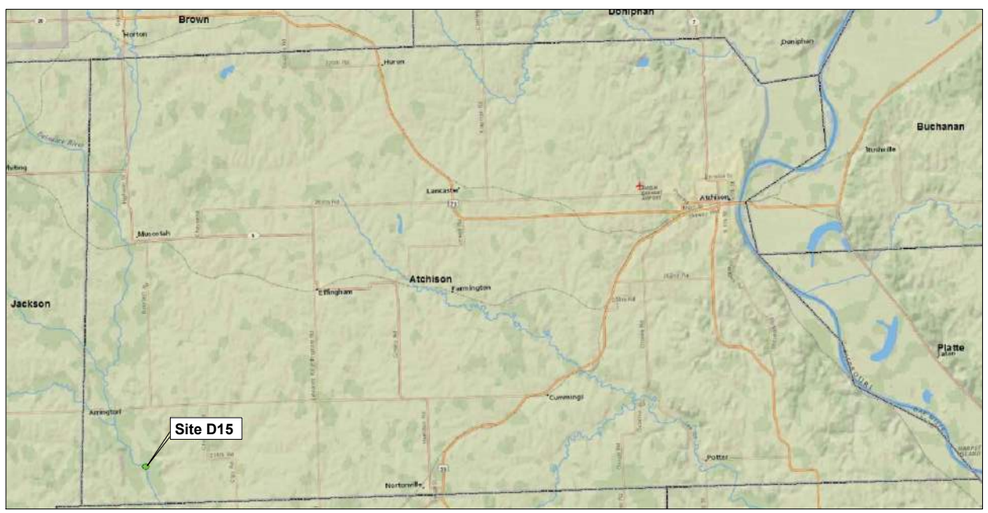
DELAWARE RIVER
STREAMBANK STABILIZATION
SITE D15
ATCHISON COUNTY, KANSAS

NE 1/4 SECTION 21, 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 - 8	Cross Section Sheets

SITE QUANTITIES

Quantities List	
Rock / Cubic Yards	1,644
Rock / Tons	2,622
Soil moving / Cubic Yards	21,000
Wood Toe Revetment / Linear Feet	592
Tree Removal / Lump Sum	1
Bare Root Trees / Each	300
Willow Cuttings / Each	275
Streambank Slope Native Grass Seeding / Acres	2.1
Streambank Slope Wildrye / Pounds Pure Live Seed	52.5
Streambank Slope Cover Crop Seeding / Acres	2.1
Streambank Slope Oats / Pounds Pure Live Seed	84.0
66-Foot Buffer Cover Crop Seeding / Acres	2.2
66-Foot Buffer Oats / Pounds Pure Live Seed	88.0
66-Foot Buffer Deep Ripping / Acre	2.2
Streambank Slope Mulching / Acres	2.1
Streambank Slope Mulching / Pounds	8,400

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
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Lenexa, Kansas Fax: (913) 307-2028
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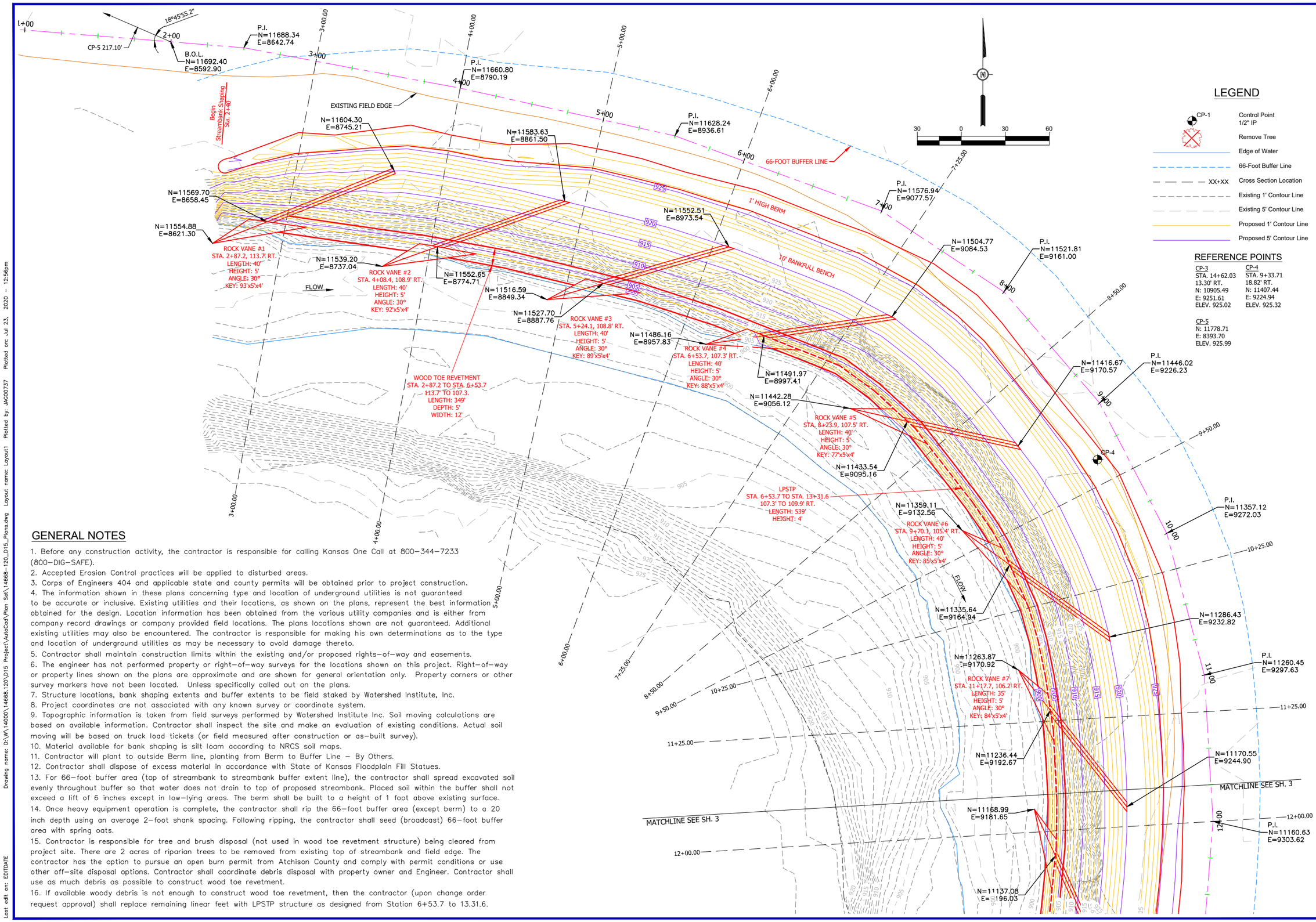
JOHN N. BROWNING LICENSED 10599 07-22-2020 KANSAS PROFESSIONAL ENGINEER



