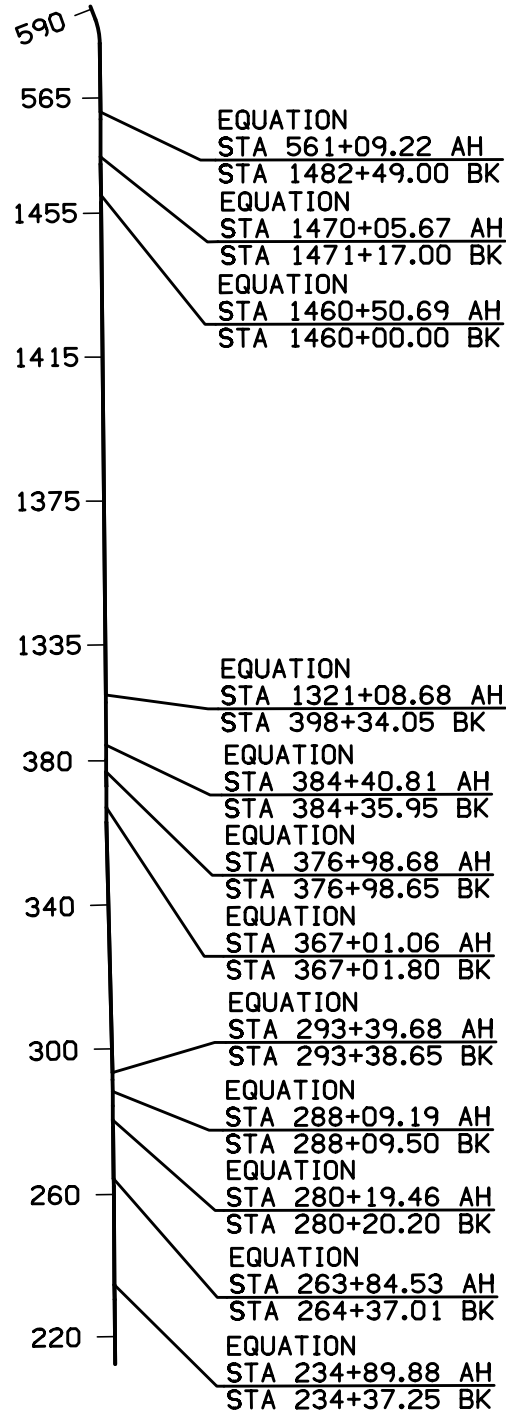
Ditch Grade

Ditch Grade

Lt  
 Med  
 Rt

|          |         |  |     |     |     |     |     |     |     |     |   |                          |
|----------|---------|--|-----|-----|-----|-----|-----|-----|-----|-----|---|--------------------------|
| FILE NO. | ENGLISH | DESIGN TEAM <b>SNYDER AND ASSOCIATES, INC.</b> | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | BUCHANAN COUNTY PROJECT NUMBER <b>NHSN-150-3(72)--2R-10</b> | SHEET NUMBER <b>D.12</b> |
|----------|---------|--|-----|-----|-----|-----|-----|-----|-----|-----|---|--------------------------|





|  |   |                |   |                 |     |                                   |
|--|---|----------------|---|-----------------|-----|-----------------------------------|
| Point MLHWY1   | N | 8,793,237.0193 | E | 15,597,513.5218 | Sta | 212+34.83                         |
| Course from MLHWY1 to MLHWY2 N 0° 36' 47.12" W Dist 1,797.9182 |   |                |   |                 |     |                                   |
| Point MLHWY2   | N | 8,795,034.8345 | E | 15,597,494.2837 | Sta | 230+32.75                         |
| Course from MLHWY2 to 1000 N 0° 36' 47.12" W Dist 404.5001     |   |                |   |                 |     |                                   |
| Equation: Sta 234+37.25 (BK) = Sta 234+89.88 (AH)              |   |                |   |                 |     | -----<br>End Region 1<br>-----    |
| Point 1000   |   |                |   |                 |     | -----<br>Begin Region 2<br>-----  |
| Point 1000   | N | 8,795,439.3114 | E | 15,597,489.9555 | Sta | 234+89.88                         |
| Course from 1000 to MLHWY4 N 0° 22' 31.39" W Dist 2,744.1250   |   |                |   |                 |     |                                   |
| Point MLHWY4   | N | 8,798,183.3775 | E | 15,597,471.9769 | Sta | 262+34.01                         |
| Course from MLHWY4 to 1001 N 0° 46' 44.34" W Dist 203.0000     |   |                |   |                 |     |                                   |
| Equation: Sta 264+37.01 (BK) = Sta 263+84.53 (AH)              |   |                |   |                 |     | -----<br>End Region 2<br>-----    |
| Point 1001   |   |                |   |                 |     | -----<br>Begin Region 3<br>-----  |
| Point 1001   | N | 8,798,386.3588 | E | 15,597,469.2170 | Sta | 263+84.53                         |
| Course from 1001 to MLHWY6 N 0° 37' 28.89" W Dist 1,432.6678   |   |                |   |                 |     |                                   |
| Point MLHWY6   | N | 8,799,818.9414 | E | 15,597,453.5971 | Sta | 278+17.20                         |
| Course from MLHWY6 to 1002 N 1° 37' 37.61" W Dist 203.0000     |   |                |   |                 |     |                                   |
| Equation: Sta 280+20.20 (BK) = Sta 280+19.46 (AH)              |   |                |   |                 |     | -----<br>End Region 3<br>-----    |
| Point 1002   |   |                |   |                 |     | -----<br>Begin Region 4<br>-----  |
| Point 1002   | N | 8,800,021.8596 | E | 15,597,447.8329 | Sta | 280+19.46                         |
| Course from 1002 to MLHWY8 N 0° 02' 33.05" W Dist 388.0364     |   |                |   |                 |     |                                   |
| Point MLHWY8   | N | 8,800,409.8959 | E | 15,597,447.5450 | Sta | 284+07.50                         |
| Course from MLHWY8 to 1003 N 0° 26' 27.46" W Dist 402.0000     |   |                |   |                 |     |                                   |
| Equation: Sta 288+09.50 (BK) = Sta 288+09.19 (AH)              |   |                |   |                 |     | -----<br>End Region 4<br>-----    |
| Point 1003   |   |                |   |                 |     | -----<br>Begin Region 5<br>-----  |
| Point 1003   | N | 8,800,811.8840 | E | 15,597,444.4512 | Sta | 288+09.19                         |
| Course from 1003 to MLHWY10 N 0° 43' 25.34" W Dist 326.9592    |   |                |   |                 |     |                                   |
| Point MLHWY10  | N | 8,801,138.8170 | E | 15,597,440.3214 | Sta | 291+36.15                         |
| Course from MLHWY10 to 1004 N 0° 37' 34.07" W Dist 202.5000    |   |                |   |                 |     |                                   |
| Equation: Sta 293+38.65 (BK) = Sta 293+39.68 (AH)              |   |                |   |                 |     | -----<br>End Region 5<br>-----    |
| Point 1004   |   |                |   |                 |     | -----<br>Begin Region 6<br>-----  |
| Point 1004   | N | 8,801,341.3050 | E | 15,597,438.1086 | Sta | 293+39.68                         |
| Course from 1004 to MLHWY12 N 1° 25' 13.68" W Dist 6,959.1228  |   |                |   |                 |     |                                   |
| Point MLHWY12  | N | 8,808,298.2892 | E | 15,597,265.5969 | Sta | 362+98.80                         |
| Course from MLHWY12 to 1005 N 0° 02' 28.58" E Dist 403.0003    |   |                |   |                 |     |                                   |
| Equation: Sta 367+01.80 (BK) = Sta 367+01.06 (AH)              |   |                |   |                 |     | -----<br>End Region 6<br>-----    |
| Point 1005   |   |                |   |                 |     | -----<br>Begin Region 7<br>-----  |
| Point 1005   | N | 8,808,701.2893 | E | 15,597,265.8872 | Sta | 367+01.06                         |
| Course from 1005 to MLHWY14 N 0° 07' 01.61" W Dist 595.0876    |   |                |   |                 |     |                                   |
| Point MLHWY14  | N | 8,809,296.3757 | E | 15,597,264.6708 | Sta | 372+96.15                         |
| Course from MLHWY14 to 1006 N 0° 18' 45.23" W Dist 402.5003    |   |                |   |                 |     |                                   |
| Equation: Sta 376+98.65 (BK) = Sta 376+98.68 (AH)              |   |                |   |                 |     | -----<br>End Region 7<br>-----    |
| Point 1006   |   |                |   |                 |     | -----<br>Begin Region 8<br>-----  |
| Point 1006   | N | 8,809,698.8700 | E | 15,597,262.4750 | Sta | 376+98.68                         |
| Course from 1006 to MLHWY16 N 0° 23' 32.14" W Dist 333.7679    |   |                |   |                 |     |                                   |
| Point MLHWY16  | N | 8,810,032.6301 | E | 15,597,260.1900 | Sta | 380+32.45                         |
| Course from MLHWY16 to 1007 N 0° 22' 30.78" W Dist 403.5002    |   |                |   |                 |     |                                   |
| Equation: Sta 384+35.95 (BK) = Sta 384+40.81 (AH)              |   |                |   |                 |     | -----<br>End Region 8<br>-----    |
| Point 1007   |   |                |   |                 |     | -----<br>Begin Region 9<br>-----  |
| Point 1007   | N | 8,810,436.1216 | E | 15,597,257.5476 | Sta | 384+40.81                         |
| Course from 1007 to MLHWY18 N 0° 21' 53.58" W Dist 1,189.7361  |   |                |   |                 |     |                                   |
| Point MLHWY18  | N | 8,811,625.8336 | E | 15,597,249.9709 | Sta | 396+30.55                         |
| Course from MLHWY18 to 1008 N 0° 14' 35.86" W Dist 203.5000    |   |                |   |                 |     |                                   |
| Equation: Sta 398+34.05 (BK) = Sta 1321+08.68 (AH)             |   |                |   |                 |     | -----<br>End Region 9<br>-----    |
| Point 1008   |   |                |   |                 |     | -----<br>Begin Region 10<br>----- |

