Yellow River 1100 E. Restoration

Kankakee River Basin and Yellow River Basin Development Commission

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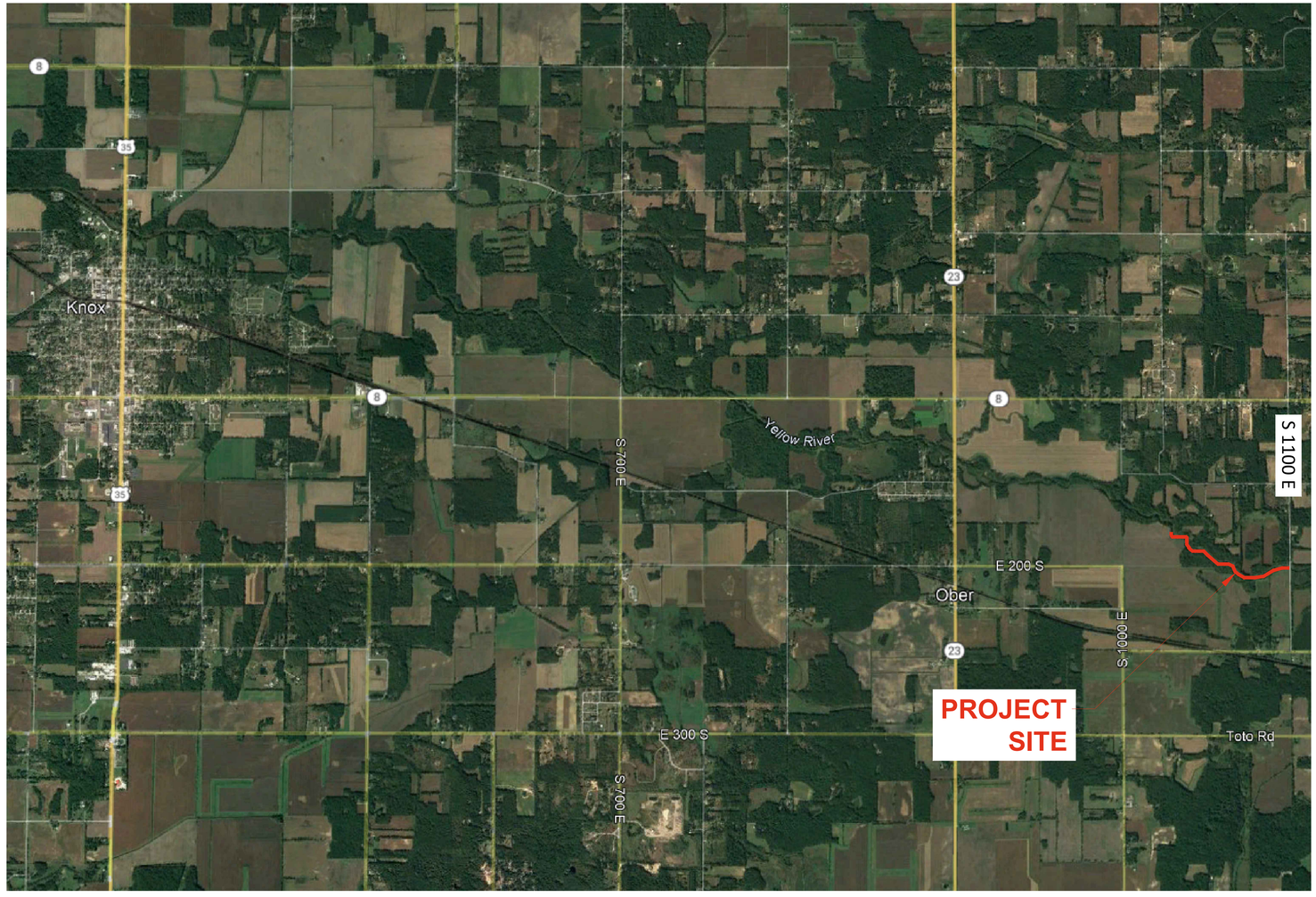

SITE MAP
SCALE: 1" = 5000'
0 2500 5000

FINAL

Cardno now Stantec

TITLE SHEET AND SHEET INDEX
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

NO.	DATE	DESCRIPTION	BY
1			

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
TITLE SHEET

SHEET NUMBER
1

LAND USE #

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PROJECT BACKGROUND

The Kanakakee River Basin and Yellow River Basin Development Commission (Commission) is looking to act upon their 40 Year Work Plan to address concerns related to more frequent flooding and higher sediment supply to and sediment aggregation within the Kankakee River. Several items have adversely impacted the stability and conveyance of the Kankakee River including large amounts of sediment from the Yellow River. Most notably the source of this sediment has been identified as bank instability along the Yellow River within Marshall and Starke Counties. Based on sediment load analysis completed from 2013 to 2018 as referenced in the Work Plan, the average sediment load increase from the Marshall County line (Oak Grove stream gauge) to Knox (Knox stream gauge) is almost 39,000 tons per year. This additional sediment has been attributed primarily to bank instability.

PROJECT GOALS & OBJECTIVES

The Project focuses on stabilization of approximately 5,000 linear feet (LF) of stream on the Yellow River in Starke County with the overall goal of reducing sediment supply downstream. The project goal can be accomplished by addressing several objectives including:

- Restoration of stream geomorphic functions by modifying stream channel cross section geometry, stream pattern, and stream bed profile.
- Reduce bank erosion by establishing appropriate banks slopes which support vegetation establishment.
- Establish native vegetation via native seed establishment and tree/shrub plantings.
- Provide enhanced floodplain connection via inside floodplain grading and bank grading.
- Construct appropriate in-stream structures to stabilize the channel bed and further enhance floodplain connection.

SITE SURVEY & FIELD INVESTIGATION

The Cardno now Stantec Team conducted a comprehensive field investigation which combined a geomorphic and topographic survey, soils review, aquatic and riparian habitat surveys, archaeological and cultural resources review, wetland determination, and aquatic and riparian habitat assessment.

Geomorphic and Topographic Survey

The geomorphic and topographic survey was a joint effort between Cardno now Stantec and Territorial Engineering. Cardno now Stantec directed all data collection while Territorial Engineering provided the appropriate survey equipment and licensed land surveyor for data collection. This collaborative effort helped ensure that existing conditions data required for the design was both comprehensive and accurate. In total, over 35 channel cross sections and 4,100 LF of streambed profile were surveyed.

To characterize the geomorphic state of the Project reach during the field investigation, the Cardno now Stantec Team utilized Rosgen's Geomorphic Survey methodology. This methodology includes data collection related to bankfull indicators, valley cross sections, streambed profile, river geometry (sinuosity, belt width, stream meander length, linear wave, radius of curvature), and pebble counts.

Pebble Counts

Active bed riffle pebble counts returned data indicating a D50 material size of 55 mm and a D84 material size of 102 mm. This data factors largely in selection of our constructed riffle bed material and assessing sediment transport.

EXISTING CONDITIONS OVERVIEW

The project reach consists of approximately 5,000 LF of the Yellow River in Starke County with a largely agricultural watershed measuring approximately 380 square miles. A determination of Rosgen's Stream Classification was based on field measurements, visual assessment and desktop review. A multitude of channel classifications are present within the project reach with the most severe conditions being associated with stretches of F type channel. The F stream type, typically entrenched and meandering, shows signs of disturbance and in the case of the Yellow River also shows signs of adjustment and reshaping. Within the project reach, the Yellow River is notably incised (deep) and in many stretches disconnected from its historic floodplain. This degraded channel geometry results in large storm event flows remaining within the confines of the channel banks rather than flooding over onto the adjacent floodplain areas. A stable stream system will display an appropriate width to depth ratio or bankfull dimensions which results in routine overbank flooding. Channel to floodplain connection and frequent flooding allow the channel to be alleviated of high shear stresses and erosive velocities that larger storm events produce.

Most of the banks of the Yellow River within the project reach are comprised of cohesionless, wind-blown eolian sands (sand dunes) which are highly erodible along with layers of gravels indicating historic floodplain levels. This has resulted in large stretches of steep, sometimes high, stream banks with high bank erosion rates. The most severely eroded sand banks are located on the outside bend of river meanders. This is typical of many river systems as high energy, fast moving flows move out of the straighter riffle sections (cobble and boulders) and collides with the outside bends of meanders. When these outside bends do not have inside bend flood relief, the erosion on a sand bank accelerates. To complicate matters, leading into several of these meander bends of the Yellow River, the high energy, fast moving riffle sections of the river are migrating downstream and into the outside bends where deep pools would normally be located. This means higher velocities in close proximity to these high sand banks. Along many sections of the river, especially outside banks of meander bends, mature trees continue to fall into the river from the top of bank as the toe of slope and the embankment become compromised. This has resulted in a large stretches of riverbank with a lack of deep rooted vegetation and increased instability on banks.

The bankfull slope has a generally flat gradient (0.12%) which is very similar to the reach-wide thalweg slope (0.13%).

CHANNEL EVOLUTION

Having a firm grasp on the trajectory of channel form is important when assessing degraded river systems to make a determination if benefit can be achieved through restoration activities or if natural stream processes are sufficient to restore a river system to a stable state. Most sections of the project reach are at intermediate phases along their channel evolution with varying degrees of horizontal and vertical adjustment. Sections of the project reach experiencing the greatest amount of streambank erosion are generally between Stage III (Bed aggrading, Banks unstable) and Stage IV (Bed aggrading, banks unstable). Some sections have started to enter Stage V (Slow aggradation, banks stable). See Figure 1 for a depiction of this process.

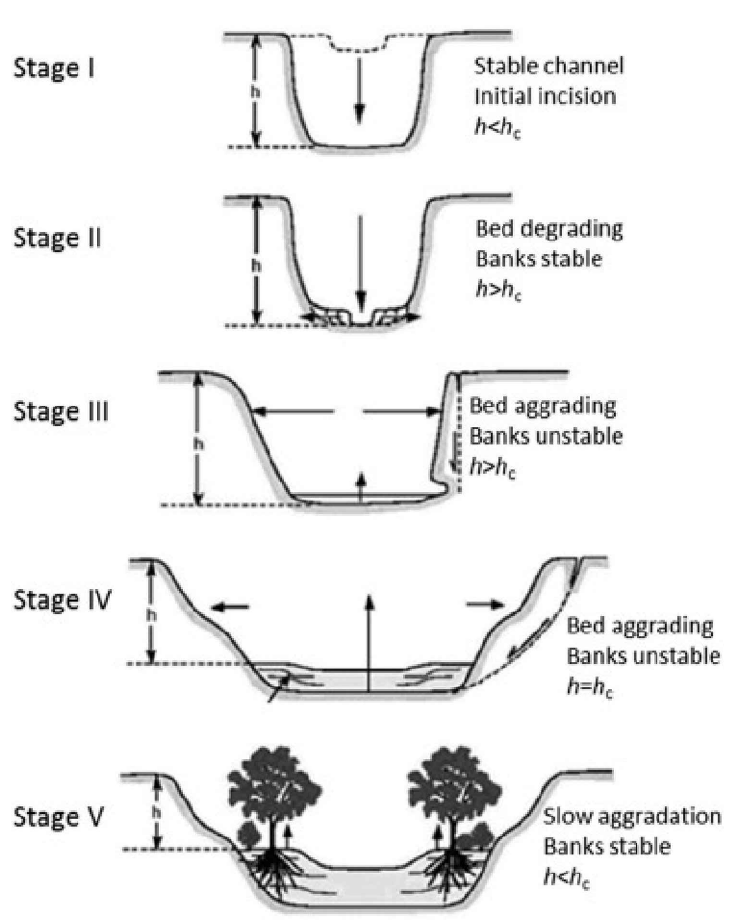


FIGURE 1. Channel Evolution Model

Furthermore, although numerous stream succession scenarios are active within the project reach, one dominating sequence was observed in many of the most severe sections of the project reach. The succession scenario C to G to F to C is observed. This scenario involves the process of an eroding and unstable system to transition from a stable state on the left (Stream Type C) to a new stable state on the right. The succession scenario is typically triggered by a disturbance to the morphology of the channel, altered flow regime, and/or increased/decreased sediment supply rates to the channel. It is believed that most sections of the project reach were historically a C channel. Likely increased sediment loads, increased flows from agricultural areas (tile drainage) and overland flows from adjacent agricultural areas resulted in channel instability.

Cardno now Stantec has decided to selectively treat sections of the project reach to accelerate channel evolution process and address sections of the project reach that are currently F channel types. Restoration of these stretches will encourage a stable system post-project and allow the channel to continue to move toward the stable end of this succession pattern. Discussion on restoration efforts is discussed in later sections.

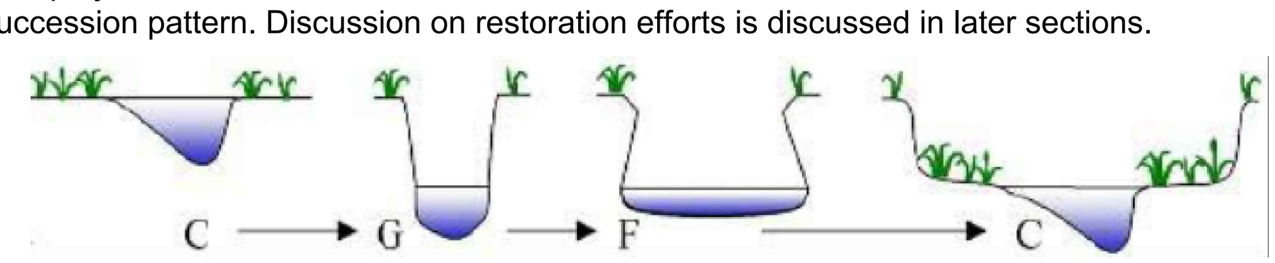


FIGURE 2. Rosgen Stream Type Succession Scenarios

RIVERMORPH ANALYSIS

RIVERMorph is a stream restoration software equipped with tools for stream classification, survey data reduction and plotting, discharge gage analysis, channel stability analysis, bank erosion prediction, and regional curve review among other things. Cardno now Stantec primarily used RIVERMorph as a means to enter, assess, and summarize existing conditions data for channel cross sections and streambed profile and make informed decisions for final design.

Cardno now Stantec input water surface elevations, cross section data (Figure 3), and streambed profile data (Figure 4) into RIVERMorph to better understand existing conditions and be in a better position to select appropriate typical channel dimensions, bankfull slope and streambed profile. Furthermore, RIVERMorph provided detail on entrenchment ratio and bank height ratio so that Cardno now Stantec could assess the streams overall floodplain connection along various sections.

