DELAWARE RIVER
STREAMBANK STABILIZATION
SITE D24
ATCHISON COUNTY, KANSAS

NW 1/4 SECTION 5, TOWNSHIP 7 SOUTH, RANGE 17 EAST

ATCHISON COUNTY MAP
NOT TO SCALE

Sheet Index

Sheet Number	Sheet Title
1	Cover Sheet
2 - 3	Plan Sheets
4 - 5	Detail Sheets
6	Profile Sheet
7 - 8	Cross Section Sheets

SITE QUANTITIES

Quantities List	
Rock / Cubic Yards	1,462
Rock / Tons	2,335
Soil moving / Cubic Yards	17,135
Wood Toe Revetment / Linear Feet	508
Tree Removal / Lump Sum	1
Pipe Letdown / Lump sum	1
Bare Root Trees / Each	250
Willow Cuttings / Each	600
Streambank Slope Native Grass Seeding / Acres	1.9
Streambank Slope Wildrye / Pounds Pure Live Seed	47.5
Streambank Slope Cover Crop Seeding / Acres	1.9
Streambank Slope Oats / Pounds Pure Live Seed	76.0
66-Foot Buffer Cover Crop Seeding / Acres	1.5
66-Foot Buffer Oats / Pounds Pure Live Seed	60.0
Streambank Slope Mulching / Acres	1.9
Streambank Slope Mulching / Pounds	7,600

SITE LOCATION MAP
NOT TO SCALE

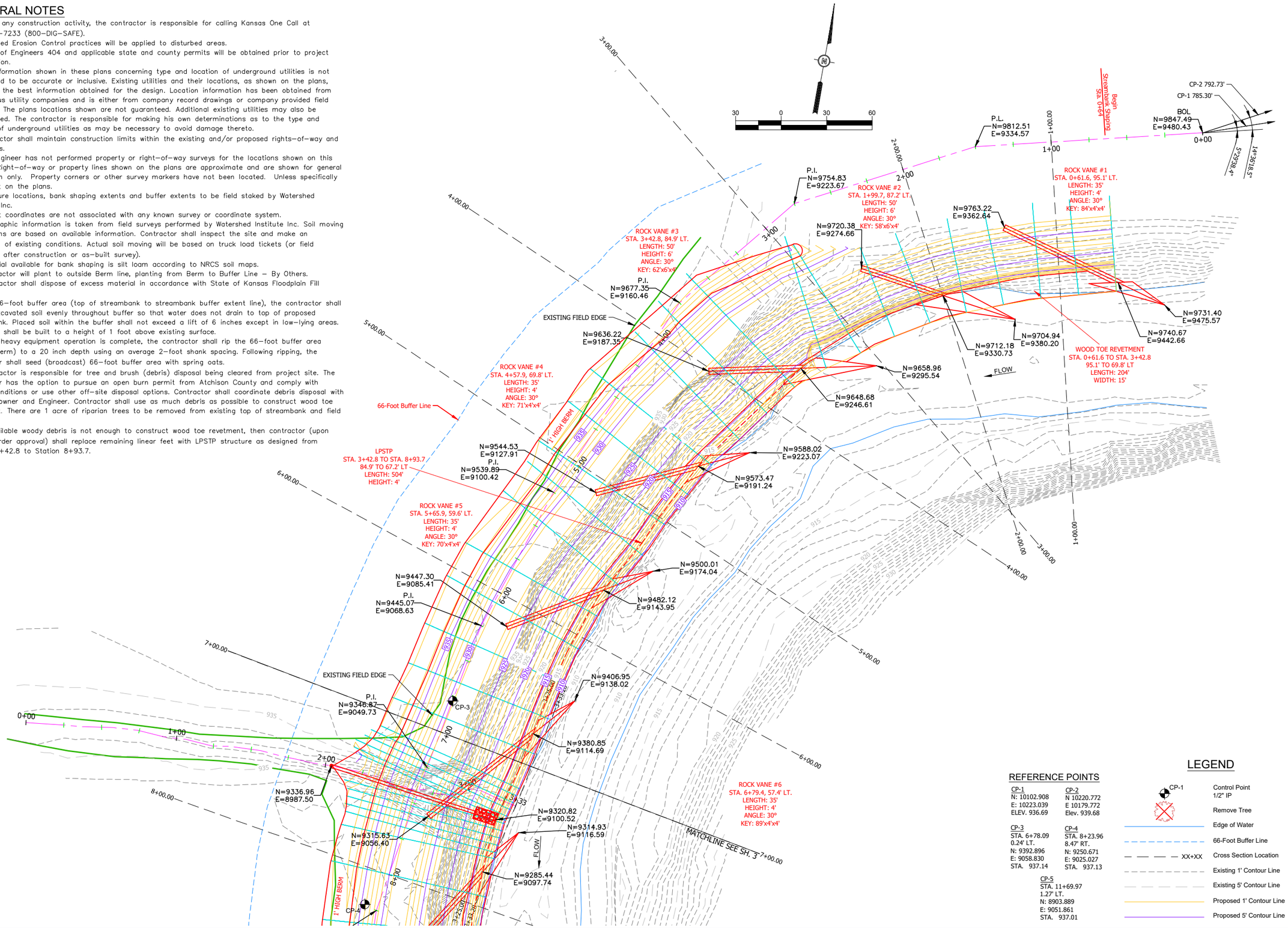
THE WATERSHED INSTITUTE
1200 SW Executive Dr. Topeka, KS 66615 (913) 685-4600

GREDELL Engineering Resources, Inc.
Environmental Engineering LAND - AIR - WATER
9718 Rosehill Road Telephone: (913) 808-5004
Lenexa, Kansas Fax: (913) 307-2028
When Experience Counts, Count on Us!