|   |   |                    |      |                 |     |                                   |
|---|---|--------------------|------|-----------------|-----|-----------------------------------|
| Point 1008  | N | 8,811,829.3317     | E    | 15,597,249.1068 | Sta | 1321+08.68                        |
| Course from 1008 to MLHWY20 N 0° 32' 23.73" W Dist 13,689.3178      |   |                    |      |                 |     |                                   |
| Point MLHWY20   | N | 8,825,518.0418     | E    | 15,597,120.1076 | Sta | 1457+98.00                        |
| Course from MLHWY20 to 1009 N 1° 08' 50.97" W Dist 202.0000         |   |                    |      |                 |     |                                   |
| Equation: Sta 1460+00.00 (BK) = Sta 1460+50.69 (AH)                 |   |                    |      |                 |     | -----<br>End Region 10<br>-----   |
| Point 1009  |   |                    |      |                 |     | -----<br>Begin Region 11<br>----- |
| Point 1009  | N | 8,825,720.0012     | E    | 15,597,116.0624 | Sta | 1460+50.69                        |
| Course from 1009 to MLHWY22 N 0° 41' 05.62" W Dist 864.3145         |   |                    |      |                 |     |                                   |
| Point MLHWY22   | N | 8,826,584.2540     | E    | 15,597,105.7309 | Sta | 1469+15.00                        |
| Course from MLHWY22 to 1010 N 0° 53' 48.18" W Dist 201.9999         |   |                    |      |                 |     |                                   |
| Equation: Sta 1471+17.00 (BK) = Sta 1470+05.67 (AH)                 |   |                    |      |                 |     | -----<br>End Region 11<br>-----   |
| Point 1010  |   |                    |      |                 |     | -----<br>Begin Region 12<br>----- |
| Point 1010  | N | 8,826,786.2291     | E    | 15,597,102.5696 | Sta | 1470+05.67                        |
| Course from 1010 to MLHWY24 N 0° 06' 41.42" E Dist 1,043.3278       |   |                    |      |                 |     |                                   |
| Point MLHWY24   | N | 8,827,829.5550     | E    | 15,597,104.6000 | Sta | 1480+49.00                        |
| Course from MLHWY24 to 1011 Due North Dist 200.0000                 |   |                    |      |                 |     |                                   |
| Equation: Sta 1482+49.00 (BK) = Sta 561+09.22 (AH)                  |   |                    |      |                 |     | -----<br>End Region 12<br>-----   |
| Point 1011  |   |                    |      |                 |     | -----<br>Begin Region 13<br>----- |
| Point 1011  | N | 8,828,029.5550     | E    | 15,597,104.6000 | Sta | 561+09.22                         |
| Course from 1011 to PC ML 150-1 N 0° 37' 24.07" W Dist 1,909.7783   |   |                    |      |                 |     |                                   |
| Curve Data<br>*-----*   |   |                    |      |                 |     |                                   |
| Curve ML 150-1  |   |                    |      |                 |     |                                   |
| P.I. Station  | = | 583+60.47          | N    | 8,830,280.6870  | E   | 15,597,081.3477                   |
| Delta   | = | 20° 23' 16.17"     | (LT) |                 |     |                                   |
| Degree  | = | 3° 01' 01.76"      |      |                 |     |                                   |
| Tangent   | = | 341.4758           |      |                 |     |                                   |
| Length  | = | 675.7301           |      |                 |     |                                   |
| Radius  | = | 1,899.0000         |      |                 |     |                                   |
| External  | = | 30.4576            |      |                 |     |                                   |
| Long Chord  | = | 672.1707           |      |                 |     |                                   |
| Mid. Ord.   | = | 29.9768            |      |                 |     |                                   |
| P.C. Station  | = | 580+19.00          | N    | 8,829,939.2202  | E   | 15,597,083.8229                   |
| P.T. Station  | = | 586+94.73          | N    | 8,830,599.9007  | E   | 15,596,960.0699                   |
| C.C.  | = |                    | N    | 8,829,925.4556  | E   | 15,595,184.8728                   |
| Back  | = | N 0° 24' 55.10" W  |      |                 |     |                                   |
| Ahead   | = | N 20° 48' 11.27" W |      |                 |     |                                   |
| Chord Bear  | = | N 10° 36' 33.18" W |      |                 |     |                                   |
| Course from PT ML 150-1 to MLHWY26 N 20° 48' 11.27" W Dist 390.9229 |   |                    |      |                 |     |                                   |
| Point MLHWY26   | N | 8,830,965.3379     | E    | 15,596,821.2305 | Sta | 590+85.65                         |



## Survey Information

BUCHANAN COUNTY  
 PIN:14-10-150-010  
 NHSN-150-3(72)--2R-10  
 PIPE CULVERTS ALONG  
 HWY 150 IN BUCHANAN COUNTY  
 SAP:0642.1

## General Information

Measurement units for this survey are US survey feet. This survey is for the design of improvements relating to the proposed culvert updates for Highway 150 in Buchanan Co. IA. Project datum and control information is provided by Design Survey Office. This project is a complete field survey, except for underground utility information (surface features only).

### Vertical Control

Vertical datum for this survey is relative to NAVD88, Geoid 12a (IARTN GPS Derived).

### Horizontal Control

Measurement units for this survey are U.S. Survey Feet.

Horizontal datum for this survey is unmodified Iowa State IARCSZONE5 coordinate system. Horizontal positions were established by 120 second averaged observations utilizing the IARTN.

## VERTICAL CONTROL

| Point | North        | East          | Elevation | Feature | Description                |
|-------|--------------|---------------|-----------|---------|----------------------------|
| BM1   | 8795329.4530 | 15597552.5700 | 894.1340  | BM      | ◇ BENCH MARK               |
| BM2   | 8800564.9830 | 15597406.7500 | 894.8560  | BM      | 60 D SPIKE PP◇ BENCH MARK  |
| BM3   | 8808416.5710 | 15597204.5700 | 912.6110  | BM      | NAIL PP◇ BENCH MARK        |
| BM4   | 8809544.0000 | 15597202.7500 | 917.1040  | BM      | ◇ BENCH MARK               |
| BM5   | 8810372.0800 | 15597196.6100 | 916.1100  | BM      | ◇ BENCH MARK               |
| BM6   | 8830297.2120 | 15597099.6600 | 899.8390  | BM      | SE BOTTOM BOLT◇ BENCH MARK |
| BM7   | 8865818.7140 | 15593033.2800 | 991.5260  | BM      | CON MON◇ BENCH MARK        |

## CONTROL POINTS

| Point | North        | East          | Elevation | Feature | Description            |
|-------|--------------|---------------|-----------|---------|------------------------|
| B3780 | 8828069.4920 | 15597044.1400 | 929.5190  | CP      | 1/2 IRS◇ CONTROL POINT |
| B3788 | 8811928.1640 | 15597220.6000 | 912.5470  | CP      | 1/2 IRS◇ CONTROL POINT |
| CP21  | 8830531.6680 | 15597111.4300 | 900.5690  | CP      | ◇ CONTROL POINT        |
| CP15  | 8809391.6680 | 15597282.2900 | 915.6720  | CP      | ◇ CONTROL POINT        |
| CP10  | 8799967.5210 | 15597469.8800 | 894.4710  | CP      | ◇ CONTROL POINT        |
| CP13  | 8808410.9560 | 15597284.5200 | 912.4470  | CP      | ◇ CONTROL POINT        |
| CP9   | 8799866.9950 | 15597470.3100 | 894.4210  | CP      | ◇ CONTROL POINT        |
| CP8   | 8798192.0570 | 15597442.6300 | 900.3560  | CP      | ◇ CONTROL POINT        |
| CP6   | 8795386.3470 | 15597516.5500 | 896.5570  | CP      | ◇ CONTROL POINT        |
| CP2   | 8773761.3770 | 15597563.3800 | 941.8390  | CP      | ◇ CONTROL POINT        |
| CP7   | 8798344.1030 | 15597231.1400 | 895.1650  | CP      | ◇ CONTROL POINT        |
| CP23  | 8865790.8730 | 15592965.4000 | 989.9220  | CP      | ◇ CONTROL POINT        |
| CP5   | 8795144.1190 | 15597511.4300 | 895.7040  | CP      | ◇ CONTROL POINT        |
| CP11  | 8800503.5940 | 15597465.5700 | 895.3830  | CP      | ◇ CONTROL POINT        |
| CP14  | 8808592.9670 | 15597283.2700 | 912.1750  | CP      | ◇ CONTROL POINT        |
| CP12  | 8800710.3290 | 15597462.7300 | 895.9790  | CP      | ◇ CONTROL POINT        |
| CP1   | 8773639.6990 | 15597563.9600 | 942.4430  | CP      | ◇ CONTROL POINT        |
| CP3   | 8778653.5630 | 15597537.3500 | 921.1330  | CP      | ◇ CONTROL POINT        |
| CP4   | 8778753.4340 | 15597536.7100 | 922.0200  | CP      | ◇ CONTROL POINT        |
| CP20  | 8830319.2390 | 15597106.5800 | 900.1170  | CP      | ◇ CONTROL POINT        |
| CP16  | 8809586.9590 | 15597280.2200 | 916.2960  | CP      | ◇ CONTROL POINT        |
| CP17  | 8810139.2660 | 15597277.0200 | 916.2410  | CP      | ◇ CONTROL POINT        |
| CP18  | 8810359.4710 | 15597275.4000 | 916.0800  | CP      | ◇ CONTROL POINT        |
| B3784 | 8827837.8850 | 15597134.2700 | 928.8110  | CP      | 1/2 IRS◇ CONTROL POINT |
| CP19  | 8830131.3740 | 15597135.5700 | 900.0070  | CP      | ◇ CONTROL POINT        |
| B3792 | 8811665.6970 | 15597223.0100 | 913.0480  | CP      | 1/2 IRS◇ CONTROL POINT |
| CP22  | 8865784.0890 | 15593035.3000 | 989.9050  | CP      | ◇ CONTROL POINT        |

|            |  |      |         |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
|------------|--|------|---------|------|-------------------|------|------|--------|------|-----------|---------|--------|------------|-------|-------|-------------|----------|------------|--|
| Buchanan   | ROW: NHSN-150-3(73)--2R-10   |      |         |      | PIN 14-10-150-010 |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
|            | Benton Co to Fayette Co  |      |         |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
|            |  |      |         |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
|            |  |      | STATE   |      | COUNTY            |      | CITY |        |      | TEMP EASE |         | BORROW |            |       |       |             |          |            |  |
| PARCEL NO  | OWNER NAME   | FEE  | EASE    | FEE  | EASE              | FEE  | EASE | EXCESS |      |           | FEE     | T.E.   | MITIGATION | OTHER | HOUSE | BUILDING(S) | A/C ONLY | TOTAL ACQ. |  |
| 1          | Shirley A Grover - Fee   |      | 0.25 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 2          | Margaret Prahm Kephart - Fee   |      | 0.01 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 3          | Ceramatech Corporation Inc. - Fee  |      | 0.08 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 4          | Daniel Denbeste - Fee  |      | 0.04 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 5          | Lorraine M. Mochal Trust - Fee   |      | 0.09 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 6          | Richard P Wiese - Fee  |      | 0.06 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 7          | Keith Smith - Fee  |      | 0.25 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 8          | Robert D. Crawford - Fee   |      | 0.04 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 9          | Betty J. Anderson - Fee  |      | 0.04 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 10         | K A L M Farms, LLC - Fee<br>Lisa M Patton, REM - Fee<br>Kimberly S Holub, REM - Fee<br>Andrew C Johnson, REM - Fee<br>Melanie K Svoboda, REM - Fee<br>Susan J. Johnson, LE - Fee |      | 0.01 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 11         | Burco Land, LC - Fee   |      | 0.08 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 12         | Rodney P Brandt - Fee<br>Ronald H Brandt - Fee   |      | 0.03 AC |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 13         | Farmer's Savings Bank - Fee<br>John C Shannon - CP1  |      |         |      |                   |      |      |        |      |           | 217 SF  |        |            |       |       |             |          |            |  |
| 14         | City of Independence - Fee   |      |         |      |                   |      |      |        |      |           | 865 SF  |        |            |       |       |             |          |            |  |
|            |  |      |         |      |                   |      |      |        |      |           |         |        |            |       |       |             |          |            |  |
| 14 Parcels | "TOTALS  | 0 AC | 0.98 AC | 0 AC | 0 AC              | 0 AC | 0 AC | 0 AC   | 0 AC | 0 AC      |         | 0 AC   | 0 AC       | 0 AC  |       |             |          |            |  |
|            |  | 0 SF |         | 0 SF | 0 SF              | 0 SF | 0 SF | 0 SF   | 0 SF | 0 SF      | 1082 SF |        |            |       |       |             |          |            |  |

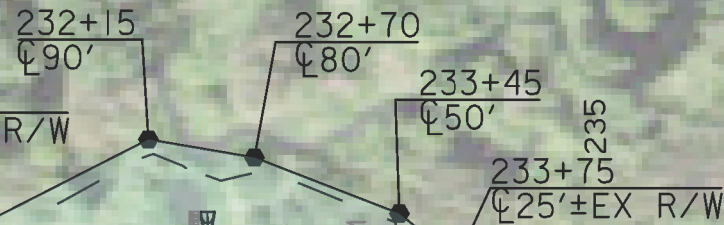
NO ACCESS RIGHTS ARE TO BE ACQUIRED ON THIS PROJECT.

