Wood River
Authorized Level
Project Summary Report

Preliminary Design Phase

Prepared for

Southwestern Illinois Flood Prevention District Council

Prepared by

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June 17, 2015

Table of Contents

1. General Information / Background

Authorized Level Project

Following the Southwestern Illinois Flood Prevention District Council's (FPD Council) design and construction of levee improvements that are required for accreditation in accordance with 44 CFR 65.10 criteria (FEMA criteria), the FPD Council desires to advance the implementation of the U.S. Army Corps of Engineers' (USACE) Authorized Level Project. The USACE Authorized Level Project further protects the region from a flood in excess of a 100-year FEMA flood event; specifically, the USACE Authorized Level project protects the many residents and businesses throughout southwestern Illinois against an approximately 500-year flood event (the actual Authorized Level Flood Event is defined as 52 feet on the Mississippi River St. Louis, Missouri gage with 2 feet of freeboard, also called the 52+2 Flood Event).

The USACE requires a 35% local sponsor match of the total estimated engineering and construction costs. The Council and the Corps have executed a Memorandum of Understanding that will allow 30% of those costs to be applied through work-in-kind credits, pending the approval of an Integral Determination Report (IDR) and a revised Partnership Agreement (PPA) between the USACE and the FPD Council. Work-in-kind credits are applied when the local sponsor performs work that would otherwise be part of the Authorized Level Project. Work performed by the local sponsor that is not part of the USACE Authorized Level Project is not eligible for work-in-kind credit. To date, the only project eligible for work-in-kind credit that is part of the Southwestern Illinois Levee Certification Design projects (FEMA certification projects) is Bid Package 7B – Lower Cutoff Wall, which is the deep cutoff wall along the Lower Wood River Levee segment.

Amec Foster Wheeler was tasked with reviewing the U.S. Army Corps of Engineers' Authorized Level Project decision segments and evaluating the most cost effective of the most vulnerable improvements for the FPD Council to begin engineering and construction on.

Wood River Levee System

This report covers the Wood River Levee System only. Summary Reports for the Metro East Sanitary District Levee and Prairie du Pont/Fish Lake Levee will be submitted at a later date under a separate cover. All of the vulnerable reaches along the Wood River Levee System are located along the Lower Wood River Levee, except for one reach along the Upper Wood River Levee, just south of the Alton Marina and Clark Bridge; along the Upper Wood River Levee the USACE has planned to build a shallow cutoff wall, which will be an extension of the shallow cutoff wall constructed as part of the FPD Council's Bid Package 7A, which was completed in Spring, 2015. The East Fork and West Fork levees in the Wood River Levee System do not require any improvements to protect against the Authorized Level Flood Event.

USACE Authorized Level Project Decision Segments

The USACE St. Louis District has provided Amec Foster Wheeler and the FPD Council a list of decision segments that require improvements before those segments of levee can adequately protect against the Authorized Level Flood Event. A decision segment is a length of levee, which typically has a length of 330 feet (or some multiple of 330 feet, such as 660 feet). The USACE split the entire levee into individual decision segments to analyze each segment of levee with the available subsurface (boring) information; borings were conducted generally every 330 feet along the entire Wood River Levee System. After each decision segment was evaluated for protection against underseepage, a decision was made regarding what underseepage improvements, if any, were needed to correct deficiencies of the particular segment. Underseepage improvements generally consist of seepage berms, fill, relief wells, pump stations, and cutoff walls; the USACE Authorized Level Project does not include any blanket drains, which was an underseepage control implemented by the Amec Foster Wheeler team for protection against the 100-year FEMA flood event in the Wood River Levee System. Decisions about underseepage improvements were based on factors such as constructability, land use, and cost. Table 1 lists the decision segments provided by the USACE St. Louis District. Each decision segment was

evaluated by the USACE as part of the *Wood River Levee System Limited Reevaluation Report, Design Deficiency Corrections, Wood River Drainage and Levee District, Madison County, IL*, approved August 31, 2011 (The LRR). The USACE developed the rankings in Table 1, based on their Factor of Safety (FS) against failure at the Authorized Level Flood Event. It is important to point out that at the time the LRR was completed, none of the FPD Council's FEMA Improvements were installed; therefore, the USACE has noted which reaches have had work done by the FPD Council and Amec Foster Wheeler subsequent to the initial underseepage analysis as part of the LRR in 2011. Currently, the USACE St. Louis District is reevaluating the decision segments which have had improvements completed as part of the FPD Council's FEMA improvement projects, which the USACE designates as "AMEC Solution". Ideally, the extent of the improvements in those reaches would be reduced, or eliminated altogether, thus reducing the overall USACE Authorized Level cost estimate for engineering and construction. The USACE has indicated that they will be complete with this reevaluation in early August of 2015.

Table 1 - Wood River Decision Segments

Abbreviations List:
AMEC: Amec Foster Wheeler / FPD Council
PS: Pump Station
FS: Factor of Safety (higher is better, lower is more vulnerable)
RW: Relief Well(s)

Designer Recommended Rank	FS Rank w/o AMEC	Levee Reach Station		Average FS with AMEC	Average FS w/o AMEC	USACE Recommended Plan	AMEC Solution
		From	To				
1*	2	151+50	188+50		0.43	Deep Cutoff Wall approximately 3970'	Deep Cutoff Wall and x RW
2	1	613+70	623+80	0.29	0.29	Fill in landside depression 1,010 linear feet	No New Features
3	3	133+65	151+50		0.44	14 RW @ 125' spacing Flow to existing PS	x RW - More than Corps Solution
4	4	530+50	530+50	N/A	N/A	New 20 cfs Pump Station	No New Features
5	5	551+00	556+05	0.63	0.63	8 RW at 92' to 110' spacing. Flow to New PS @ 530+50	No New Features
6	6	562+65	589+05		1.02	20 RW at 221' to 777' spacing. Flow to New PS at 530+50	Blanket Drain and Seepage Berm
7	7	123+75	127+05	1.05	1.05	3 RW @ 110' spacing. Flow to existing PS	No New Features
8	8	298+65	308+55		1.06	6 RW @ 85' to 165' spacing Flow to existing PS	x RW - More than Corps Solution
9	9	627+00	630+30	1.08	1.08	330 linear ft seepage berm 5' thick, 100' wide	No New Features

10	10	608+85	613+70	1.13	1.13	485 linear feet seepage berm 5' thick, 100' wide	No New Features
11	11	592+35	605+55		1.18	8 RW at 120' to 164' spacing. Flow to New PS at 530+50	Blanket Drain and Seepage Berm
12	12	455+50	480+15	1.24	1.24	15 RW @ 110' to 660' and New PS. Flow to New PS	No New Features
13	13	430+65	455+50	1.29	1.29	17 RW @ 83' to 165' spacing and New PS. Flow to New PS	No New Features
14	14	486+75	493+35	1.45	1.45	3 RW at 330' spacing. Flow to existing PS	No New Features

*USACE is currently evaluating incremental benefits of the 100-yr seepage control measures on the Authorized Level Project in the area of the phase 2 cutoff wall (LWR Station 170+00 to 188+50).

2. Recommended Plan

Integral Determination Report (IDR)

On May 13, 2015, the FPD Council and Amec Foster Wheeler received a draft copy of the IDR (draft dated May 12, 2015). The USACE has estimated the total cost of the project to be $51,890,000. The draft IDR estimated the total cost of work items proposed for work-in-kind credit at $40,033,000. Of the $40,033,000, $12,932,000 is the total for work-in-kind credit that the FPD Council can perform as part of the Authorized Project. In other words, the FPD Council can fund engineering and construction for $12,932,000 and supply an additional $2,594,500 in cash to the USACE, and the requirements for the local match to the federal project will have been met. Note that the FPD Council already has a credit with the USACE for $2,635,000 resulting from cash contributions previously made.

The draft IDR states that the FPD Council's deep cutoff wall project (Bid Package 7B – Lower Cutoff Wall), which is currently under construction, could fulfill the $12,932,000 work-in-kind credit. If the Council opts to use this as their in-kind match, it would effectively prohibit the FPD Council from completing any additional work within the Wood River Levee District. This is due to the fact that in-kind improvements are reviewed against the Corps Authorized Project, while improvements that are not considered in-kind improvements would be reviewed through the 408 process to determine whether the improvements are injurious to the levee. Under this option, the USACE will complete the remainder of the work along the Wood River Levee System to protect against the Authorized Level flood event. After many discussions with the FPD Council staff, it was determined that this is not the best approach for the southwestern Illinois region. By conceding the remainder of the work to USACE, the region will wait for the USACE to receive funding to complete the remainder of the work.