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 disposal (not used in wood toe revetment structure) being cleared from project site. There are 2 acres of riparian trees to be removed from existing top of streambank and field edge. The contractor has the option to pursue an open burn permit from Atchison County and comply with permit conditions or use other off–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.
16. If available woody debris is not enough to construct wood toe revetment, then the contractor (upon change order request approval) shall replace remaining linear feet with LPSTP structure as designed from Station 6+53.7 to 13.31.6.

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DELAWARE RIVER
ATCHISON COUNTY, KANSAS

SITE D15
PLAN SHEET

JOHN N. BROWNING LICENSED 10599 KANSAS PROFESSIONAL ENGINEER 2-22-20

DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	----
SCALETAG	AS NOTED
DATE:	2/11/2020
DRAWING NO:	CO2
SHEET NO:	2 of 8

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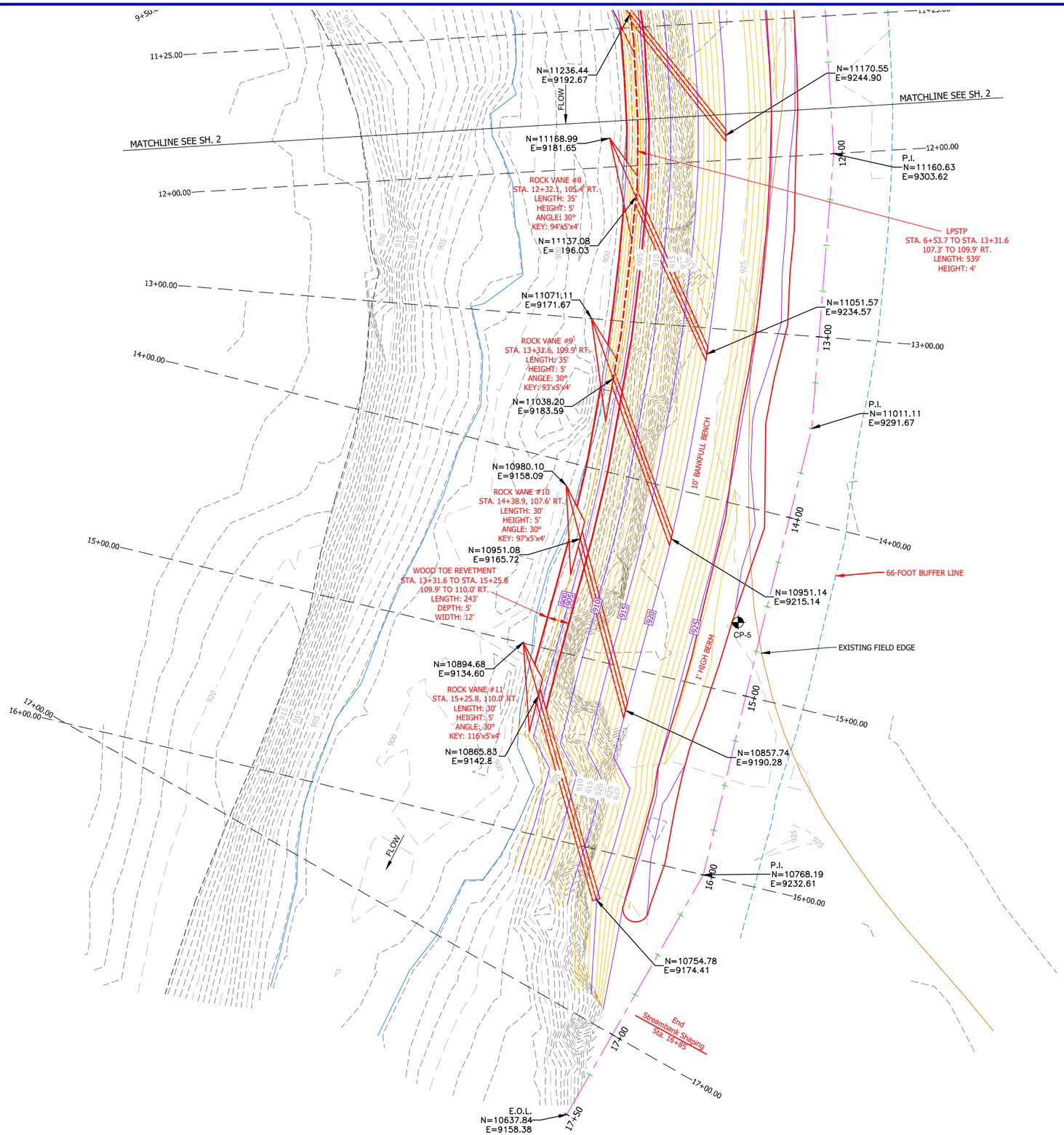