ACCESS CONTROL PREVIOUSLY ACQUIRED

HOMER TWP.  
T-87N R-9W  
SEC. 09

①  
SHIRLEY A. GROVER

Sta. 232+45.25  
Install 48" x 80' Trenchless 2000D RCP  
F.L. = Lt. 886.80  
Rt. 889.32

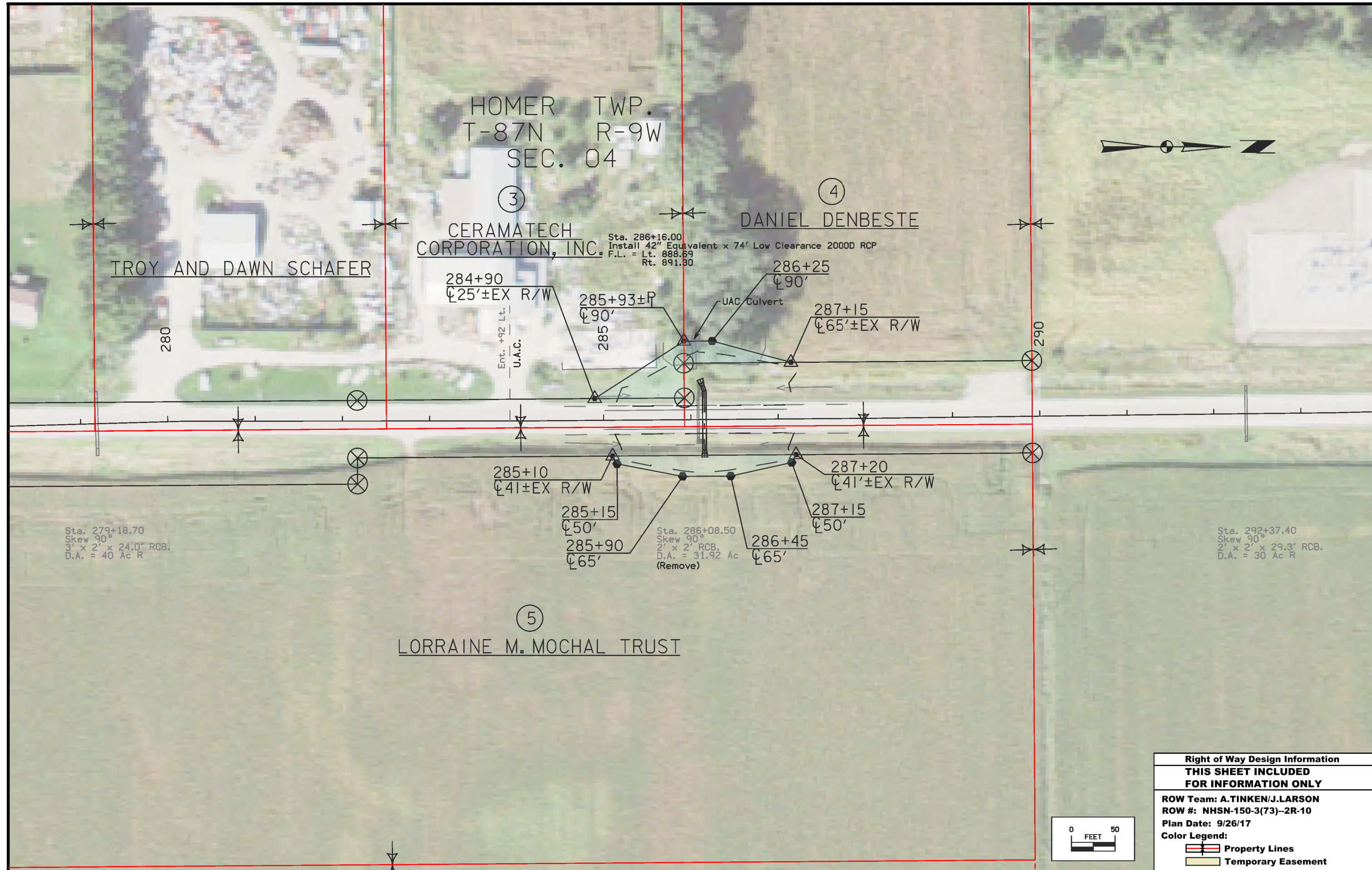


Sta. 235+35  
skew 90°  
4' x 4' RCB, w/54" RCP Ext.  
D.A. = 66.47 Ac  
(Abandon)

②  
MARGARET PRAHM KEPHART



|   |                       |
|---|-----------------------|
| <b>Right of Way Design Information</b>          |                       |
| <b>THIS SHEET INCLUDED FOR INFORMATION ONLY</b> |                       |
| ROW Team: A.TINKEN/J.Larson                     |                       |
| ROW #: NHSN-150-3(73)--2R-10                    |                       |
| Plan Date: 9/26/17                              |                       |
| Color Legend:                                   |                       |
|   | Property Lines        |
|   | Temporary Easement    |
|   | Permanent Acquisition |



HOMER TWP.  
T-87N R-9W  
SEC. 04

③ CERAMATECH CORPORATION, INC.  
④ DANIEL DENBESTE

TROY AND DAWN SCHAFER

⑤ LORRAINE M. MOCHAL TRUST

Sta. 286+16.00  
Install 42" Equivalent x 74' Low Clearance 2000D RCP  
F.L. = Lt. 888.69  
Rt. 891.90

Sta. 279+18.70  
Skew 90°  
3' x 2' x 24.0' RCB.  
D.A. = 40 Ac R

Sta. 286+08.50  
Skew 90°  
2' x 2' RCB.  
D.A. = 31.92 Ac  
(Remove)

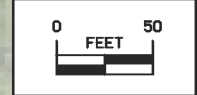
Sta. 292+37.40  
Skew 90°  
2' x 2' x 29.3' RCB.  
D.A. = 30 Ac R

**Right of Way Design Information**  
**THIS SHEET INCLUDED FOR INFORMATION ONLY**

ROW Team: A.TINKEN/J.LARSON  
ROW #: NHSN-150-3(73)--2R-10  
Plan Date: 9/26/17

**Color Legend:**

- Property Lines
- Temporary Easement
- Permanent Acquisition

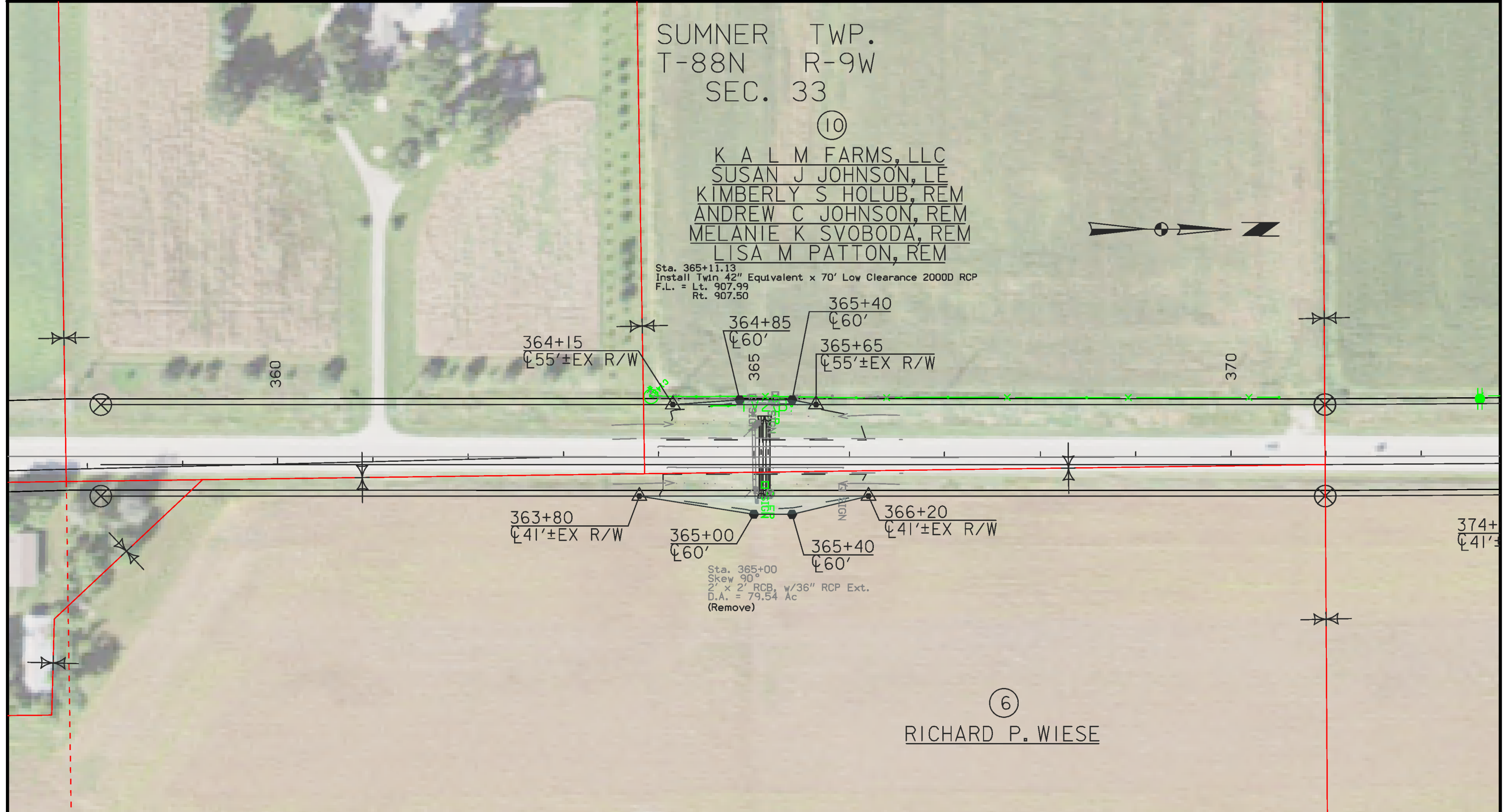
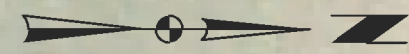


SUMNER TWP.  
T-88N R-9W  
SEC. 33

⑩

K A L M FARMS, LLC  
SUSAN J JOHNSON, LE  
KIMBERLY S HOLUB, REM  
ANDREW C JOHNSON, REM  
MELANIE K SVOBODA, REM  
LISA M PATTON, REM

Sta. 365+11.13  
Install Twin 42" Equivalent x 70' Low Clearance 2000D RCP  
F.L. = Lt. 907.99  
Rt. 907.50

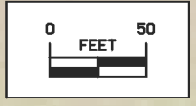


Sta. 365+00  
Skew 90°  
2' x 2' RCB, w/36" RCP Ext.  
D.A. = 79.54 Ac  
(Remove)

⑥  
RICHARD P. WIESE

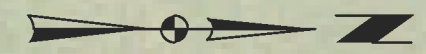
SUMNER TWP.  
T-88N R-9W  
SEC. 34

|   |                       |
|---|-----------------------|
| <b>Right of Way Design Information</b>          |                       |
| <b>THIS SHEET INCLUDED FOR INFORMATION ONLY</b> |                       |
| ROW Team: A.TINKEN/J.LARSON                     |                       |
| ROW #: NHSN-150-3(73)--2R-10                    |                       |
| Plan Date: 9/26/17                              |                       |
| <b>Color Legend:</b>                            |                       |
|   | Property Lines        |
|   | Temporary Easement    |
|   | Permanent Acquisition |



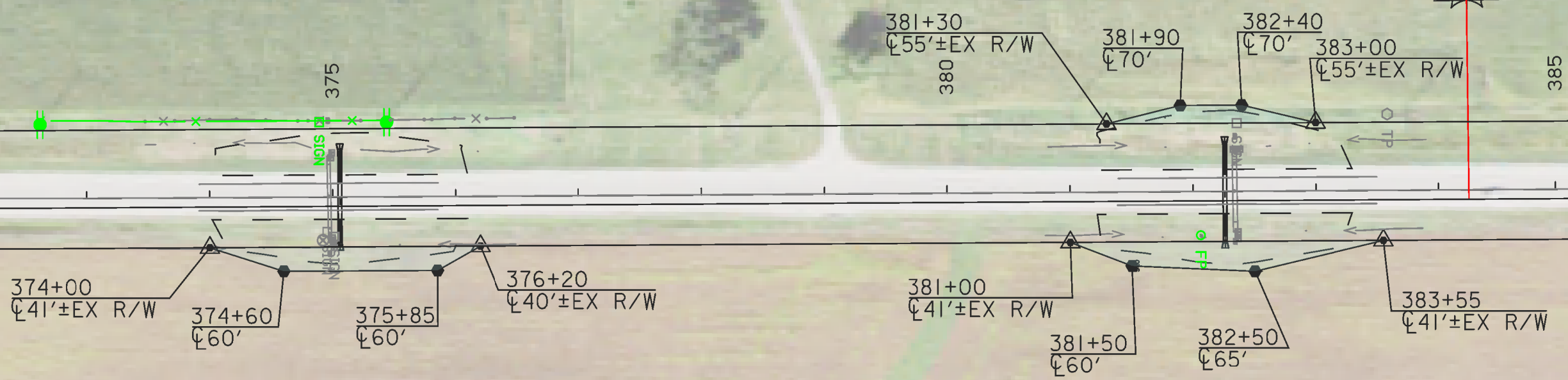
SUMNER TWP.  
T-88N R-9W  
SEC. 28

9  
BETTY J. ANDERSON



Sta. 375+05.90  
Install 30" x 74' Trenchless RCP  
F.L. = Lt. 912.75  
Rt. 911.25

