# UPPER MISSISSIPPI RIVER RESTORATION
# FEASIBILITY REPORT
# WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

## GILEAD SLOUGH
## HABITAT REHABILITATION AND ENHANCEMENT PROJECT

**POOL 25, UPPER MISSISSIPPI RIVER MILES 252-248**
**CALHOUN COUNTY, IL**

Appendix L: Civil Engineering

US Army Corps of Engineers
St. Louis District

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Upper Mississippi River Restoration
Leading·Innovating·Partnering

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# 1 EXISTING CONDITIONS

## 1.1 Location

The project is located along the Mississippi River in Calhoun County, IL approximately six miles east of Hardin, IL.

## 1.2 Access

The site can be accessed through W Gilead Ln which is the only public access road to the site. There is a boat ramp at the end of W Gilead Ln that provides marine access to the inner sloughs that connects to the Mississippi River. Figure 1 shows the access routes at Gilead Slough.

## 1.3 Utilities

A Corrugated Metal Pipe (CMP) crosses W Gilead Ln approximately 250 feet from the boat ramp parking area. There are power lines crossing W Gilead Ln. The vertical clearance needs to be verified during Pre-construction Engineering and Design (PED) to ensure no impacts to power lines during construction.

# 2 MODELING

## 2.1 Survey Data

The Hydraulics and Hydrology (H&H) Appendix provides detailed information on the survey data used for modeling.

## 2.2 OpenRoads Designer

The proposed measures were modeled using OpenRoads Designer (ORD) CE 2022 Release 2 Version 10.12.1.59 with USACE Workspace Version 4.0.40.

# 3 TENTATIVELY SELECTED PLAN

The Intermediate Alternative was selected as the Tentatively Selected Plan (TSP) which includes the following measures as shown in Figure 2:

- Dredging
- Island Creation
- Bank Protection
- Gradual Slope Revetment (GSR)
- Moist Soil Units (MSU)
- Scour Structures
- Hard Points
- Barbs

## 3.1 Dredging

Approximately 280,400 cubic yards of material will be hydraulically dredged from channels at varying depths. The dredging parameters, as shown in Table 1, were given by the H&H team and are discussed in H&H Appendix. This material will be used for island creation in the main channel. No disposal material is anticipated. Dredge cuts are categorized as primary, secondary, tertiary, and backwater excavation (EPM) depending on excavation depth and width. Table 1 presents the typical dredge cross section details.