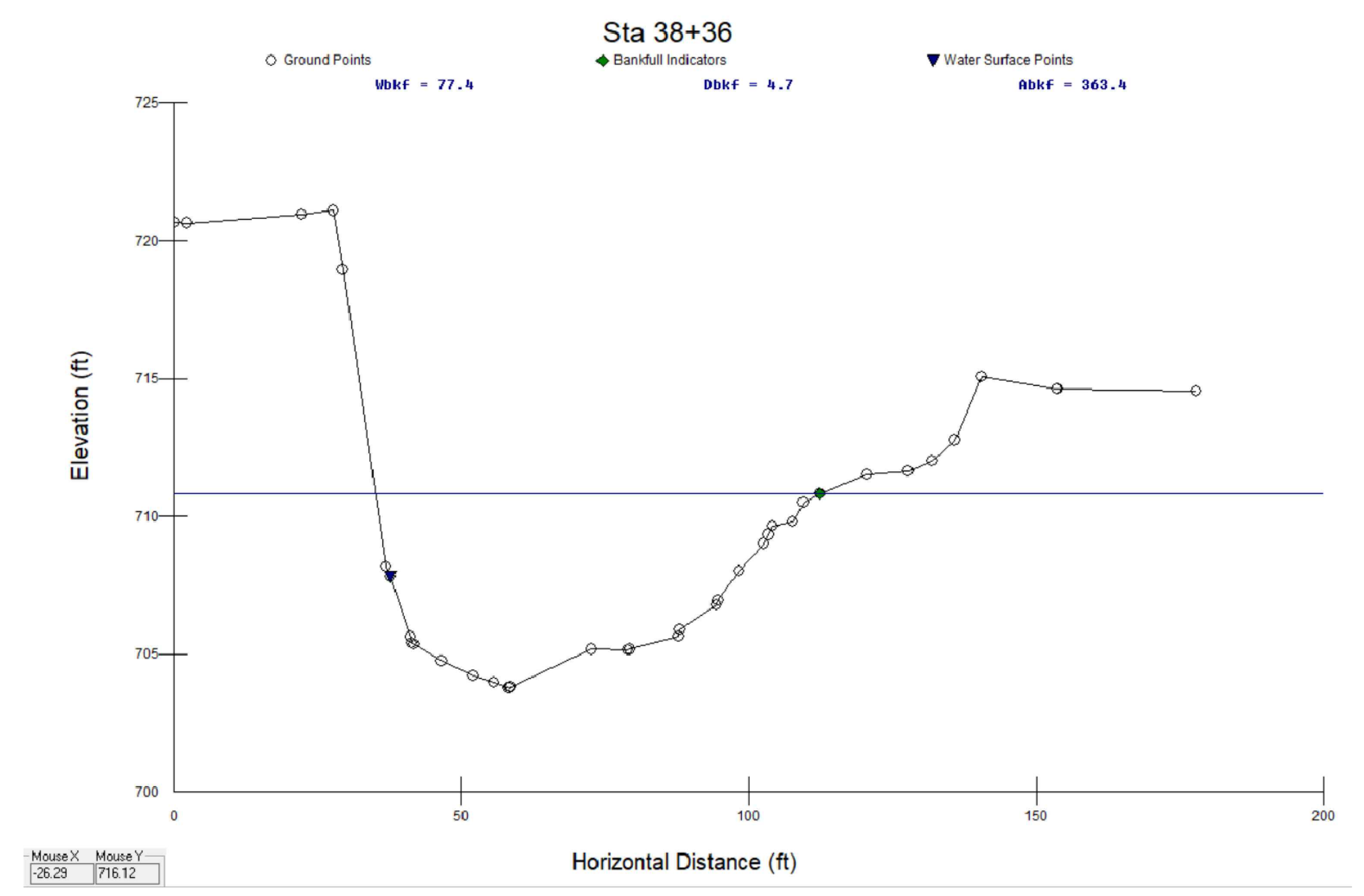


FIGURE 3. Example Existing Channel Cross Section

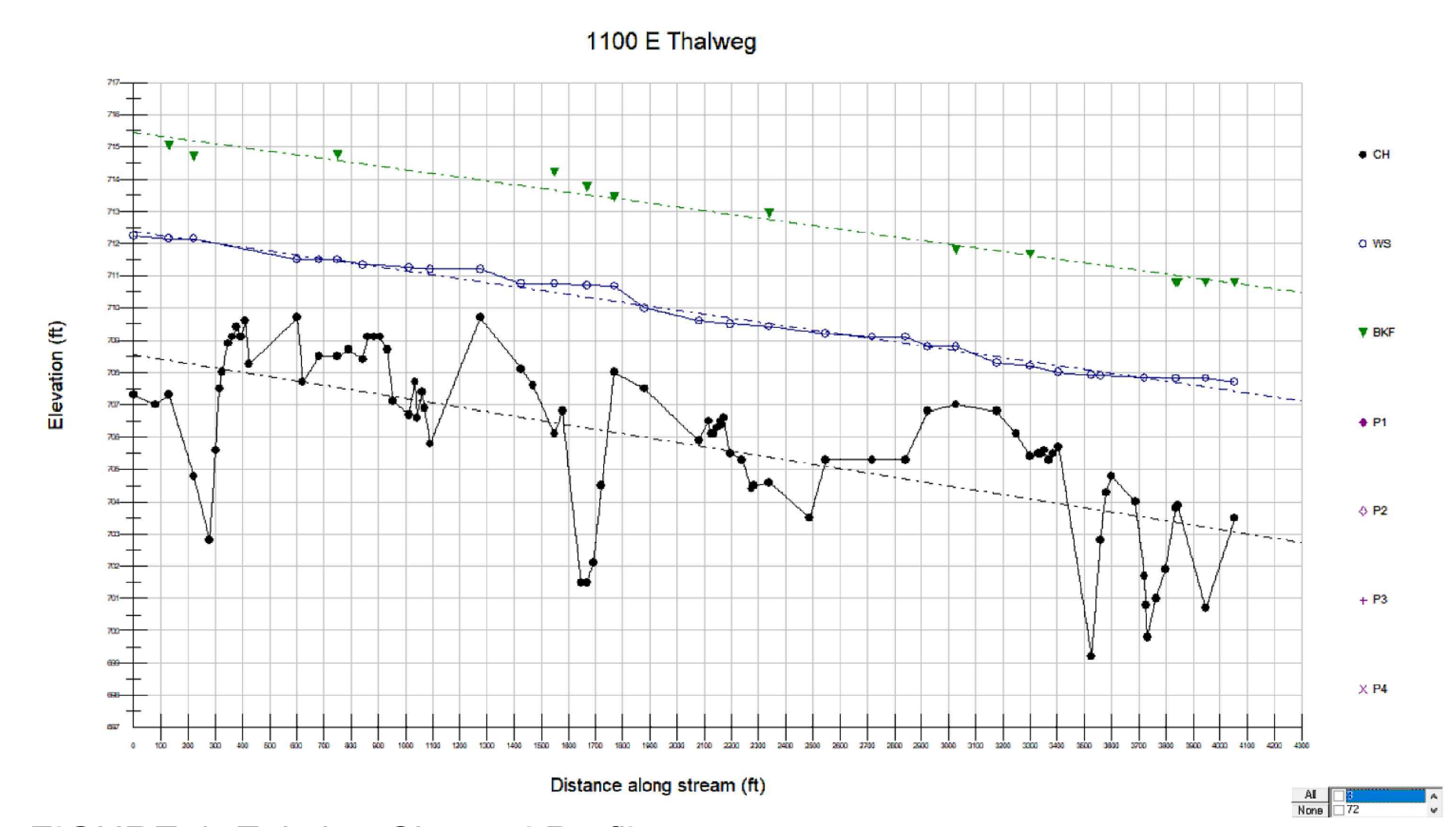
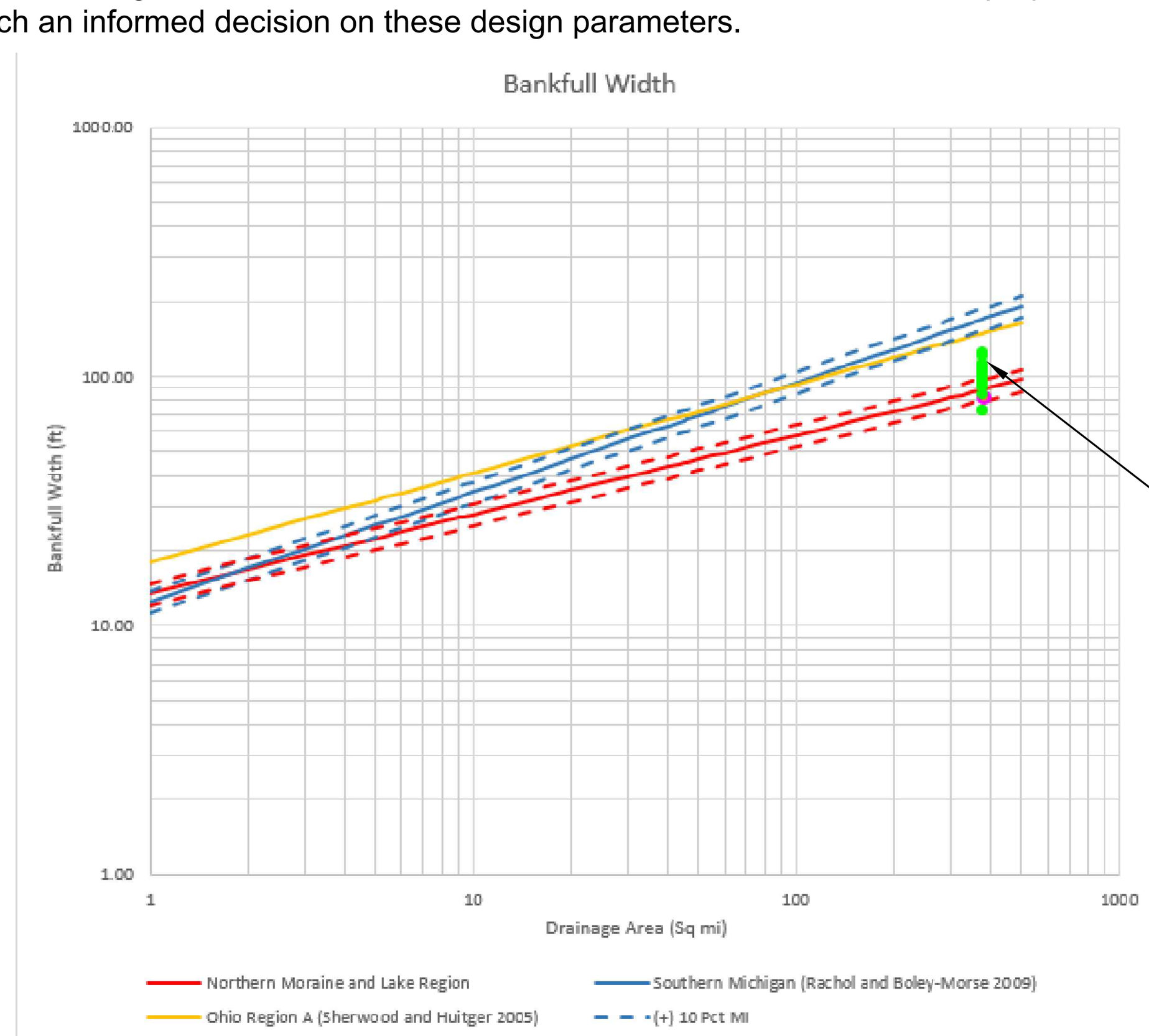


FIGURE 4. Existing Channel Profile

REGIONAL CURVE REVIEW

Overall there was a lack of reliable bankfull indicators available due to the ongoing degradation processes in the project reach. True F channel sections of the river did display signs of horizontal migration and evidenced by sand/gravel bars forming within the overwidened channel. These sand/gravel bars served as the most reliable bankfull indicators but given the overall unstable nature of the project reach, additional regional curve data was reviewed. Regional curves for the Northern Moraine and Lake Region, Southern Michigan (Rachol and Boley-Morse 2009), and Ohio Region A (Sherwood and Huitger 2005) were analyzed related to bankfull area, bankfull width, and bankfull depth. Cardno now Stantec utilized Excel to plot data from these regional curves and compare to the bankfull dimension data Cardno now Stantec collected in the field (Figure 5). This comparison of on-site data to the most applicable regional curves, allowed Cardno now Stantec to fine tune their proposed bankfull dimension selection and reach an informed decision on these design parameters.



YELLOW RIVER DATA POINTS

FIGURE 5. Regional Curve Comparisons for bankfull width.

STREAM GAGE ANALYSIS AND FLOWS DETERMINATION

Stream gage data for the Oak Grove (County Line Road Bridge) gage was reviewed and incorporated into Cardno now Stantec's design. Having historical data related to stream flows and total suspended solids is quite beneficial as it provides a great opportunity to view historical trends and support anticipated bankfull dimensions and sediment loading rates. Cardno now Stantec looked at historical water depths going back more than 20 years and was able to determine typical average annual peak discharges which may be compared to the 1-year return interval storm. Furthermore larger storm flows and corresponding flow depths were reviewed for historical flood levels.

BANKFULL DIMENSIONS SUMMARY

Bankfull dimensions were selected based on a combination of field observed bankfull indicators, reference reach review parameters, and engineering judgement. Very few stable sections were identified during site assessment making it difficult to rely on bankfull indicators observed in the field. Cardno now Stantec made every effort to accurately identify bankfull elevations at previously surveyed cross sections. Glide and Riffle facets were primarily assessed as these were overall the least variable facets of the stream and provided the best opportunity for bankfull idicators. A select number of pool cross sections were also assessed for bankfull indicators. Overall ten riffles and ten glide sections were assessed for bankfull indicators with a summary of bankfull findings below:

- Average riffle bankfull depth = 4.2 feet
- Max riffle bankfull depth = 4.78 feet
- Min riffle bankfull depth = 2.78 feet
- Average glide bankfull depth = 3.9 feet
- Max glide bankfull depth = 6.91 feet
- Min glide bankfull depth = 3.48 feet

Typical riffle bankfull dimensions were determined as follows:

- Riffle bankfull width: 95-100 feet
- Riffle bankfull depth: 3.8-4 feet
- Riffle max depth: 4.0-4.2 feet

Typical pool bankfull dimensions were determined based on field observations, land disturbance constraints, cut/fill considerations, Rivermorph analysis. Typical pool bankfull dimensions are as follows:

- Pool bankfull width: 95-105 feet
- Pool max depth: 8-8.5 feet

DESIGN CONSTRAINTS

Multiple design constraints were considered throughout the process of conceptual and final design, which included:

- Overall cost.
- Home and roadway impacts.
- Landowner approval and access.
- Minimizing land disturbance where possible.
- Equipment access to severe slopes.
- Availability/proximity of affordable limestone rock for install of in-stream structures.
- Future maintenance needs.

PROPOSED DESIGN OVERVIEW

Cardno now Stantec's proposed design is rooted in providing increased channel to floodplain access, providing stable stream pattern and profile conditions through meander bends, establishing deep rooted, native vegetation and utilizing as much on-site material as possible.

To provide enhanced floodplain access Cardno now Stantec is proposing floodplain grading (4H:1V or flatter) on the inside of meanders bends and bank grading (2H:1V) on the outside of meander bends. Sections of instability and excessive bank scour are proposed for 2H:1V bank grading also. This grading will allow flood flows to exit the primary channel more regularly and access adjacent floodplains. Floodplains with their relatively flat slope and dense vegetation will dissipate energy and drop out sediment. Furthermore, Cardno now Stantec selectively proposed rock grade control structures at various locations along the river to establish grade and in most cases slightly increase the overall streambed elevation which can provide increased access to adjacent floodplains. Cardno now Stantec chose to selectively implement these structures where flood flows were relatively close to reaching adjacent floodplains but needed slight channel adjustments to encourage this channel to floodplain access.

To remedy stream pattern and streambed profile instability most evident in the meander bends along the project reach, Cardno now Stantec chose to implement a combination of streambank grading and stabilization techniques along with in-stream structures designed to direct flow and establish grade along the streambed. Stabilizing banks, providing increased scour protection at the toe of slope and combating the migrating riffle sections were the main objectives in these meander bends.

MATERIAL SELECTION & MATERIAL SOURCING

Numerous material types were selected for purposes of in-stream structures and bank protection measures. All wood material needed for structure install will be sourced on-site while all rock material not already available on-site will be sourced from outside vendors as detailed in the construction specifications.

- Rock and wood toe stabilization will be built primarily out of repurposed trees harvested on-site. Rootwad, trunk and branches from harvested trees will be reincorporated into these structures. INDOT Class I riprap will also be incorporated for enhanced bank protection.
- Constructed riffles will be constructed primarily out of on-site, repurposed cobble and boulders. Boulder glide structures, boulder j-hooks, rock vanes, and rock cross vanes will all be built primarily out of limestone shot rock sized 30-36" in diameter. Limestone shot rock was selected for these structures to ensure that the structures are properly keyed into the streambed and to also avoid risk of scour and displacement during large storm events.

FINAL

Cardno now Stantec

BASIS OF DESIGN

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

ROSS A. St.Clair REGISTERED No. PE11900350 STATE OF INDIANA PROFESSIONAL ENGINEER 1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
BASIS OF DESIGN

SHEET NUMBER
2

LAND USE # ----

LEGEND

- EXISTING MINOR CONTOUR (1')
- EXISTING MAJOR CONTOUR (5')
- DRAINAGE FLOW
- PARCEL BOUNDARIES
- EXISTING STREAM ALIGNMENT
- APPROVED ACCESS ROUTE FROM ROAD TO DRAINAGE EASEMENT
- DELINEATED WETLAND AREAS - AVOID IMPACT

1100 E Restoration

PLAN VIEW
SCALE: 1" = 150'
0 75 150 Feet

SURVEY CONTROL POINTS - 1100E				
POINTS	NORTHING	EASTING	ELEVATION (NAVD88)	DESCRIPTION
10	2194723.4930	3116996.5270	725.7590	PMAG
22	2195265.8240	3117014.3620	728.4890	PMAG
23	2195045.8640	3116988.4890	729.3100	PBMK - STARKE L773
24	2195867.6780	3113679.3580	721.5160	PBMK - HUB TACK
25	2194953.0260	3115244.9280	712.8950	PBMK - HUB TACK
250	2195114.0380	3117005.0280	729.7850	PMAG FL

SHEET 7
SHEET 6
SHEET 5
SHEET 4

ERIC DENNY & RAQUEL MARTINEZ
PARCEL ID:
75-07-26-400-021.000-012

DAVID & JANET THOMPSON
PARCEL ID:
75-07-26-300-038.000-012

DAVID FAZZINI
PARCEL ID:
75-07-26-400-037.000-012

ERIC & CAITLIN FIER
PARCEL ID:
75-07-35-200-004.000-012

DAVID FAZZINI
PARCEL ID:
75-07-26-400-041.000-012

RAY HEWLETT
PARCEL ID:
75-07-35-200-005.200-012

GUY LUCAS
PARCEL ID:
75-07-35-100-001.000-012

DELINEATED WETLAND - AVOID IMPACT

24
721.516
pbmk - hub tack

25
712.895
pbmk - hub tack

22
728.489
pmag

250
729.785
pmag fl

23
729.311
pbmk - starke L77

10
725.759
pmag

C.R. S. 1100 E.