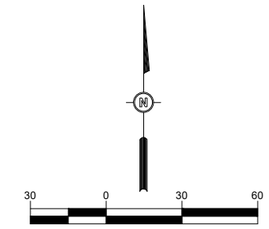

REFERENCE POINTS

CP-3	CP-4
STA. 14+62.03	STA. 9+33.71
13.30' RT.	18.82' RT.
N: 10905.49	N: 11407.44
E: 9251.61	E: 9224.94
ELEV. 925.02	ELEV. 925.32

CP-5
N: 11778.71
E: 8393.70
ELEV. 925.99

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 D15
PLAN SHEET

JOHN N. BROWNING LICENSED 10599 07-22-20 KANSAS PROFESSIONAL ENGINEER

DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
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SCALETAG	AS NOTED
DATE:	2/11/2020
DRAWING NO:	CO3
SHEET NO:	3 of 8

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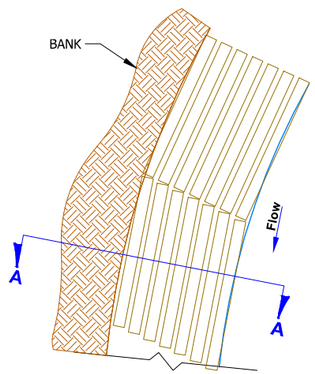
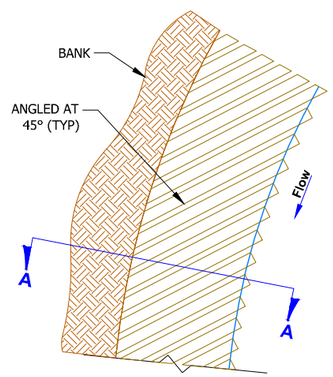


1ST, 3RD, 5TH
WOOD TOE LAYER
PLAN

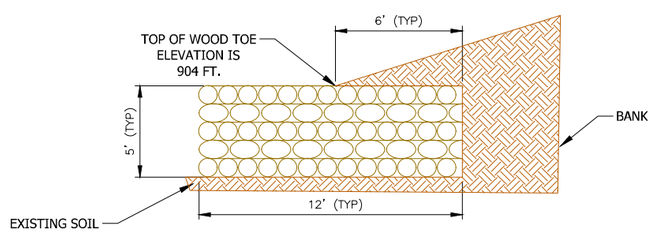


2ND, 4TH
WOOD TOE LAYER
PLAN

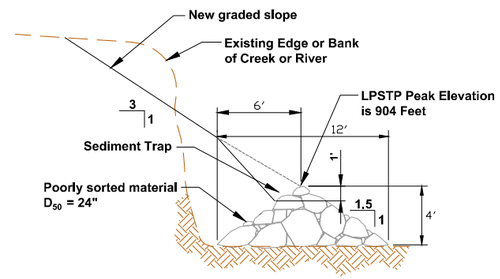
NUMBER OF TREES AND LAYERS WILL VARY DEPENDING ON DIAMETER AND LENGTH. MINIMUM TREE DIAMETER IS 12-INCHES.