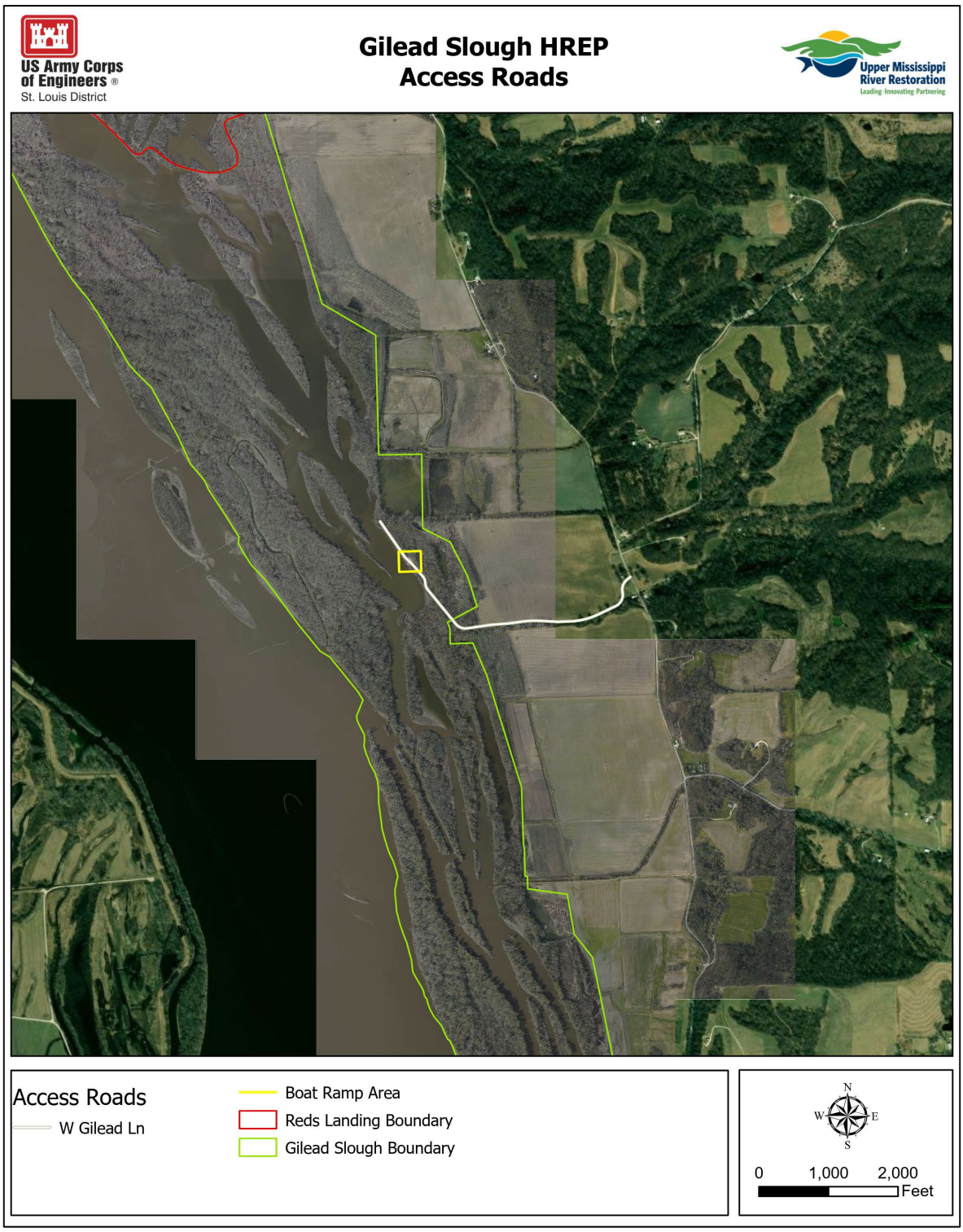


**Figure 1. Access Roads at Gilead Slough**

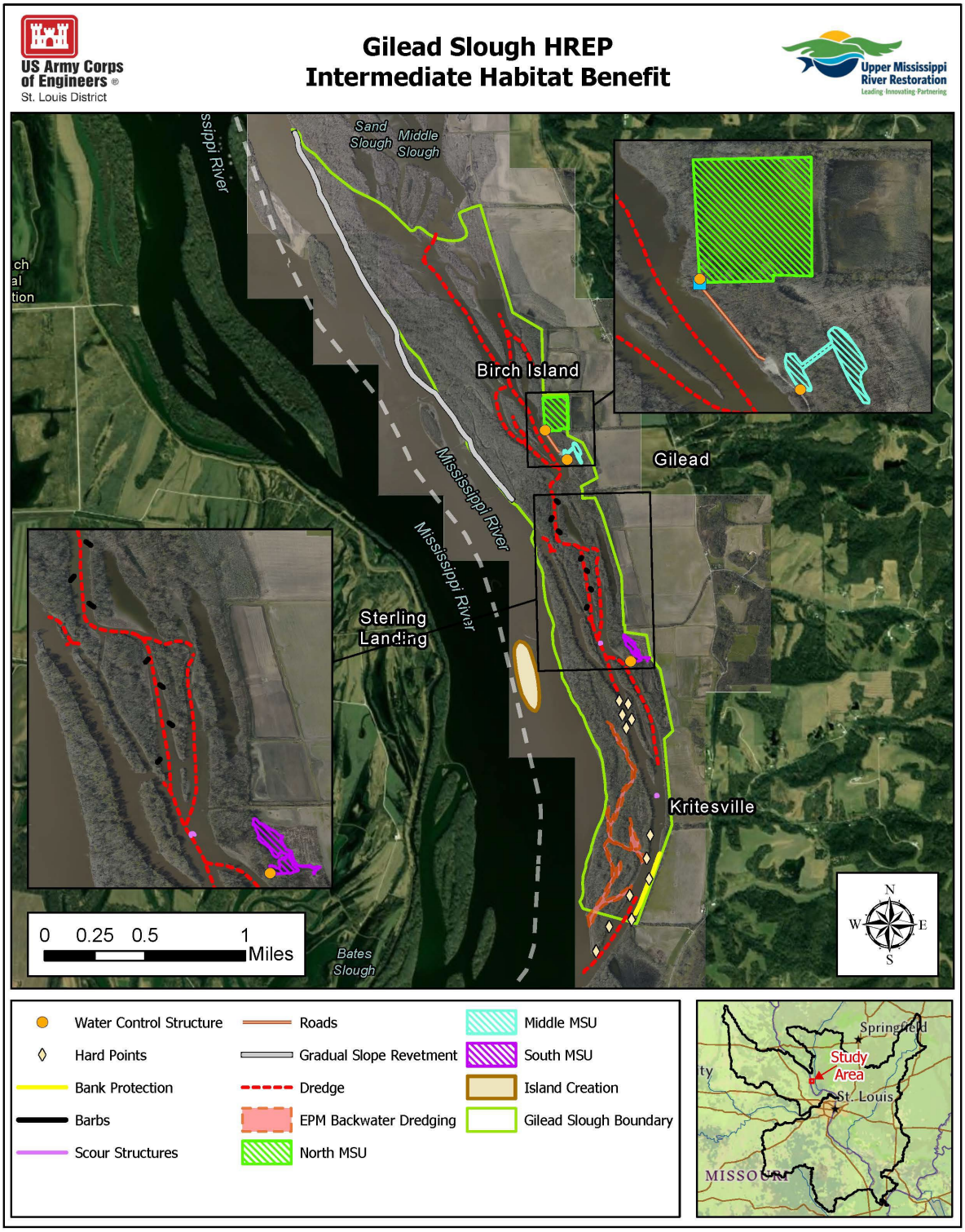


**Figure 2. Tentatively Selected Plan**

**Table 1. Dredge Cross Sections**

| Dredge | Average Depth (feet) | Bottom Width (feet) | Slope |
|---|---|---|---|
| EPM | 3 | 20 | 1V:2H |
| Primary Dredge | 3 | 100 | 1V:5H |
| Secondary Dredge | 4 | 30 | 1V:5H |
| Tertiary Dredge | 3 | 15 | 1V:5H |

### 3.2 Island Creation

The dredge material will be hydraulically pumped into a rock containment berm for island creation. The containment berm will reduce sedimentation in the main channel. The rock berm has a top width of 5 feet and 1V:2H side slopes. The island will be placed in the main channel while ensuring no adverse impacts to the navigation channel. The team needs to verify dredged material properties to ensure no environmental impacts during PED. Attachment L-1 provides additional information.

### 3.3 Bank Protection

Approximately 2,300 tons of Graded A-Stone was proposed along the right bank near the southern opening to the Mississippi River as shown in Figure 2. Figure 3 shows the bank protection typical section taken from ORD. The bank protection will tie into the top of bank with a 2-foot bench and slope 1V:2H into the bottom channel. These parameters were determined by the H&H team and further discussed in the H&H Appendix.