Recommendation

It is recommended that the FPD Council proceed with subsurface investigations and design activities for all relief wells, seepage berms, fill, and pump stations required for the USACE Authorized Level Project and postpone the decision to take work-in-kind credit for the deep cutoff wall project. Should federal funding become available in the near future, the FPD Council could utilize the work-in-kind credit at that time. The USACE estimated the total cost for engineering and construction of these improvements to be $10,294,900. By the FPD Council taking on this work, it will be possible for the design and construction of those levee improvements to occur sooner than if the USACE were to perform the design and construction.

Should the FPD Council accept the recommended plan, the only work the USACE will have left to construct as part of the USACE Authorized Level Project are the shallow cutoff wall extension, and the deep cutoff wall extension; both of which require specialty contractors that will most likely be from out of state.

Development of Bid Packages

Amec Foster Wheeler has reviewed the USACE decision segments and has determined that three construction bid packages will appropriately subdivide the decision segments. By splitting the work into three bid packages, the FPD Council has the ability to cancel any one bid package if the remaining bid package(s) approach the work-in-kind credit contribution limit of $12,932,000. While there is nothing stopping the FPD Council from constructing improvements in excess of $12,932,000, the USACE will require Section 408 approval for any work over and above the $12,932,000 limit, whereas any work done as work-in-kind, as agreed upon in the final IDR, which is still in development, does not require Section 408 approval. The three bid packages have been named Bid Package 08, 09, and 10, a continuation of the numbering from Amec Foster Wheeler's Certification Design. The packages were divided by pump station, and tributary relief wells. The resultant bid packages are as follows:

- Bid Package 08 is comprised of four USACE decision segments and spans from Levee Station 123+75 to 455+50. This package includes the construction of a new pump station, between Stations 430+65 and 455+50, and 40 relief wells, 23 of which are tributary to existing a/an existing pump station(s).

- Bid Package 09 is comprised of two USACE decision segments and spans from Levee Station 493+35 to 480+15. This package includes the construction of a new pump station, between Stations 455+50 and 450+15, and 18 relief wells, 3 of which are tributary to existing a/an existing pump station(s).

- Bid Package 10 is comprised of seven USACE decision segments and spans from Levee Station 530+50 to 630+30. This package includes the construction of a new pump station, at Station 530+50, and 36 tributary relief wells. This package is the only one to also include seepage berm and fill areas. Two seepage berms, 5 feet thick and 100 wide, are to be constructed between Stations 608+85 and 613+70 & 627+00 and 630+30, for a total of 815 linear feet of berm. In addition, 1,010 linear feet of fill is to be added to landside depressions between Stations 613+70 and 623+80.

Exhibits are appended to this report which depict the approximate location of each improvement as part of the recommended plan; see Appendix 1.

3. Schedule

If the recommended plan discussed herein is accepted by the FPD Council, Amec Foster Wheeler will begin to prepare an estimate to begin field work immediately. The scope, schedule, fee for preliminary field work (drilling), and conceptual engineering and coordination with USACE, will be presented at the July 2015 FPD Council board meeting, assuming all costs are received by USACE in sufficient time.

AMEC Foster Wheeler, the FPD, and the USACE St. Louis District have worked together to develop the role and responsibilities for each party in the design process. Flow charts outlining the responsibilities through the design process are included as Attachment 2.

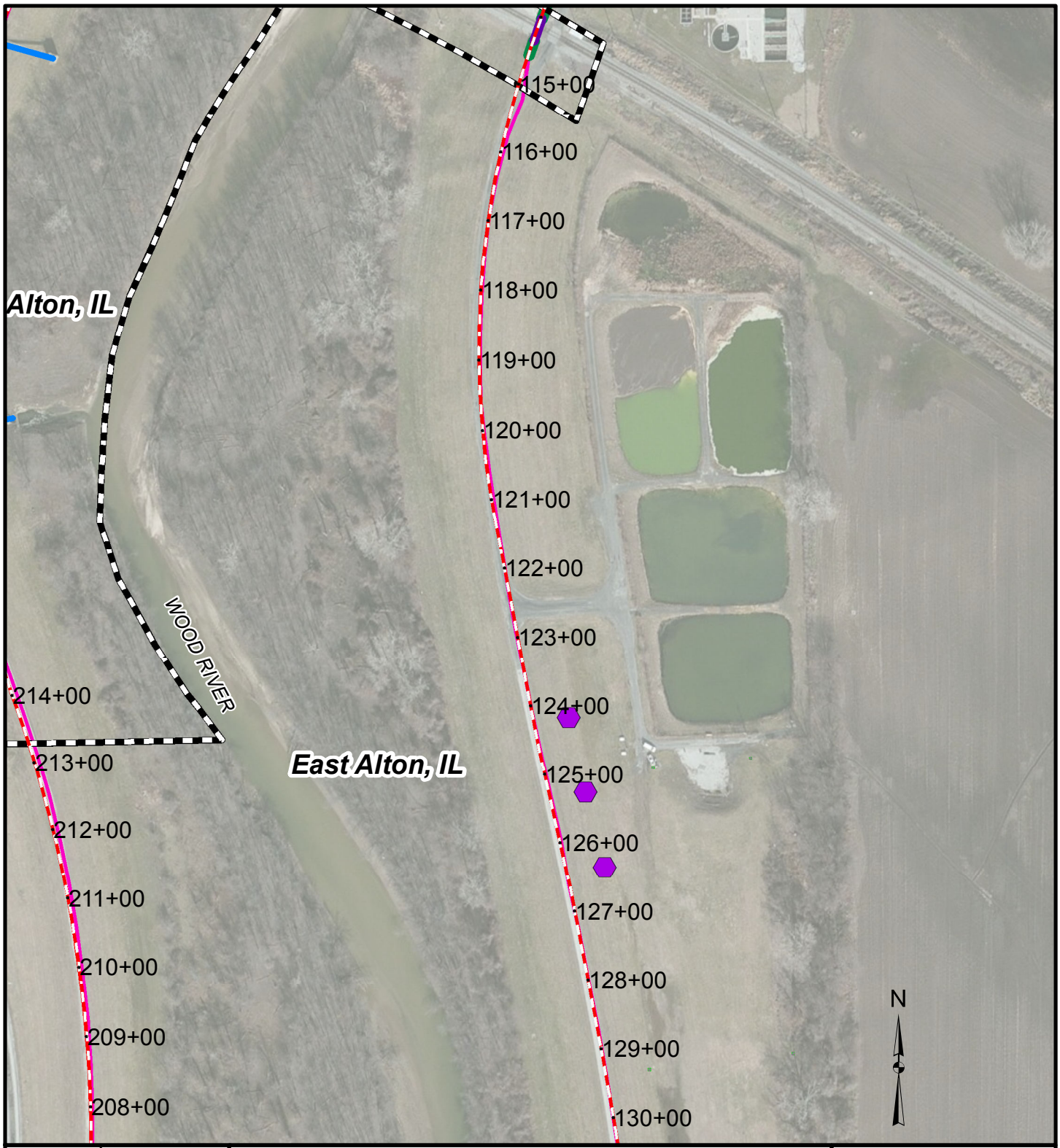
4. Risk in Moving Forward

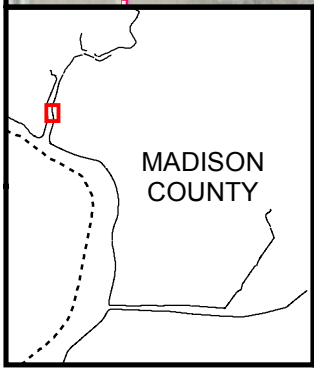
Should the FPD Council accept this recommended plan and move forward with field investigation, conceptual engineering, and drilling of relief well pilot holes, the FPD Council should understand the risk associated in doing so. By beginning drilling prior to August 2015, the FPD Council runs the risk of drilling relief well pilot holes that might be eliminated as a result of the USACE's reevaluation of the FEMA improvements with respect to the USACE Authorized Level Project. This risk can be managed in such a way that all drilling occurs on reaches that are not being reevaluated by USACE at this time.

There is also risk associated with moving forward with these activities without an approved IDR and revised PPA. Risk decreases substantially after IDR approval, and risk of not receiving work-in-kind credit is eliminated after the revised PPA is approved. It is anticipated that a final IDR will be signed in September, 2015, and the amended PPA approximately 1 year later (September, 2016).