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

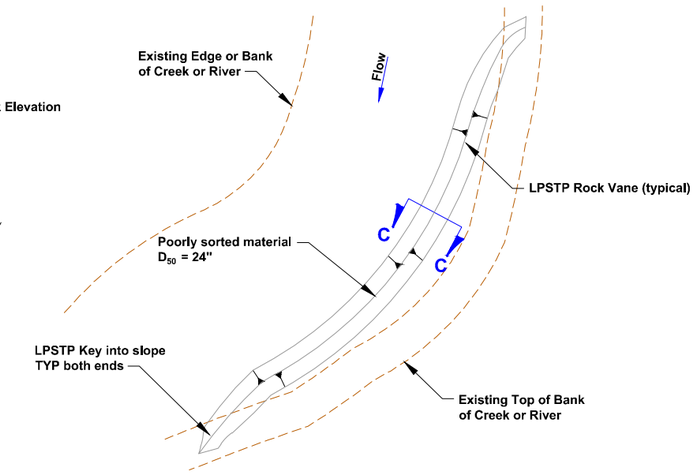
PLACE 6-INCHES OF SOIL ON TOP AND VEGETATE.



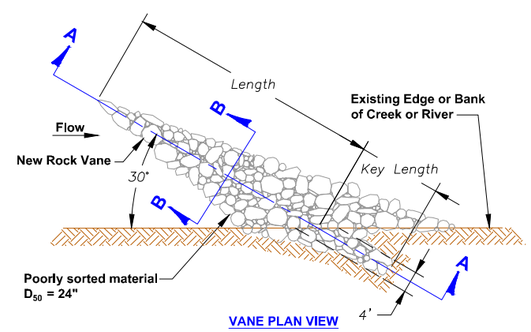
12 FOOT WOOD TOE SECTION
SECTION A - A



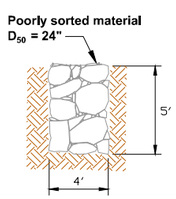
LPSTP 2 CROSS SECTION C-C



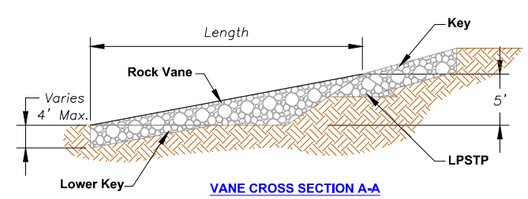
LONGITUDINAL PEAKED STONE TOE PROTECTION
(LPSTP)
PLAN VIEW



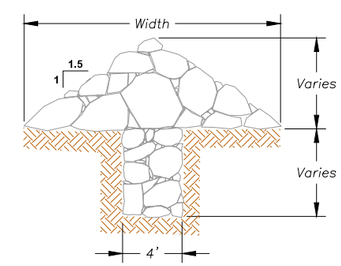
VANE PLAN VIEW



VANE KEY SECTION VIEW



VANE CROSS SECTION A-A



VANE CROSS SECTION B-B

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COTTONWOOD RIVER
ATCHISON COUNTY, KANSAS
SITE D15
DETIALS

JOHN N. BROWNING LICENSED 10599 KANSAS PROFESSIONAL ENGINEER 07-22-20

DESIGNED	BAE
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALE:	AS NOTED
DATE:	2/11/2020
DRAWING NO:	CO4
SHEET NO:	4 of 8

Structure Specification Sheet

Project Name	Stream	County	State	Streambank	
D15	Delaware River	Atchison	Kansas	Length (ft)	Height (ft)
				Shaped / Total	23.3
				1,445 / 1,550	

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	539	-	480	-	792	Poorly Sorted Limestone Rock (D_{50} = 24")
1	Rock Vane	120	30	5	40	93	55	56	175	Poorly Sorted Limestone Rock (D_{50} = 24")
2	Rock Vane	120	30	5	40	92	55	55	173	Poorly Sorted Limestone Rock (D_{50} = 24")
3	Rock Vane	120	30	5	40	89	55	53	170	Poorly Sorted Limestone Rock (D_{50} = 24")
4	Rock Vane	120	30	5	40	88	55	53	170	Poorly Sorted Limestone Rock (D_{50} = 24")
5	Rock Vane	120	30	5	40	77	55	46	160	Poorly Sorted Limestone Rock (D_{50} = 24")
6	Rock Vane	105	30	5	40	85	55	51	167	Poorly Sorted Limestone Rock (D_{50} = 24")
7	Rock Vane	105	30	5	35	84	49	50	156	Poorly Sorted Limestone Rock (D_{50} = 24")
8	Rock Vane	105	30	5	35	94	49	56	165	Poorly Sorted Limestone Rock (D_{50} = 24")
9	Rock Vane	90	30	5	35	93	49	56	165	Poorly Sorted Limestone Rock (D_{50} = 24")
10	Rock Vane	90	30	5	30	97	42	58	156	Poorly Sorted Limestone Rock (D_{50} = 24")
11	Rock Vane	-	30	5	30	116	42	69	173	Poorly Sorted Limestone Rock (D_{50} = 24")
						Total	1,041	603	2,622	