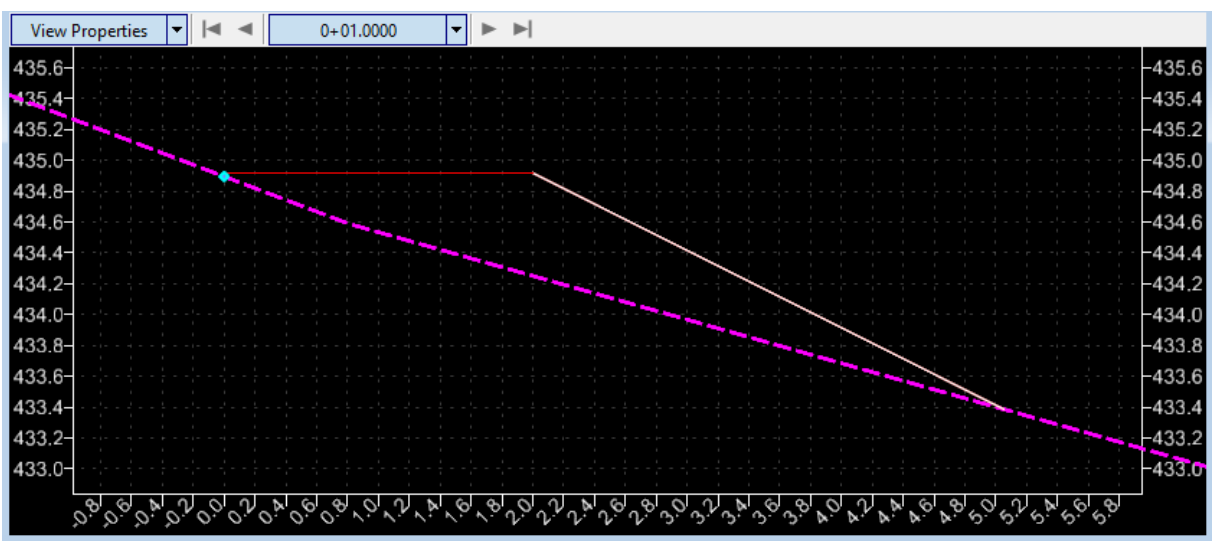


**Figure 3. Bank Protection Typical Section**

### 3.4 Gradual Slope Revetment

Approximately 5,900 feet of GSR along the existing bank toe was proposed for habitat enhancement. The GSR runs from the north boundary berm to the first dike along the bank line to reduce cost. The GSR is 50 feet wide and up to 24 inches thick as shown in Figure 4. Graded C-Stone is typically used for GSR due to the larger voids between the stones. Attachment L-2 includes the gradation curve for Graded C-

Stone.