Cardno now Stantec

OVERVIEW

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
Ryan A. St. Clair
No. PE11960351
STATE OF INDIANA
11/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
OVERVIEW

SHEET NUMBER
3

LAND USE #

FINAL

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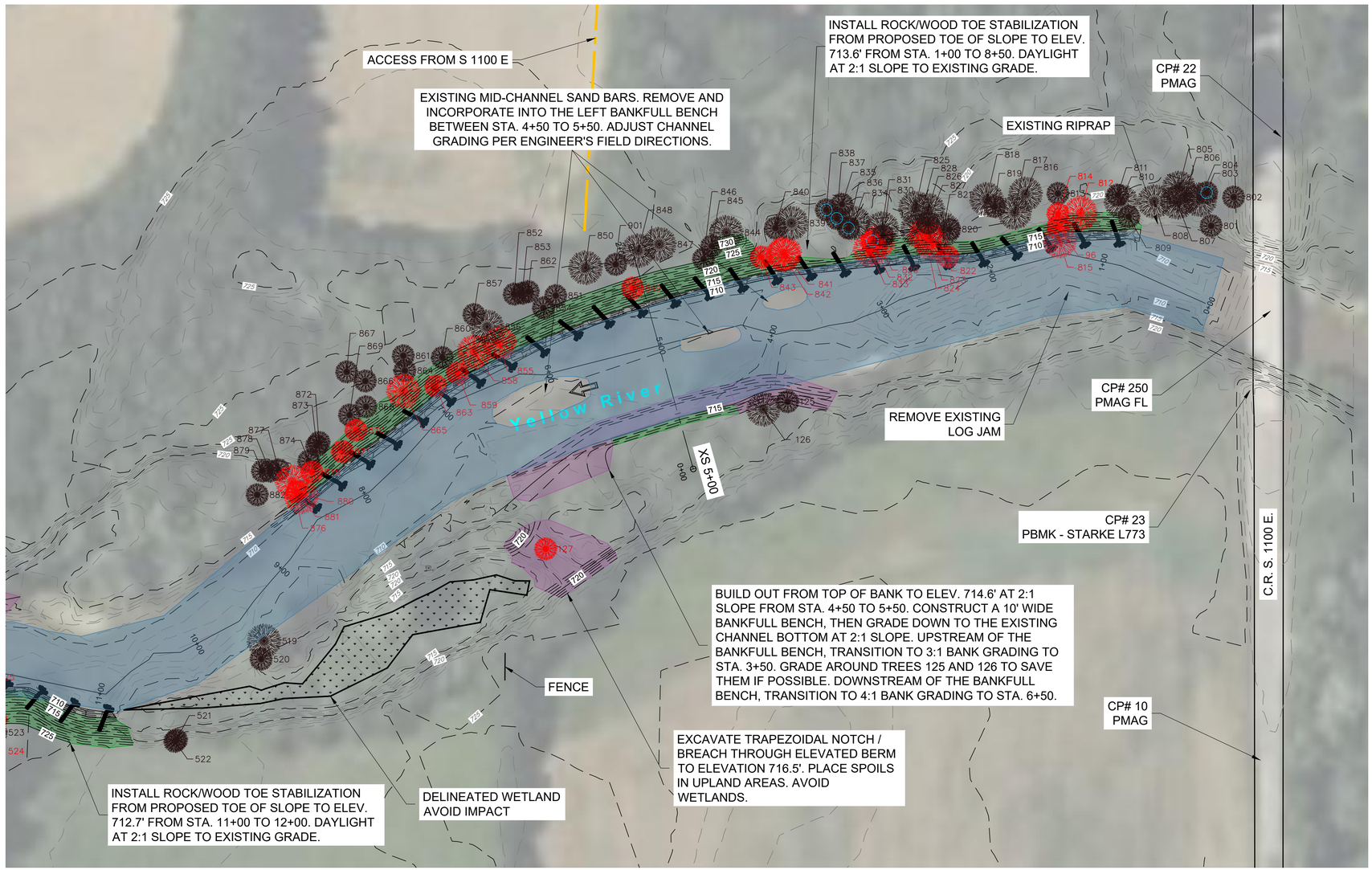


PLAN VIEW
SCALE: 1" = 50'
0 25 50 Feet

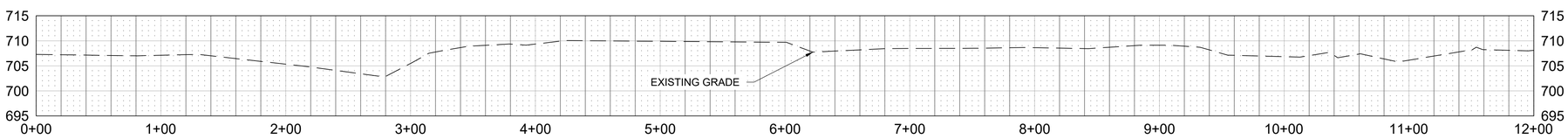
1100 E Restoration

LEGEND

- EXISTING MINOR CONTOUR (1')
- EXISTING MAJOR CONTOUR (5')
- DRAINAGE FLOW
- STREAM THALWEG ALIGNMENT
- PROPOSED MINOR CONTOUR (1')
- PROPOSED MAJOR CONTOUR (5')
- CROSS-SECTION
- WOOD & ROCK TOE STABILIZATION
- BANK GRADING (TYP 2H:1V) STABILIZATION SEED MIX, BLANKET
- INSIDE FLOODPLAIN GRADING (3H:1V OR FLATTER) STABILIZATION SEED MIX, BLANKET
- BASE FLOW AREA
- 930 TREE TO BE REMOVED
- 930 TREE TO REMAIN
- 930 TREE TO BE REMOVED - POTENTIAL BAT TREE
- 930 TREE TO BE REMAIN - POTENTIAL BAT TREE

GENERAL NOTES

1. SEE TYPICAL RIFFLE/POOL CROSS SECTIONS AND TYPICAL STRUCTURE DETAILS FOR FURTHER DETAIL RELATED TO IN-CHANNEL WORK.
2. ALL LOG JAMS WITHIN LIMITS OF PROPOSED STRUCTURE PLACEMENT AND CHANNEL GRADING TO BE REMOVED TO FACILITATE WORK. ALL LOG JAM REMOVAL WORK INCIDENTAL TO CLEARING, GRUBBING & OBSTRUCTION REMOVAL.
3. ALL NON-DEGRADED LOGS FROM REMOVAL PLAN AND LOG JAM REMOVAL TO BE REPURPOSED FOR TOEWOOD AND/OR ROOTWAD COMPOSITE.
4. ALL DISTURBED AREAS TO BE SEEDED WITH STABILIZATION SEED MIX. SEE DETAILS FOR FURTHER SEED APPLICATION, SLOPE PROTECTION AND MULCHING DETAILS.
5. ALL EXISTING AND PROPOSED CONTOURS ARE TO BE CONSIDERED APPROXIMATE AND MAY REQUIRE FIELD ADJUSTMENTS AT THE DIRECTION OF THE ENGINEER OR OWNER.



PROFILE VIEW
SCALE: 1" = 50'
1H : 4V
0 25 50 Feet

FINAL

Cardno now Stantec

PROPOSED CONDITIONS
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

#	DATE	DESCRIPTION	BY

ROBERT A. STCLAIR REGISTERED No. PE11960351 STATE OF INDIANA PROFESSIONAL ENGINEER
1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE: PLAN
SHEET NUMBER: 4
LAND USE # ----

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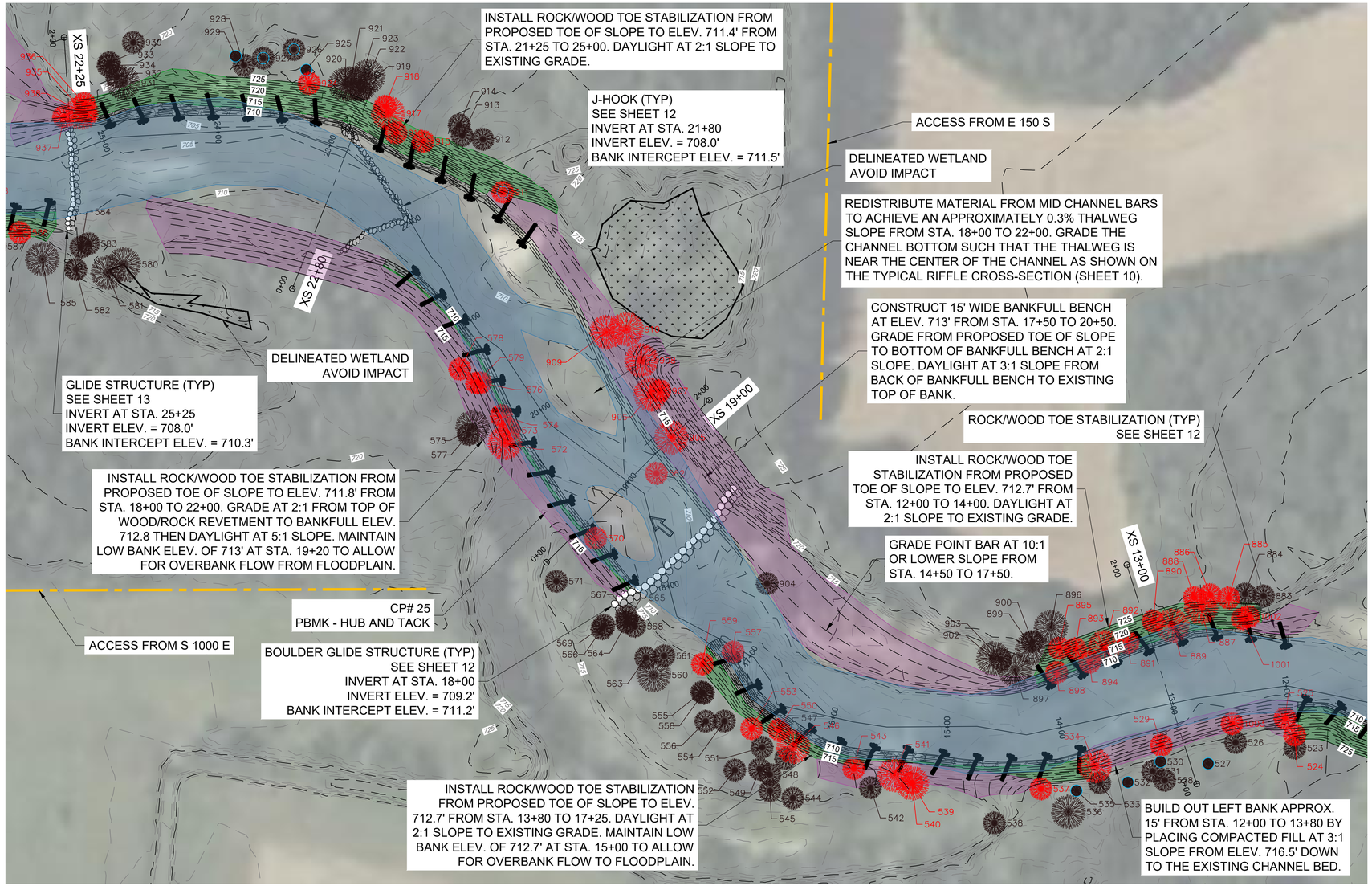

PLAN VIEW
SCALE: 1" = 50'
0 25 50 Feet

1100 E Restoration

LEGEND

- EXISTING MINOR CONTOUR (1')
- EXISTING MAJOR CONTOUR (5')
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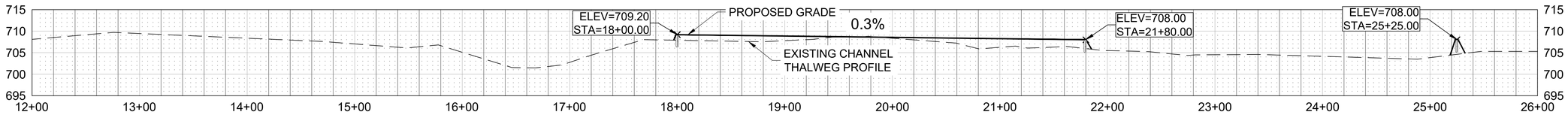

PROFILE VIEW
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FINAL

Cardno now Stantec

PROPOSED CONDITIONS
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

BY	DESCRIPTION	DATE
2		
1		

REGISTERED PROFESSIONAL ENGINEER
STATE OF INDIANA
No. PE11900351
Robert A. St. Clair
11/7/2023

DATE | JANUARY 2023
DRAWN | JTC
DESIGNED | RAS
CHECKED |
PROJECT # | J19Z500501
SHEET TITLE: PLAN
SHEET NUMBER: 5
LAND USE # ----

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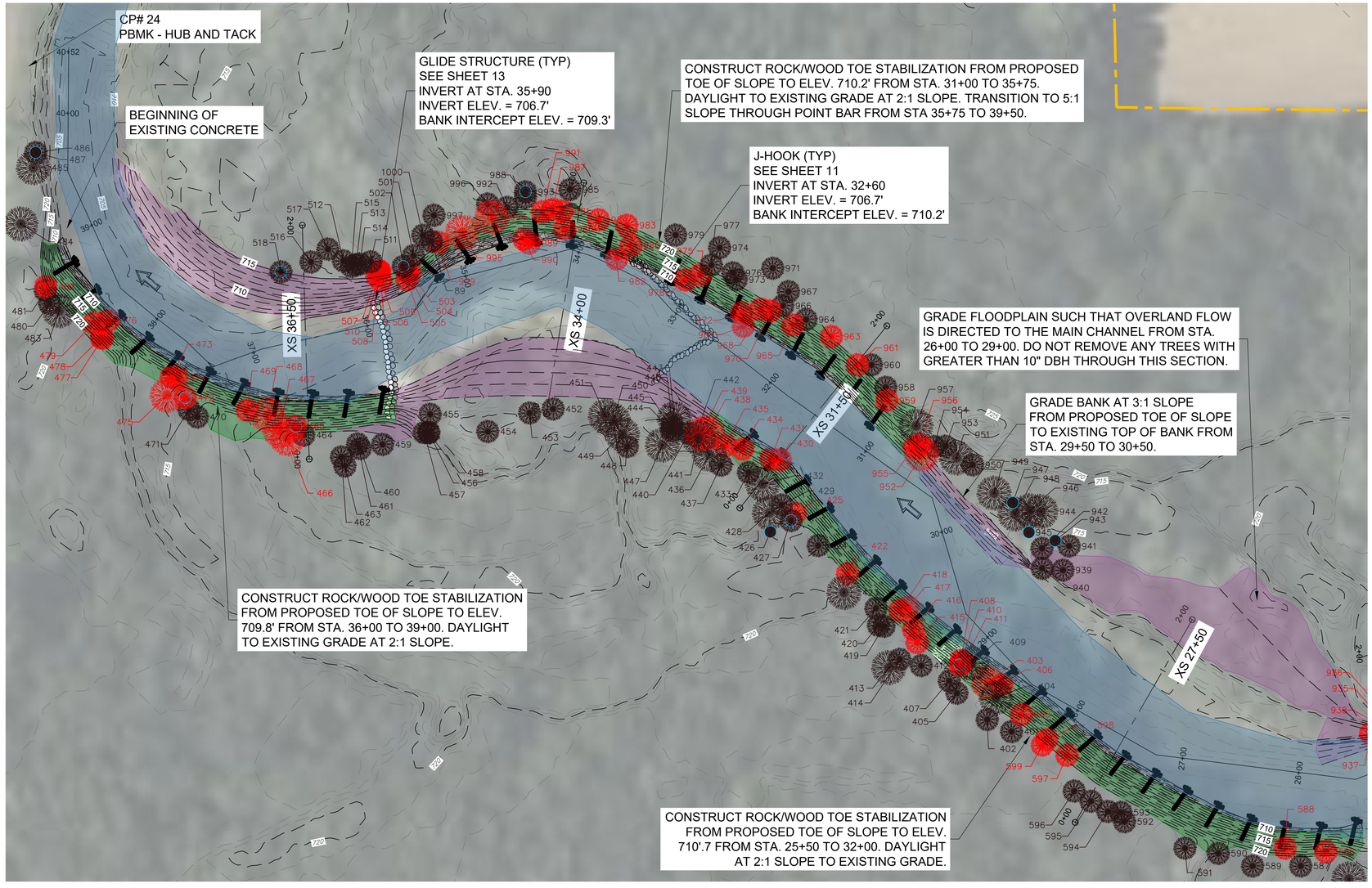

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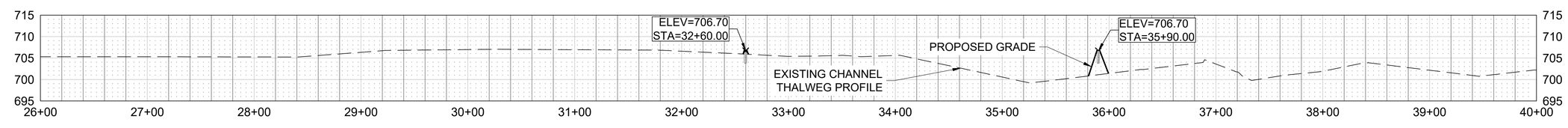
2. ALL LOG JAMS WITHIN LIMITS OF PROPOSED STRUCTURE PLACEMENT AND CHANNEL GRADING TO BE REMOVED TO FACILITATE WORK. ALL LOG JAM REMOVAL WORK INCIDENTAL TO CLEARING, GRUBBING & OBSTRUCTION REMOVAL.
3. ALL NON-DEGRADED LOGS FROM REMOVAL PLAN AND LOG JAM REMOVAL TO BE REPURPOSED FOR TOEWOOD AND/OR ROOTWAD COMPOSITE.
4. ALL DISTURBED AREAS TO BE SEEDED WITH STABILIZATION SEED MIX. SEE DETAILS FOR FURTHER SEED APPLICATION, SLOPE PROTECTION AND MULCHING DETAILS.
5. ALL EXISTING AND PROPOSED CONTOURS ARE TO BE CONSIDERED APPROXIMATE AND MAY REQUIRE FIELD ADJUSTMENTS AT THE DIRECTION OF THE ENGINEER OR OWNER.