JOHN N. BROWNING LICENSED 10599 07-22-2024 KANSAS PROFESSIONAL ENGINEER

GENERAL NOTES

1. Before any construction activity, the contractor is responsible for calling Kansas One Call at 800-344-7233 (800-DIG-SAFE).
2. Accepted Erosion Control practices will be applied to disturbed areas.
3. Corps of Engineers 404 and applicable state and county permits will be obtained prior to project construction.
4. The information shown in these plans concerning type and location of underground utilities is not guaranteed to be accurate or inclusive. Existing utilities and their locations, as shown on the plans, represent the best information obtained for the design. Location information has been obtained from the various utility companies and is either from company record drawings or company provided field locations. The plans locations shown are not guaranteed. Additional existing utilities may also be encountered. The contractor is responsible for making his own determinations as to the type and location of underground utilities as may be necessary to avoid damage thereto.
5. Contractor shall maintain construction limits within the existing and/or proposed rights-of-way and easements.
6. The engineer has not performed property or right-of-way surveys for the locations shown on this project. Right-of-way or property lines shown on the plans are approximate and are shown for general orientation only. Property corners or other survey markers have not been located. Unless specifically called out on the plans.
7. Structure locations, bank shaping extents and buffer extents to be field staked by Watershed Institute, Inc.
8. Project coordinates are not associated with any known survey or coordinate system.
9. Topographic information is taken from field surveys performed by Watershed Institute Inc. Soil moving calculations are based on available information. Contractor shall inspect the site and make an evaluation of existing conditions. Actual soil moving will be based on truck load tickets (or field measured after construction or as-built survey).
10. Material available for bank shaping is silt loam according to NRCS soil maps.
11. Contractor will plant to outside Berm line, planting from Berm to Buffer Line – By Others.
12. Contractor shall dispose of excess material in accordance with State of Kansas Floodplain Fill Statues.
13. For 66-foot buffer area (top of streambank to streambank buffer extent line), the contractor shall spread excavated soil evenly throughout buffer so that water does not drain to top of proposed streambank. Placed soil within the buffer shall not exceed a lift of 6 inches except in low-lying areas. The berm shall be built to a height of 1 foot above existing surface.
14. Once heavy equipment operation is complete, the contractor shall rip the 66-foot buffer area (except berm) to a 20 inch depth using an average 2-foot shank spacing. Following ripping, the contractor shall seed (broadcast) 66-foot buffer area with spring oats.
15. Contractor is responsible for tree and brush (debris) disposal being cleared from project site. The contractor has the option to pursue an open burn permit from Atchison County and comply with permit conditions or use other off-site disposal options. Contractor shall coordinate debris disposal with property owner and Engineer. Contractor shall use as much debris as possible to construct wood toe revetment. There are 1 acre of riparian trees to be removed from existing top of streambank and field edge.
16. If available woody debris is not enough to construct wood toe revetment, then contractor (upon change order approval) shall replace remaining linear feet with LPSTP structure as designed from Station 3+42.8 to Station 8+93.7.



REFERENCE POINTS

CP-1	CP-2
N: 10102.908	N 10220.772
E: 10223.039	E 10179.772
ELEV. 936.69	Elev. 939.68

CP-3	CP-4
STA. 6+78.09	STA. 8+23.96
0.24' LT.	8.47' RT.
N: 9392.896	N: 9250.671
E: 9058.830	E: 9025.027
STA. 937.14	STA. 937.13

CP-5
STA. 11+69.97
1.27' LT.
N: 8903.889
E: 9051.861
STA. 937.01

LEGEND

- CP-1 — Control Point 1/2" IP
- Remove Tree
- Edge of Water
- 66-Foot Buffer Line
- XX+XX — Cross Section Location
- Existing 1' Contour Line
- Existing 5' Contour Line
- Proposed 1' Contour Line
- Proposed 5' Contour Line

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DELAWARE RIVER
ATCHISON COUNTY, KANSAS

SITE D24
PLAN SHEET

JOHN N. BROWNING LICENSED 10209 07-22-2020 KANSAS PROFESSIONAL ENGINEER

DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALETAG	AS NOTED
DATE:	1/7/2020
DRAWING NO:	CO2
SHEET NO:	2 of 8