At this time, there is no indication that the IDR or PPA will not be approved, although the schedule for approval is a 'best estimate' by the USACE St. Louis District. Approval of the IDR is contingent on implementation guidance regarding the Water Resource Development Act of 2014 (WRDA 2014); the Federal Government has yet to hand down this guidance, and therefore, the IDR and subsequent PPA will be stalled until such time that the WRDA 2014 implementation guidance is received.

Appendix 1 – Bid Package / Design Reach Exhibits





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 08

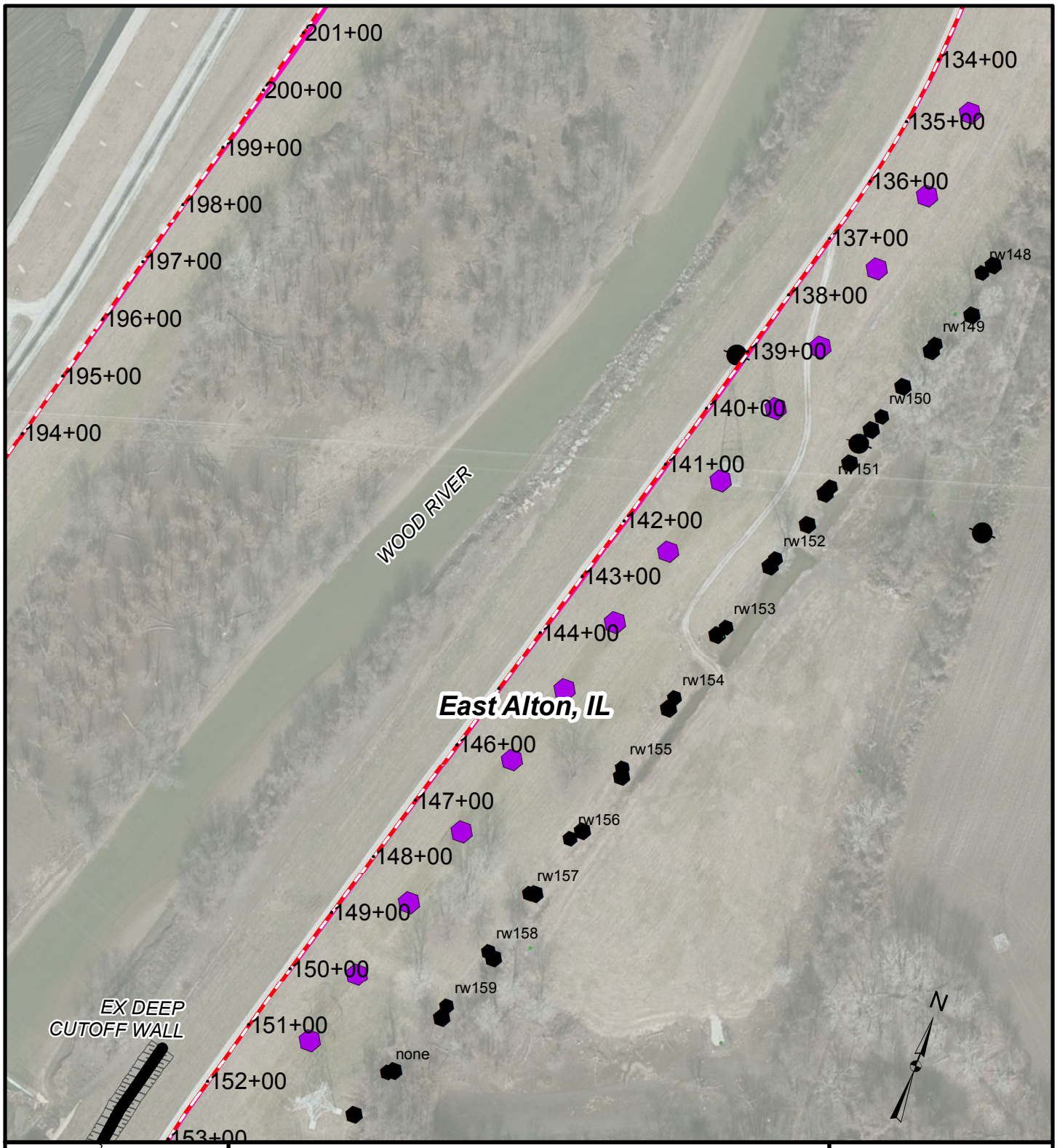
WOOD RIVER LEVEE SYSTEM

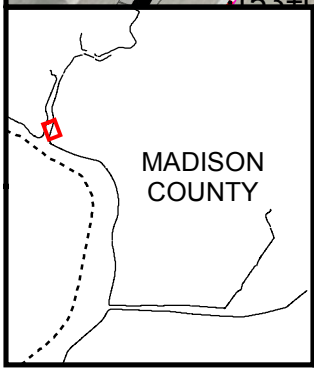
DESIGN STA: 123+75 TO 127+05

06/16/2015

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 08

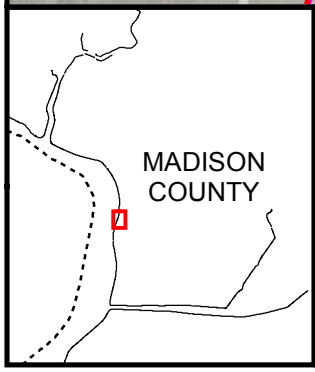
WOOD RIVER LEVEE SYSTEM

DESIGN STA: 133+65 TO 151+50

06/16/2015

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary



USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 08

WOOD RIVER LEVEE SYSTEM

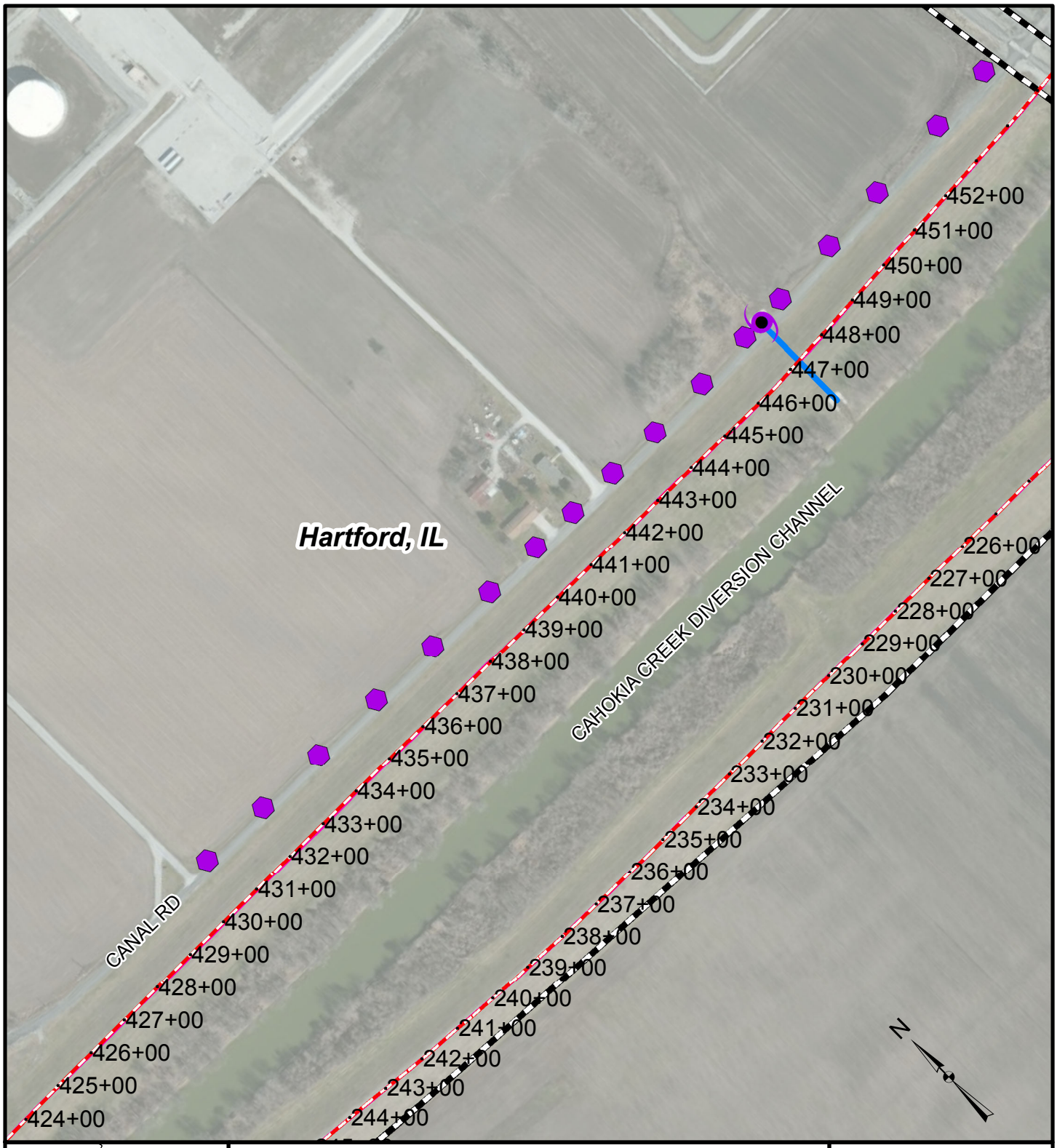
DESIGN STA: 298+65 TO 308+55

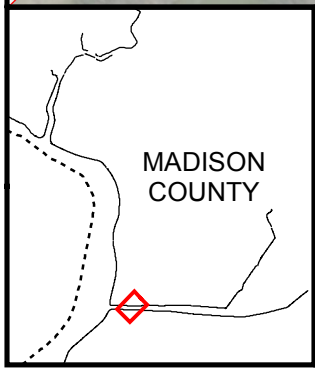
06/16/2015

SHEET 3 OF 13