PROFILE VIEW
SCALE: 1" = 50'
1H : 4V
0 25 50 Feet

FINAL

Cardno now Stantec

PROPOSED CONDITIONS
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

#	DATE	DESCRIPTION	BY

PROFESSIONAL ENGINEER
ROBERT A. STCLAIR
REGISTERED
No. PE11960351
STATE OF INDIANA
1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501
SHEET TITLE	PLAN
SHEET NUMBER	6
LAND USE #	—

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PLAN VIEW
SCALE: 1" = 50'
0 25 50 Feet

1100 E Restoration

LEGEND

- EXISTING MINOR CONTOUR (1')
- EXISTING MAJOR CONTOUR (5')
- DRAINAGE FLOW
- STREAM THALWEG ALIGNMENT
- PROPOSED MINOR CONTOUR (1')
- PROPOSED MAJOR CONTOUR (5')
- BANK GRADING (TYP 2H:1V) STABILIZATION SEED MIX, BLANKET
- INSIDE FLOODPLAIN GRADING (3H:1V OR FLATTER) STABILIZATION SEED MIX, BLANKET
- BASE FLOW AREA
- 930 TREE TO BE REMOVED
- 930 TREE TO REMAIN
- 930 TREE TO BE REMOVED - POTENTIAL BAT TREE
- 930 TREE TO REMAIN - POTENTIAL BAT TREE

GENERAL NOTES

1. SEE TYPICAL RIFFLE/POOL CROSS SECTIONS, GRADING SECTIONS, AND TYPICAL STRUCTURE DETAILS FOR FURTHER DETAIL RELATED TO IN-CHANNEL WORK.
2. ALL LOG JAMS WITHIN LIMITS OF PROPOSED STRUCTURE PLACEMENT AND CHANNEL GRADING TO BE REMOVED TO FACILITATE WORK. ALL LOG JAM REMOVAL WORK INCIDENTAL TO CLEARING, GRUBBING & OBSTRUCTION REMOVAL.
3. ALL NON-DEGRADED LOGS FROM REMOVAL PLAN AND LOG JAM REMOVAL TO BE REPURPOSED FOR TOEWOOD AND/OR ROOTWAD COMPOSITE.
4. ALL DISTURBED AREAS TO BE SEEDED WITH STABILIZATION SEED MIX. SEE DETAILS FOR FURTHER SEED APPLICATION, SLOPE PROTECTION AND MULCHING DETAILS.
5. ALL EXISTING AND PROPOSED CONTOURS ARE TO BE CONSIDERED APPROXIMATE AND MAY REQUIRE FIELD ADJUSTMENTS AT THE DIRECTION OF THE ENGINEER OR OWNER.

FINAL

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PROPOSED CONDITIONS

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

ROSS A. St.Clair REGISTERED No. PE11900351 STATE OF INDIANA PROFESSIONAL ENGINEER

1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

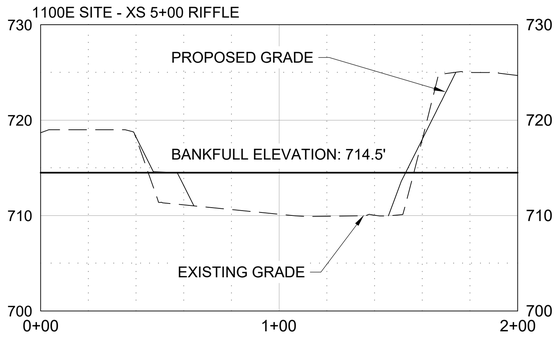
SHEET TITLE
PLAN

SHEET NUMBER
7

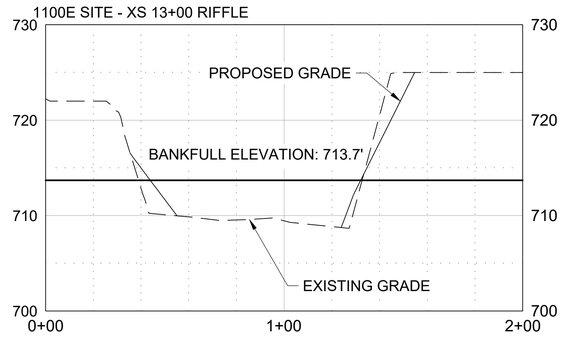
LAND USE # —

1100 E Restoration

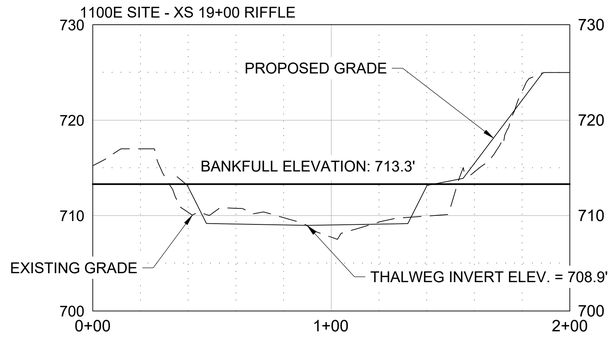
CROSS SECTION VIEW
SCALE: 1" = 30'
1H : 4V
0 15 30 Feet



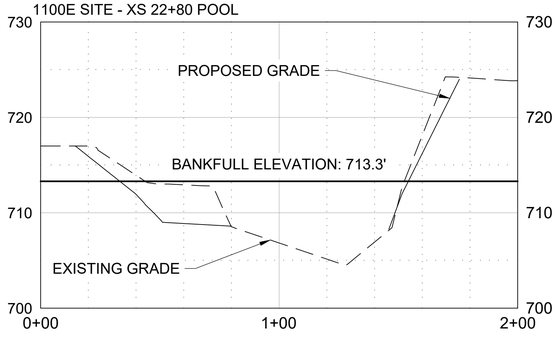
FILL: 78.8 SQ. FT.
CUT: 19.1 SQ. FT.



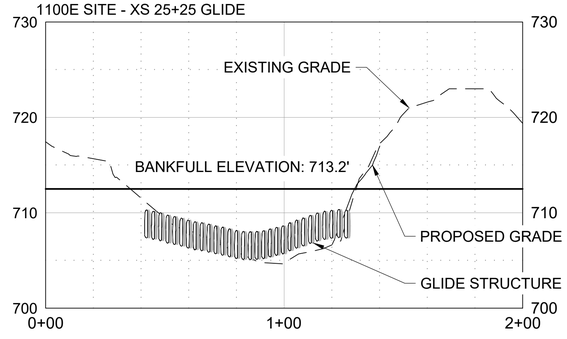
FILL: 58.4 SQ. FT.
CUT: 52.4 SQ. FT.



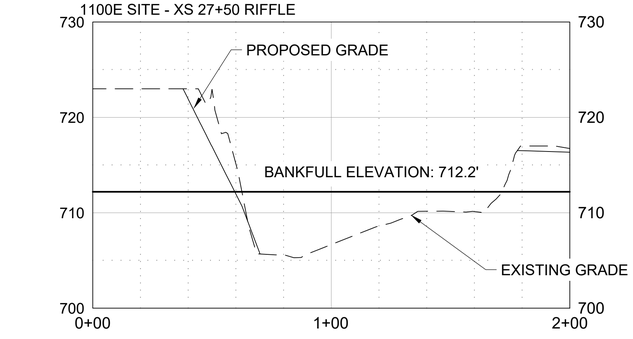
FILL: 117.4 SQ. FT.
CUT: 106.0 SQ. FT.



FILL: 1.3 SQ. FT.
CUT: 215.2 SQ. FT.



FILL: 10.5 SQ. FT.
CUT: 4.2 SQ. FT.



FILL: 2.8 SQ. FT.
CUT: 91.4 SQ. FT.

FINAL

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CROSS SECTIONS
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

#	DATE	DESCRIPTION	BY

ROSS A. St. CLAIR REGISTERED No. PE11900351 STATE OF INDIANA PROFESSIONAL ENGINEER
11/7/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
CROSS SECTIONS

SHEET NUMBER
8

LAND USE # —

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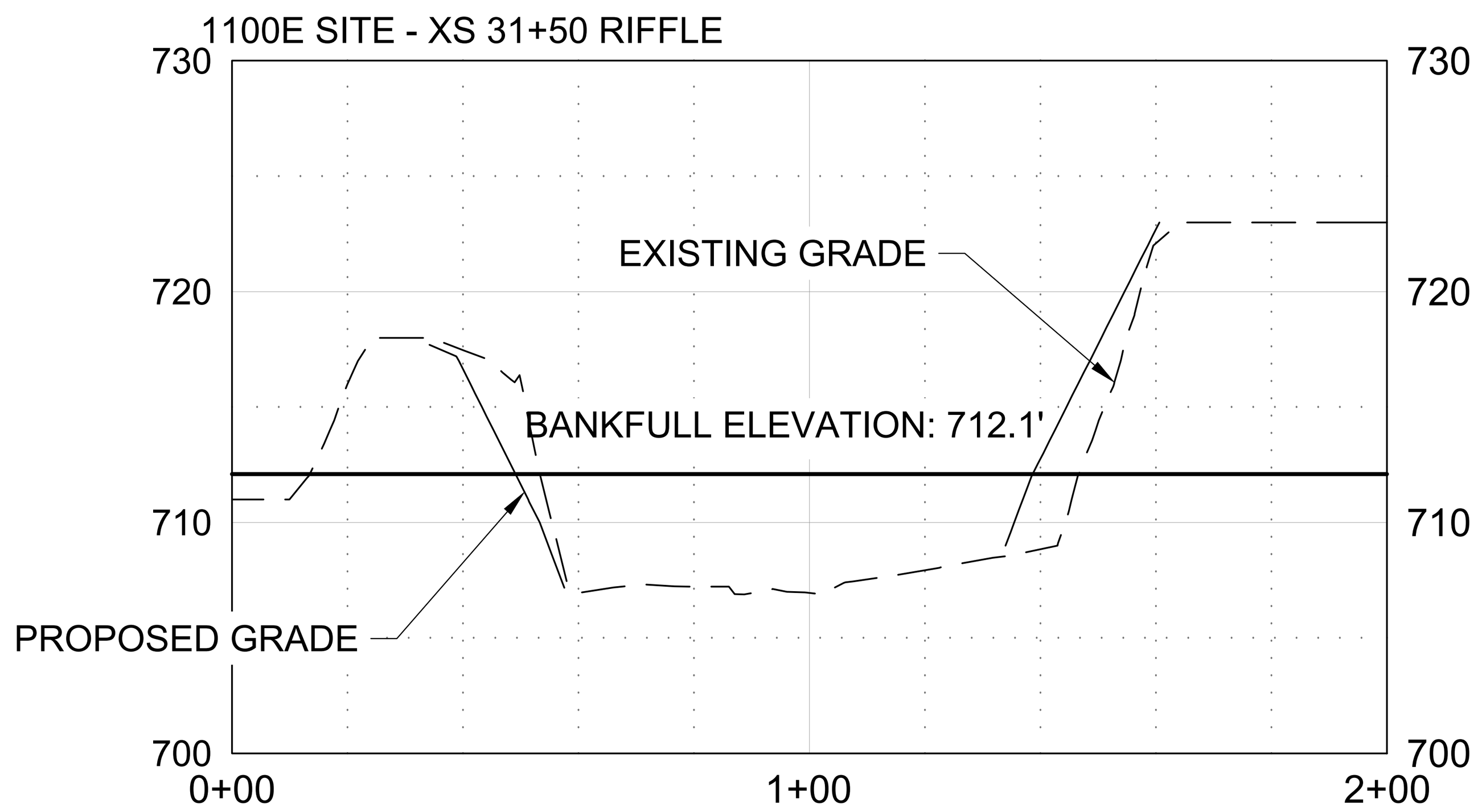
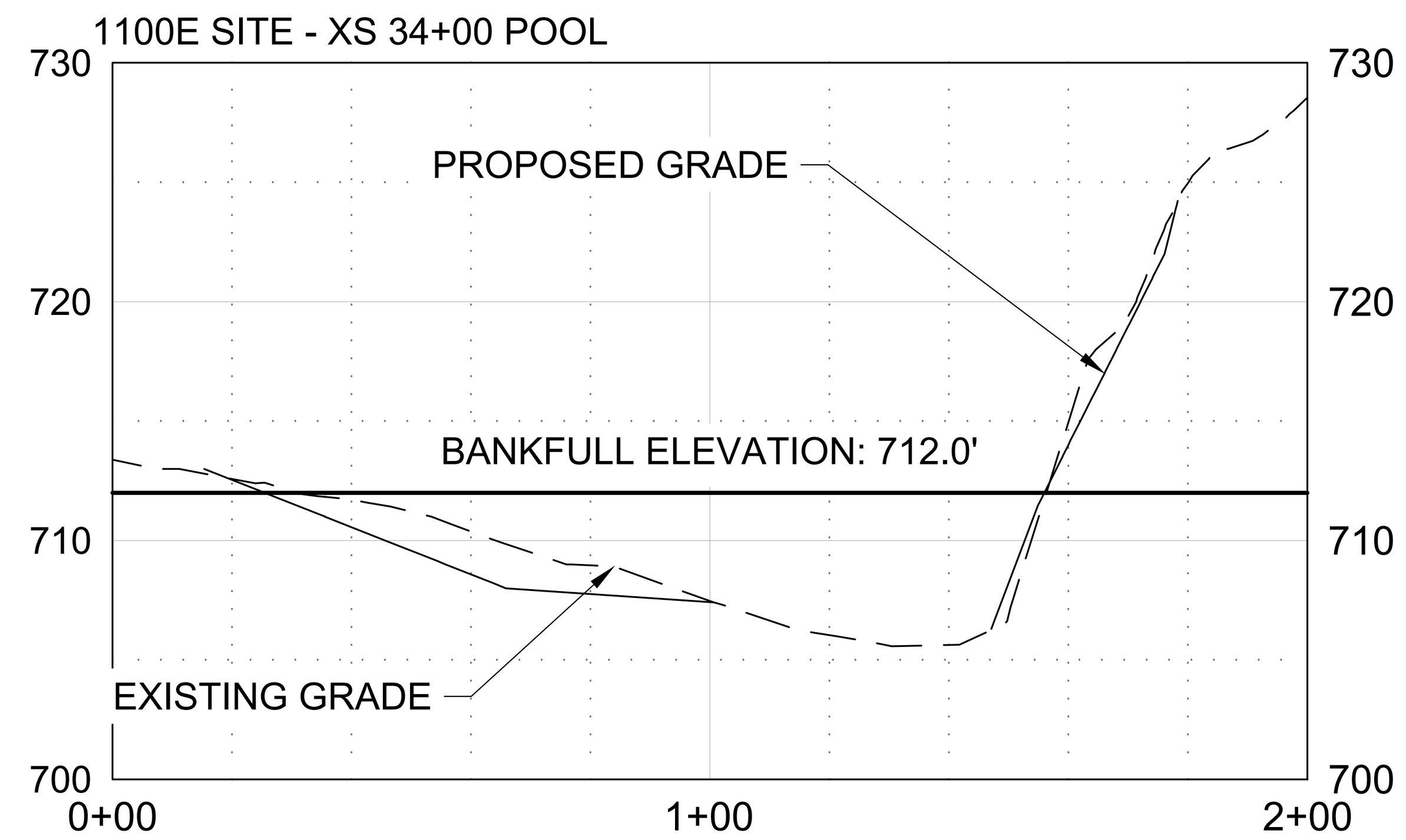
1100 E Restoration