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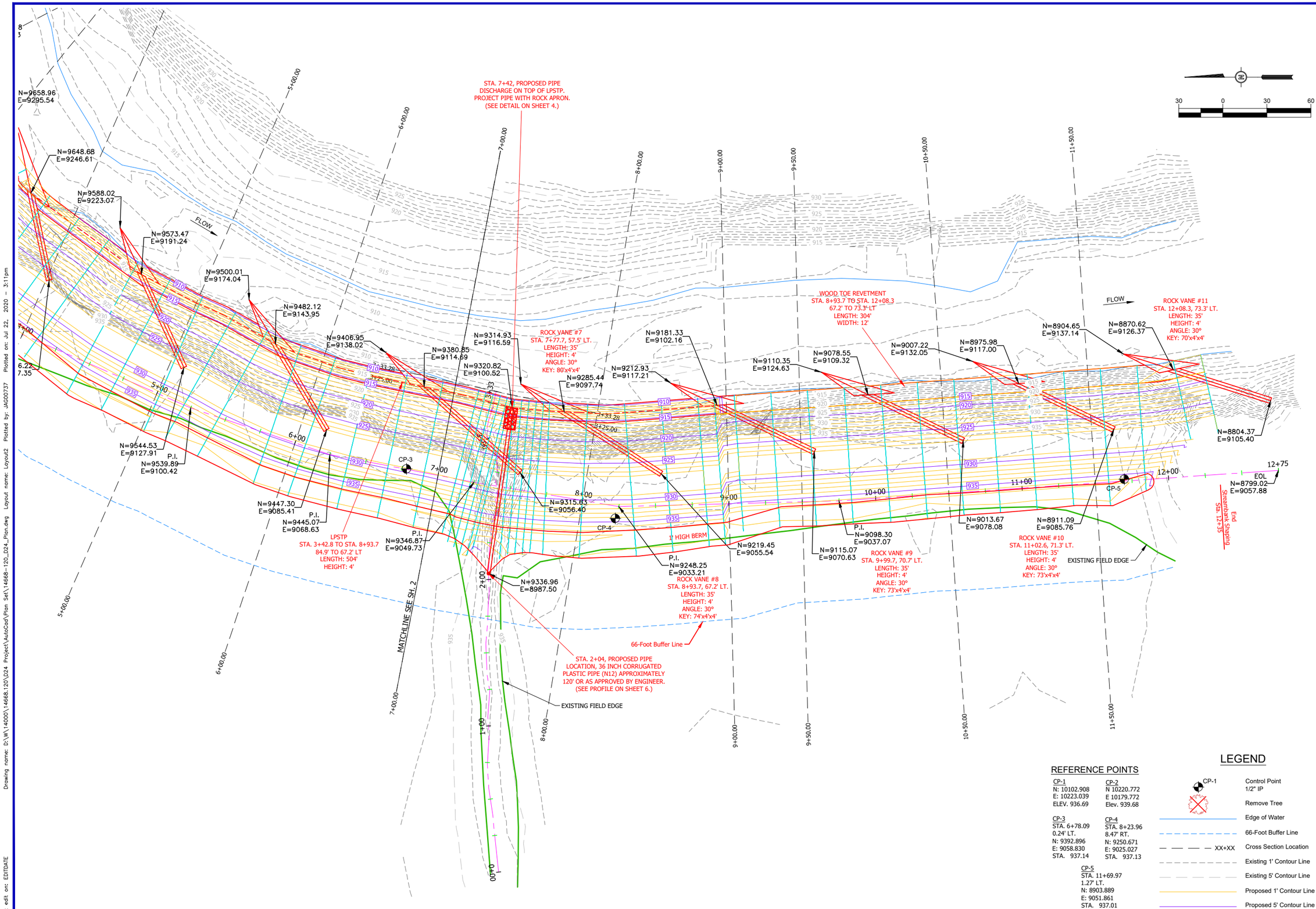

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	Remove Tree
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	66-Foot Buffer Line
XX+XX	Cross Section Location
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	Proposed 1' Contour Line
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DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D24
PLAN SHEET

JOHN N. BROWNING LICENSED 10599 07-22-2020 KANSAS PROFESSIONAL ENGINEER

DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALETAG	AS NOTED
DATE:	1/7/2020
DRAWING NO:	CO3
SHEET NO:	3 of 8

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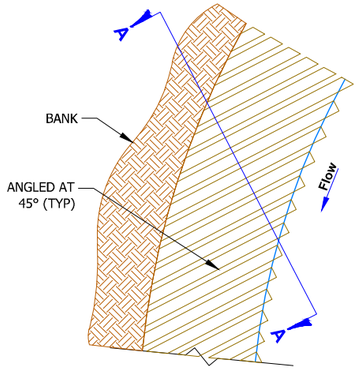
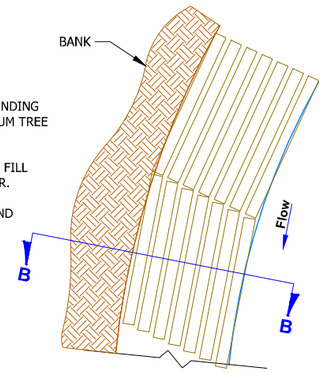


1ST, 3RD, 5TH
WOOD TOE LAYER
PLAN

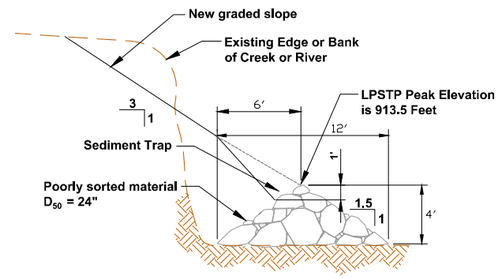
NUMBER OF TREES WILL VARY DEPENDING ON DIAMETER AND LENGTH. MINIMUM TREE DIAMETER IS 12-INCHES.

USE SOIL AND SMALL BRANCHES TO FILL VOIDS BEFORE PLACING NEXT LAYER.