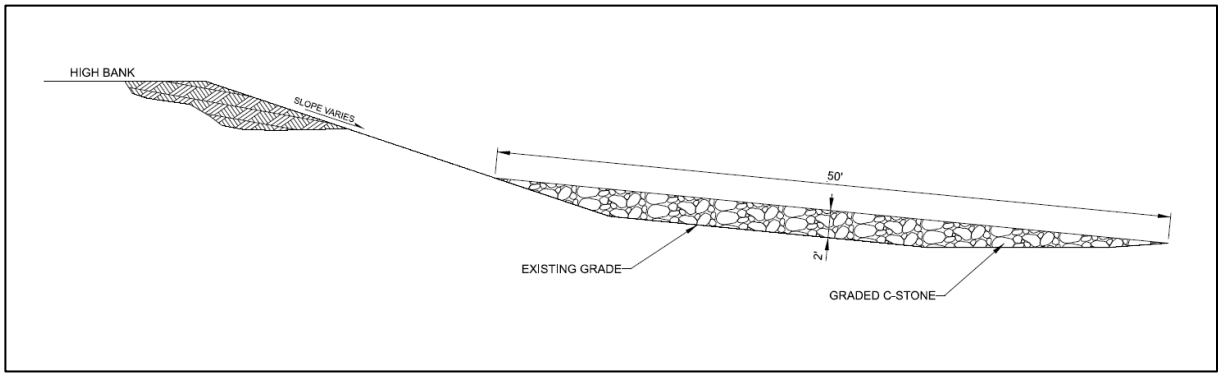


**Figure 4. Gradual Slope Revetment Typical Cross Section**

### 3.5 Moist Soil Units

The TSP proposed three MSU's named North MSU, Middle MSU, and South MSU as shown in Figure 2. The North MSU will be graded to elevation 443 feet at the southwest quadrant to improve drainage at the existing wetland. The existing berm bordering the North MSU will be partially raised to meet the proposed water control structure (WCS). The Structural Engineering Appendix and Attachment L-1 provides additional information on the proposed WCS. A new berm is proposed to provide access to the North MSU from the existing boat ramp parking area. The team assumed 12 inches of Aggregate Surface Course, Type B for the berm surface.

The boat ramp parking area will be repaired with 4 inches of aggregate surface. In addition, the parking will be expanded by 100 feet in length and 50 feet in width. The team assumed 8 inches of Aggregate Base Course, Type A and 4 inches of Aggregate Surface Course, Type A. The unit weight for all aggregate surfaces was 2 tons per cubic yard as recommended by the Illinois Department of Transportation (IDOT).

The Middle MSU will be graded to drain to the existing CMP located under W Gilead Ln. The South MSU includes a new berm to enhance the existing wetland. The South MSU berm was modeled from elevation 440 feet to 442 feet at a constant slope. All MSU's will be cleared of any trees and shrubs.

### 3.6 Scour Structures

Approximately 2,000 tons of Graded A-Stone will be used for scour structures, specifically chevrons. Figure 5 shows an example of chevrons. The heights vary from approximately 6 to 8 feet from the existing ground. The team assumed a length of 100 feet and a radius of 25 feet for modeling as shown in Figure 6. Table 2 presents the typical details for the scour structures. The H&H Appendix and Attachment L-1 provides additional information on the scour structures. Attachment L-2 includes the gradation curve for Graded A-Stone.