Sta. 382+25.90  
Install 30" x 78' Trenchless RCP  
F.L. = Lt. 911.00  
Rt. 910.50

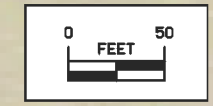


Sta. 374+97  
Skew 90°  
2' x 2' RCB, w/30" RCP Ext.  
D.A. = 8.83 Ac  
(Abandon)

Sta. 382+34  
Skew 90°  
RCB  
D.A. = 10.30 Ac  
(Abandon)

7  
SUMNER TWP.  
T-88N R-9W  
SEC. 27

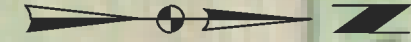
KEITH AND LINDA SMITH



|   |                       |
|---|-----------------------|
| <b>Right of Way Design Information</b>          |                       |
| <b>THIS SHEET INCLUDED FOR INFORMATION ONLY</b> |                       |
| ROW Team: A.TINKEN/J.LARSON                     |                       |
| ROW #: NHSN-150-2(73)--2R-10                    |                       |
| Plan Date: 9/26/17                              |                       |
| <b>Color Legend:</b>                            |                       |
|   | Property Lines        |
|   | Temporary Easement    |
|   | Permanent Acquisition |



SUMNER TWP.  
T-88N R-9W  
SEC. 28



⑧  
ROBERT D. CRAWFORD, ETAL

397+21±EX R/W  
⌀75'

Sta. 397+13.70  
Install 66" x 72' Trenchless RCP  
F.L. = Lt. 906.20  
Rt. 905.40

396+60  
⌀80'

396+20  
⌀55'±EX R/W

395

390

1325

396+20  
⌀41'±EX R/W

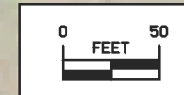
396+30  
⌀65'

Sta. 397+32.3  
Skew 90°  
4' x 3' RCB. w/30" CMP LF, 42" RCP RT  
D.A. = 140 Ac  
(Abandon)

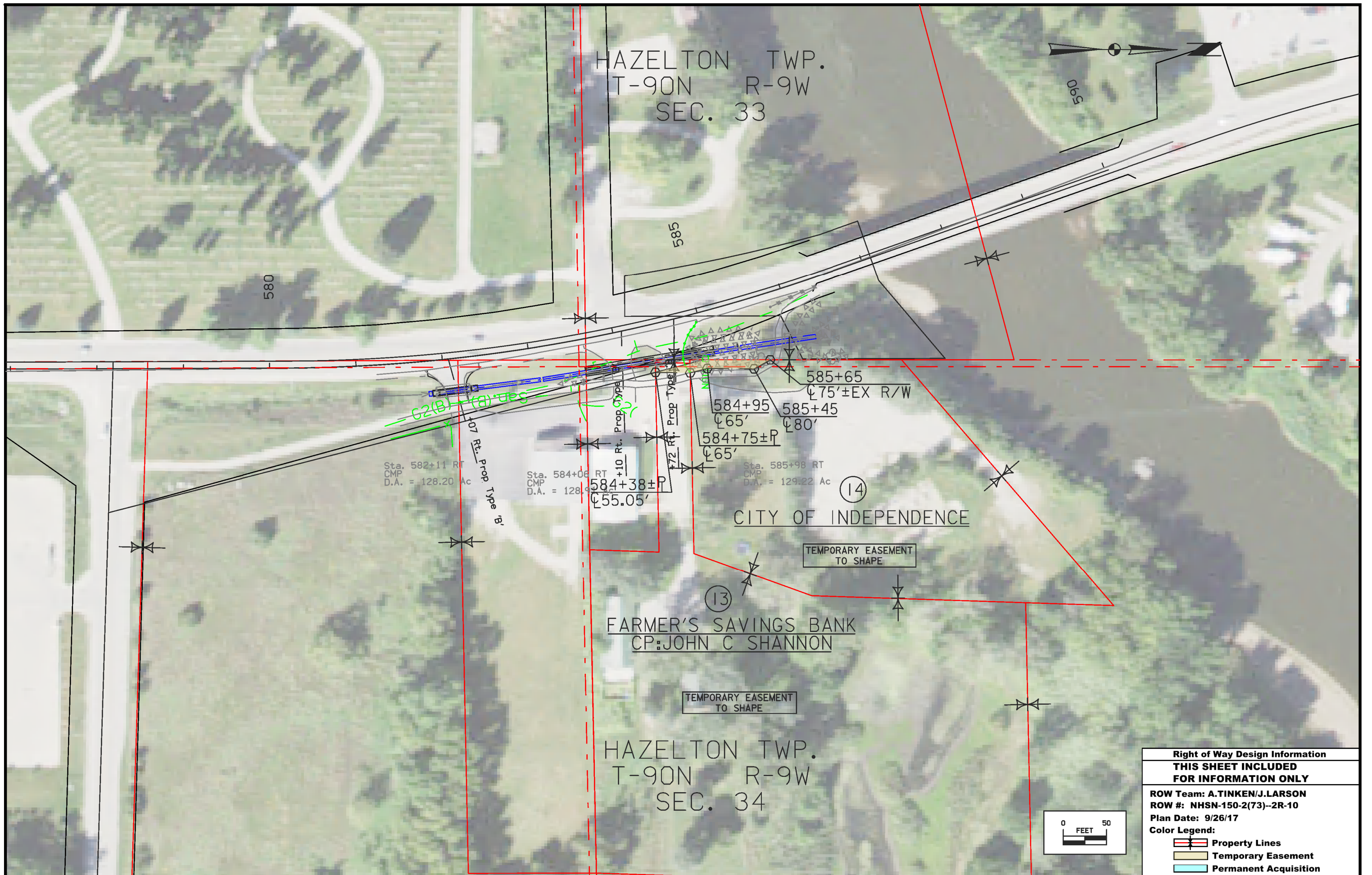
397+23±EX R/W  
⌀90'

⑦  
KEITH AND LINDA SMITH

SUMNER TWP.  
T-88N R-9W  
SEC. 27



|   |                       |
|---|-----------------------|
| <b>Right of Way Design Information</b>          |                       |
| <b>THIS SHEET INCLUDED FOR INFORMATION ONLY</b> |                       |
| ROW Team: A.TINKEN/J.LARSON                     |                       |
| ROW #: NHSN-150-2(73)--2R-10                    |                       |
| Plan Date: 9/26/17                              |                       |
| <b>Color Legend:</b>                            |                       |
|   | Property Lines        |
|   | Temporary Easement    |
|   | Permanent Acquisition |



|   |                       |
|---|-----------------------|
| <b>Right of Way Design Information</b>          |                       |
| <b>THIS SHEET INCLUDED FOR INFORMATION ONLY</b> |                       |
| ROW Team: A.TINKEN/J.LARSON                     |                       |
| ROW #: NHSN-150-2(73)--2R-10                    |                       |
| Plan Date: 9/26/17                              |                       |
| Color Legend:                                   |                       |
|   | Property Lines        |
|   | Temporary Easement    |
|   | Permanent Acquisition |

HAZELTON TWP.  
T-90N R-9W  
SEC. 33

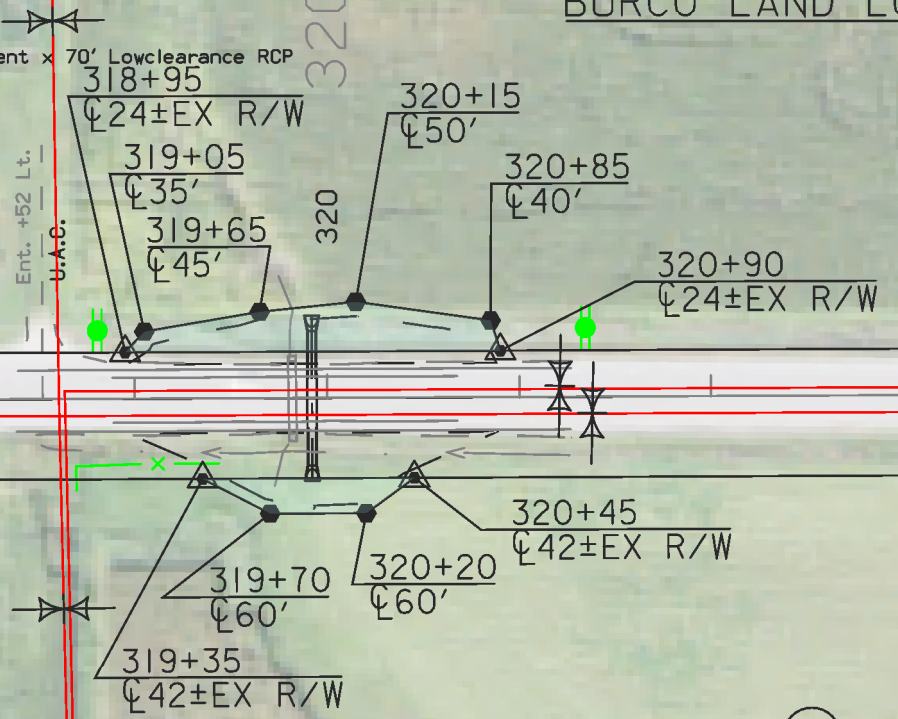


315

Sta. 319+92.00  
Install 48" Equivalent x 70' Lowclearance RCP  
F.L. = L.t. 986.90  
R.t. 988.60

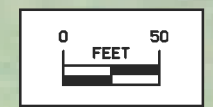
(11)  
BURCO LAND LC

325



(12)  
RODNEY P. AND MARY ELLEN BRANDT  
AND RONALD H. AND RUTH E. BRANDT

HAZELTON TWP.  
T-90N R-9W  
SEC. 34



|   |                       |
|---|-----------------------|
| <b>Right of Way Design Information</b>          |                       |
| <b>THIS SHEET INCLUDED FOR INFORMATION ONLY</b> |                       |
| ROW Team: A.TINKEN/J.LARSON                     |                       |
| ROW #: NHSN-150-2(73)--2R-10                    |                       |
| Plan Date: 9/26/17                              |                       |
| <b>Color Legend:</b>                            |                       |
|   | Property Lines        |
|   | Temporary Easement    |
|   | Permanent Acquisition |

108-23A  
08-01-08

### TRAFFIC CONTROL PLAN

1. At least one lane of traffic on Iowa 150 shall be maintained at all times.
2. Shoulder closures as necessary to jack pipe or tie joints shall be per Standard Road Plan TC-202.
3. Lane closures as necessary to install trenched pipe, tie joints, or repair collars shall be per Standard Road Plan TC-217 and details shown elsewhere in these plans.
4. Access to individual properties shall be maintained at all times.

108-26A  
08-01-08

### STAGING NOTES

Culverts installed by open trench methods shall be constructed half-at-a-time using single lane closures and TBR. Abandon existing culvert once new culvert is complete.

Stage construction of storm sewer system near Sta. 584 such that at least one entrance to the property remains open at all times.

113-2  
04-16-13

### PEDESTRIAN PATH CLOSURES

Refer to TC-601.