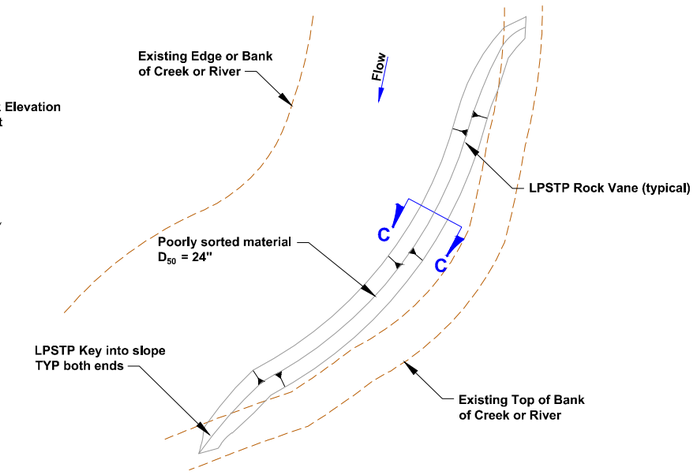
PLACE 6-INCHES OF SOIL ON TOP AND VEGETATE.



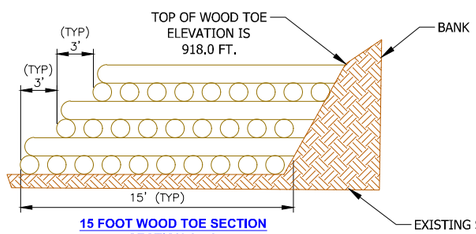
2ND, 4TH, 6TH
WOOD TOE LAYER
PLAN



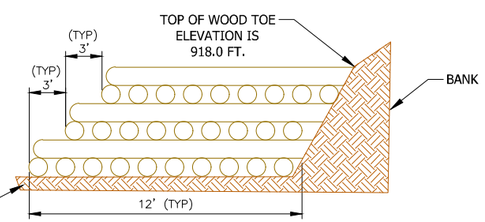
LPSTP 2 CROSS SECTION C-C



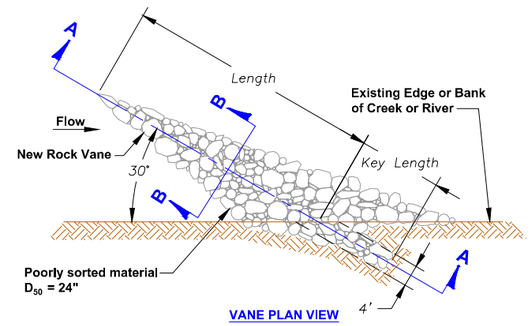
LONGITUDINAL PEAKED STONE TOE PROTECTION
(LPSTP)
PLAN VIEW



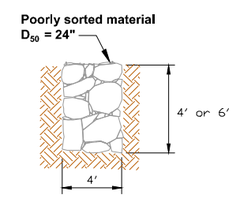
15 FOOT WOOD TOE SECTION
SECTION A - A



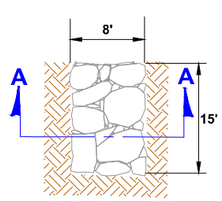
12 FOOT WOOD TOE SECTION
SECTION B - B



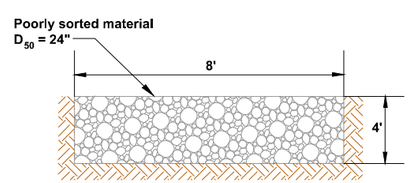
VANE PLAN VIEW



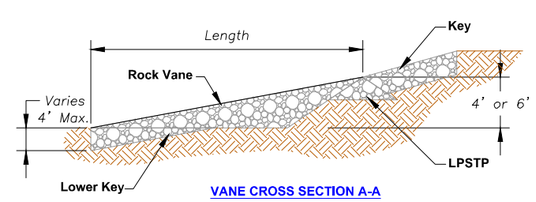
VANE KEY SECTION VIEW



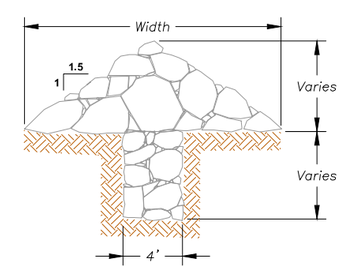
APRON PLAN VIEW



APRON CROSS SECTION A-A



VANE CROSS SECTION A-A



VANE CROSS SECTION B-B

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DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D24
DETIALS

JOHN N. BROWNING LICENSED 10503 07-22-2020 KANSAS PROFESSIONAL ENGINEER

DESIGNED	BAE
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALE:	AS NOTED
DATE:	1/7/2020
DRAWING NO:	CO4
SHEET NO:	4 of 8

Structure Specification Sheet

Project Name	Stream	County	State	Streambank	
D24	Delaware River	Atchison	Kansas	Length (ft)	Height (ft)
				Shaped / Total	24.5
				1,171 / 1,275	