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 08

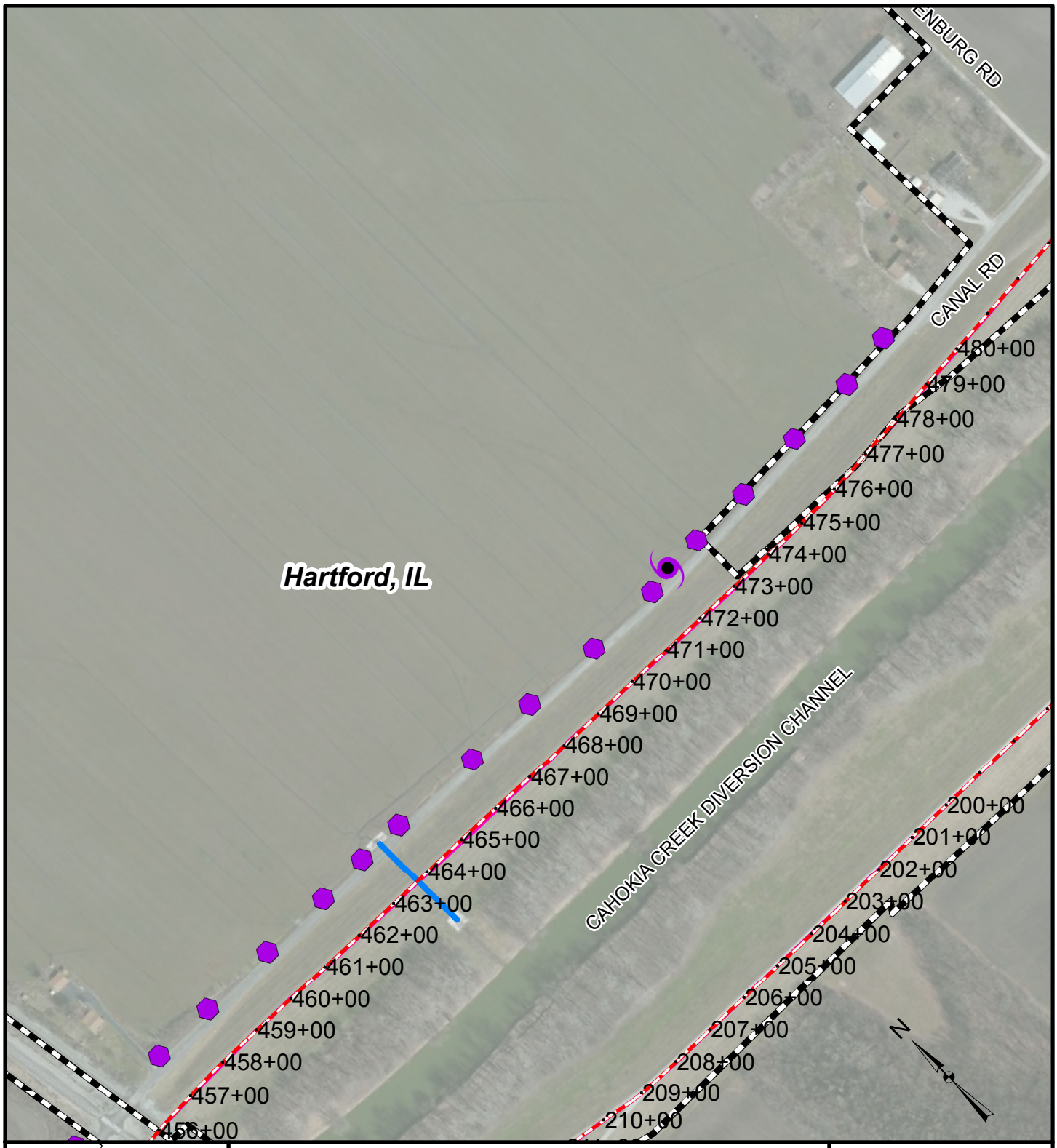
WOOD RIVER LEVEE SYSTEM

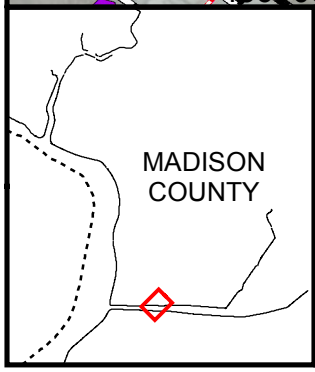
DESIGN STA: 430+65 TO 455+50

06/16/2015

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 09

WOOD RIVER LEVEE SYSTEM

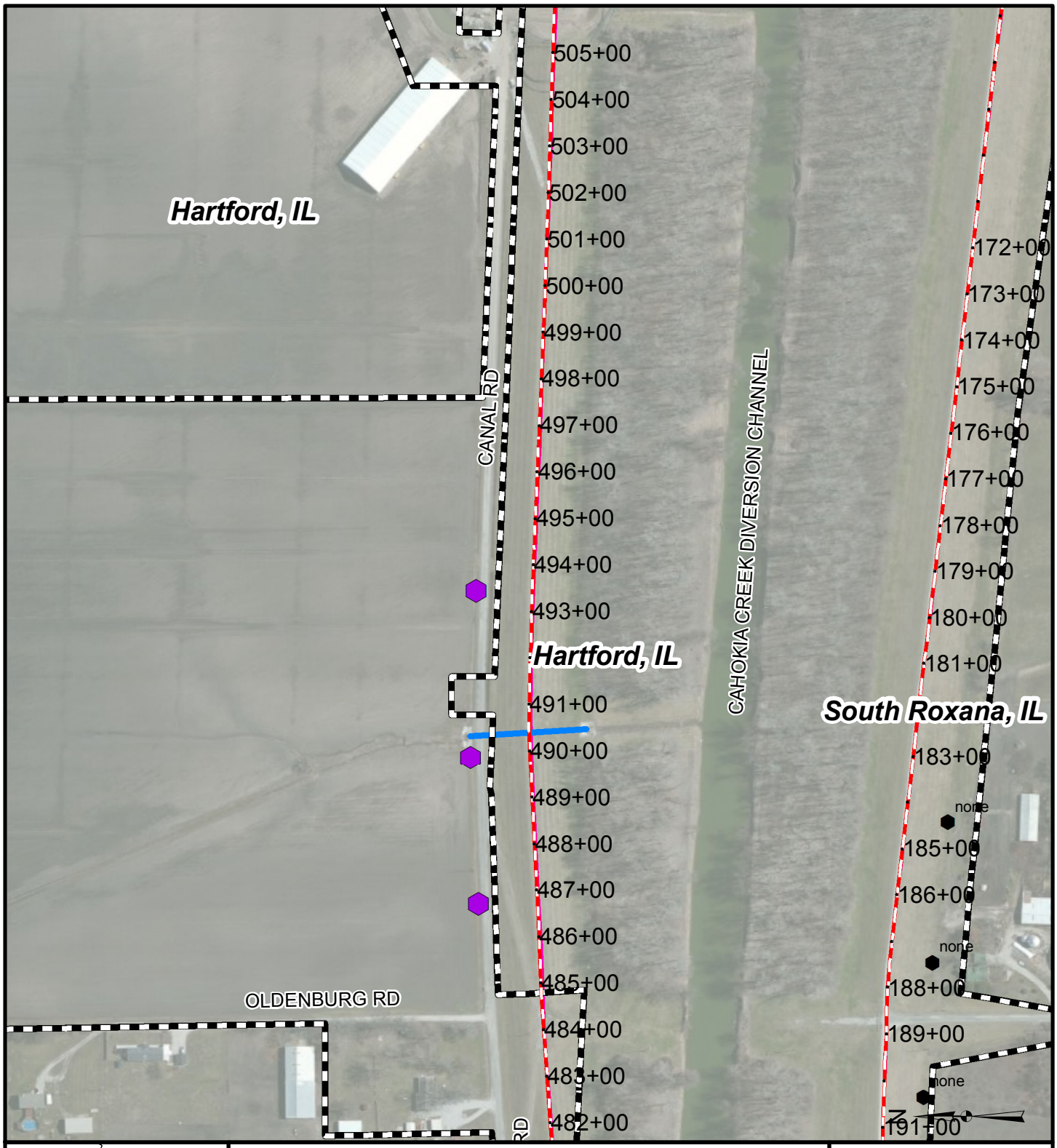
DESIGN STA: 455+55 TO 480+15

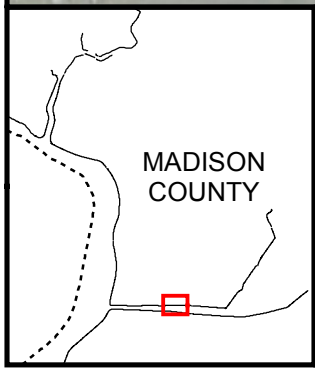
06/16/2015

SHEET 5 OF 13

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 09

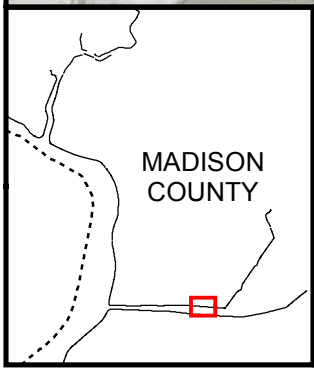
WOOD RIVER LEVEE SYSTEM

DESIGN STA: 486+75 TO 493+35

06/16/2015