**Figure 5. Example of Scour Structures (Chevrons)**

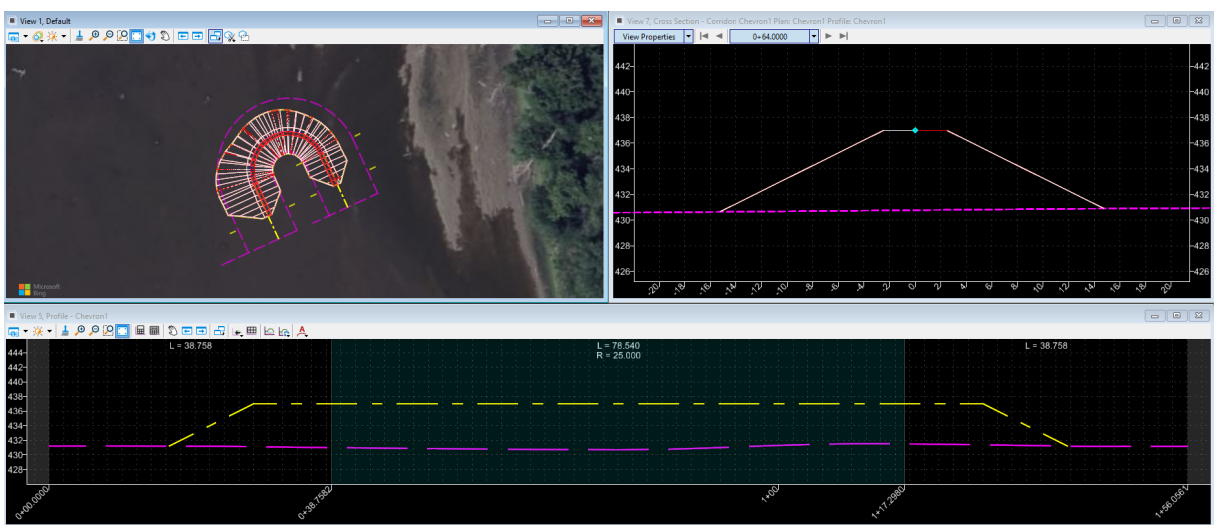


**Figure 6. Scour Structure Plan View, Cross Section, and Profile**

### 3.7 Hard Points

Approximately 15,900 tons of Graded A-stone will be used for hard points. The hard points will be perpendicular to the existing bank line as shown in Figure 7. Heights vary from 15 feet to 18 feet from the existing ground. The team did not propose key-

ins for the river training structures (RTS) due to low velocities along the channels. Table 2 presents the typical details for the hard points. The H&H Appendix and Attachment L-1 provides additional information on the hard points. Attachment L-2 includes the gradation curve for Graded A-Stone.

### 3.8 Barbs

Approximately 330 tons of Graded A-stone will be used for barbs. The barbs will be angled upstream at approximately 30 degrees from the existing bank line as shown in Figure 8. Heights vary up to 3 feet from the existing ground. The team assumed no barb key-ins. Table 2 presents the typical details for the barbs. The H&H Appendix and Attachment L-1 provides additional information on the hard points. Attachment L-2 includes the gradation curve for Graded A-Stone.