Structure								Key		
Number	Type	Spacing (ft)	Angle (Degrees)	Height (ft)	Length (ft)	Key Length (ft)	Volume (yd^3)	Volume (yd^3)	Tons	Material Specifications
1	LPSTP	-	-	4	504	-	448	-	739	Poorly Sorted Limestone Rock (D_{50} = 24")
1	Rock Vane	105	30	4	35	84	31	50	126	Poorly Sorted Limestone Rock (D_{50} = 24")
2	Rock Vane	105	30	6	50	58	100	52	243	Poorly Sorted Limestone Rock (D_{50} = 24")
3	Rock Vane	105	30	6	50	62	100	56	249	Poorly Sorted Limestone Rock (D_{50} = 24")
4	Rock Vane	105	30	4	35	71	31	42	114	Poorly Sorted Limestone Rock (D_{50} = 24")
5	Rock Vane	105	30	4	35	70	31	42	114	Poorly Sorted Limestone Rock (D_{50} = 24")
6	Rock Vane	105	30	4	35	89	31	53	131	Poorly Sorted Limestone Rock (D_{50} = 24")
1	Rock Apron	-	-	4	15	-	18	-	30	Poorly Sorted Limestone Rock (D_{50} = 24")
7	Rock Vane	105	30	4	35	80	31	48	123	Poorly Sorted Limestone Rock (D_{50} = 24")
8	Rock Vane	105	30	4	35	74	31	44	117	Poorly Sorted Limestone Rock (D_{50} = 24")
9	Rock Vane	105	30	4	35	73	31	44	117	Poorly Sorted Limestone Rock (D_{50} = 24")
10	Rock Vane	105	30	4	35	73	31	44	117	Poorly Sorted Limestone Rock (D_{50} = 24")
11	Rock Vane	-	30	4	35	70	31	42	114	Poorly Sorted Limestone Rock (D_{50} = 24")
							945	517	2,335	
						Total cu yds	1,462			

Site Information

Bank Erodibility Hazard Index	42.6	BkF Elev	927.9	At Station	2+00
Near Bank Stress (lb./sq. ft)	1.25	Rosgen Classification		C5c-	
Estimated Annual Erosion (ft/yr.)	1.4	Width/Depth Ratio		13.2	
Schumm Channel Stage	IV	Entrenchment Ratio		29.6	
Radius of Curvature (ft)	594	Channel Width (ft)		166	
Tortuosity	3.58	Shear Stress (lbs./sq. ft)		0.75	
Hydraulic Radius (ft)	12.0	Slope = (ft/ ft)		0.00100	
Mean Depth (ft)	12.6	Wetted Perimeter (ft)		174.0	
Cross Sectional Area (sq. ft)	2,088	Manning's n		0.048	
Bank Full Discharge (cfs)	10,881	Mean Velocity (ft/sec)		5.21	
Q_5 Discharge (cfs)	18,100	Drainage Area (sq. mi)		576.4	

Quantities List

Rock / Cubic Yards	1,462
Rock / Tons	2,335
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66-Foot Buffer Oats / Pounds Pure Live Seed	60.0
Streambank Slope Mulching / Acres	1.9
Streambank Slope Mulching / Pounds	7,600

Streambank Slope Native Grass Seeding Table

Species	Variety	PLS (lbs/acre)	Percent of Mix	PLS (lbs/acre)	Acres	Total PLS (lbs)
Virginia Wildrye	Omaha	25.0	100	25.00	1.9	47.50

Notes:
Native Grass to be planted between August 15-October 1; December 1-April 15

Strembank slope Cover Crop Seeding Table

Species	PLS (lbs/acre)	Percent of Mix	PLS (lbs/acre)	Acres	Total PLS (lbs)
Oats	40.0	100	40.00	1.9	76.00

Notes:
Cover Crop to be planted following construction

66-Foot Buffer Cover Crop Seeding Table

Species	PLS (lbs/acre)	Percent of Mix	PLS (lbs/acre)	Acres	Total PLS (lbs)
Oats	40.0	100	40.00	1.5	60.00

Notes:
Cover Crop to be planted following construction

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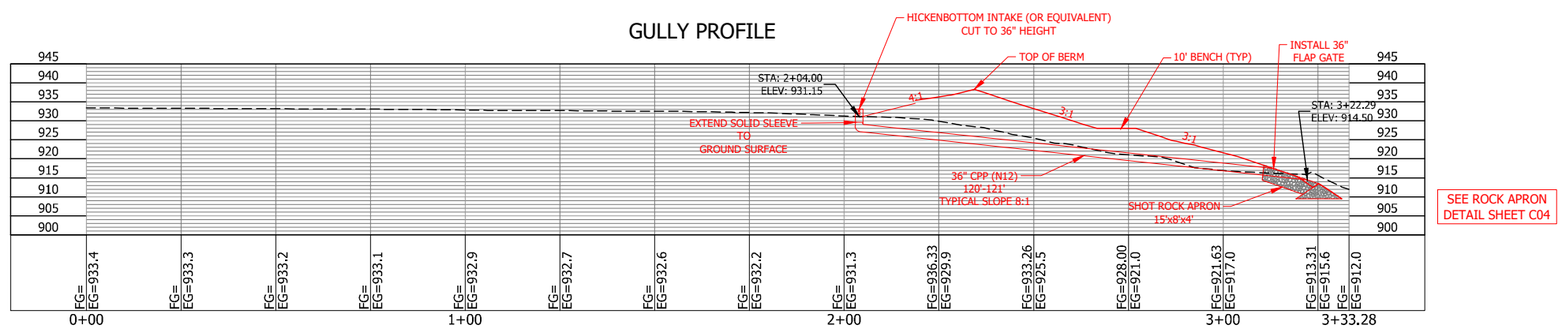
DELAWARE RIVER
ATCHISON COUNTY, KANSAS

SITE D24
DETIALS

JOHN N. BROWNING LICENSED 10590 07-22-2020 KANSAS PROFESSIONAL ENGINEER

DESIGNED	BAE
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALE:	AS NOTED
DATE:	1/7/2020
DRAWING NO:	CO5
SHEET NO:	5 of 8

GULLY PROFILE



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DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D24
GULLY PROFILE SHEET