\*Assumes 6 foot wide barricade.  
Closures may need to be removed and re-established.

| Location    | Side | Type III<br>Barricades* | Remarks |
|-------------|------|-------------------------|---------|
|             |      | No.                     |         |
| Sta. 580+75 | RT   | 2                       |         |
| Sta. 585+50 | RT   | 2                       |         |

### STORM SEWER

① Diameter or equivalent diameter

\* Bid Item

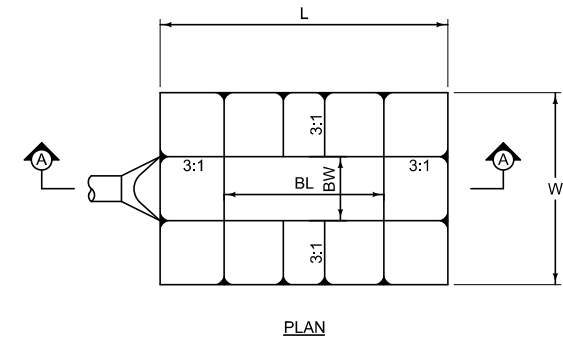
\*\* For SW-545

#### INTAKES AND UTILITY ACCESSES

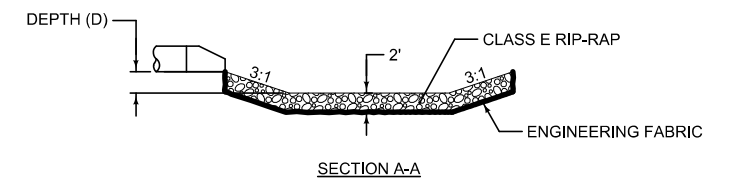
#### PIPES

Design Length, Slope, and Flowlines are calculated from center of structure to center of structure along CL of pipe.

| No. | Location Station and Offset | *Type or Standard Road Plan | Form Grade | Bottom Well | Extension Length** | Notes     | Line Number | Intake/Utility Access No. |      | Class 'D' | Pipe Size ① | Bid* Length | Design Length | Slope % | Connected Pipe Joint (DR-121) Type | Flow Lines      |                  |                 | Pipe Profile Sheet No. | Notes             |
|-----|-----------------------------|-----------------------------|------------|-------------|--------------------|-----------|-------------|---------------------------|------|-----------|-------------|-------------|---------------|---------|------------------------------------|-----------------|------------------|-----------------|------------------------|-------------------|
|     |                             |                             | Elev.      | Elev.       | FT                 |           |             | From                      | To   |           |             |             |               |         |                                    | Inlet Elevation | Outlet Elevation | Other Elevation |                        |                   |
|     |                             |                             |            |             |                    |           |             | IN                        | FT   |           |             |             |               |         |                                    | FT              |                  |                 |                        |                   |
| 1   | 581+73.2, 38.2' RT          | DR-201                      |            |             |                    | 66"       | P1          | 1                         | BEND | 2000      | 66          | 4           | 12.0          | 1.00    |                                    | 894.96          |                  | 894.84          |                        | 20 DEG BEND       |
| 2   | 583+10.4, 37.9' RT          | SW-402                      | 897.25     | 889.54      |                    | 40" x 77" |             | BEND                      | BEND | 2000      | 66          | 8           | 8.0           | 30.00   |                                    |                 |                  | 892.44          |                        | 20 DEG BEND       |
| 3   | 585+35.9, 51.8' RT          | SW-403                      | 897.22     | 884.2       |                    | 40" x 84" |             | BEND                      | RED  | 2000      | 66          | 8           | 8.0           | 1.91    |                                    |                 |                  | 892.28          |                        | W 66"-54" REDUCER |
| 4   | 586+28.7, 67.0' RT          | DR-201                      |            |             |                    | 60"       |             | RED                       | 2    | 2000      | 54          | 112         | 112.0         | 1.91    |                                    |                 | 890.14           |                 |                        |                   |
|     |                             |                             |            |             |                    |           | P2          | 2                         | 3    | 2000      | 54          | 230         | 230.0         | 1.91    |                                    | 890.04          |                  | 885.65          |                        |                   |
|     |                             |                             |            |             |                    |           | P3          | 3                         | 4    | 2000      | 60          | 90          | 98.0          | 1.07    |                                    | 884.70          |                  | 883.65          |                        |                   |



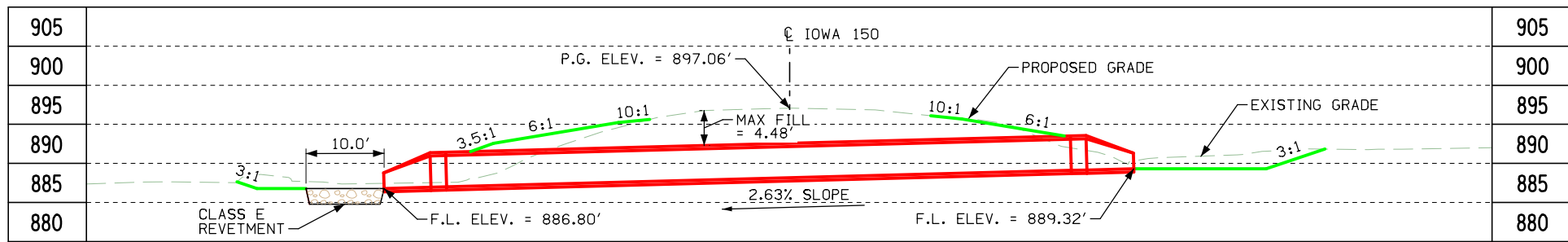
PLAN



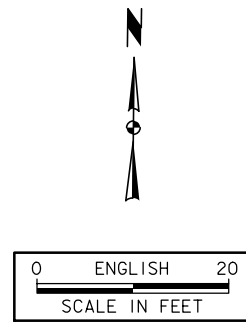
SECTION A-A

Refer to Tab 100-23  
For further information

SETTLING BASIN



LONGITUDINAL SECTION ALONG CL CULVERT



BENCH MARK NO.1  
 ELEV. 894.13  
 STA. 233+26.73, 61' RT  
 60D SPIKE IN POWER POLE

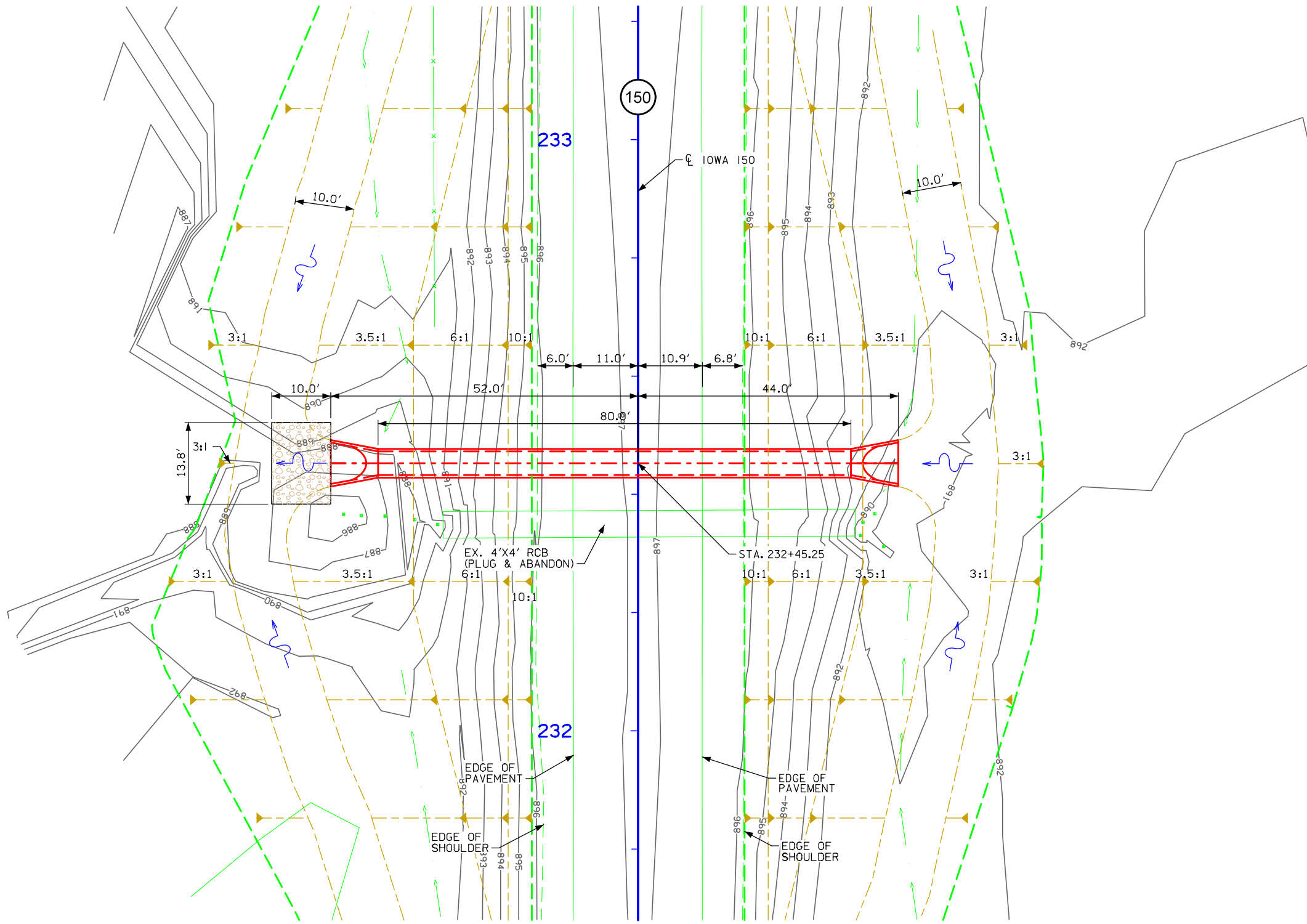
**HYDRAULIC DATA**

DRAINAGE AREA = 66.47 ACRES  
 $Q_{50} = 108.35$  CFS  
 HW ELEV. = 894.18'