Site Information

Bank Erodibility Hazard Index	34.4	BkF Elev	918.8	At Station	16+00
Near Bank Stress (lb./sq. ft)	0.94	Rosgen Classification		C5c-	
Estimated Annual Erosion (ft/yr.)	1.9	Width/Depth Ratio		12.8	
Schumm Channel Stage	IV	Entrenchment Ratio		29.6	
Radius of Curvature (ft)	459	Channel Width (ft)		191	
Tortuosity	2.41	Shear Stress (lbs./sq. ft)		0.54	
Hydraulic Radius (ft)	14.3	Slope = (ft/ ft)		0.00061	
Mean Depth (ft)	14.9	Wetted Perimeter (ft)		199.5	
Cross Sectional Area (sq. ft)	2,849	Manning's n		0.051	
Bank Full Discharge (cfs)	12,124	Mean Velocity (ft/sec)		4.26	
Q_5 Discharge (cfs)	17,290	Drainage Area (sq. mi)		740.0	

Quantities List

Rock / Cubic Yards	1,644
Rock / Tons	2,622
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Willow Cuttings / Each	275
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Streambank Slope Wildrye / Pounds Pure Live Seed	52.5
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Streambank Slope Oats / Pounds Pure Live Seed	84.0
66-Foot Buffer Cover Crop Seeding / Acres	2.2
66-Foot Buffer Oats / Pounds Pure Live Seed	88.0
66-Foot Buffer Deep Ripping / Acre	2.2
Streambank Slope Mulching / Acres	2.1
Streambank Slope Mulching / Pounds	8,400

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	2.1	52.50

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

Streambank 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	2.1	84.00

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	2.2	88.00

Notes:
Cover Crop to be planted following construction

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COTTONWOOD RIVER
ATCHISON COUNTY, KANSAS

SITE D15
DETIALS

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

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DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
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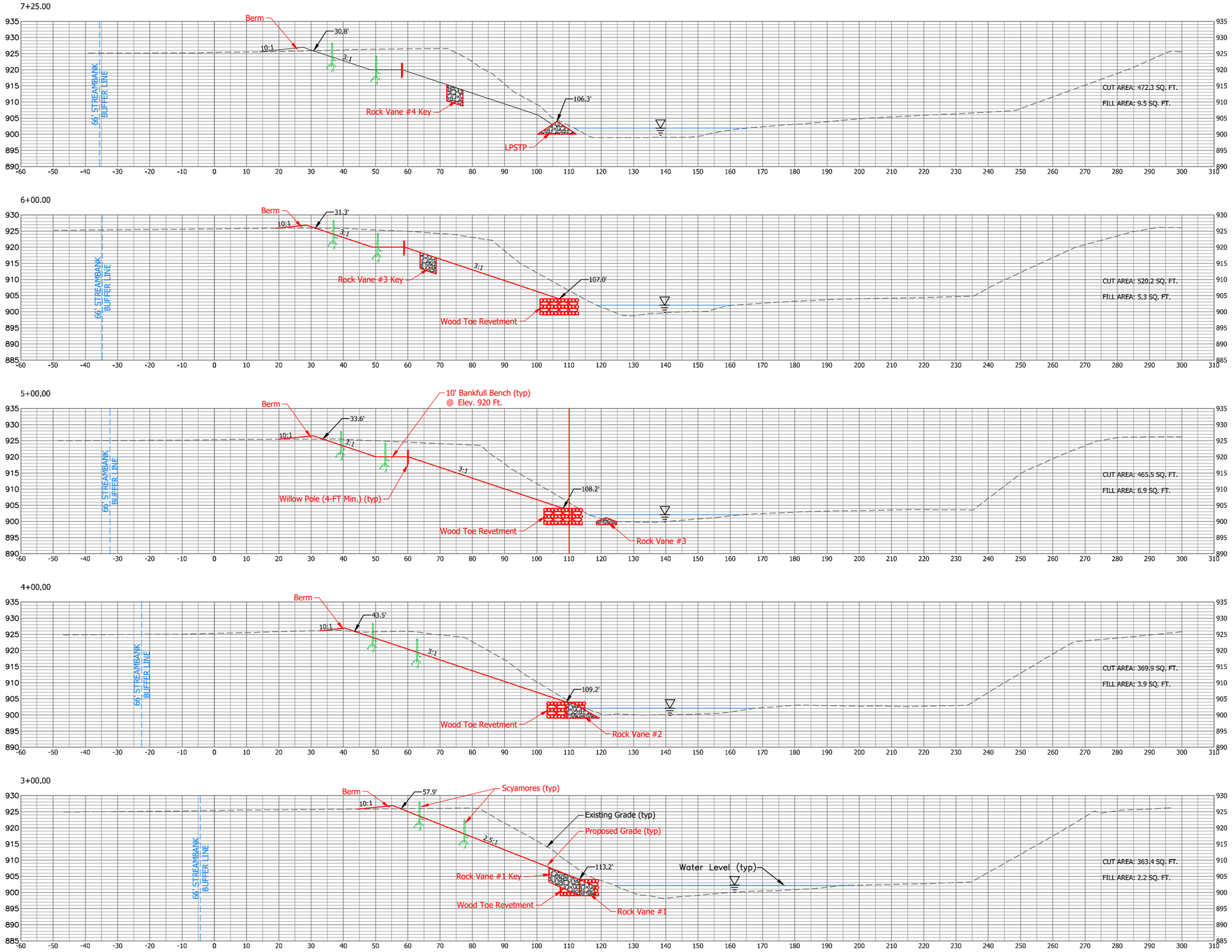
SCALE:	AS NOTED
DATE:	2/11/2020
DRAWING NO:	CO5
SHEET NO:	5 of 8