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary



USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

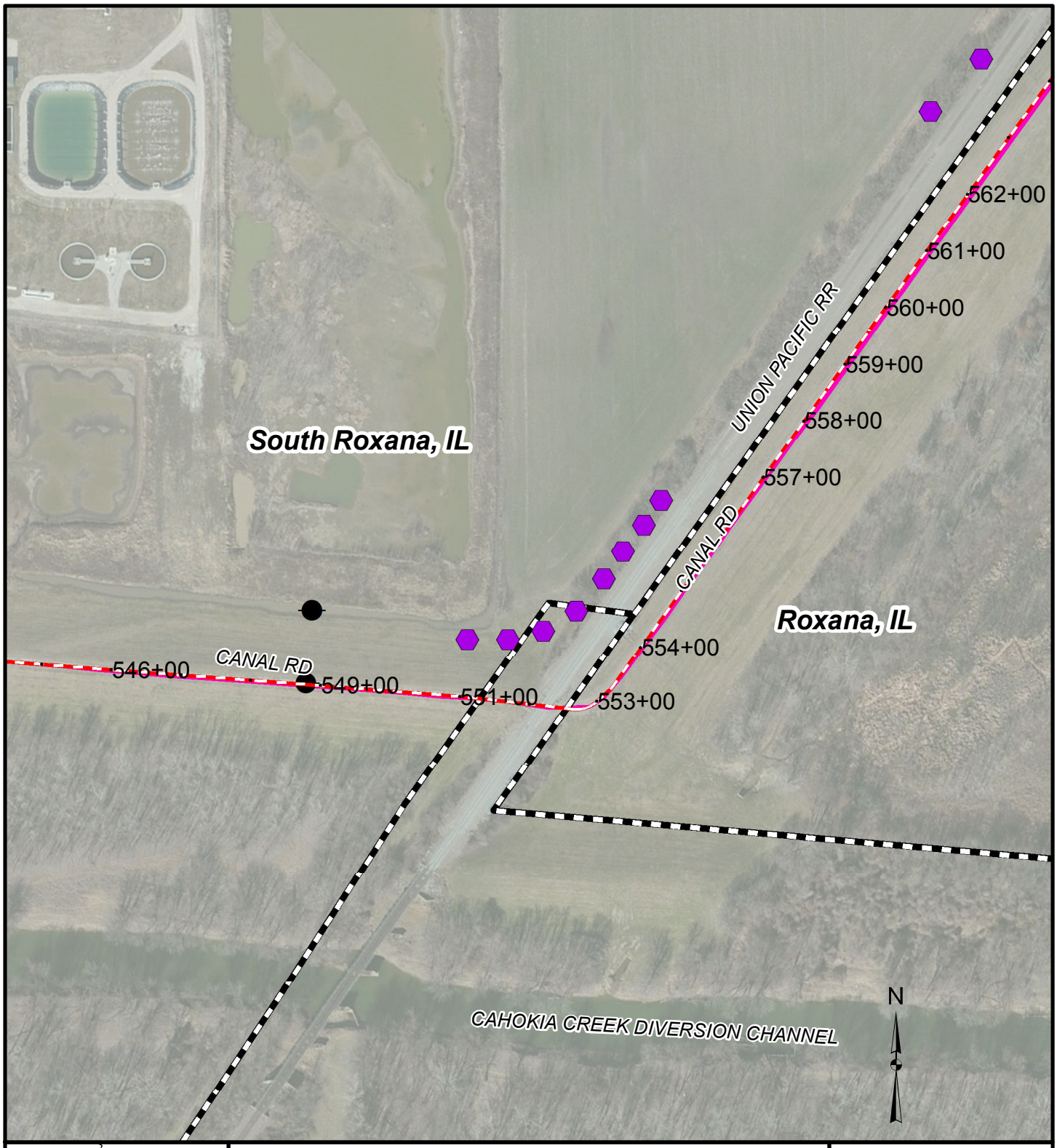
WOOD RIVER LEVEE SYSTEM

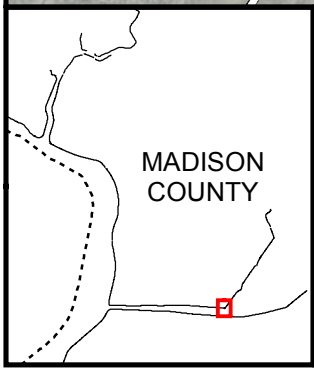
DESIGN STA: 530+50 TO 530+50

06/16/2015

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

WOOD RIVER LEVEE SYSTEM

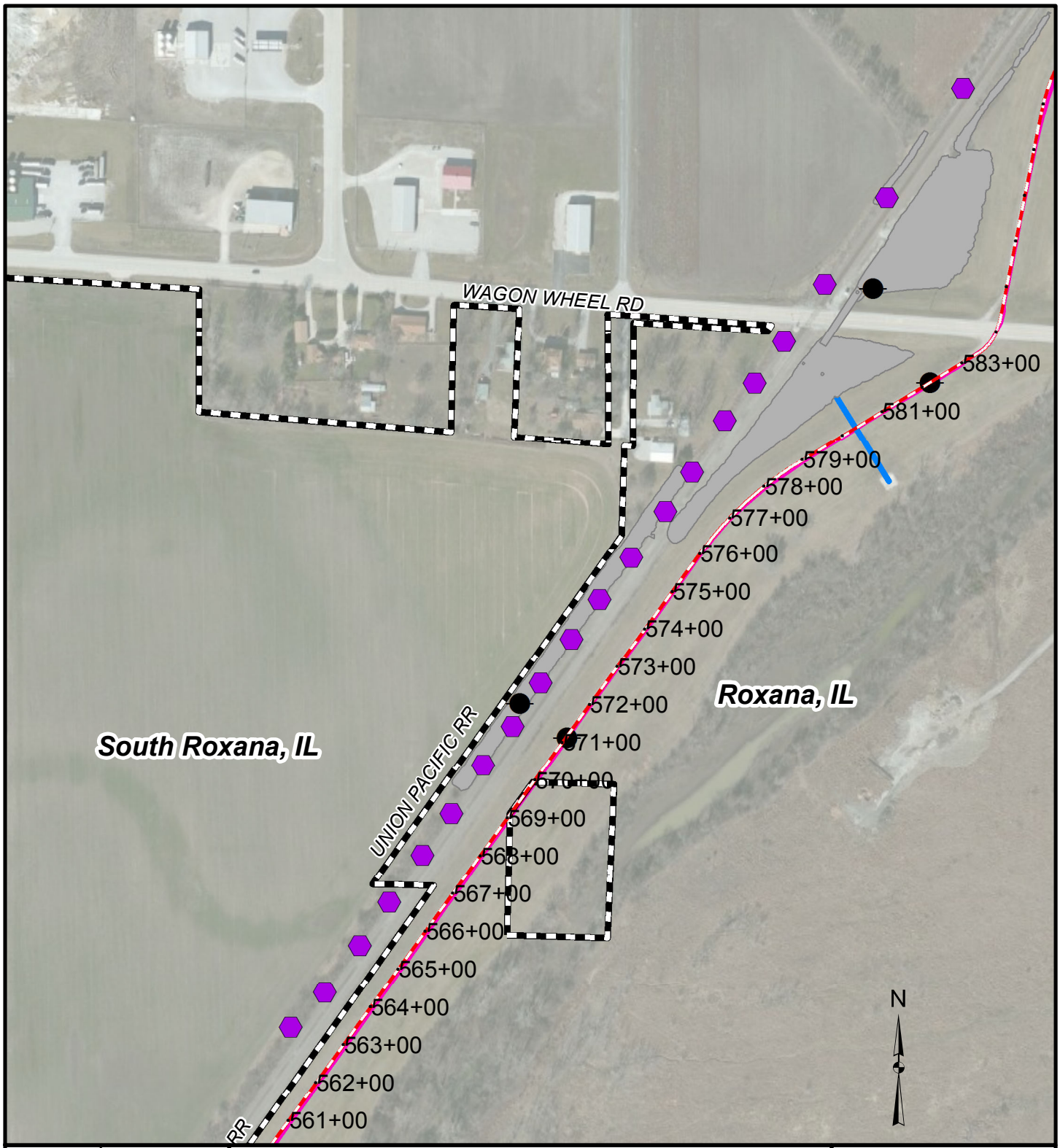
DESIGN STA: 551+00 TO 556+05

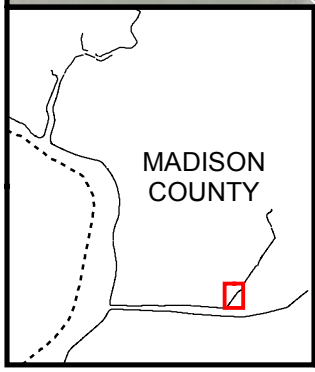
06/16/2015

SHEET 8 OF 13

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

WOOD RIVER LEVEE SYSTEM

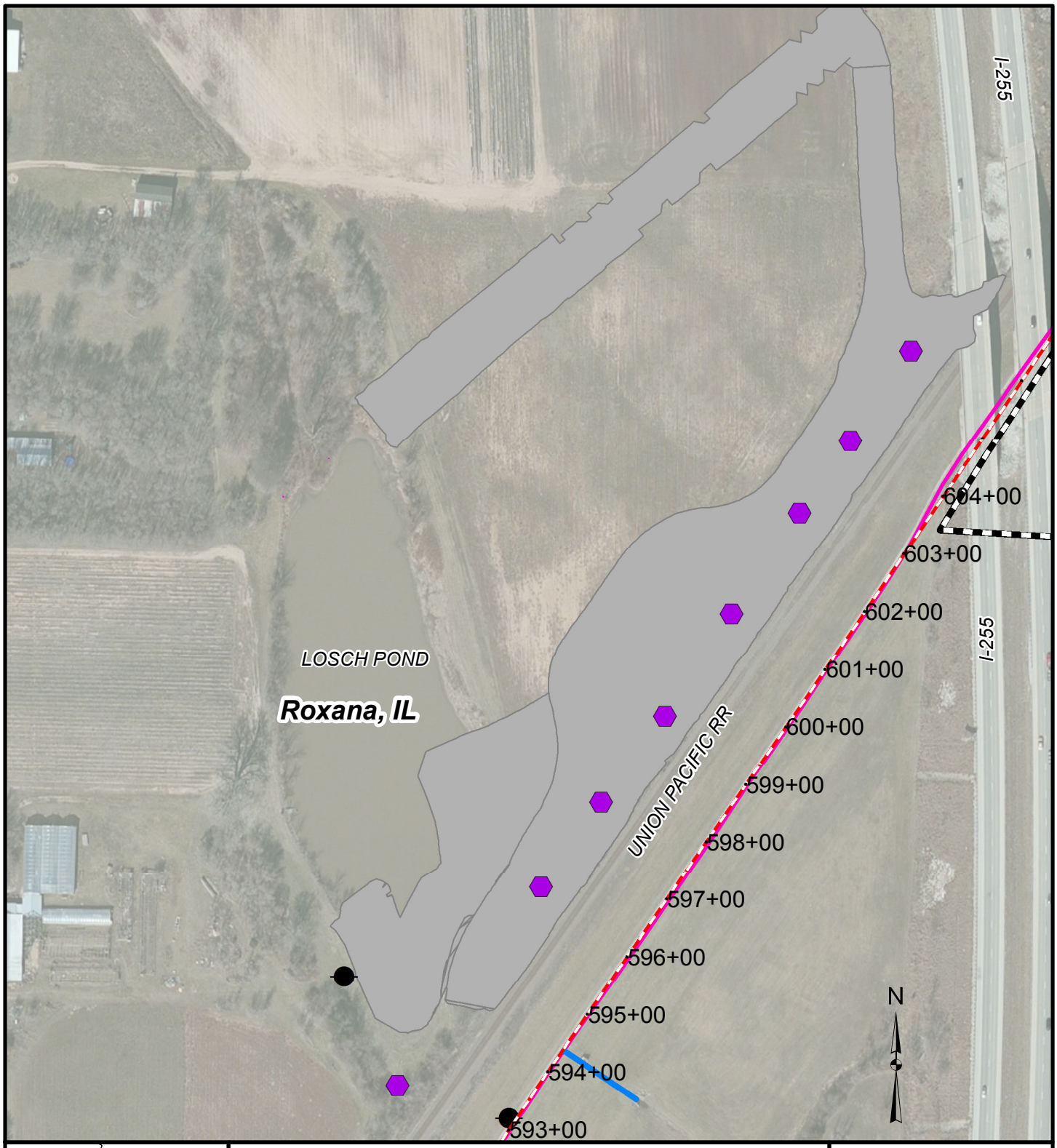
DESIGN STA: 562+65 TO 589+05