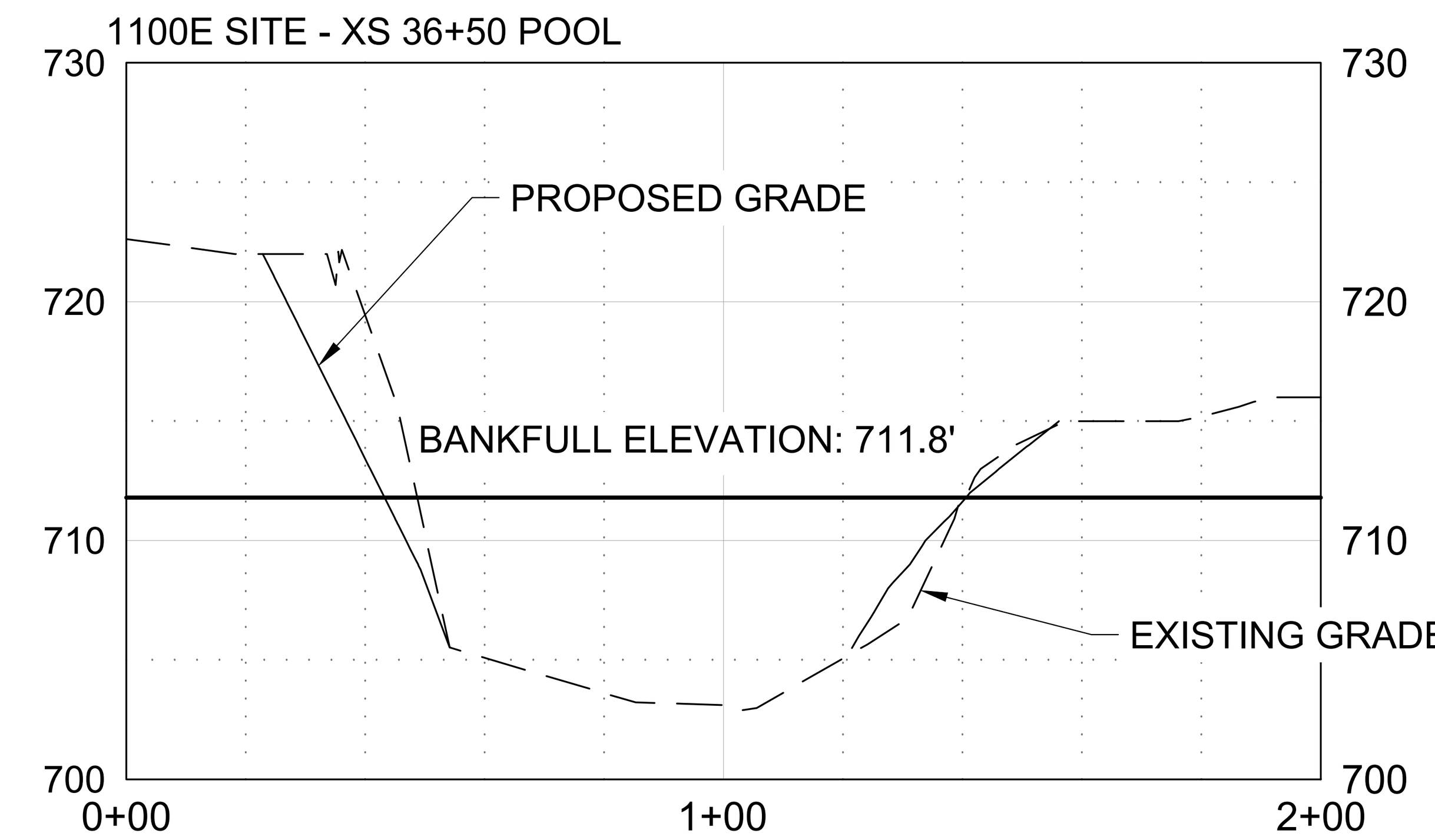
CROSS SECTION VIEW
SCALE: 1" = 30'
1H : 4V
0 15 30 Feet



FILL: 79.9 SQ. FT.
CUT: 46.5 SQ. FT.



FILL: 7.5 SQ. FT.
CUT: 104.6 SQ. FT.



FILL: 23.2 SQ. FT.
CUT: 122.4 SQ. FT.

FINAL

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CROSS SECTIONS
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

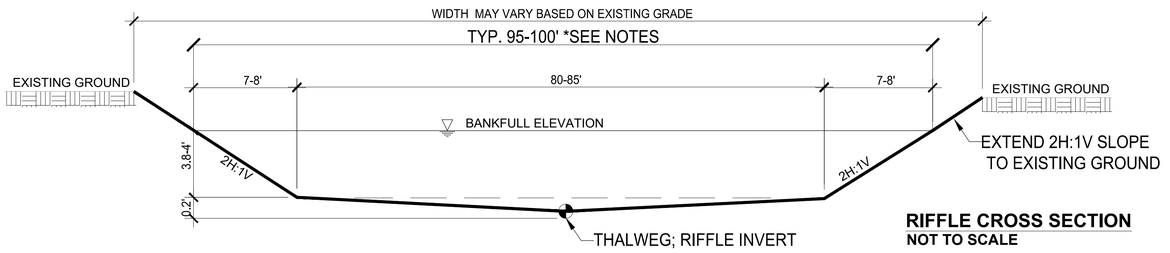
#	DATE	DESCRIPTION	BY

DATE: JANUARY 2023
DRAWN: JTC
DESIGNED: RAS
CHECKED:
PROJECT #: J19Z500501

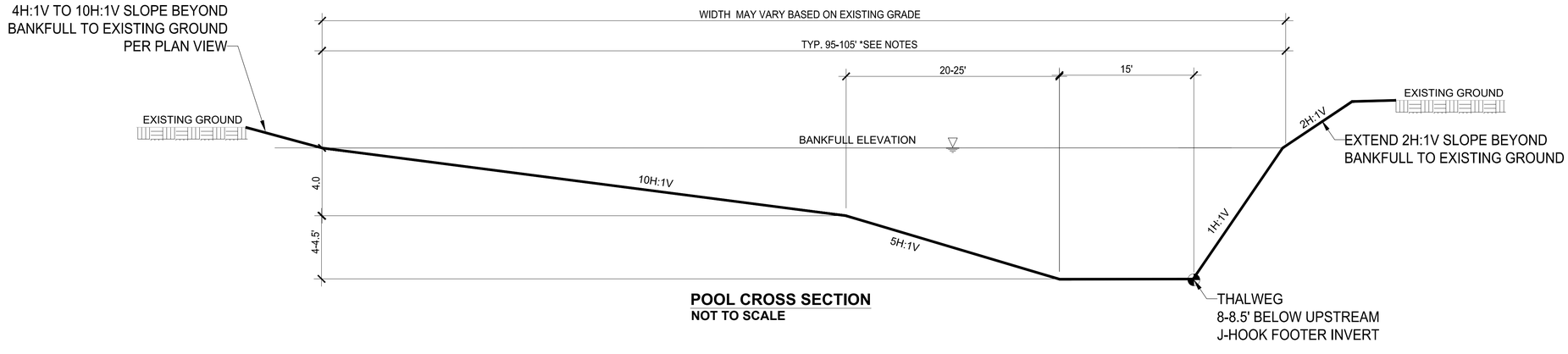
SHEET TITLE: CROSS SECTIONS
SHEET NUMBER: 9
LAND USE #: —

NOTES:

1. SEE PLAN AND PROFILE SHEETS FOR LOCATIONS TO APPLY TYPICAL CROSS SECTIONS. POOL CROSS SECTION TO BE APPLIED DOWNSTREAM OF J-HOOK EXTENDING TO DOWNSTREAM BOULDER GLIDE STRUCTURE.
2. RIFFLE CROSS SECTION TYPICALLY OCCURS AT MID-RIFFLE AND POOL CROSS SECTION AT MID-POOL. CHANNEL DEPTH AND SIDE SLOPES WILL VARY ALONG TRANSITION FROM POOL CROSS SECTION TO RIFFLE CROSS SECTION. REFER TO PROPOSED PROFILE FOR BANKFULL ELEVATION AND CHANNEL INVERT/THALWEG ELEVATION.
3. POOL TYPICAL FOR RIGHT MEANDER SHOWN. MIRROR SECTION FOR LEFT MEANDERS.
4. INSIDE FLOODPLAIN GRADING MAY BE MODIFIED IN ORDER TO AVOID SELECT TREES LARGER THAN 10" DBH. MODIFICATIONS TO TYPICAL CROSS SECTIONS TO BE APPROVED BY ENGINEER.
5. ALL TYPICAL DIMENSIONS MAY BE MODIFIED UPON APPROVAL BY THE ENGINEER BASED ON FIELD CONDITIONS.



RIFFLE CROSS SECTION
NOT TO SCALE



POOL CROSS SECTION
NOT TO SCALE

FINAL

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TYPICAL CROSS SECTION

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY
1	1/17/2023		

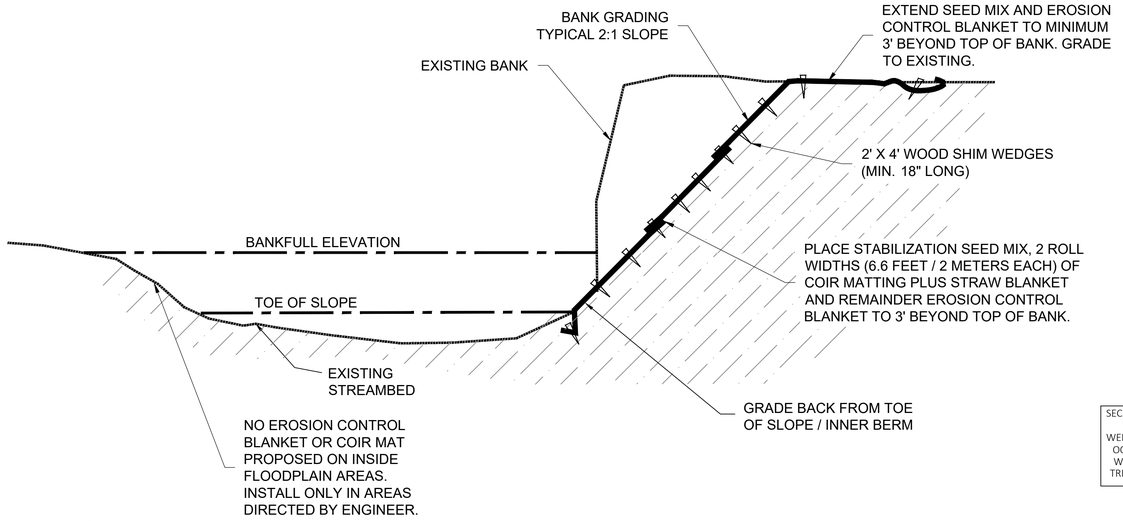
REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA No. PE11900351 ROBERT A. ST. CLAIR

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
TYPICAL XS

SHEET NUMBER
10

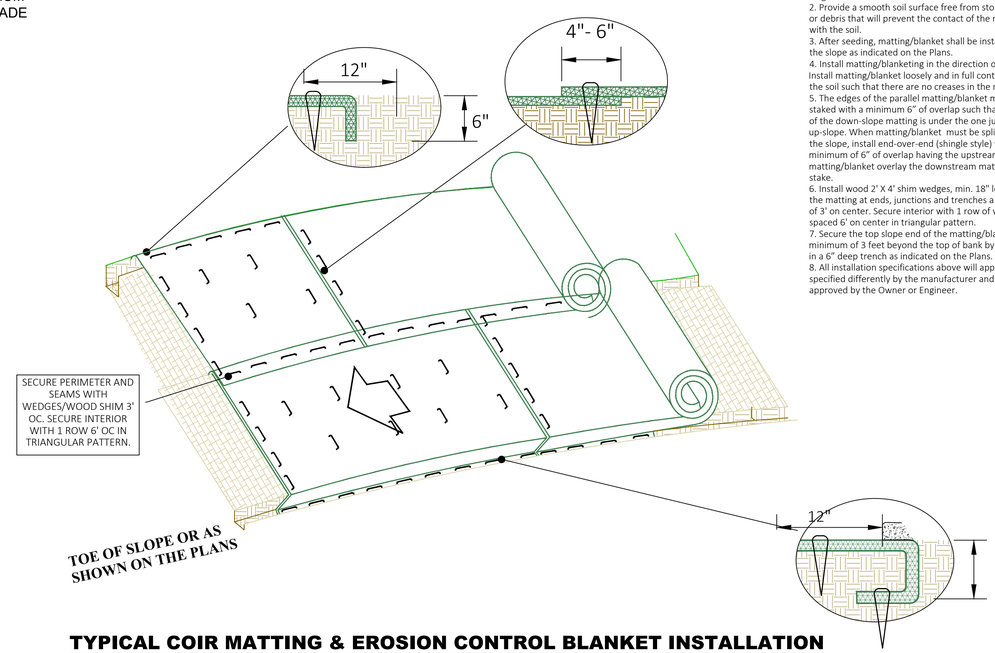
LAND USE # ----



NOTES:

1. SECURE COIR MAT AND EROSION CONTROL BLANKET WITH WEDGES OR STAKES (AS DETAILED IN SPECIFICATIONS) 3' ON CENTER AROUND PERIMETER AND AT ALL SEAMS. INTERIOR CAN BE SECURED WITH 1 ROW 6' ON CENTER.

BANK GRADING & INSIDE FLOODPLAIN GRADING
NOT TO SCALE



1.The coir matting plus straw blanket or erosion control blanket shall be installed at the locations, elevations and lengths as indicated on the Plans.
2. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the matting with the soil.
3. After seeding, matting/blanket shall be installed along the slope as indicated on the Plans.
4. Install matting/blanketing in the direction of flow. Install matting/blanket loosely and in full contact with the soil such that there are no creases in the matting.
5. The edges of the parallel matting/blanket must be staked with a minimum 6" of overlap such that the edge of the down-slope matting is under the one just up-slope. When matting/blanket must be spliced -along the slope, install end-over-end (shingle style) with a minimum of 6" of overlap having the upstream matting/blanket overlay the downstream matting and stake.
6. Install wood 2' X 4' shim wedges, min. 18" long, across the matting at ends, junctions and trenches a maximum of 3' on center. Secure interior with 1 row of wedges spaced 6' on center in triangular pattern.
7. Secure the top slope end of the matting/blanket a minimum of 3 feet beyond the top of bank by anchoring in a 6" deep trench as indicated on the Plans.
8. All installation specifications above will apply unless specified differently by the manufacturer and also approved by the Owner or Engineer.

TYPICAL COIR MATTING & EROSION CONTROL BLANKET INSTALLATION
NOT TO SCALE

Stabilization Seed Mix		
Botanic Name	**Common Name**	**PLS oz/ac**
Avena sativa	Common Oat	640
Bromus latiglumis	Early-leaf Brome	1
Carex brevior	Plains Oval Sedge	1.5
Cinna arundinacea	Common Wood Reed	1
Elymus canadensis	Canada Wild Rye	80
Elymus virginicus	Virginia Wild Rye	80
Glyceria striata	Fowl Manna Grass	2
Leersia oryzoides	Rice Cut Grass	2.5
Monarda fistulosa	Wild Bergamot	1.5
Panicum virgatum	Switch Grass	8
Rudbeckia hirta	Black-Eyed Susan	3.5
Rudbeckia laciniata	Wild Golden Glow	1.5
Verbesina alternifolia	Wingstem	2.5
Verbena urticifolia	Hairy White Vervain	1
		826

PLANTING NOTES:

1. ALL DISTURBED AREAS TO BE SEEDED WITH STABILIZATION SEED MIX. SEE DETAILS ABOVE FOR TYPICAL BANK GRADING AND INSTALLATION OF COIR MAT / EROSION CONTROL BLANKET.
2. BANK GRADING AREAS (GREEN HATCH) TO BE PLANTED WITH SINGLE ROW OF TREES/SHRUBS 12-14' O.C. AND PLANTED 5' BEYOND TOP OF BANK.

PROPOSED TREE REMOVAL WITHIN FLOODWAY
SEE TREE REMOVAL PLAN LIST, SHEET 15 AND 16

TREE SHRUB PLANTING PLAN
-TREES TO BE PLANTED APPROXIMATELY 12-14' ON CENTER AT A DISTANCE 5' LANDWARD FROM PROPOSED TOP OF BANK LIMIT IN ALL BANK GRADING (2H:1V) AREAS.
-EXCESS TREES SHALL BE PLANTED AS DIRECTED BY THE ENGINEER AND WITH APPROVAL FROM LANDOWNER.
-TREES TO BE PROTECTED BY STAKED TREE TUBES MINIMUM 4' TALL.
-SUBSTITUTIONS TO TREE SPECIES TO BE APPROVED BY ENGINEER.