4-foot (minimum) willow pole & row is located at bankfull bench. Within row spacing is 4-feet. Willows to be planted during dormancy.

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.

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DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D15
CROSS SECTIONS SHEET

JOHN N. BROWNING LICENSED 10599 2-7-22 KANSAS PROFESSIONAL ENGINEER

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DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
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SCALETAG	AS NOTED
DATE:	2/11/2020
DRAWING NO:	CO6
SHEET NO:	6 of 8

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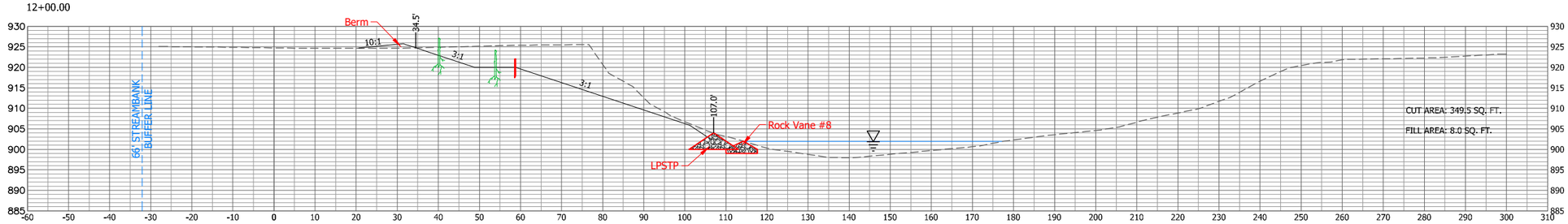
12+00.00



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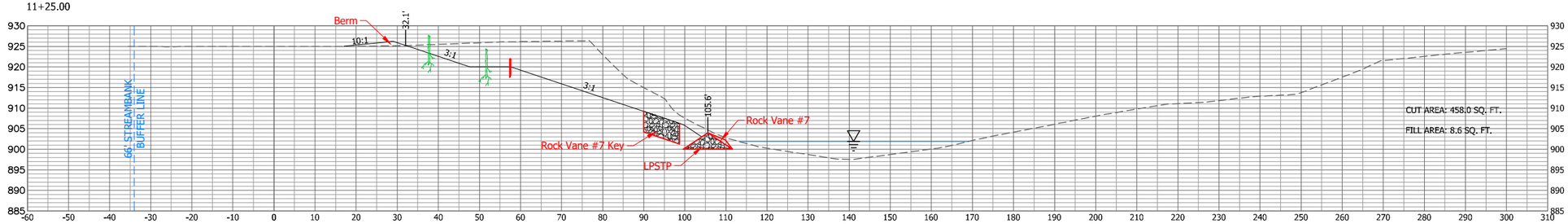

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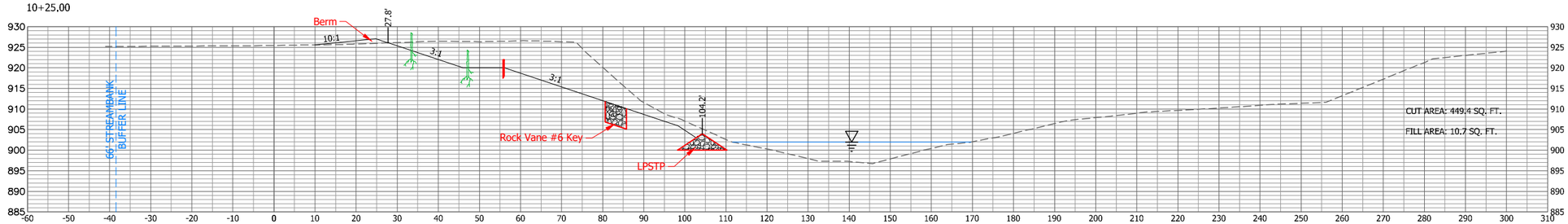