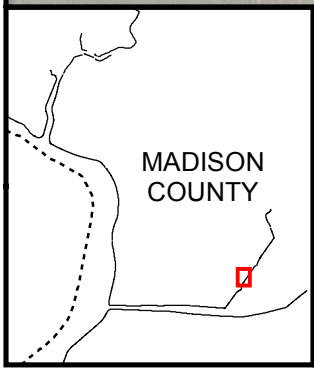
06/16/2015

SHEET 9 OF 13

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

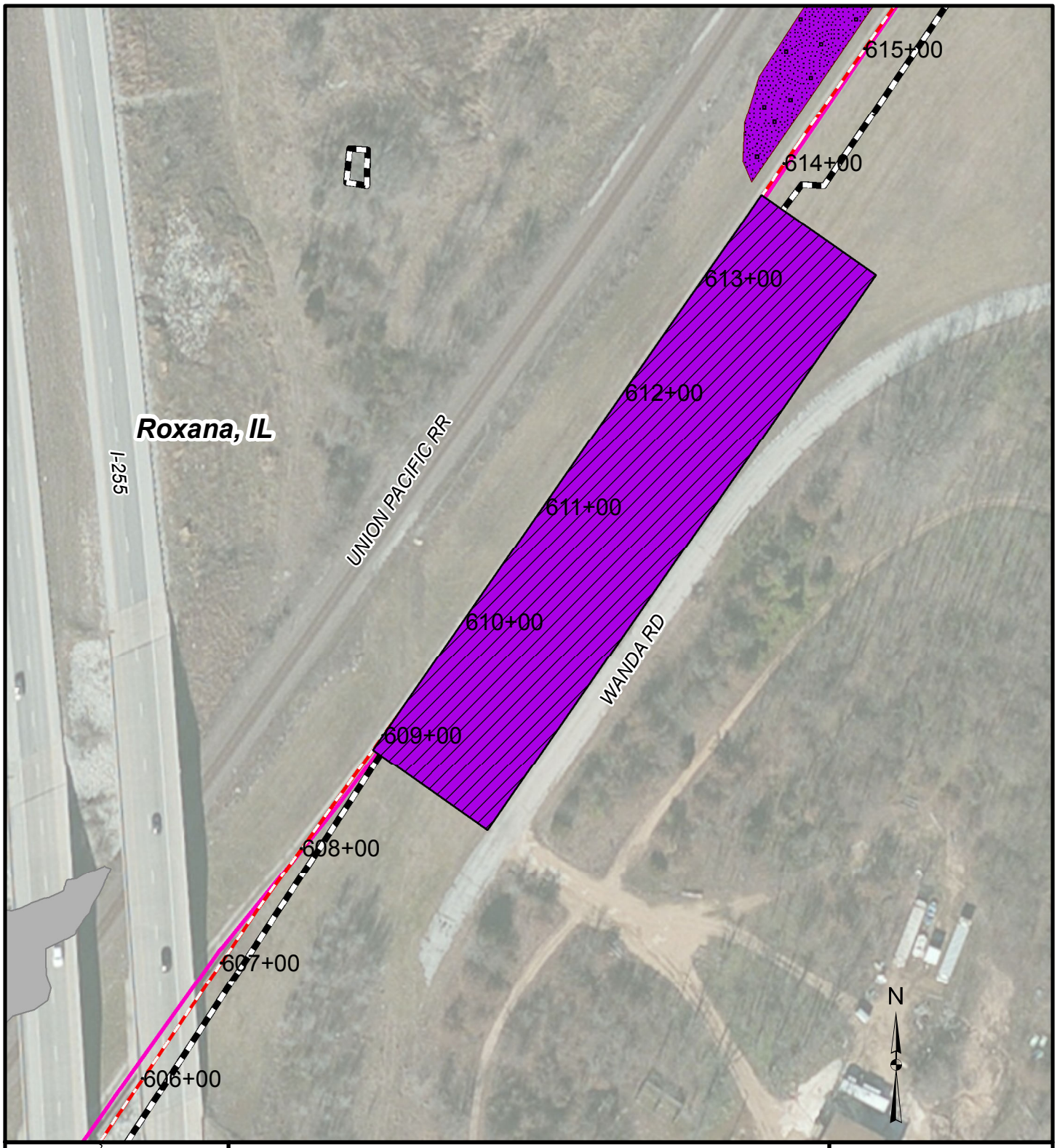
WOOD RIVER LEVEE SYSTEM

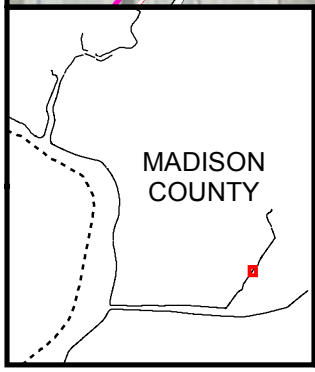
DESIGN STA: 592+35 TO 605+55

06/16/2015

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

WOOD RIVER LEVEE SYSTEM

DESIGN STA: 608+85 TO 613+70

06/16/2015

Legend

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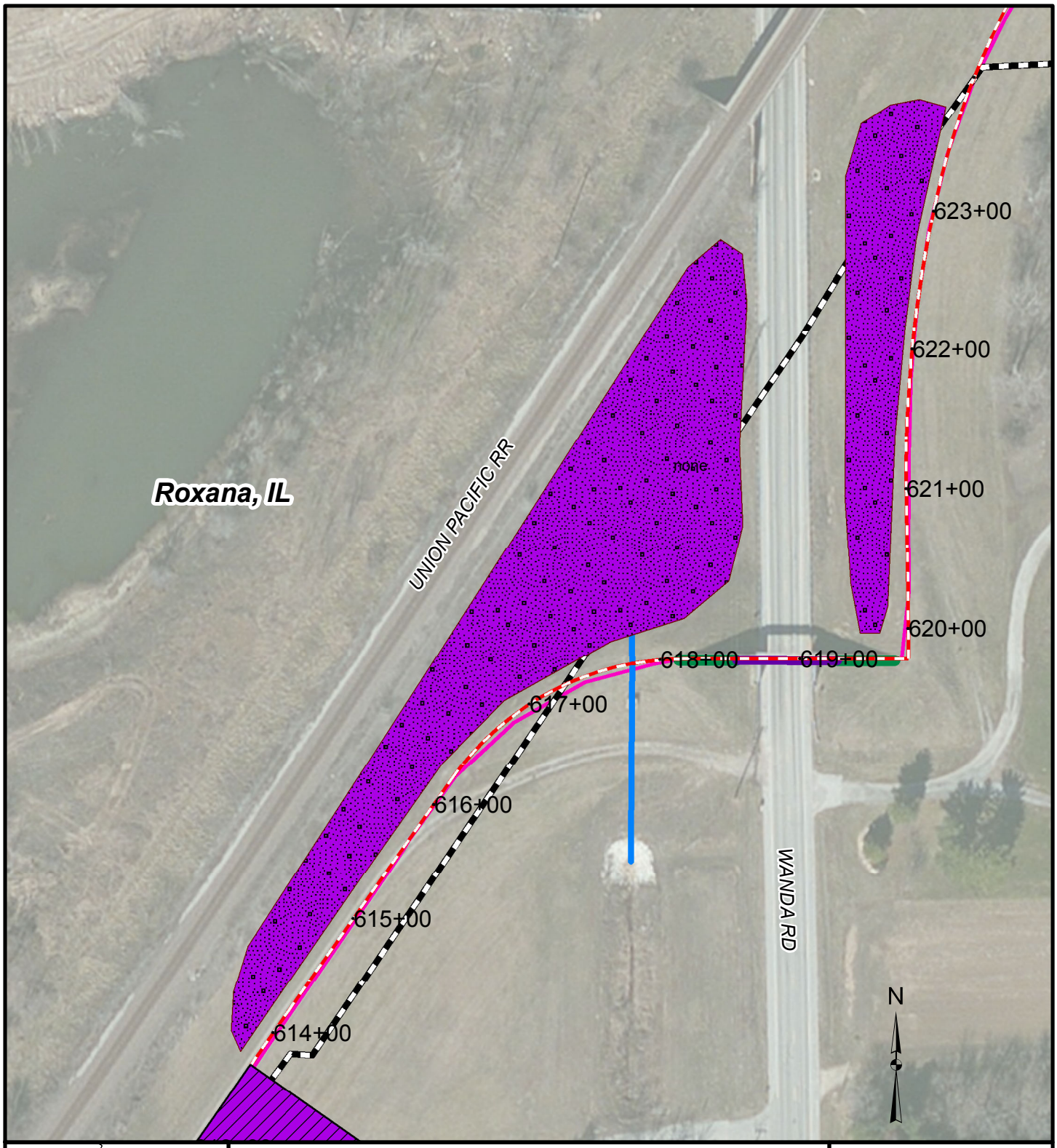
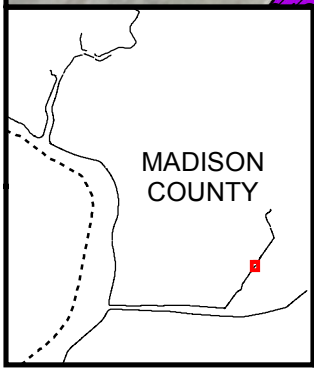
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