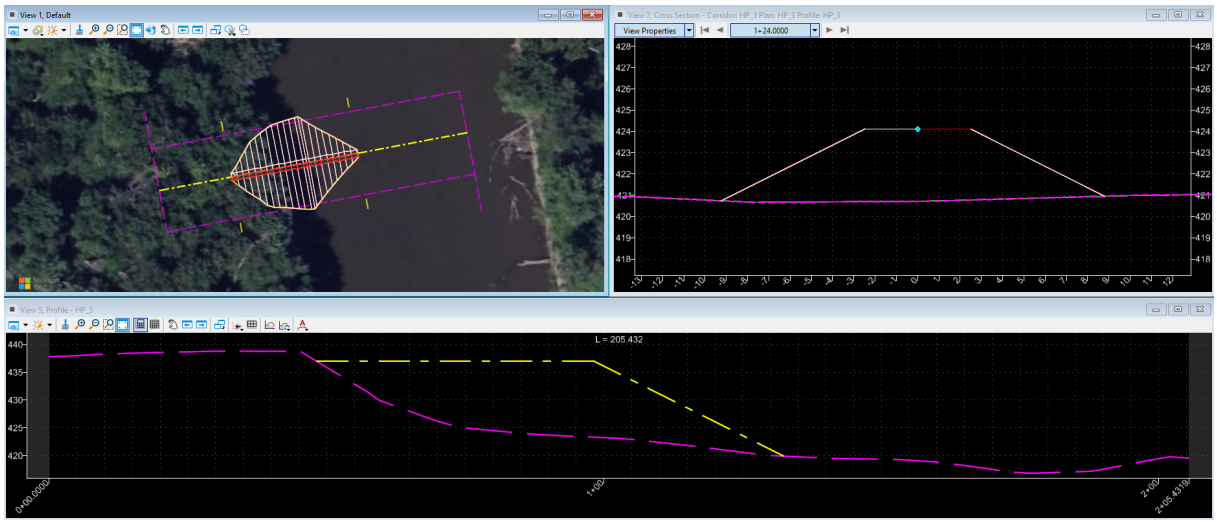


**Figure 7. Hard Point Plan View, Cross Section, and Profile**

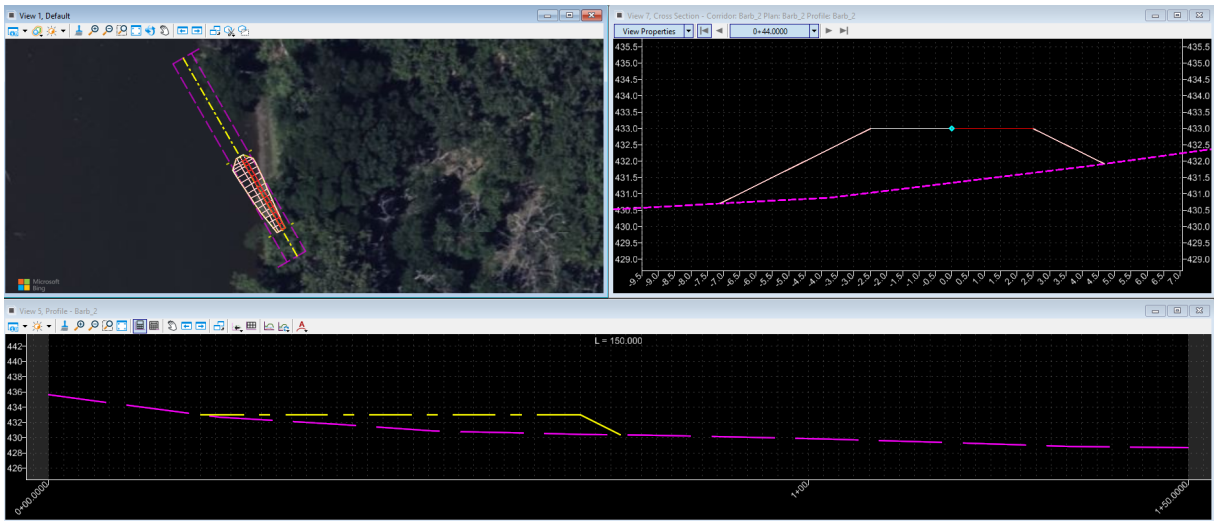


**Figure 8. Barb Plan View, Cross Section, and Profile**

**Table 2. River Training Structure Details**

| RTS | Start Elevation (feet) | End Elevation (feet) | Top Width (feet) | Side Slope | Length (feet) |
|---|---|---|---|---|---|
| Scour Structures | Varies* | Varies* | 5 | 1V:2H | 100 |
| Hard Points | 437 | 437 | 5 | 1V:2H | 50 |
| Barbs | 433 | 433 | 5 | 1V:2H | 50 |

*Appendix L-1 presents additional information for each RTS.

## 4 SUMMARY OF QUANTITIES

Table 18 in the main report summaries the quantities for the TSP. Attachment L-1 includes detailed quantities, calculations, and assumptions.

## 5 DESIGN CONSIDERATIONS

The following items can be considered during PED to refine the TSP:

- The CMP crossing W Gilead Ln may need adjusting to accommodate the new ditch at the Middle MSU.
- Additional planimetric and topographic survey will be needed for land features and utilities such as roads (centerline and edge of pavement), berms, property boundaries, boat ramps, top of bank, culverts, transmission towers, power lines, and any other obstruction within the site.

## 6 CONSTRUCTION CONSIDERATIONS

- The team identified approximately 10 acres of land for staging. The preliminary staging area needs to be verified during PED to avoid or reduce real estate, cultural, and environmental impacts.
- The existing access road, W Gilead Ln, needs to be surfaced with an additional 4 inches of aggregate surface.
- The team assumed land-based access for the MSU efforts. This may include clearing, grubbing, stripping, and surfacing of temporary access roads.

## 7 REFERENCES

IDOT. (2022). Standard Specifications for Road and Bridge Construction.
USACE. (2025). Applied River Engineering Center. Webpage. https://www.mvs-wc.usace.army.mil/arec/Basics_Chevrons.html
USACE. (2012). UMRR Environmental Design Handbook.
USACE. (2015). EM 1110-2-5025 Dredging and Dredged Material Management.

# ATTACHMENT L-1

# ATTACHMENT L-2