JOHN N. BROWNING
LICENSED
10599
07-22-2020
KANSAS
PROFESSIONAL ENGINEER

DESIGNED	PGB
DRAWN BY:	JAC
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALETAG	AS NOTED
DATE:	1/7/2020
DRAWING NO:	CO6
SHEET NO:	6 of 8

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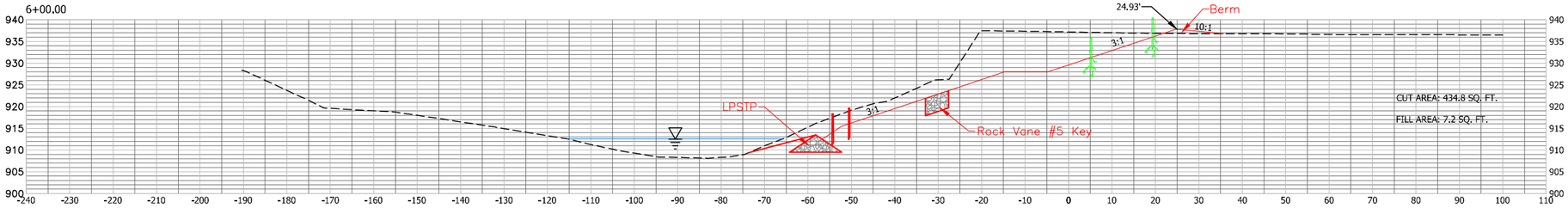