Tree Replacement		
Common Name	Type	# Trees
Sugar Maple	Bare Root	50
Hackberry		50
American Sycamore		50
Black Walnut		50
Eastern Redbud		50
Bur Oak		50

FINAL

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DETAILS
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

#	DATE	DESCRIPTION	BY

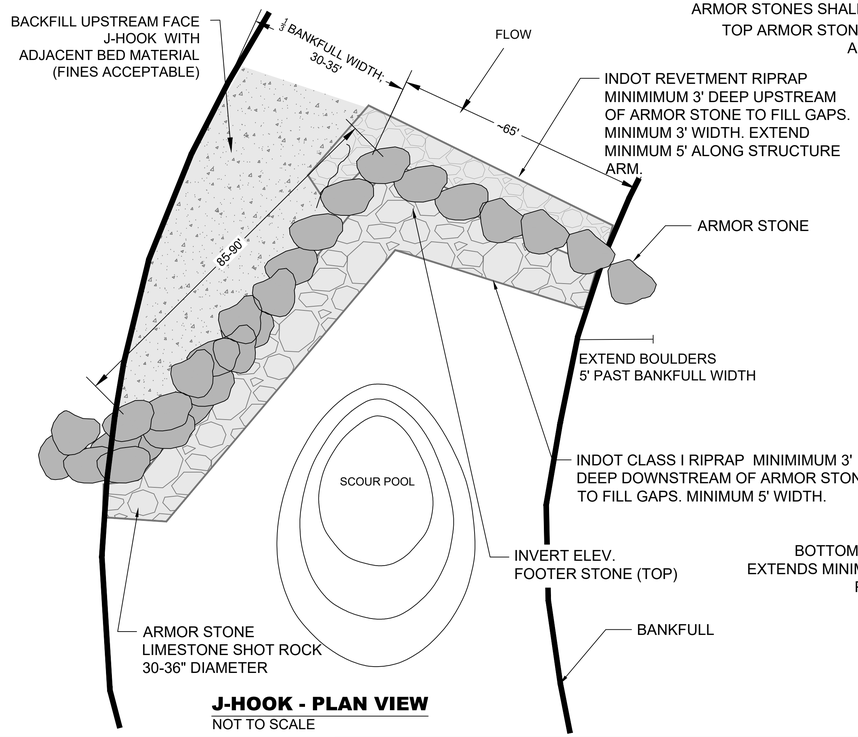
PROFESSIONAL ENGINEER — REGISTERED — R. A. St. Clair — No. PE11900351 — STATE OF INDIANA
1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

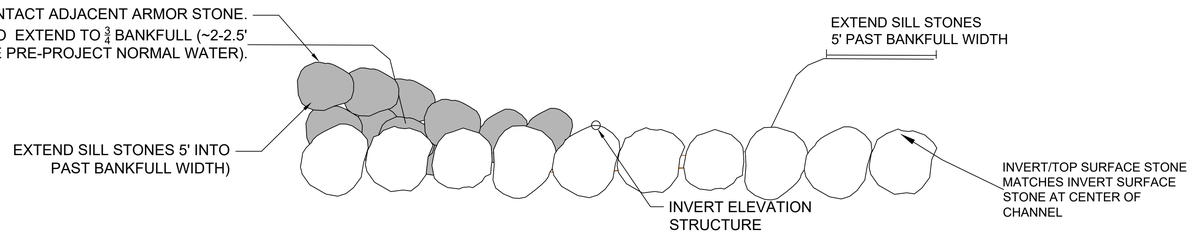
SHEET TITLE
DETAILS

SHEET NUMBER
11

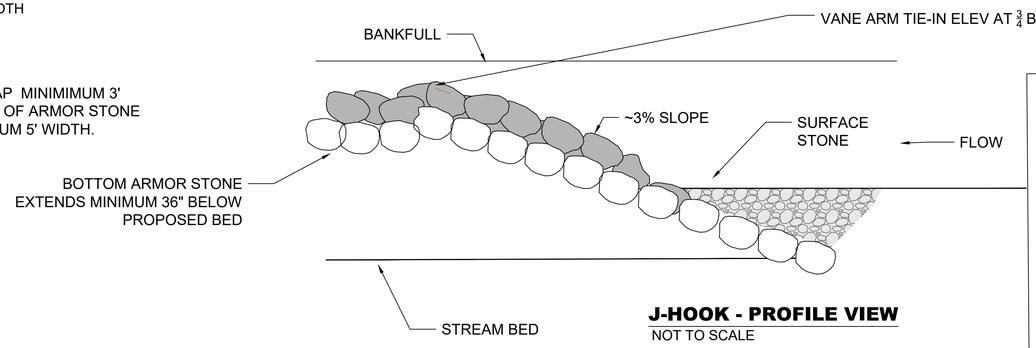
LAND USE # ----



J-HOOK - PLAN VIEW
NOT TO SCALE



J-HOOK VANE - CROSS SECTION VIEW
NOT TO SCALE

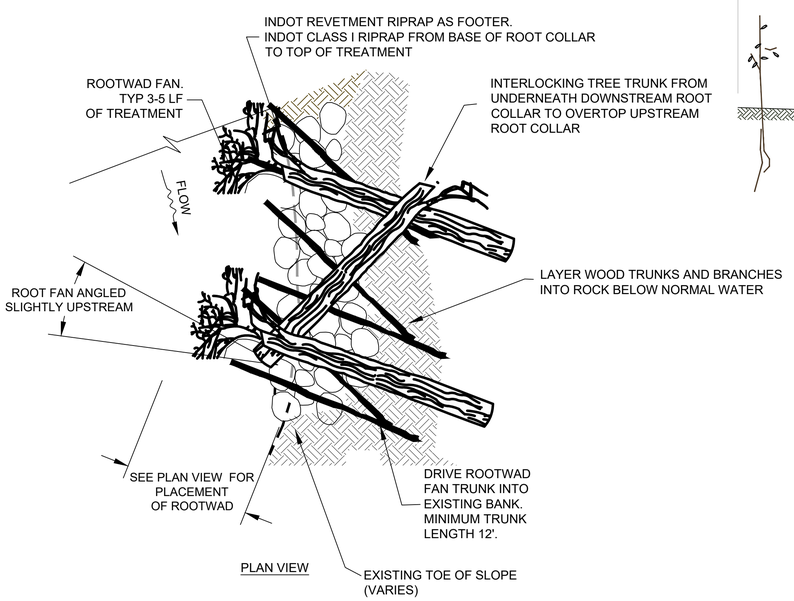


J-HOOK - PROFILE VIEW
NOT TO SCALE

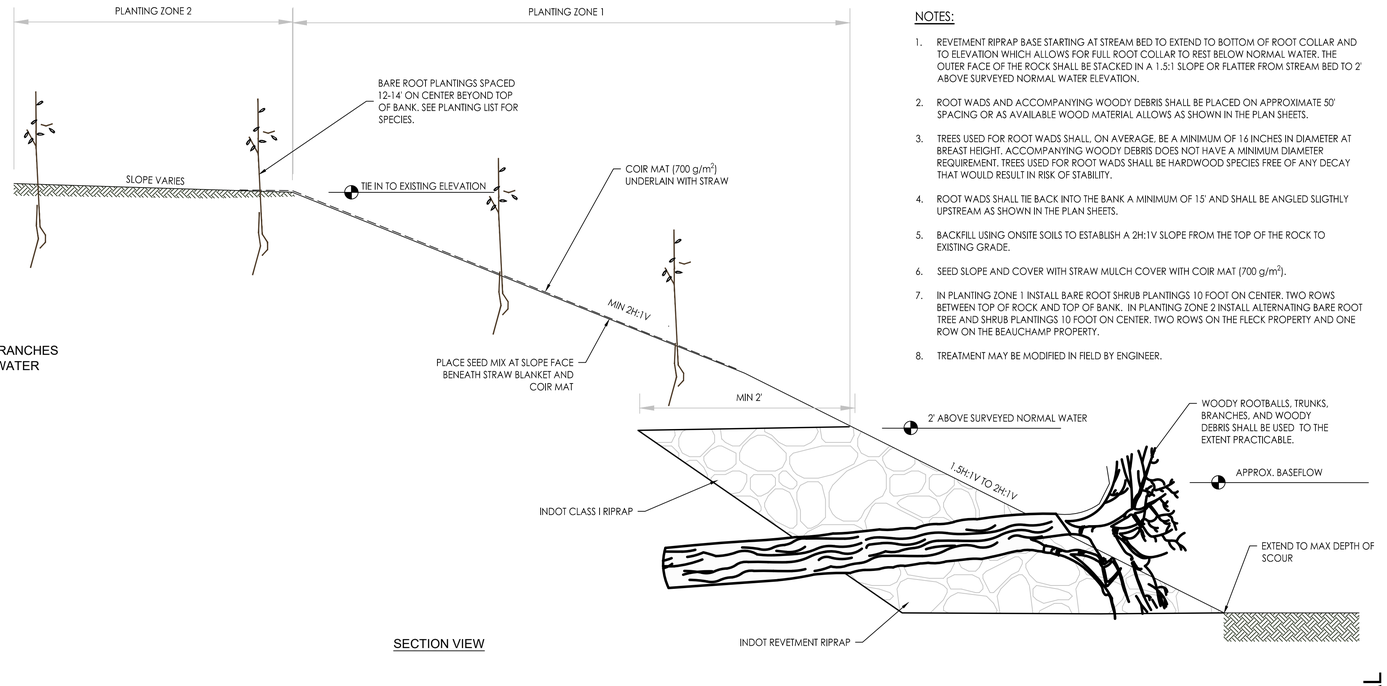
ROCK VANE DETAIL

NOTES:

1.FOR ROCK VANE STRUCTURES, THE J-HOOK DETAIL MINUS THE "HOOK/ARCH" PORTION SHOULD BE APPLIED. ROCK VANE TO BE KEYED INTO BANKFULL AND TERMINATE IN RIVER BOTTOM AT APPROXIMATELY ⅓ BANKFULL WIDTH. SEE STRUCTURES TABLE FOR FURTHER DETAIL.



PLAN VIEW



SECTION VIEW

NOTES:

1. REVETMENT RIPRAP BASE STARTING AT STREAM BED TO EXTEND TO BOTTOM OF ROOT COLLAR AND TO ELEVATION WHICH ALLOWS FOR FULL ROOT COLLAR TO REST BELOW NORMAL WATER. THE OUTER FACE OF THE ROCK SHALL BE STACKED IN A 1.5:1 SLOPE OR FLATTER FROM STREAM BED TO 2' ABOVE SURVEYED NORMAL WATER ELEVATION.
2. ROOT WADS AND ACCOMPANYING WOODY DEBRIS SHALL BE PLACED ON APPROXIMATE 50' SPACING OR AS AVAILABLE WOOD MATERIAL ALLOWS AS SHOWN IN THE PLAN SHEETS.
3. TREES USED FOR ROOT WADS SHALL, ON AVERAGE, BE A MINIMUM OF 16 INCHES IN DIAMETER AT BREAST HEIGHT. ACCOMPANYING WOODY DEBRIS DOES NOT HAVE A MINIMUM DIAMETER REQUIREMENT. TREES USED FOR ROOT WADS SHALL BE HARDWOOD SPECIES FREE OF ANY DECAY THAT WOULD RESULT IN RISK OF STABILITY.
4. ROOT WADS SHALL TIE BACK INTO THE BANK A MINIMUM OF 15' AND SHALL BE ANGLED SLIGTHLY UPSTREAM AS SHOWN IN THE PLAN SHEETS.
5. BACKFILL USING ONSITE SOILS TO ESTABLISH A 2H:1V SLOPE FROM THE TOP OF THE ROCK TO EXISTING GRADE.
6. SEED SLOPE AND COVER WITH STRAW MULCH COVER WITH COIR MAT (700 g/m²).
7. IN PLANTING ZONE 1 INSTALL BARE ROOT SHRUB PLANTINGS 10 FOOT ON CENTER. TWO ROWS BETWEEN TOP OF ROCK AND TOP OF BANK. IN PLANTING ZONE 2 INSTALL ALTERNATING BARE ROOT TREE AND SHRUB PLANTINGS 10 FOOT ON CENTER. TWO ROWS ON THE FLECK PROPERTY AND ONE ROW ON THE BEAUCHAMP PROPERTY.
8. TREATMENT MAY BE MODIFIED IN FIELD BY ENGINEER.

ROCK & WOOD TOE STABILIZATION WITH 2:1 BANK GRADING
NOT TO SCALE

FINAL

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DETAILS

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA No. PE11960351 1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
DETAILS

SHEET NUMBER
12

LAND USE # ----

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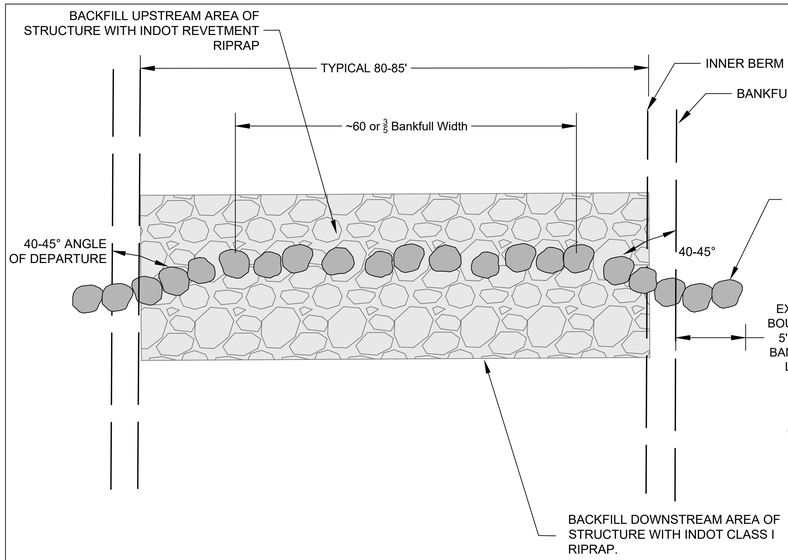
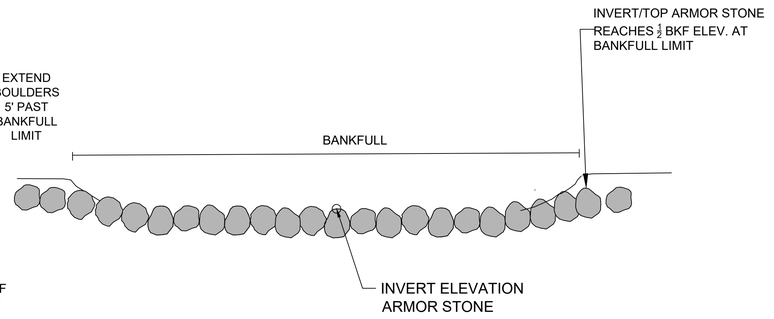


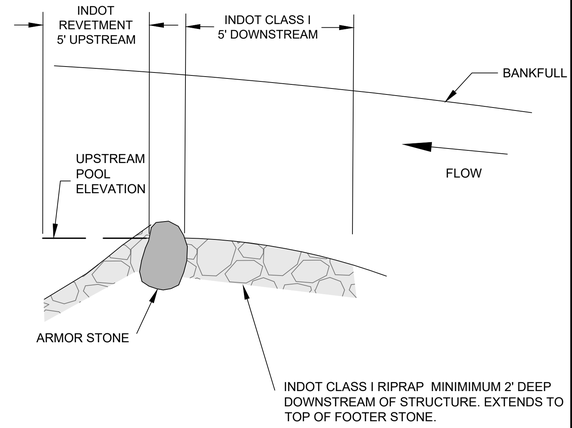
BOULDER GLIDE STRUCTURE - PLANVIEW

NOT TO SCALE



BOULDER GLIDE STRUCTURE- CROSS SECTION

NOT TO SCALE



BOULDER GLIDE STRUCTURE - PROFILE

NOT TO SCALE

FINAL

Cardno now Stantec

DETAILS

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

ROBERT A. STAIR REGISTERED No. PE11900351 STATE OF INDIANA PROFESSIONAL ENGINEER
1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE: DETAILS