WOOD RIVER LEVEE SYSTEM

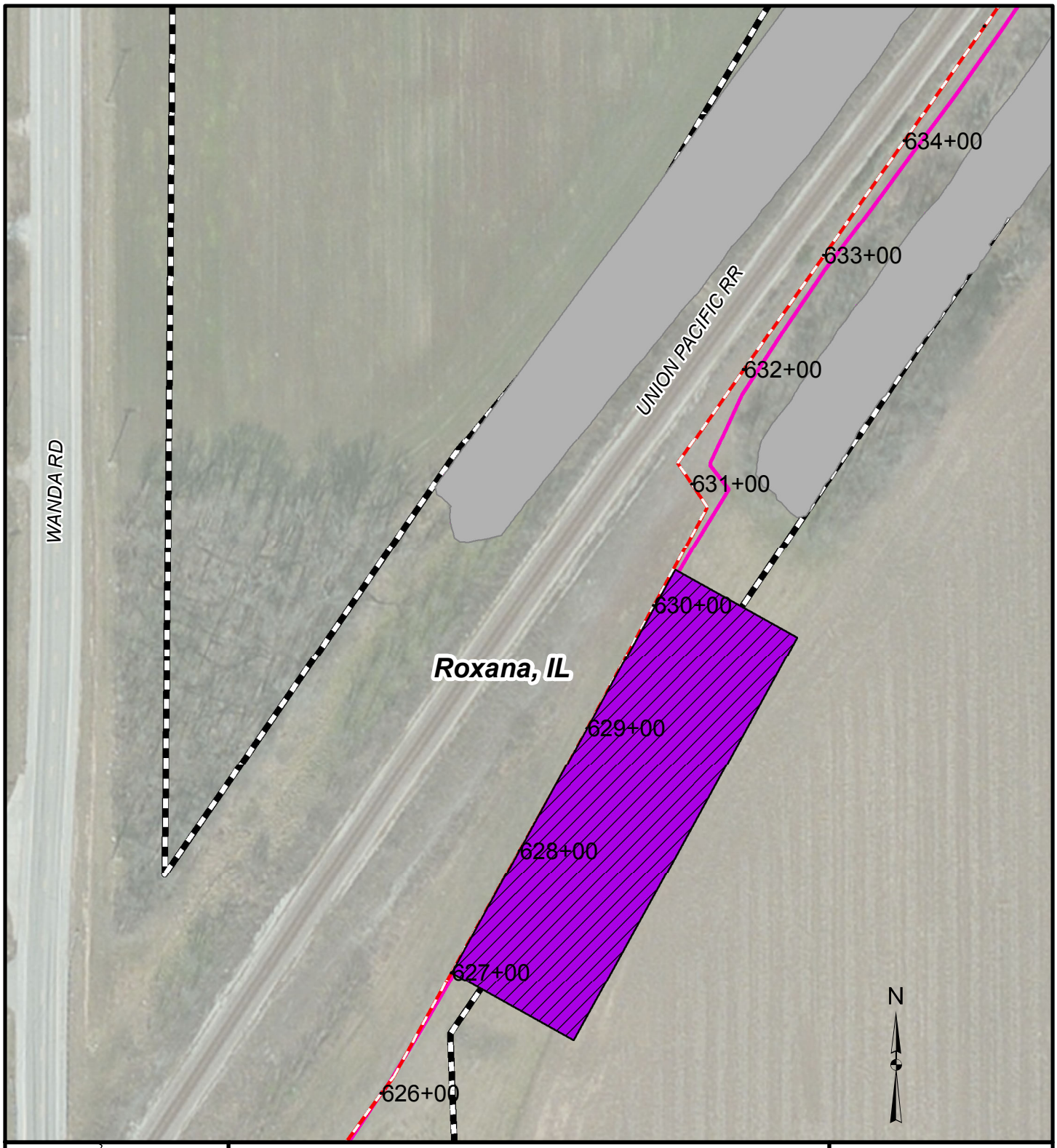
DESIGN STA: 613+70 TO 623+80

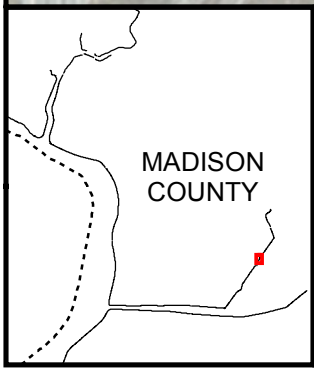
06/16/2015

SHEET 12 OF 13

Legend

- New Pump Station
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary





USACE Authorized Level of Protection Planning and Analysis

BID PACKAGE 10

WOOD RIVER LEVEE SYSTEM

DESIGN STA: 627+00 TO 630+30

06/16/2015

Legend

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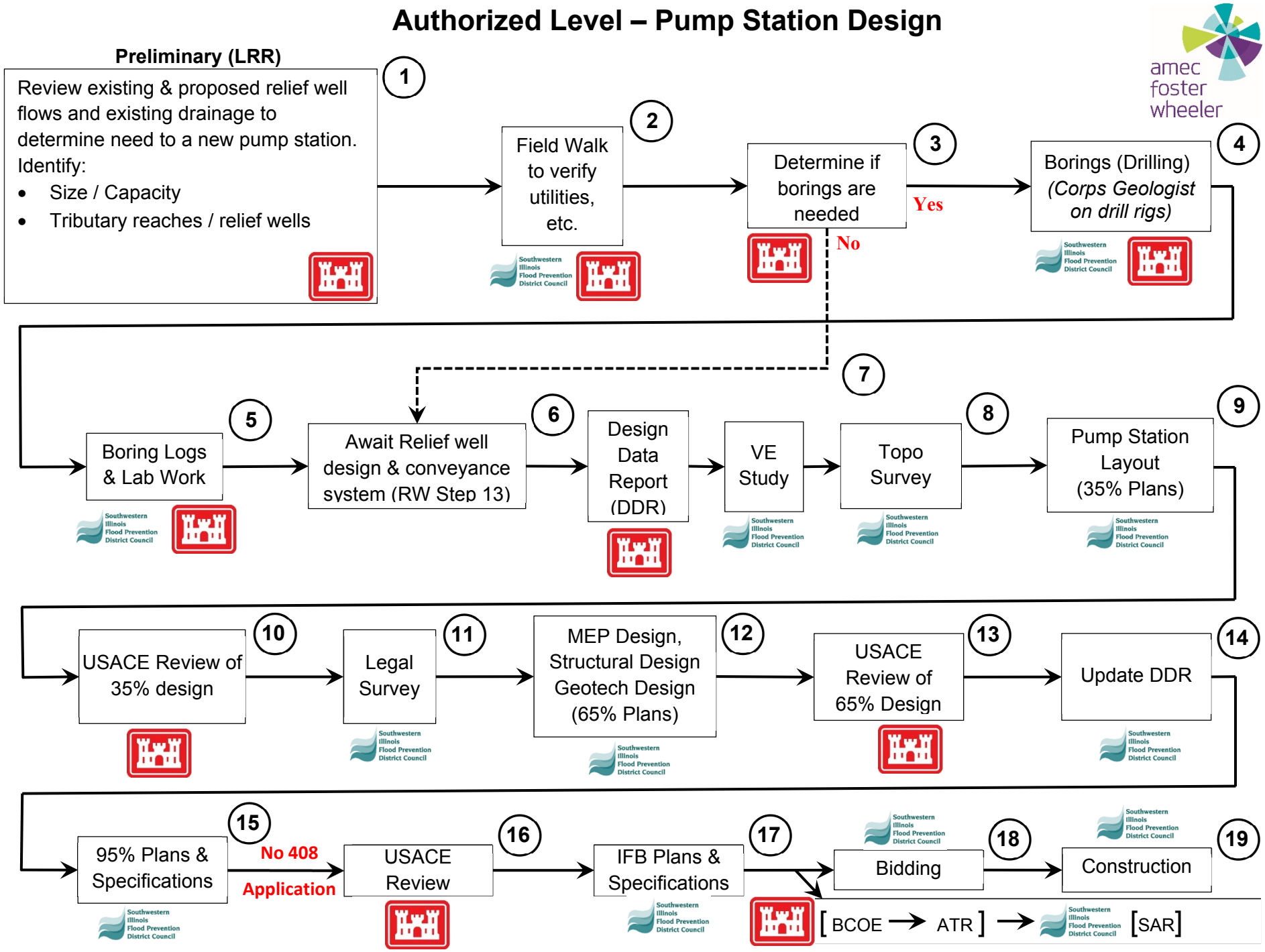
- New Seepage Berm
- New Fill Area
- New Relief Well
- Municipality Boundary

Appendix 2 – Design Process Flow Charts

Authorized Level – Pump Station Design



Authorized Level – Relief Well Design

Preliminary (LRR)

Review existing sub-surface data & analyze underseepage to determine relief well solution. Identify:

- Relief well spacing per reach
- Station & Offset for each relief well
- "D" or "T" type relief well
- Discharge flow
- Discharge elevation

1

Field Walk to verify wells will work

No

Yes

2

Corps Geologist on drill rigs

Pilot Hole Drilling

3

Pilot Hole Boring Logs & Lab Work

4

Re-review well data with pilot hole data. Identify / Confirm:

- Relief well spacing per reach
- Station & Offset for each relief well
- "D" or "T" type relief well
- Discharge flow
- Discharge elevation
- Aquifer percent penetration

5

6 Design Data Report (DDR)

7 VE Study

8 Topo Survey

9 Relief Well Design (35% Plans)

10 Check of Relief Well Design (35% Design)

11 Identify Piezometer Locations

12 Design of Conveyance Systems

13 Determine Need for Pump Station

14 Design of Pump Station as needed

15 Legal Survey

16 65% Plans

16 USACE Review of 65% Design

17 Update DDR

18 95% Plans & Specifications

No 408 Application

19 USACE Review of 95% Design

20 Bidding

21 Construction

[BCOE → ATR] → [SAR]

Authorized Level – Seepage Berm Design