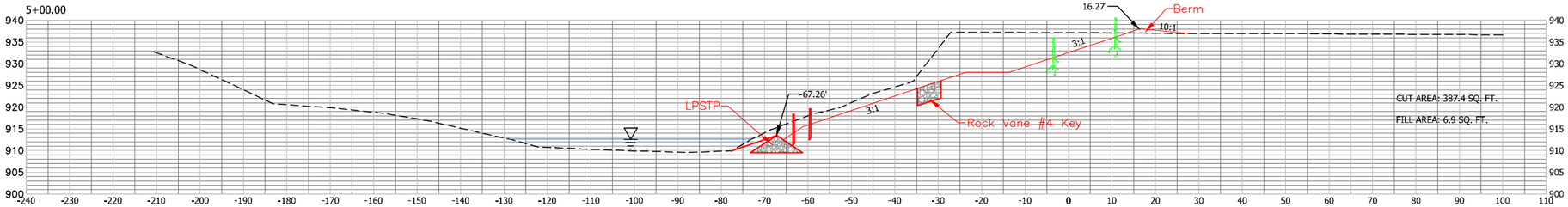

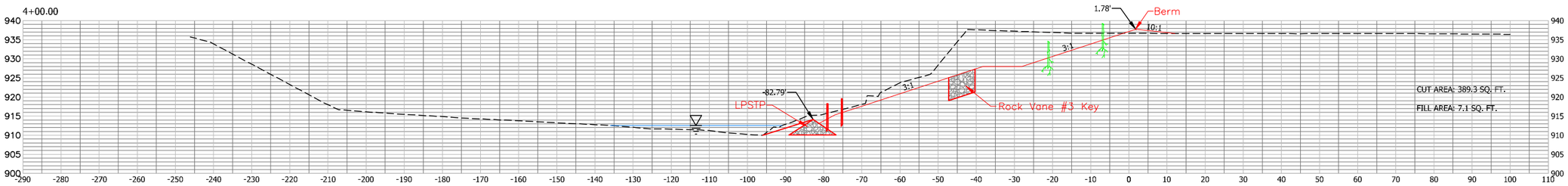

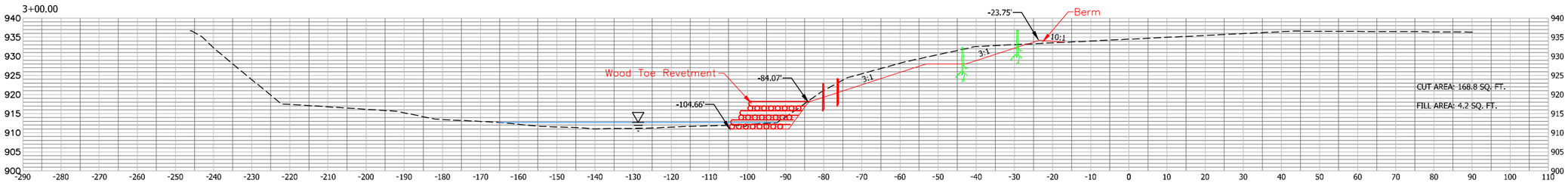

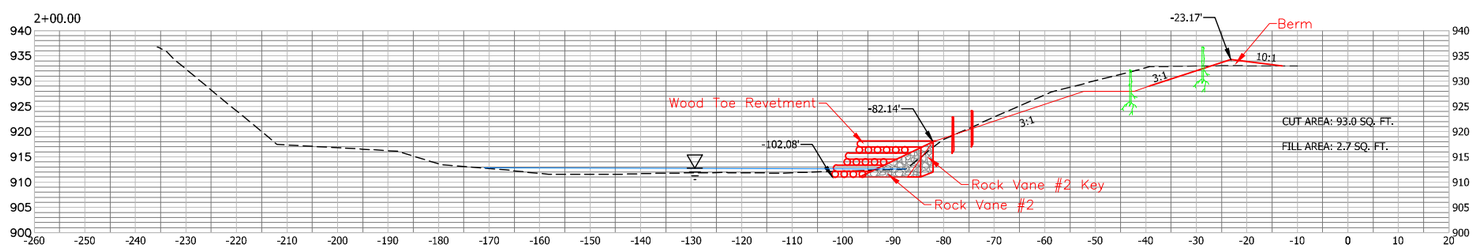

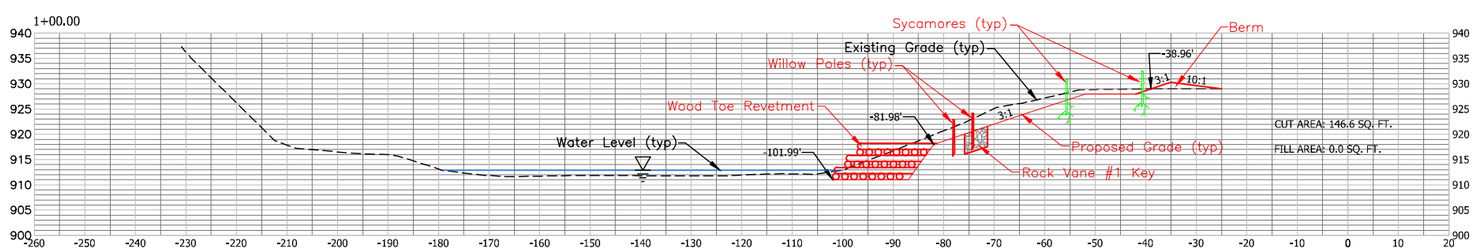

The first sycamore row is located 21-feet down-slope from top of bank. The second sycamore row is located 6-feet down-slope from top of bank. Within row spacing is 10-feet and between row spacing is 15-feet. Sycamores to be planted between March 1 - May 1.

The first willow row is located 4-feet up-slope from Wood Toe or LPSTP. The second willow row is located 8-feet up-slope from Wood Toe or LPSTP. Within row spacing is 4-feet and between row spacing is 8-feet. Willows to be planted during dormancy. Willow poles shall be a minimum 1-inch in diameter and a minimum 4-feet long.

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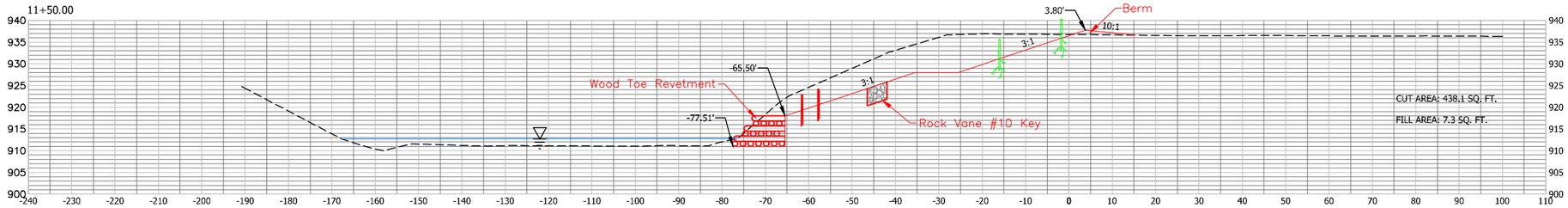
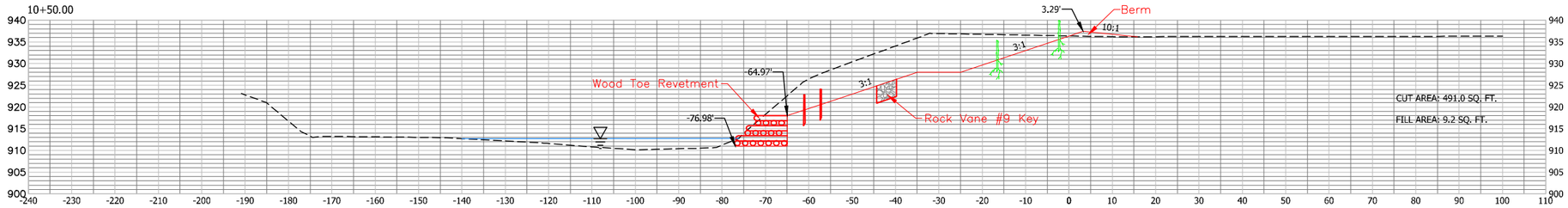
DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D24
CROSS SECTIONS SHEET