SHEET NUMBER: 13

LAND USE # ----

GENERAL NOTES

1. There shall be no storage of equipment, materials, debris, soil, etc. in streets, parking areas, or the public right-of-way without written permission from the local jurisdiction.
2. Coordinate locations for all required access with OWNER and ENGINEER.
3. CONTRACTOR shall minimize interference with adjoining roads and other adjacent occupied or used facilities during construction operations. CONTRACTOR shall not close or obstruct roads without permission from the OWNER and authorities having jurisdiction. CONTRACTOR shall protect all roads at heavy-equipment crossings as needed to protect pavement. CONTRACTOR shall provide road barriers and/or a flag person to control traffic during all times when construction equipment is crossing public roads or when otherwise warranted.
4. CONTRACTOR shall be responsible to secure the construction site against unauthorized entrance by persons and vehicles outside of and during working hours. If CONTRACTOR fails to maintain security or safety measures at the project site, OWNER may at the expiration of a period of 48 hours, after having given CONTRACTOR written notice, proceed to provide additional measures as deemed necessary, and the cost thereof shall be deducted from any compensation due, or which may become due to CONTRACTOR under this contract.
5. CONTRACTOR shall allow OWNER, ENGINEER, OWNER'S REPRESENTATIVE(s), and other contractors working for OWNER access to the site at all times.
6. If CONTRACTOR finds a conflict, error or discrepancy in the construction documents or plans, CONTRACTOR shall report it immediately to ENGINEER in writing or by email before proceeding with the work affected thereby and shall obtain a written interpretation or clarification from ENGINEER.
7. All work shall be constructed in accordance with the lines and grades shown on the plans. The full responsibility for keeping alignment and grade shall rest upon CONTRACTOR at no additional cost to OWNER.
8. CONTRACTOR shall be fully responsible to OWNER for all acts and omissions of his SUB-CONTRACTORS, suppliers, and other persons and organizations performing or furnishing any of the work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR'S own acts and omissions. CONTRACTOR shall assume sole obligation for the payment of any monies due to any SUB-CONTRACTOR, supplier, or other person or organization, except as may be otherwise required by laws and regulations.
9. The Owner shall provide permission from the necessary landowners for all work performed outside of OWNER'S easement.
10. CONTRACTOR shall stake out and mark limits of construction so they are clearly visible. All construction activities shall be performed within the designated construction limits.
11. OWNER does not bear any responsibility for the cost of injuries to CONTRACTOR, SUBCONTRACTOR, or employees injured during the course of the contract. CONTRACTOR shall be responsible for the transport of injured employees needing medical or other attention.
12. CONTRACTOR shall, at all times, keep the premises free from accumulation of waste materials or rubbish caused by his/her employees or work and prevent the spread of debris during windy conditions. At the completion of work, CONTRACTOR shall leave the premises in a neat, clean, and orderly fashion.
13. CONTRACTOR shall power wash any mechanical equipment or vehicle to be used on the job site to remove all mud and debris prior to unloading on the site. No other vehicles/machines shall be permitted in the project area. All other equipment or project-related vehicles must be parked in specified parking areas.
14. CONTRACTOR shall immediately remove mud tracked by vehicles onto the public roadways when the road is in use, otherwise, before a closed section is returned to service.
15. Temporary traffic control is the responsibility of the CONTRACTOR. The CONTRACTOR shall coordinate with the local authorities and/or other authorities having jurisdiction to determine exact traffic control requirements.
16. Shop drawings or product certification information of all constructed or supplied project materials shall be submitted to OWNER or ENGINEER for review prior to installation.
17. Upon substantial completion and again at final completion of construction, prior to demobilization, CONTRACTOR shall ensure that all excess construction materials and debris, including soil, aggregate, trash, temporary erosion control measures, and miscellaneous construction materials are removed from the project site and disposed of properly. All disturbed areas shall be restored to the satisfaction of OWNER and ENGINEER.
18. Upon completion of the work and prior to acceptance of the project, CONTRACTOR shall be required to furnish the ENGINEER with one set of marked-up prints showing the as-built location of improvements, field changes, and details not on original drawings.
19. CONTRACTOR shall attend a pre-construction meeting at the project site prior to beginning work.
20. CONTRACTOR shall submit a project schedule for review by OWNER and ENGINEER prior to beginning work. Submit revised schedules with each application for payment.
21. CONTRACTOR shall provide, maintain, and pay for temporary facilities and utilities as required to complete the work. Remove temporary facilities prior to the application for final payment.
22. CONTRACTOR shall restore existing and permanent facilities used during construction to original condition or as otherwise specified.

CONSTRUCTION NOTES

1. CONTRACTOR shall clearly mark all underground utilities, culverts, and underground drains prior to construction.
2. Responsibility for the repair of utilities and structures when broken or otherwise damaged shall be borne by CONTRACTOR. Materials damaged by CONTRACTOR during handling or placement operations shall be replaced in-kind by CONTRACTOR at CONTRACTOR'S sole expense. Such damaged materials shall be removed from the site by CONTRACTOR.
3. CONTRACTOR shall deploy suitable equipment for the excavation, compaction, and grading of soil to construct the work. CONTRACTOR shall perform excavation to the lines and grades shown on the plans.
4. Positive drainage shall be provided and maintained at all times. CONTRACTOR shall be responsible for all costs associated with dewatering of any excavation in order to provide positive drainage and any costs associated with the disposal of such water.
5. Uniformly grade areas to create a smooth surface to the cross-sections, lines, and elevations indicated on the drawings. Provide a smooth transition between existing grades and new grades.

DEMOLITION NOTES

1. CONTRACTOR shall be responsible for the protection of all facilities during the entire period of service. Any damages to the existing facilities, roads, or other property caused by CONTRACTOR or SUBCONTRACTOR shall be repaired at CONTRACTOR'S expense and in a manner and schedule approved by OWNER.
2. Notify ENGINEER immediately upon the discovery of any hazardous materials.
3. Protect and maintain survey benchmarks from disturbance.
4. Protect existing vegetation, structures, utilities, and other items to remain.
5. Regularly clean-up and remove demolished materials from the site so that they do not accumulate.

UTILITY NOTES

CONTRACTOR shall call the Indiana Underground Plant Protection Service ("Indiana 811") by dialing 811 at least 48 hours prior to commencement of land-disturbing activities to schedule a utility locate. It is CONTRACTOR'S responsibility to verify the location of all existing utilities and to report any discrepancies or omissions with the existing utilities shown on the plans to ENGINEER immediately.

6. CONTRACTOR shall protect all existing utilities as required to prevent damage.
7. All utilities must be fully operational and accessible throughout the project unless otherwise coordinated with and approved by OWNER, ENGINEER, and utility company at least two (2) days in advance of the proposed interruption.
8. Any and all damage to existing utilities must be repaired in kind at CONTRACTOR'S expense.

EROSION PREVENTION AND SEDIMENT CONTROL

1. The Contractor shall secure a local 327 IAC 15-5 (Rule 5) Permit required for all disturbances 1 acre or larger.
2. The temporary erosion control systems installed by CONTRACTOR shall be properly maintained as indicated on the plans and indicated in the acquired Rule 5 Permit or as directed by OWNER or ENGINEER to control erosion and siltation at all times during the life of the contract. This work shall include repair of the various systems, removal of trapped sediment, and cleaning or replacement of erosion control measures. Accumulated silt in the work area shall be removed from the site as an incidental cost to the project or shall be used on-site if approved by OWNER. Any additional materials and work required by ENGINEER to control erosion shall be measured and paid for as specified. If CONTRACTOR fails to maintain the erosion control systems as directed by ENGINEER, OWNER may at the expiration of a period of 48 hours, after having given CONTRACTOR written notice, proceed to maintain the systems as deemed necessary, and the cost thereof shall be deducted from any compensation due to CONTRACTOR.
3. CONTRACTOR shall install temporary erosion control measures as indicated on the erosion control plans prior to commencement of land-disturbing activities.
4. CONTRACTOR shall repair erosion damage to the finished surfaces at no additional cost to OWNER

STAGING/STOCKPILE AREA

1. All excavated material not immediately reused shall be placed within previously identified temporary stockpile areas. The Contractor shall ensure that silt fence is properly installed between the stockpile area and the existing stream channel.

TEMPORARY STREAM CROSSING

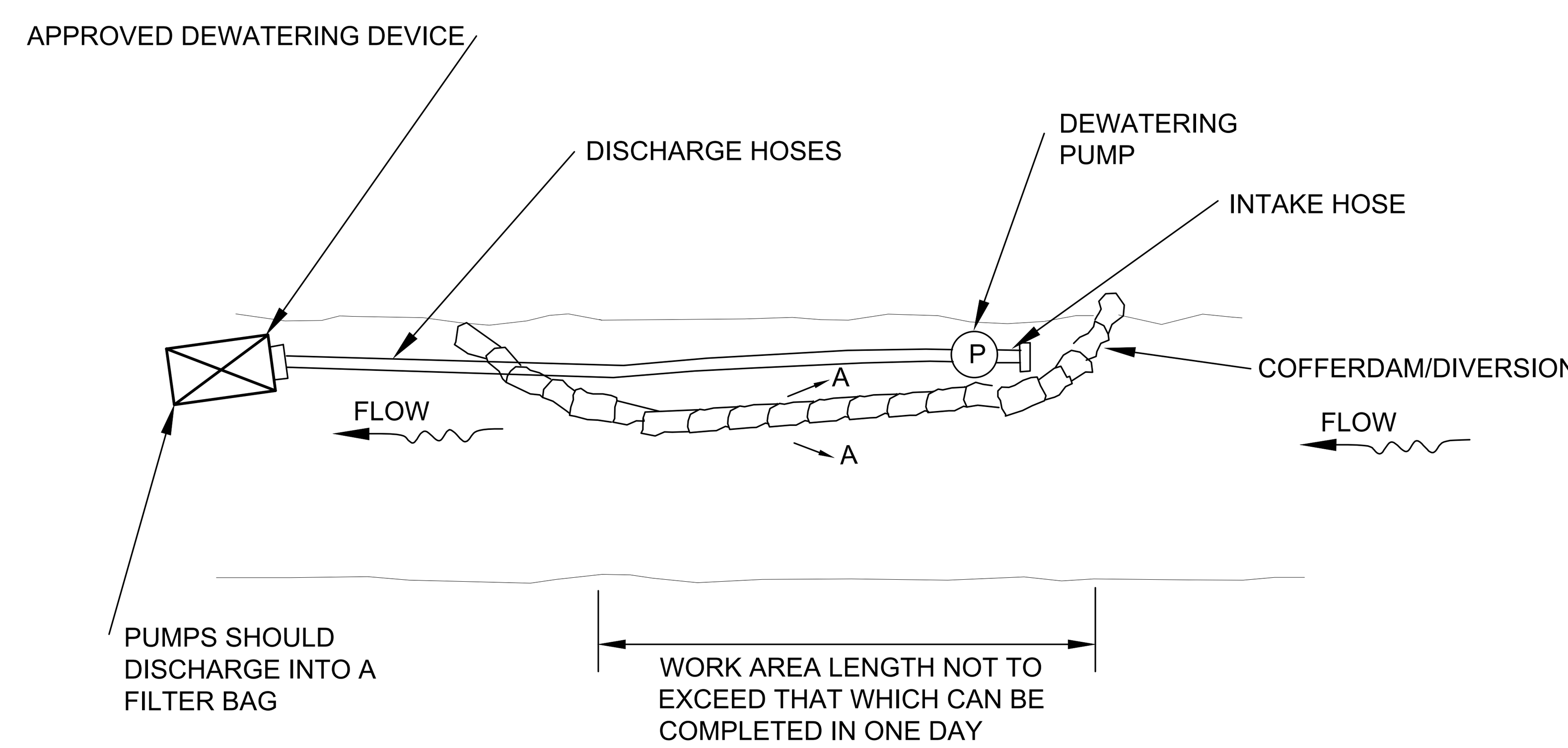
1. Temporary stream crossings shall be utilized when equipment to cross the river from one bank to another.
2. Temporary stream crossings to be at existing cobble riffles and/or the proposed constructed riffle structures identified on the plans. These constructed riffles consist of a minimum depth of 1.5' of native bedstone (cobbles and gravel) or substituted bedstone material consisting of INDOT revetment riprap and INDOT No. 2 stone.
3. If equipment must cross the river in areas outside the limits of the designated stream crossings, native bedstone or substitute bedstone must be built up a minimum 1.5' above the existing channel bottom to facilitate crossing. Furthermore, alternative stream crossings should be approved by the Engineer and should be located in the vicinity of other rock based structures so that the applied bedstone may be repurposed for proposed structure installation.

SILT FENCE

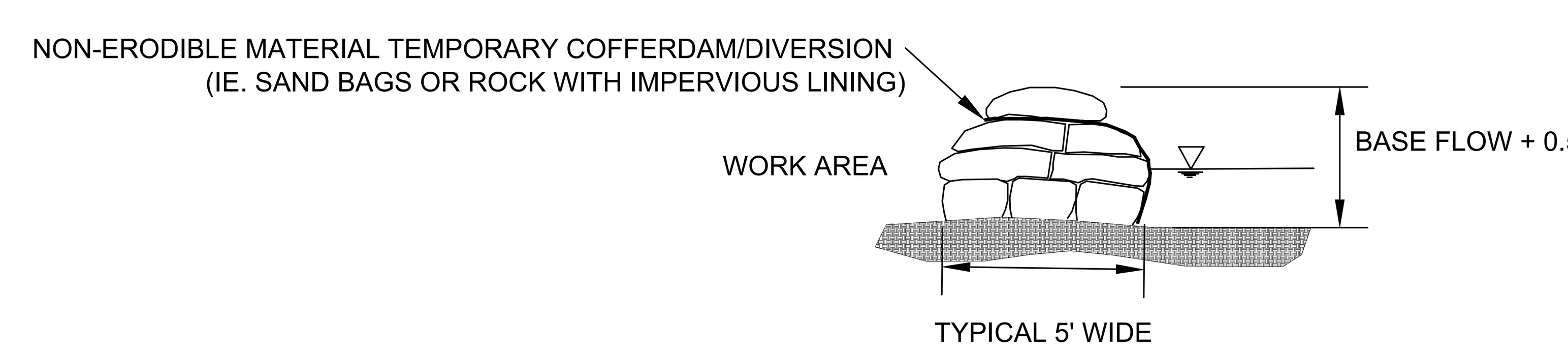
1. The Contractor shall utilize silt fence as required to prevent loose sediment from leaving overbank areas and entering the river. Silt fence should not be placed in locations of concentrated flow.

CONTROL OF WATER

1. The Contractor shall utilize an appropriate system during earthwork, toewood and rock placement below existing water line in order to maintain non-flowing water conditions within the portions of stream embankment being worked on during a given time period. Work included in this Section includes furnishing all labor, equipment, materials, and performing all operations necessary to control water during installation of structures. This work shall include the provision, operation and maintenance of pumps and/or diversion systems along with any temporary barriers, water plugs, or temporary piping necessary to allow the safe and proper construction of the Work.
2. Contractor is required to manage the work during construction to account for fluctuations in water flow and water levels as necessary to protect the Work and Contractor's equipment, material, and personnel according to all applicable laws and regulations.
3. Contractor shall be responsible for detailed development of sequencing and staging for control of water in the work area. Acceptable methods for water control include temporary cofferdams/diversions made of non-erodible material such as sand bags or rocks. Temporary cofferdams may need to be paired with a pump around system to ensure non-flowing conditions in the work area.
4. Contractor must be aware that significant changes in flow and water level can occur in the project area at any given time. Contractor is responsible for any impacts that could result from changing water flow/level conditions.
5. Water levels and flow volumes shall be controlled in the work area by pumping or by-passing to an extent that the permanent work being performed is not adversely affected.
6. Contractor shall provide filter bags where pumped water re-enters the river.
7. Contractor shall include adequate costs in the Contract Price to assure that the water in the work areas can be controlled and the work completed.
8. Contractor shall maintain all systems for controlling water for the period required to complete the Work.
9. Contractor shall be solely responsible for mean and methods, integrity of any cofferdams or dewatering methods, and maintaining integrity of the river.
10. Contractor shall be responsible for re-grading, filling or otherwise removing temporary water control features upon completion of that portion of the water control Work. The areas shall be permanently restored as shown on the Drawings.



CONTROL OF WATER - PLAN VIEW
NOT TO SCALE



COFFERDAM/WATER DIVERSION - CROSS SECTION
NOT TO SCALE

NOTES

1. PUMP AROUND AND/OR COFFERDAM (SAND, ROCK, SHEET PILE) ARE PROVIDED AS EXAMPLES OF ACCEPTABLE CONTROL OF WATER. CONTRACTOR RESPONSIBLE FOR MEANS AND METHODS OF MAINTAINING NON-FLOWING CONDITIONS WHEN REQUIRED FOR INSTALL.