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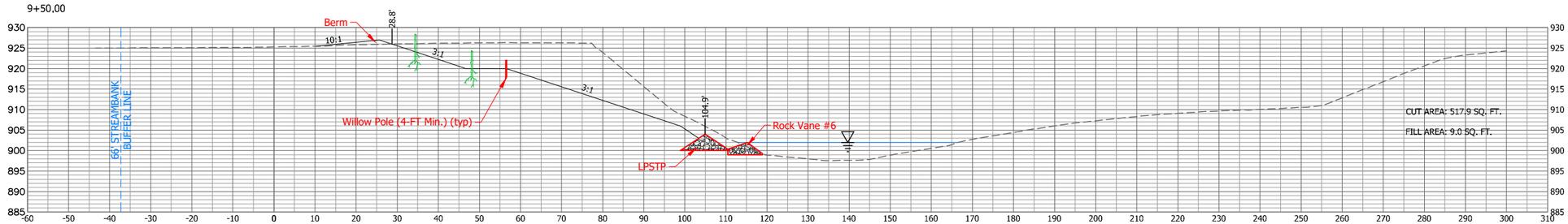

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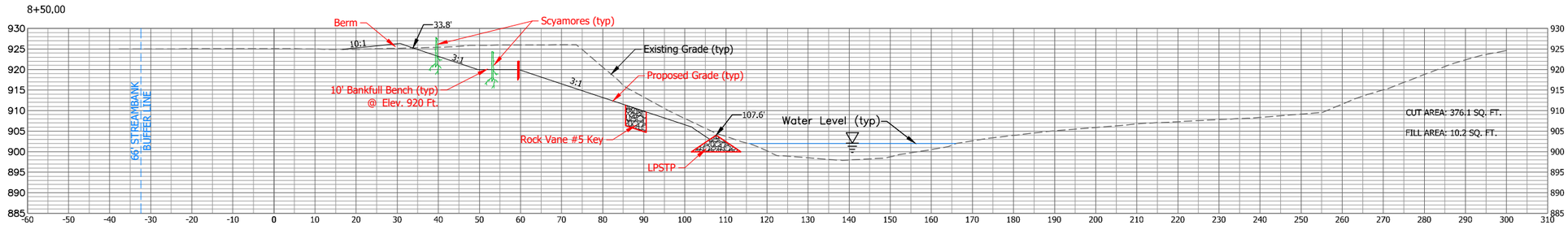

4-foot (minimum) willow pole & row is located at bankfull bench. Within row spacing is 4-feet. Willows to be planted during dormancy.

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.

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DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D15
CROSS SECTIONS SHEET

JOHN N. BROWNING LICENSED 10599 12-22-2020 KANSAS PROFESSIONAL ENGINEER

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APPROVED BY:	JNB
DESIGN PROJ:	14668.120
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DATE:	2/11/2020
DRAWING NO:	CO7
SHEET NO:	7 of 8

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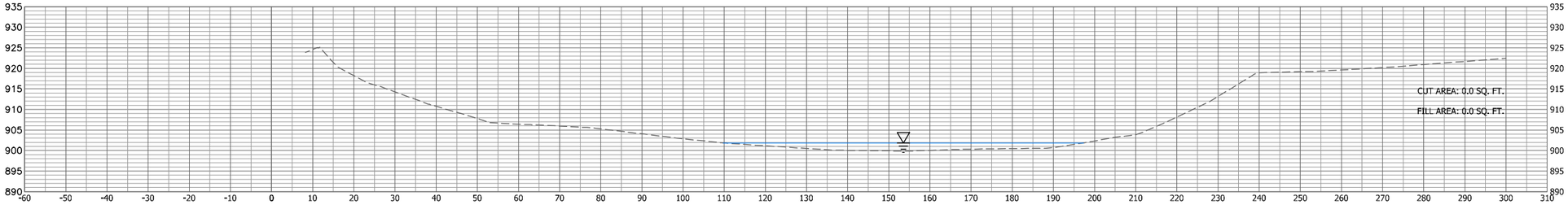

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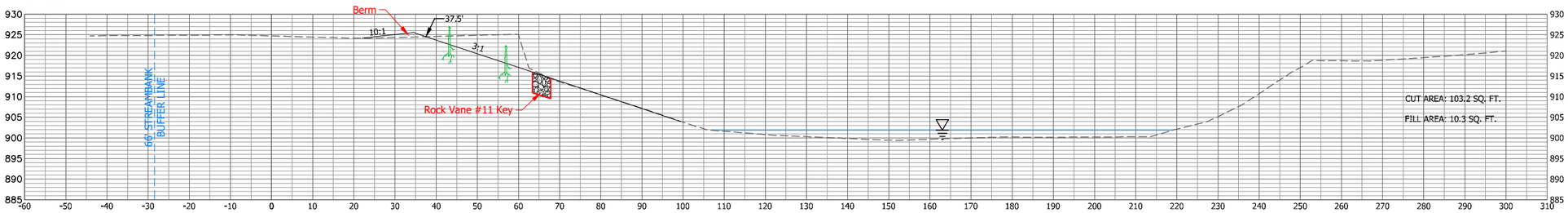