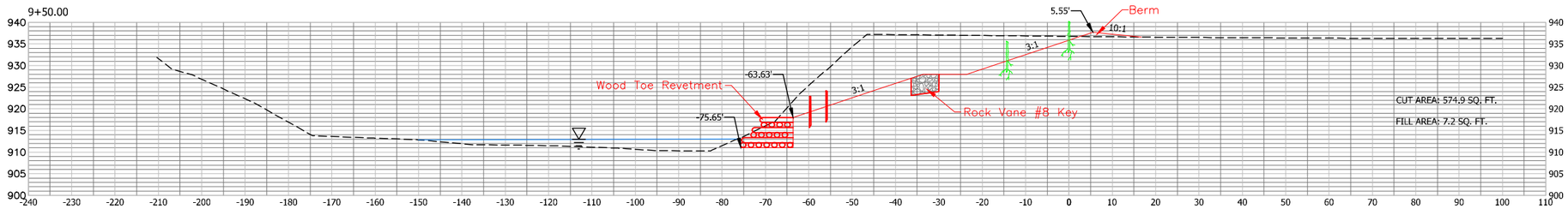
JOHN N. BROWNING LICENSED 10999 07-22-2020 KANSAS PROFESSIONAL ENGINEER

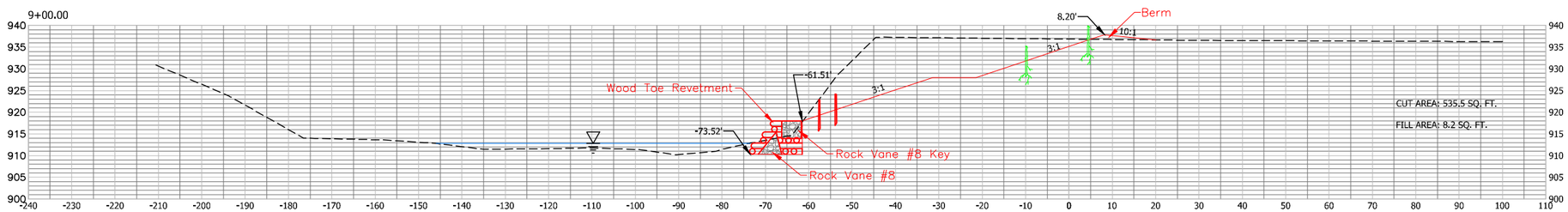
DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	----
SCALETAG	AS NOTED
DATE:	1/7/2020
DRAWING NO:	C07
SHEET NO:	7 of 8

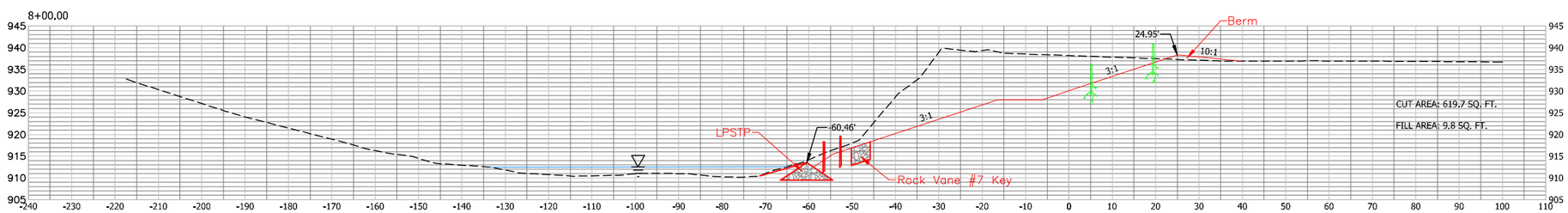
Drawing name: D:\W\14000\14668.120\D24 Project\AutoCad\Plan Set\14668-120_D24_X-Sections.dwg Layout name: Layout1 Plotted by: JAG00737 Plotted on: Jul 22, 2020 - 3:16pm
Last edit on: EDITDATE

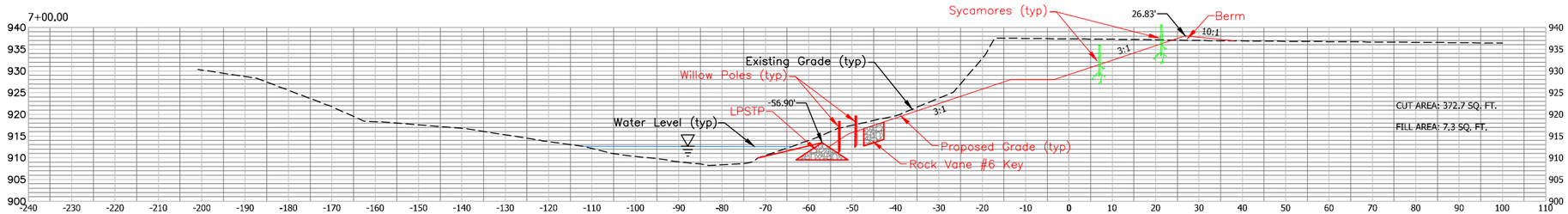












The first sycamore row is located 21-feet down-slope from top of bank. The second sycamore row is located 6-feet down-slope from top of bank. Within row spacing is 10-feet and between row spacing is 15-feet. Sycamores to be planted between March 1 - May 1.

The first willow row is located 4-feet up-slope from Wood Toe or LPSTP. The second willow row is located 8-feet up-slope from Wood Toe or LPSTP. Within row spacing is 4-feet and between row spacing is 8-feet. Willows to be planted during dormancy. Willow poles shall be a minimum 1-inch in diameter and a minimum 4-feet long.

THE WATERSHED INSTITUTE
1200 SW Executive Dr. Topeka, KS 66615 (913) 685-4600

GREDELL Engineering Resources, Inc.
Environmental Engineering LAND - AIR - WATER
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DELAWARE RIVER
ATCHISON COUNTY, KANSAS

SITE D24
CROSS SECTIONS SHEET

JOHN N. BROWING LICENSED 10999 07-22-2020 KANSAS PROFESSIONAL ENGINEER

DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	----
SCALETAG	AS NOTED
DATE:	1/7/2020
DRAWING NO:	CO8
SHEET NO:	8 of 8

Drawing name: D:\W\14000\14668.120\D24 Project\AutoCad\Plan Set\14668-120_D24_X-Sections.dwg Layout name: Layout2 Plotted by: JAG00737 Plotted on: Jul 22, 2020 - 3:17pm
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