**UTILITIES LEGEND:**  
 REFER TO SHEET D.1 FOR UTILITY LEGEND

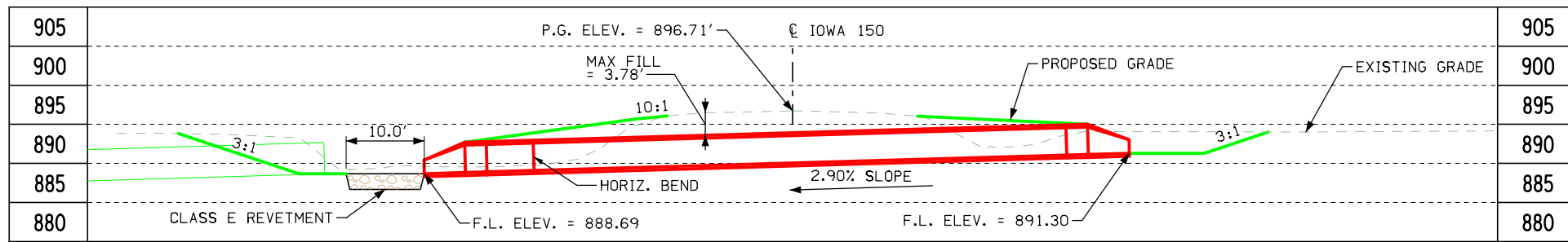
**LOCATION**

IOWA 150  
 T-87N R-9W  
 SECTION 9 & 10  
 HOMER TOWNSHIP  
 BUCHANAN COUNTY

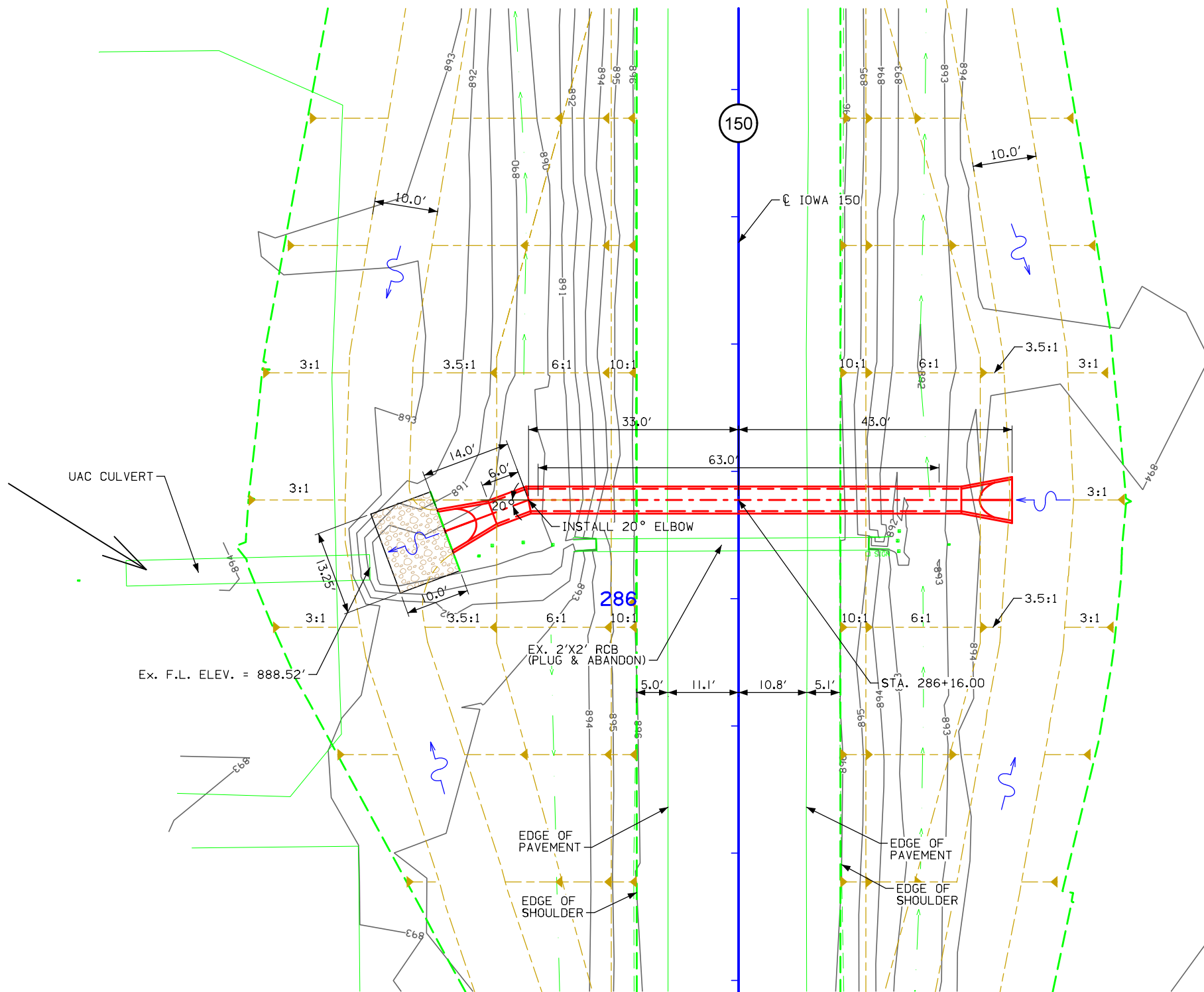


PLAT PLAN

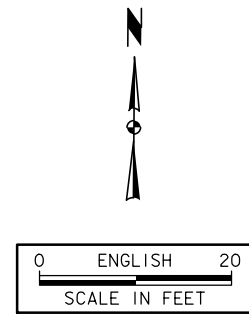
DESIGN FOR 0° SKEW  
**48" (TRENCHLESS) X 80'**  
**REINFORCED CONCRETE PIPE**  
 PLAT PLAN  
 STA. 232+45.25 CL IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. \_\_\_ OF \_\_\_ FILE NO. \_\_\_ DESIGN NO. \_\_\_



LONGITUDINAL SECTION ALONG  $\phi$  CULVERT



PLAT PLAN



BENCH MARK NO.2  
 ELEV. 894.86  
 STA. 285+62.86, 40' LT  
 60D SPIKE IN POWER POLE

**HYDRAULIC DATA**

DRAINAGE AREA = 31.92 ACRES  
 $Q_{50}$  = 63.01 CFS  
 HW ELEV. = 893.04

**UTILITIES LEGEND:**

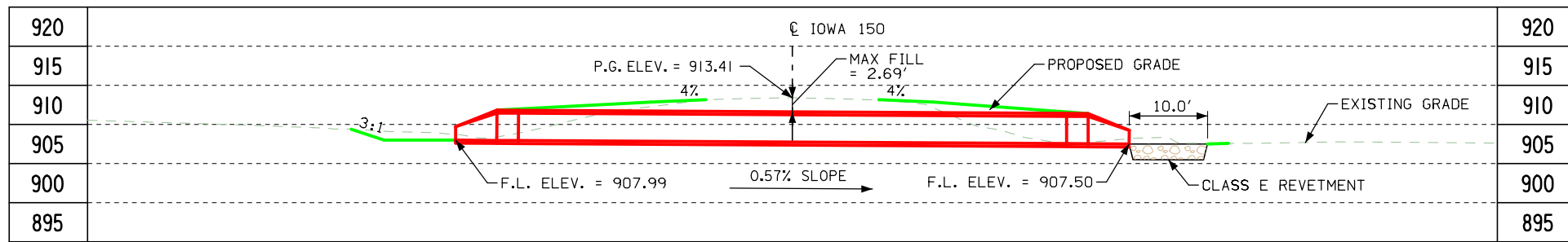
REFER TO SHEET D,1 FOR UTILITY LEGEND

**LOCATION**

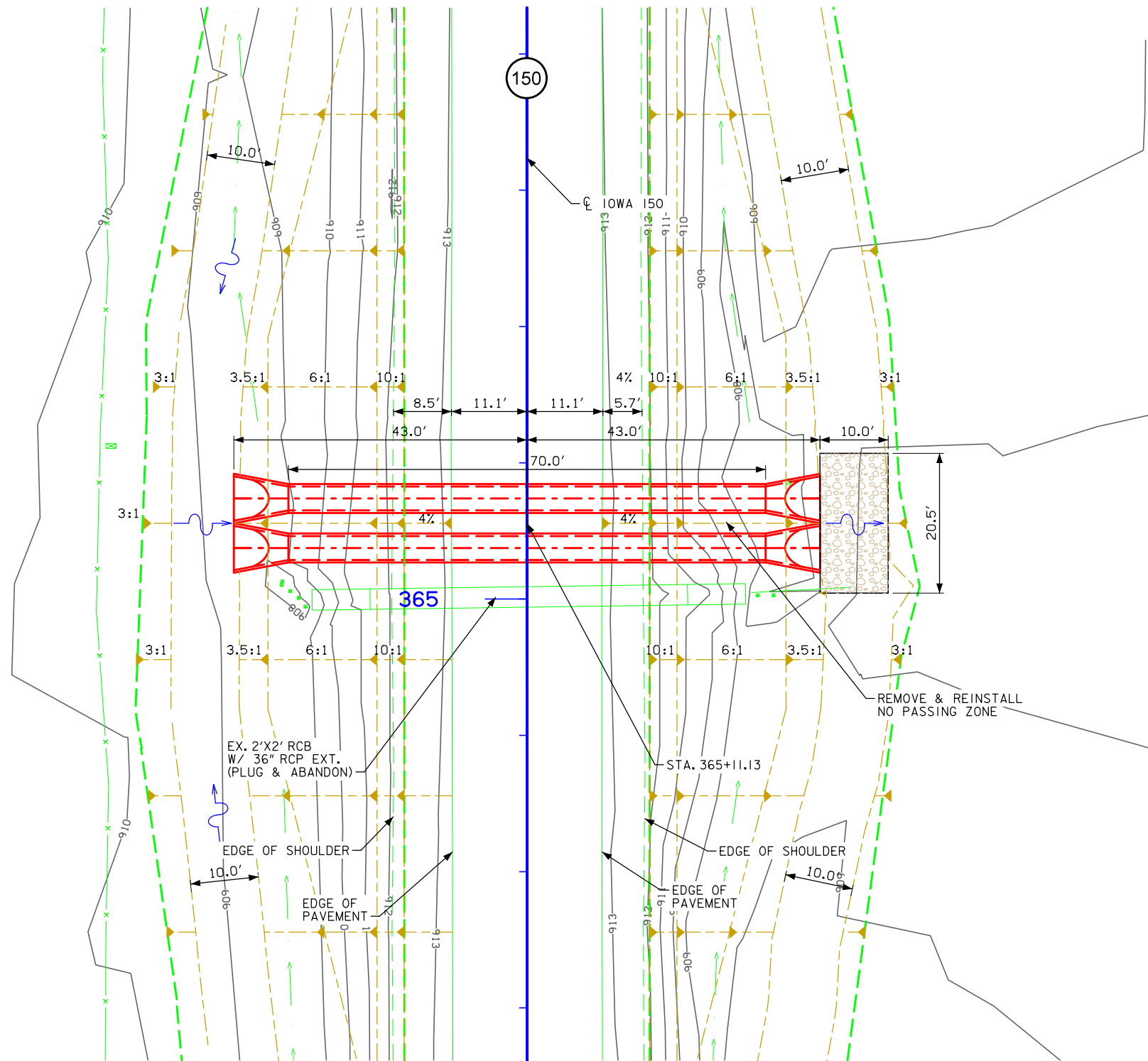
IOWA 150  
 T-87N R-9W  
 SECTION 3 & 4  
 HOMER TOWNSHIP  
 BUCHANAN COUNTY

DESIGN FOR 0° SKEW  
**42" EQUIVALENT X 74'**  
**LOW CLEARANCE**  
**REINFORCED CONCRETE PIPE**  
**PLAT PLAN**  
 STA. 286+16.00  $\phi$  IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. \_\_\_\_ OF \_\_\_\_ FILE NO. \_\_\_\_ DESIGN NO. \_\_\_\_

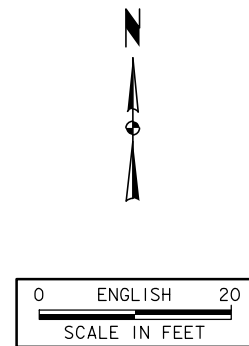




LONGITUDINAL SECTION ALONG  $\phi$  CULVERT



PLAT PLAN



BENCH MARK NO.3  
ELEV. 912.61  
STA. 364+17.04, 61' LT  
60D SPIKE IN POWER POLE

HYDRAULIC DATA

DRAINAGE AREA = 79.54 ACRES  
 $Q_{50} = 124.25$  CFS

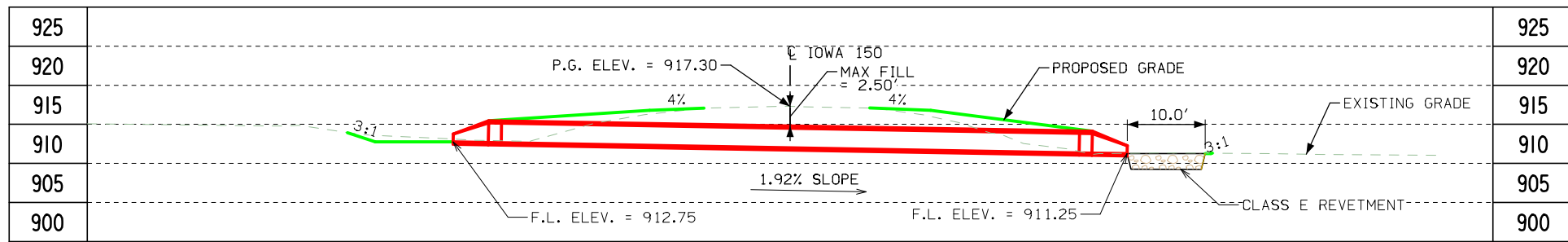
UTILITIES LEGEND:

REFER TO SHEET D.1 FOR UTILITY LEGEND

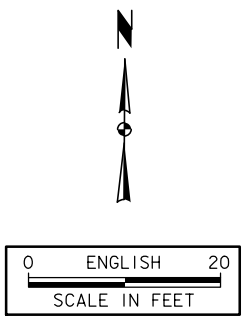
LOCATION

IOWA 150  
T-88N R-9W  
SECTION 33 & 34  
SUMNER TOWNSHIP  
BUCHANAN COUNTY

DESIGN FOR 0° SKEW  
**TWIN 42" EQUIVALENT X 70'  
LOW CLEARANCE  
REINFORCED CONCRETE PIPE  
PLAT PLAN**  
STA. 365+11.13  $\phi$  IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
DESIGN SHEET NO. \_\_\_\_ OF \_\_\_\_ FILE NO. \_\_\_\_ DESIGN NO. \_\_\_\_



LONGITUDINAL SECTION ALONG CULVERT



BENCH MARK NO.4  
 ELEV. 917.10  
 STA. 375+44.11, 61' LT  
 60D SPIKE IN POWER POLE

**HYDRAULIC DATA**

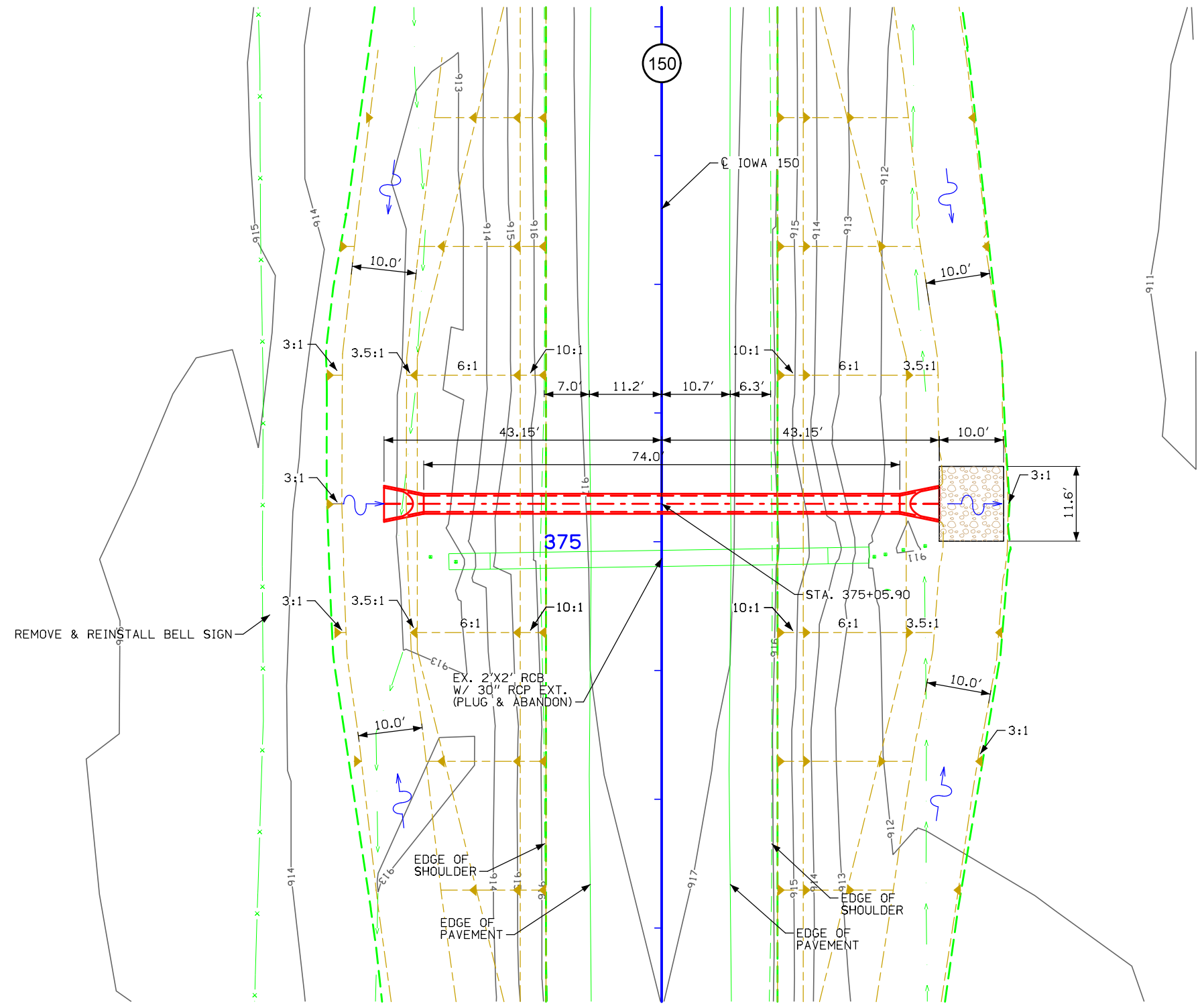
DRAINAGE AREA = 8.83 ACRES  
 Q<sub>50</sub> = 24.72 CFS

**UTILITIES LEGEND:**

REFER TO SHEET D.1 FOR UTILITY LEGEND

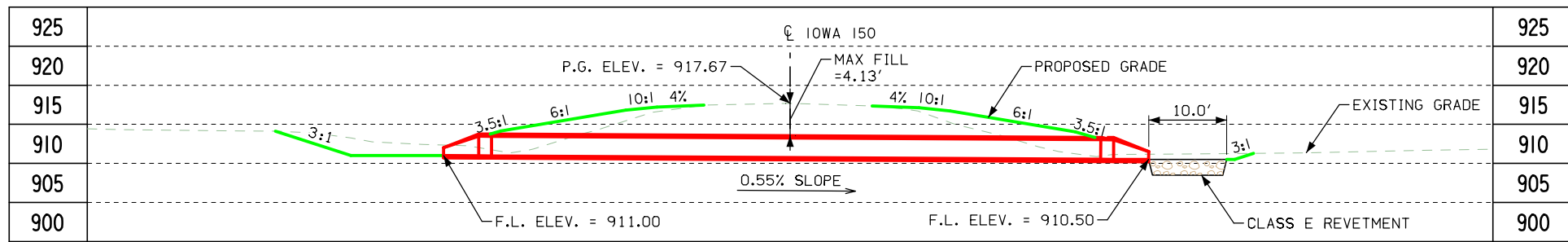
**LOCATION**

IOWA 150  
 T-88N R-9W  
 SECTION 27 & 28  
 SUMNER TOWNSHIP  
 BUCHANAN COUNTY

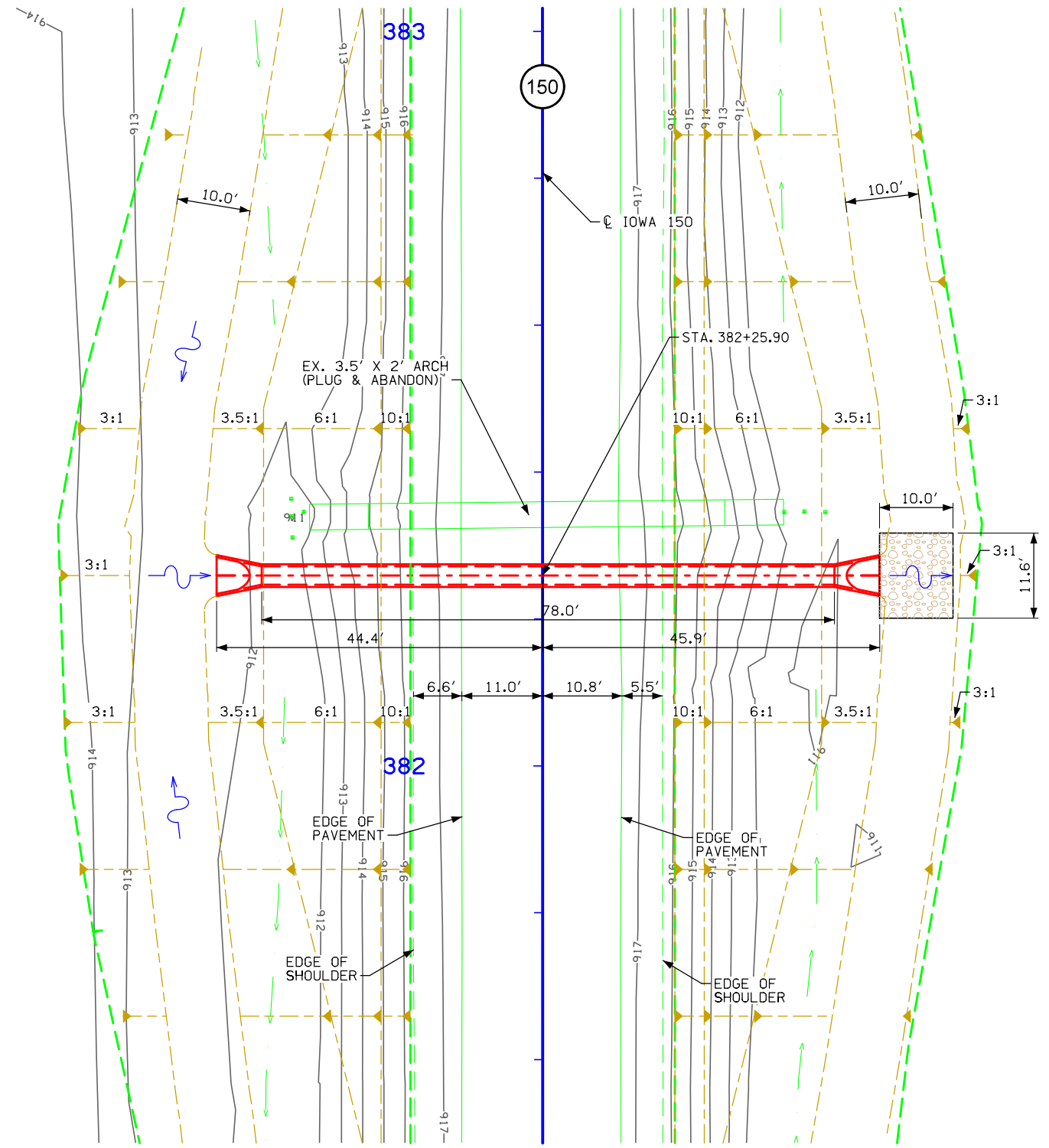


PLAT PLAN

DESIGN FOR 0° SKEW  
**30" (TRENCHLESS) X 74'**  
**REINFORCED CONCRETE PIPE**  
 PLAT PLAN  
 STA. 375+05.90 C IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
 IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
 DESIGN SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_ FILE NO. \_\_\_\_\_ DESIGN NO. \_\_\_\_\_