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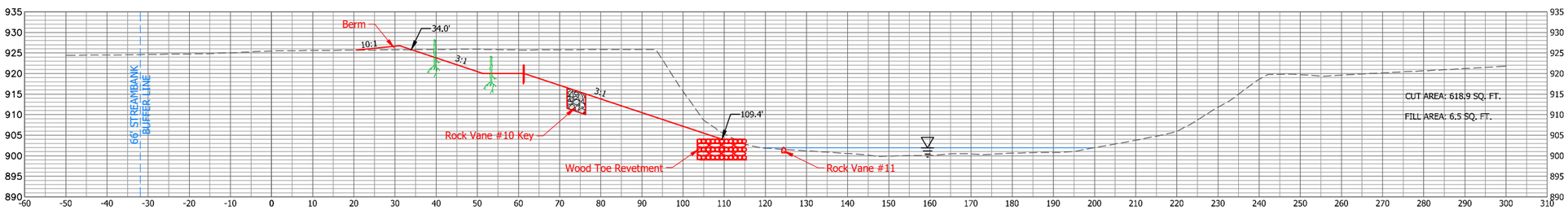

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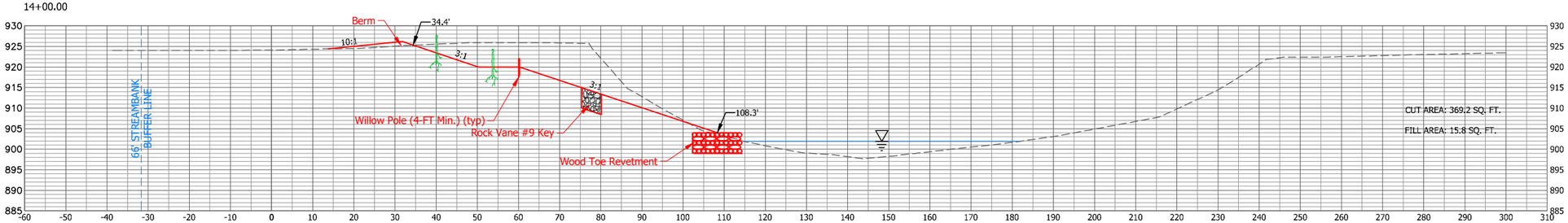

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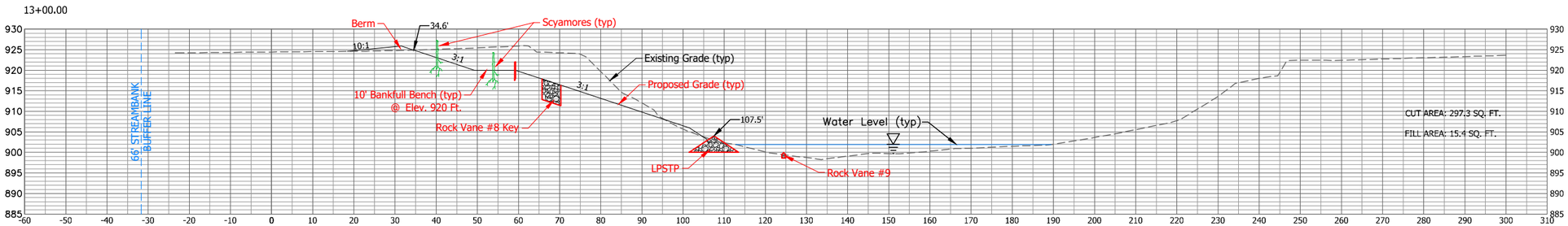

4-foot (minimum) willow pole & row is located at bankfull bench. Within row spacing is 4-feet. Willows to be planted during dormancy.

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.

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DELAWARE RIVER
ATCHISON COUNTY, KANSAS
SITE D15
CROSS SECTIONS SHEET

JOHN N. BROWNING LICENSED 10599 KANSAS PROFESSIONAL ENGINEER

DESIGNED	PGB
DRAWN BY:	JAG
APPROVED BY:	JNB
DESIGN PROJ:	14668.120
CONST	-----
SCALETAG	AS NOTED
DATE:	2/11/2020
DRAWING NO:	CO8
SHEET NO:	8 of 8

Last edit on: EDITDATE Drawing name: D:\W\14000\14668.120\D15 Project\AutoCad\Plan Set\14668-120_D15_X-Sections.dwg Layout name: Layout3 Plotted by: JAG00737 Plotted on: Jul 23, 2020 - 1:02pm