FINAL

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Erosion Prevention & Sediment Control
Yellow River Phase II Restoration: 1100 E. Site
Kankakee River Basin and Yellow River Basin Development Commission
Starke County, Indiana

#	DATE	DESCRIPTION	BY

Ross A. St. Clair, Registered, No. PE11900351, State of Indiana, Professional Engineer — 1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE
EPSC

SHEET NUMBER
14

LAND USE # —

PROPOSED TREE REMOVAL WITHIN FLOODWAY

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
89	Silver_Maple_12	N	N
96	Hackberry_16	N	Y
125	Silver_Maple_18	N	N
126	Sycamore_36	N	N
127	Hackberry_14	N	Y
128	Black_Locust_10	N	Y
401	Walnut_10	N	N
402	Walnut_10	N	N
403	Sycamore_27	N	Y
404	Sycamore_27	N	N
405	Hackberry_13_6	N	N
406	Walnut_15	N	Y
407	Hackberry_12	N	N
408	Sycamore_16	N	Y
409	Sycamore_30	N	N
410	BT_12	Y	Y
411	Sycamore_16	N	Y
412	Hackberry_10	N	N
413	Walnut_20	N	N
414	Walnut_14	N	N
415	Hackberry_15	N	Y
416	Hackberry_10	N	Y
417	Hackberry_10	N	Y
418	Basswood_18_9_6	N	Y
419	Hackberry_14	N	N
420	White_Oak_11	N	N
421	Hackberry_15	N	N
422	Basswood_15	N	Y
423	Hackberry_21	N	N
424	Hackberry_13	N	N
425	Elm_18	N	Y
426	Redbud,_BT_6	Y	N
427	Elm_Dead_BT_10	Y	N
428	Sycamore_24	N	N
429	Silver_Maple_20_17	N	N
430	River_Birch_16	N	Y
431	Elm_16	N	Y
432	Silver_Maple_34	N	N
433	Elm_10	N	N
434	Elm_10	N	Y
435	Elm_12	N	Y
436	Sycamore_21	N	N
437	Sycamore_16	N	N
438	Sycamore_22	N	Y
439	Sycamore_22	N	Y
440	Sycamore_12	N	N
441	Sycamore_23	N	N
442	Sycamore_12	N	N
443	Sycamore_23	N	N
444	Sycamore_10	N	N
445	Elm_16_8	N	N
446	Sycamore_14	N	N
447	Sycamore_31	N	N
448	Sycamore_14	N	N
449	Sycamore_19	N	N
450	Sycamore_32	N	N
451	Sycamore_21	N	N
452	Box_Elder_13	N	N
453	Elm_11	N	N
454	Honey_Locust_11_10	N	N
455	Sycamore_22_14	N	N
456	Hackberry_13	N	N
457	Sycamore_13	N	N
458	Basswood_17	N	N
459	Hackberry_12	N	N
460	Elm_13	N	N

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
461	Hackberry_18	N	N
462	Hickory_17	N	N
463	Walnut_16	N	N
464	Basswood_18	N	N
465	Elm,_BT_6	Y	Y
466	Hackberry_22	N	Y
467	Hackberry_21	N	Y
468	Hackberry_22	N	Y
469	Hackberry_10	N	Y
470	Hackberry_11	N	N
471	Hackberry_11	N	N
472	Silver_Maple_Dead_BT_20	Y	Y
473	Hackberry_13	N	Y
474	Hackberry_11	N	Y
475	Silver_Maple_20	N	Y
476	Hackberry_16	N	Y
477	Hackberry_12	N	Y
478	Hackberry_13	N	Y
479	Hackberry_17	N	Y
480	Hickory_17	N	N
481	Hackberry_13	N	N
482	Hackberry_10	N	Y
483	Basswood_20	N	N
484	White_Oak_46	N	N
485	Red_Oak_46	N	N
486	Hackberry_10	N	N
487	Box_Elder,_Dead,_BT_8	Y	N
488	Silver_Maple_16	N	N
489	Sycamore_13_18	N	N
490	Honey_Locust_10	N	Y
491	Silver_Maple_10_10_12	N	N
492	Silver_Maple_Cluster_10-12_(x5)_3-10_(x5)	N	N
493	Sycamore_16	N	N
494	Box_Elder_11_11_	N	N
501	Silver_Maple_12	N	N
502	Dead_BT_12	Y	N
503	Silver_Maple_17	N	Y
504	Silver_Maple_13	N	Y
505	Silver_Maple_17	N	Y
506	Silver_Maple_15	N	Y
507	Silver_Maple_18	N	Y
508	River_Birch_12	N	Y
509	Silver_Maple_15	N	Y
510	Silver_Maple_14	N	Y
511	Silver_Maple_15	N	N
512	Silver_Maple_15	N	N
513	Silver_Maple_16	N	N
514	Silver_Maple_17	N	N
515	Silver_Maple_18	N	N
516	Silver_Maple_12	N	N
517	Silver_Maple_13	N	N
518	Honey_Locust_BT_14	Y	N
519	Sycamore_32	N	N
520	Box_Elder_11_11_8_	N	N
521	Basswood_16_16	N	N
522	Walnut_15	N	N
523	Walnut_16	N	N
524	Hackberry_17	N	Y
525	Basswood_10_8_	N	Y
526	Hackberry_13	N	N
527	Redbud,_BT_9	Y	N
528	Hackberry_12	N	N
529	Oak_14	N	Y
530	Redbud,_BT_<10	Y	N

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
531	Hackberry_10	N	N
532	Redbud_Cluster,_BT_8,_8,_6,_6	Y	N
533	Hackberry_10	N	N
534	Sycamore_20	N	Y
535	BT_	Y	N
536	Walnut_23	N	N
537	Hackberry_10	N	Y
538	Basswood_11	N	N
539	Silver_Maple_23	N	Y
540	Silver_Maple_20_12_10_10	N	Y
541	Silver_Maple_22	N	Y
542	Silver_Maple_12	N	N
543	Elm_16	N	Y
544	Sycamore_17	N	N
545	Honey_Locust_18	N	N
546	Silver_Maple_19	N	Y
547	Silver_Maple_14	N	N
548	Silver_Maple_12	N	N
549	Silver_Maple_10	N	N
550	Sycamore_12_9	N	Y
551	Silver_Maple_12	N	N
552	Silver_Maple_12	N	N
553	Silver_Maple_16	N	Y
554	Sycamore_10	N	N
555	Silver_Maple_15	N	N
556	Silver_Maple_16	N	N
557	Silver_Maple_18	N	Y
558	Hackberry_10	N	N
559	Silver_Maple_12	N	Y
560	Silver_Maple_26	N	N
561	Silver_Maple_18	N	N
562	Sycamore_18	N	Y
563	Silver_Maple_28_13_14	N	N
564	Silver_Maple_18	N	N
565	Honey_Locust_14	N	N
566	Silver_Maple_12	N	N
567	Ash_14	N	N
568	Honey_Locust_15_12	N	N
569	Box_Elder_12	N	N
570	Honey_Locust_10	N	Y
571	Walnut_14	N	N
572	Silver_Maple_12_23	N	Y
573	River_Birch_14	N	Y
574	River_Birch_13_14	N	Y
575	Sycamore_21	N	N
576	Elm_12	N	Y
577	Elm_10	N	N
578	Elm_14	N	Y
579	Sycamore_18	N	Y
580	Silver_Maple_27	N	N
581	River_Birch_27	N	N
582	Ash_Dead_15	N	N
583	Box_Elder_10	N	N
584	Silver_Maple_24_11	N	N
585	Silver_Maple_24	N	N
586	Basswood_12	N	Y
587	Hackberry_10	N	N
588	Elm_10	N	Y
589	Hackberry_11	N	N
590	Hickory_15	N	N
591	Hackberry_17	N	N
592	Hackberry_12	N	N
593	Hickory_16	N	N
594	Honey_Locust_15	N	N

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
595	Hickory_14	N	N
596	Hackberry_10	N	N
597	Hackberry_14	N	Y
598	Hickory_12	N	Y
599	Hackberry_14	N	Y
600	White_Oak_18	N	Y
801	Black_Walnut_15	N	N
802	Black_Walnut_15	N	N
803	Green_Ash_BT_36	Y	N
804	Black_Cherry_26	N	N
805	American_Hophornbeam_25	N	N
806	Hackberry_19	N	N
807	Sassafras_20	N	N
808	Hackberry_29	N	N
809	Cottonwood_12	N	N
810	Basswood_33	N	N
811	Basswood_12	N	N
812	Basswood_47	N	Y
813	Hackberry_17	N	N
814	Hackberry_16	N	Y
815	Hackberry_31	N	Y
816	Black_Walnut_37	N	N
817	Black_Walnut_37	N	N
818	Red_Oak_30	N	N
819	Hackberry_13	N	N
820	Elm_14	N	N
821	Sycamore_27	N	N
822	Hackberry_17	N	Y
823	Slippery_Elm_23	N	Y
824	Elm_33	N	Y
825	Cottonwood_58	N	N
826	Sycamore_45	N	N
827	Sippery_Elm_15	N	N
828	Silver_Maple_21	N	N
829	Sycamore_21	N	Y
830	Elm_21	N	N
831	Slippery_Elm_23	N	N
832	Elm_27	Y	Y
833	Sycamore_24	N	Y
834	Basswood_20	N	N
835	Mulberry_15	N	N
836	Elm_26	Y	N
837	Silver_Maple_12	Y	N
838	Elm_19	Y	N
839	Sycamore_42	N	N
840	Elm_18	N	N
841	Boxelder_19	N	Y
842	Sycamore_54	N	Y
843	Black_Walnut_12	N	Y
844	Black_Walnut_36	N	N
845	Black_Walnut_13	N	N
846	Basswood_16	N	N
847	Black_Walnut_32	N	N
848	Red_Oak_20	N	N
849	Honey_Locust_13	N	Y
850	Elm_24	N	N
851	Honey_Locust_18	N	N
852	Hackberry_11	N	N
853	Hackberry_14	N	N
854	Hackberry_16	N	N
855	Hackberry_24	N	Y
856	Basswood_22	N	N
857	Basswood_13	N	N
858	Hackberry_63	N	Y
859	Hackberry_10	N	Y

NOTES:
1. ALL TREES LABELED AS POTENTIAL BAT ROOST TREES AND DESIGNATED FOR REMOVAL MUST BE FELLED BY THE CONTRACTOR PRIOR TO MARCH 30. ALL REMAINING TREES WILL BE REMOVED DURING THE BULK OF CONSTRUCTION (ANTICIPATED TO BEGIN IN MAY).
2. TREE REMOVAL INVOLVES REMOVAL OF TREES WITH ROOTBALL AND TRUCK INTACT FOR REUSE IN THE ROCK AND WOOD TOE STABILIZATION.
3. TREES SHALL BE STOCKPILED ONSITE AND THEN UTILIZED FOR ROCK AND WOOD TOE STABILIZATION.
4. NO TREES SHALL BE FELLED AND LEFT IN THE RIVER.
5. ALL BAT TREES NOT DESIGNATED FOR REMOVAL SHALL BE AVOIDED.

Cardno now Stantec

TREE REMOVAL

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

ROBERT A. ST.CLAIR REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA No. PE11900351

11/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE: TREE REMOVAL

SHEET NUMBER: 15

LAND USE #: —

FINAL

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PROPOSED TREE REMOVAL WITHIN FLOODWAY

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
860	Hackberry_11	N	N
861	Hackberry_13	N	N
862	_	N	N
863	Hackberry_14	N	Y
864	Slippery_Elm_18	N	N
865	Black_Walnut_22	N	Y
866	Hackberry_10	N	N
867	White_Ash_14	N	N
868	Hackberry_11	N	N
869	Hackberry_11	N	N
870	Hackberry_11	N	Y
871	Hackberry_14	N	Y
872	Honey_Locust_13	N	N
873	Honey_Locust_17	N	N
874	Honey_Locust_12	N	N
875	Hackberry_15	N	Y
876	Silver_Maple_43	N	Y
877	Hackberry_12	N	N
878	Silver_Maple_11	N	N
879	Silver_Maple_17	N	N
880	Silver_Maple_12	N	Y
881	Silver_Maple_20	N	Y
882	Honey_Locust_12	N	N
883	Hackberry_11	N	N
884	Elm_14	N	N
885	Basswood_12	N	Y
886	White_Ash_15	N	Y
887	Red_Oak_27	N	Y
888	Elm_10	N	Y
889	Black_Walnut_21	N	Y
890	Hackberry_13	N	Y
891	River_Birch_11	N	Y
892	White_Ash_26	N	Y
893	Cherry_13	N	Y
894	Cherry_13	N	Y
895	Hackberry_14	N	Y
896	Basswood_45.6	N	N
897	Elm_24	N	N
898	Honey_Locust_13	N	Y
899	White_Ash_34	N	N
900	White_Ash_14	N	N
901	Basswood_11	N	N
902	Sycamore_32	N	N
903	Hackberry_11	N	N
904	Sycamore_14	N	N
905	White_Oak_28	N	Y
906	Sycamore_22	N	Y
907	Honey_Locust_10	N	Y
908	Sycamore_23	N	Y
909	Sycamore_36	N	Y
910	River_Birch_21	N	Y
911	BT_Dead_13	Y	Y
912	Walnut_12	N	N
913	Walnut_12	N	N
914	Walnut_16	N	N
915	Walnut_11	N	Y
916	Sycamore_18	N	Y
917	Sycamore_21	N	Y
918	Sycamore_15	N	Y
919	Basswood_10	N	N
920	Sycamore_21	N	N
921	Sycamore_28	N	N
922	Sycamore_27	N	N
923	Sycamore_26	N	N
924	Elm_18	N	Y
925	Redbud_Stump,_BT_	Y	N

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
926	Elm_Dead_BT_10	Y	N
927	Dead_BT_27	Y	N
928	Honey_Locust_18	N	N
929	Dead,_BT_	Y	N
930	Sycamore_11	N	N
931	Sycamore_19	N	N
932	Sycamore_10	N	N
933	Sycamore_20_5	N	N
934	Basswood_Cluster_10_18_16	N	N
935	Silver_Maple_16_14	N	Y
936	Silver_Maple_18	N	Y
937	Silver_Maple_15	N	Y
938	Walnut_20	N	Y
939	Walnut_10	N	N
940	Honey_Locust_13	N	N
941	Elm_16	N	N
942	Honey_Locust_18	N	N
943	Honey_Locust,_Dead,_BT_	Y	N
944	Sycamore_24	N	N
945	BT_	Y	N
946	Sycamore_19	N	N
947	BT_	Y	N
948	Sycamore_29	N	N
949	Sycamore_23	N	N
950	Sycamore_18	N	N
951	Sycamore_28	N	N
952	Sycamore_22	N	Y
953	Sycamore_16	N	N
954	Sycamore_13	N	N
955	Sycamore_16	N	Y
956	Sycamore_18	N	Y
957	Sycamore_20	N	N
958	Basswood_24_20	N	N
959	Walnut_12	N	Y
960	Walnut_11	N	N
961	Hackberry_10	N	Y
963	Hackberry_10	N	Y
964	Hackberry_13	N	N
965	Walnut_16	N	Y
966	Elm_12	N	N
967	Hackberry_14	N	N
968	Hackberry_10	N	Y
969	Hackberry_10	N	Y
970	Walnut_11	N	Y
971	Walnut_12	N	N
972	Walnut_10	N	Y
973	Walnut_15	N	N
974	Walnut_14	N	N
975	Hackberry_10	N	Y
976	Walnut_15	N	N
977	Walnut_14	N	N
978	Hackberry_14	N	Y
979	Walnut_13	N	N
980	Hackberry_10	N	Y
981	Walnut_13	N	Y
982	Walnut_11	N	Y
983	Hackberry_10	N	Y
984	Walnut_18	N	Y
985	Elm_14	N	N
986	Elm_11	N	Y
987	Hackberry_18	N	Y
988	Elm_13	N	N
989	Sycamore_18	N	Y
990	Walnut_10	N	Y
991	Elm_11	N	Y

POINT NUMBER	SPECIES_DIAMETER AT BREAST HEIGHT (IN.)	POTENTIAL BAT TREE? (Y/N)	TO BE REMOVED? (Y/N)
992	Cottonwood_18	N	N
993	Elm_Dead_BT_10	Y	N
994	Sycamore_23	N	Y
995	Sycamore_26	N	Y
996	Elm_10	N	N
997	Silver_Maple_11_11	N	N
999	Sycamore_13	N	Y
1000	Silver_Maple_14	N	N
1001	White_Ash_10_5_No_tag1	N	Y
1002	Hackberry_hanging_out_over_river_11_No_tag2	N	Y
1003	Hackberry_leaning_out_over_river_10_U1	N	Y
1004	Silver_Maple_4_10_11_U3	N	N
1006	Silver_Maple_Cluster_8_10_U4	N	N
1007	Silver_Maple_Cluster_6_10_10_10_10_U5	N	N
1008	Silver_Maple_13_U6	N	N
1011	Sycamore_20	N	Y
1012	Hackberry_12	N	Y
1013	Honey Locust_10	N	Y

NOTES:
1. ALL TREES LABELED AS POTENTIAL BAT ROOST TREES AND DESIGNATED FOR REMOVAL MUST BE FELLED BY THE CONTRACTOR PRIOR TO MARCH 30. ALL REMAINING TREES WILL BE REMOVED DURING THE BULK OF CONSTRUCTION (ANTICIPATED TO BEGIN IN MAY).
2. TREE REMOVAL INVOLVES REMOVAL OF TREES WITH ROOTBALL AND TRUCK INTACT FOR REUSE IN THE ROCK AND WOOD TOE STABILIZATION.
3. TREES SHALL BE STOCKPILED ONSITE AND THEN UTILIZED FOR ROCK AND WOOD TOE STABILIZATION.
4. NO TREES SHALL BE FELLED AND LEFT IN THE RIVER.
5. ALL BAT TREES NOT DESIGNATED FOR REMOVAL SHALL BE AVOIDED.

FINAL

Cardno now Stantec

TREE REMOVAL

Yellow River Phase II Restoration: 1100 E. Site

Kankakee River Basin and Yellow River Basin Development Commission

Starke County, Indiana

#	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA No. PE11960351 1/17/2023

DATE	JANUARY 2023
DRAWN	JTC
DESIGNED	RAS
CHECKED	
PROJECT #	J19Z500501

SHEET TITLE: TREE REMOVAL

SHEET NUMBER: 16

LAND USE # ----