LONGITUDINAL SECTION ALONG  $\phi$  CULVERT



PLAT PLAN

N  
↑  
↓

0 ENGLISH 20  
SCALE IN FEET

BENCH MARK NO.5  
ELEV. 916.11  
STA. 383+72.31, 61' LT  
60D SPIKE IN POWER POLE

**HYDRAULIC DATA**

DRAINAGE AREA = 10.30 ACRES  
Q<sub>50</sub> = 27.31 CFS

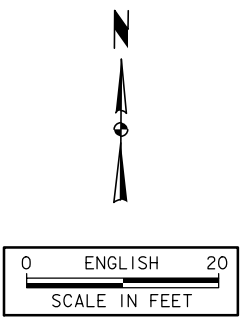
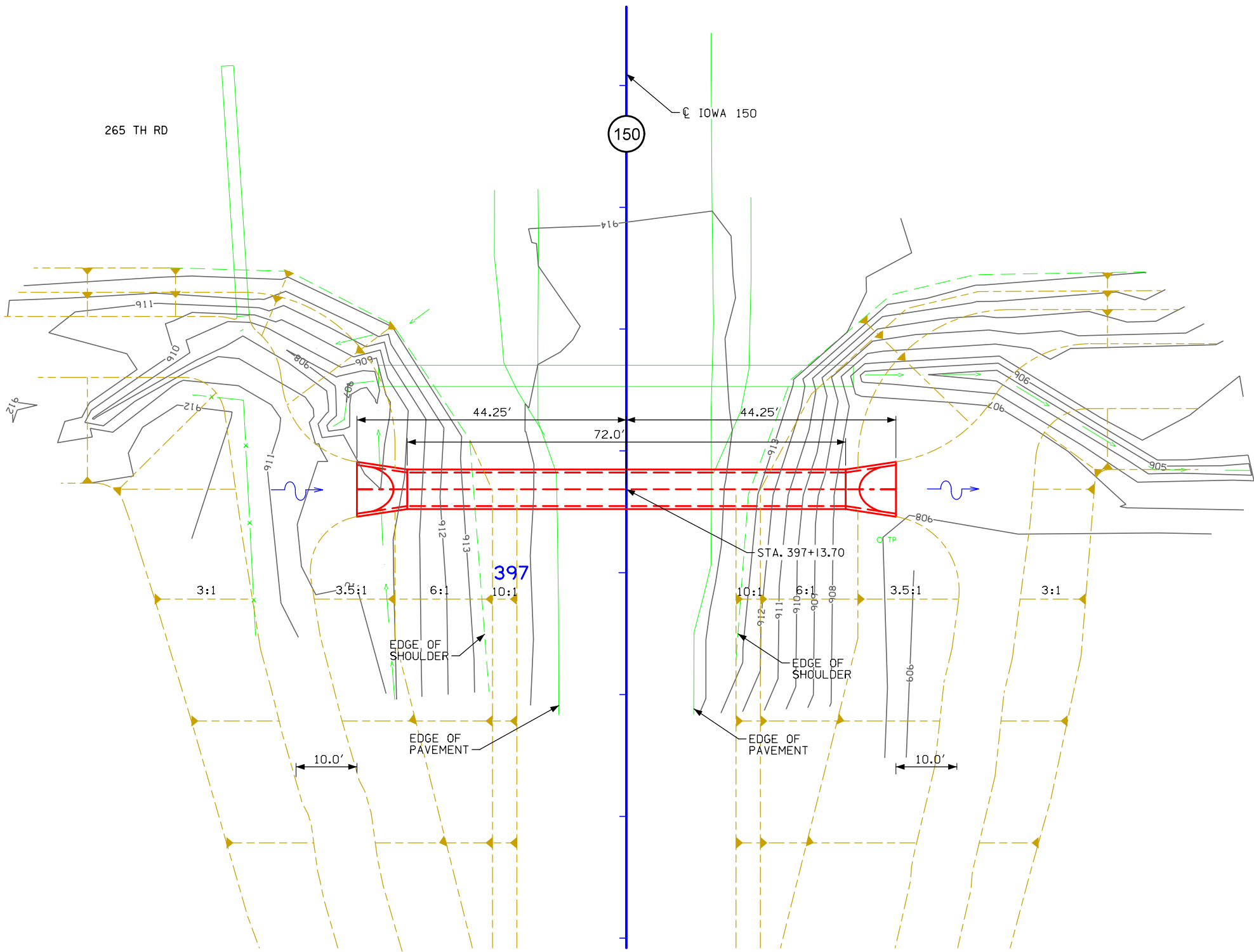
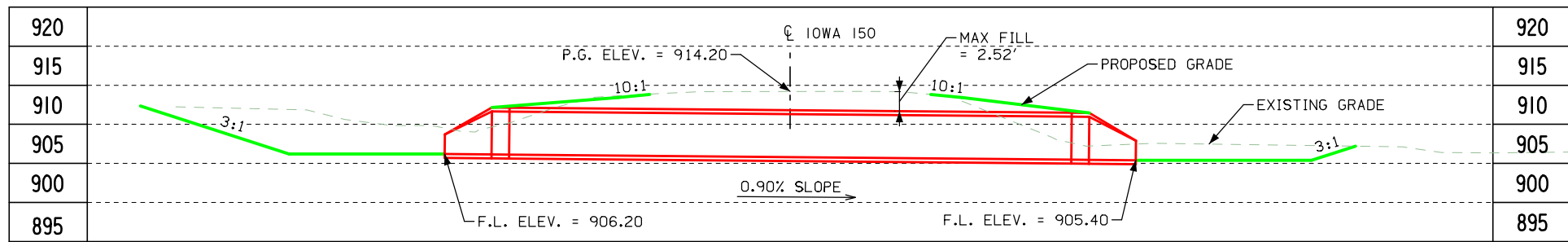
**UTILITIES LEGEND:**

REFER TO SHEET D.1 FOR UTILITY LEGEND

**LOCATION**

IOWA 150  
T-88N R-9W  
SECTION 27 & 28  
SUMNER TOWNSHIP  
BUCHANAN COUNTY

DESIGN FOR 0° SKEW  
**30" (TRENCHLESS) X 78'  
REINFORCED CONCRETE PIPE**  
PLAT PLAN  
STA. 382+25.90  $\phi$  IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
DESIGN SHEET NO. \_\_\_\_ OF \_\_\_\_ FILE NO. \_\_\_\_ DESIGN NO. \_\_\_\_



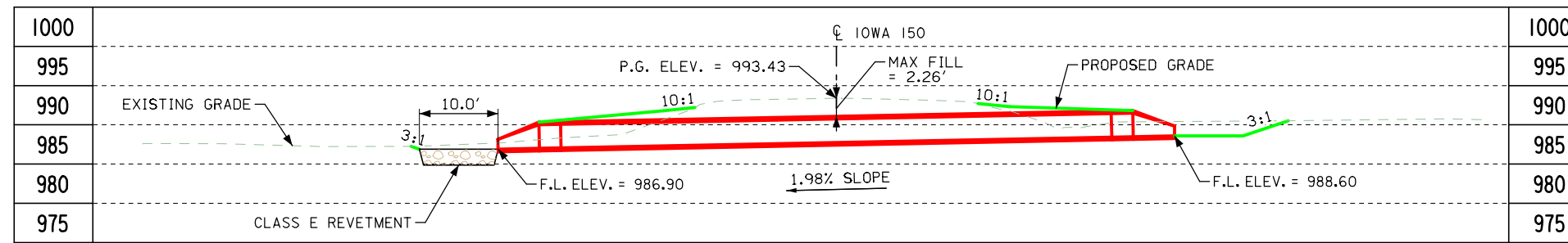
BENCH MARK NO.7  
ELEV. 991.53  
STA. 318+95.66, 33' RT  
2" ALUMINIUM DISC

**HYDRAULIC DATA**  
DRAINAGE AREA = 140 ACRES  
 $Q_{50}$  = 188.00 CFS

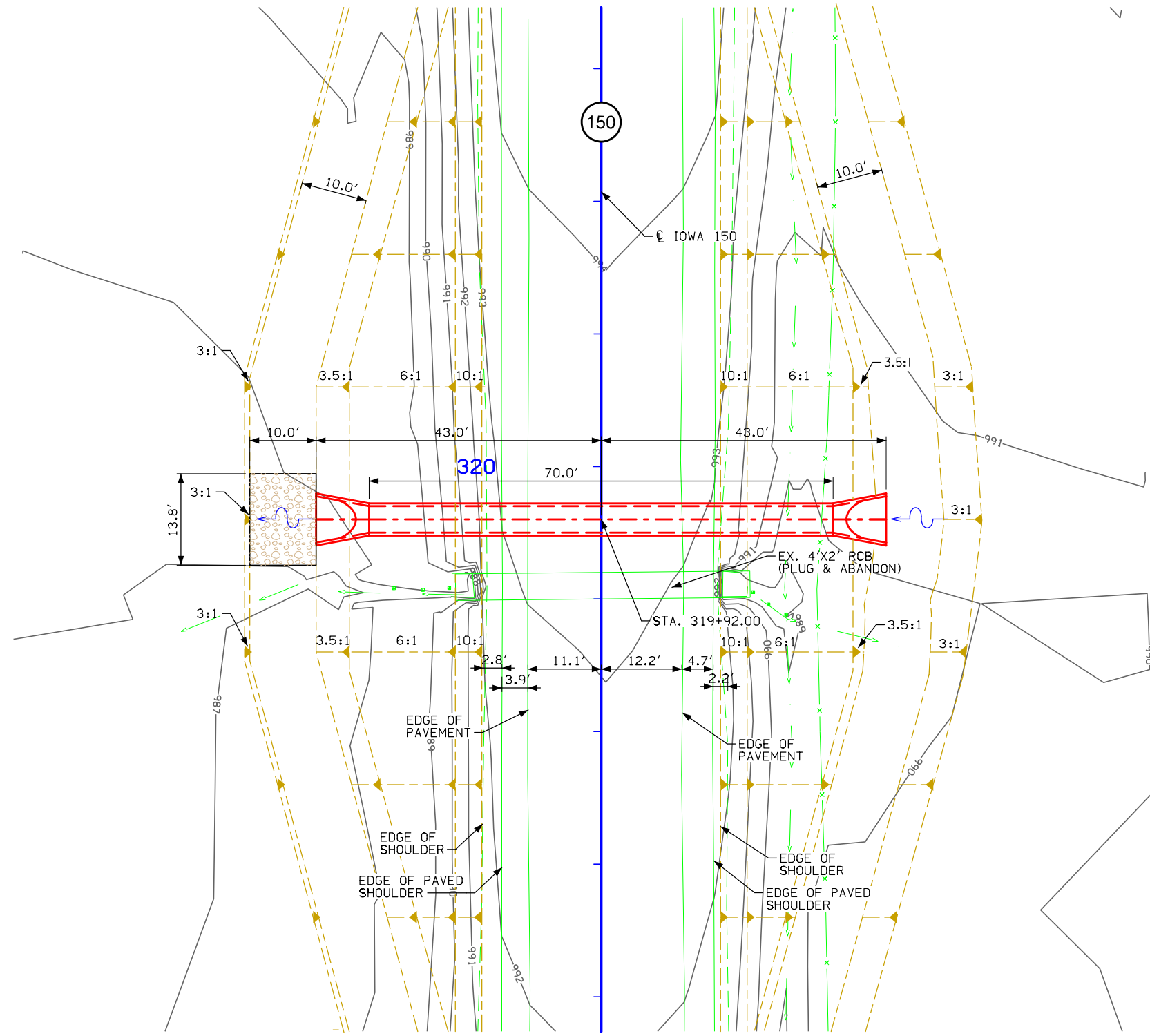
**UTILITIES LEGEND:**  
REFER TO SHEET D.1 FOR UTILITY LEGEND

**LOCATION**  
IOWA 150  
T-89N R-9W  
SECTION 3 & 4  
WASHINGTON TOWNSHIP  
BUCHANAN COUNTY

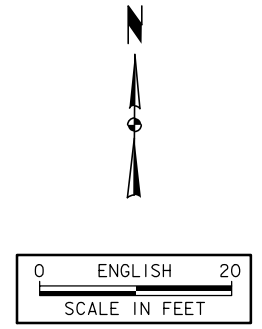
DESIGN FOR 0° SKEW  
**66" (TRENCHLESS) X 72'  
REINFORCED CONCRETE PIPE**  
**PLAT PLAN**  
STA. 397+13.70  $\text{CL}$  IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
DESIGN SHEET NO. \_\_\_ OF \_\_\_ FILE NO. \_\_\_ DESIGN NO. \_\_\_



LONGITUDINAL SECTION ALONG  $\bar{C}$  CULVERT



PLAT PLAN



BENCH MARK NO.7  
ELEV. 991.53  
STA. 318+95.66, 33' RT  
2" ALUMINIUM DISC

**HYDRAULIC DATA**  
DRAINAGE AREA = 47.59 ACRES  
 $Q_{50} = 84.65$  CFS

**UTILITIES LEGEND:**  
REFER TO SHEET D.1 FOR UTILITY LEGEND

**LOCATION**  
IOWA 150  
T-89N R-9W  
SECTION 3 & 4  
WASHINGTON TOWNSHIP  
BUCHANAN COUNTY

DESIGN FOR 0° SKEW  
**48" EQUIVALENT X 70'  
LOW CLEARANCE REINFORCED  
CONCRETE PIPE  
PLAT PLAN**  
STA. 319+92.00  $\bar{C}$  IOWA 150 DEC. 2018  
**BUCHANAN COUNTY**  
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
DESIGN SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_ FILE NO. \_\_\_\_\_ DESIGN NO. \_\_\_\_\_