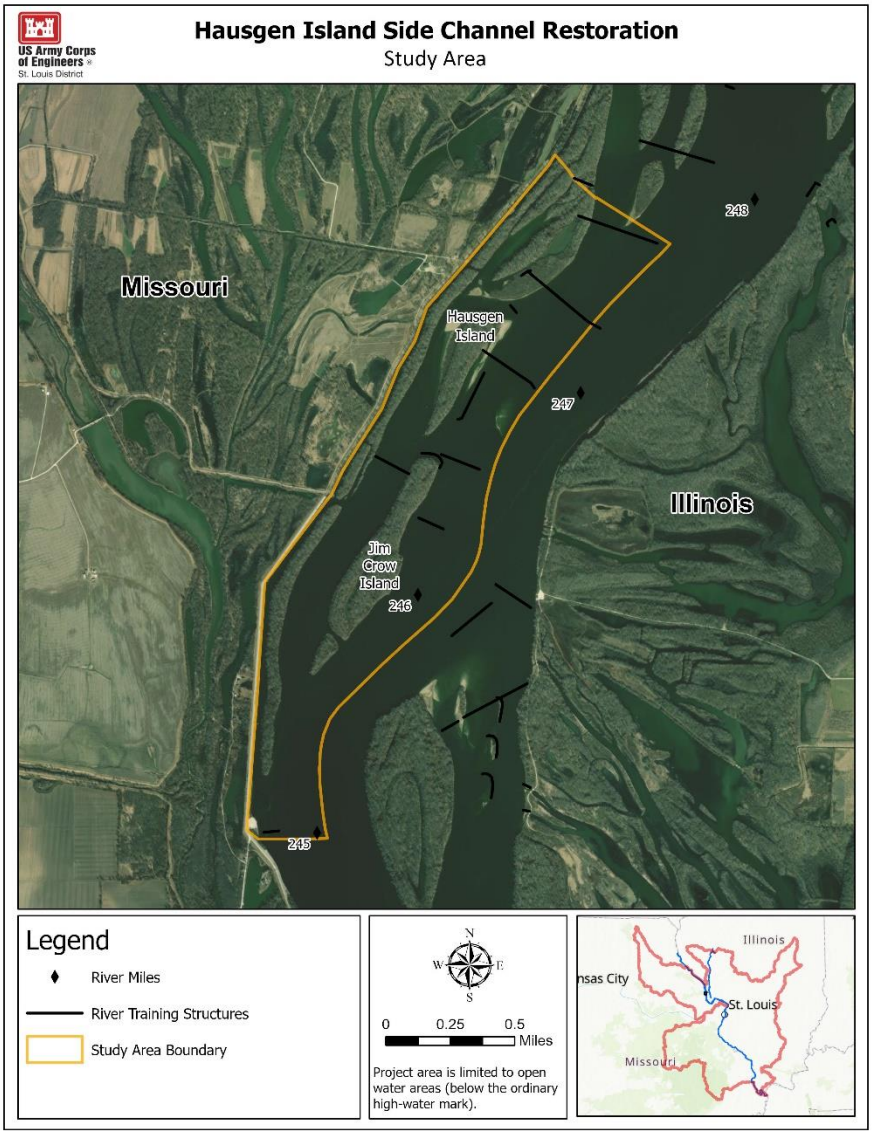
NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION
ECOSYSTEM RESTORATION PROJECT

POOL 25, UPPER MISSISSIPPI RIVER MILES 248-245
LINCOLN COUNTY, MISSOURI



US Army Corps of Engineers ®
St. Louis District

July 2025

EXECUTIVE SUMMARY

Purpose of the Report: The purpose of this project implementation report (PIR) with environmental assessment (EA) (report), including the anticipated Finding of No Significant Impact (FONSI), is to document the decision-making process for the proposed U.S. Army Corps of Engineers (USACE), Navigation and Ecosystem Sustainability Program (NESP) Hausgen Island Complex Side Channel restoration project (Project). The proposed project focuses on an approximate 386-acre side channel complex in the Upper Mississippi River (UMR) in the lower portion of Pool 25.

This report was developed by the USACE serving as the lead federal agency in close coordination with the U.S. Fish and Wildlife Service (USFWS), Illinois Department of Natural Resources (IDNR), and Missouri Department of Conservation (MDC). This report provides planning (including National Environmental Policy Act compliance), engineering, and sufficient construction details for the Tentatively Selected Plan (TSP) to help inform the final recommendation.

Project Area Description: The Project is located on the right descending bank of the Mississippi River, near Foley, Missouri, in Lincoln County, Missouri. The proposed project lies in the lower portion of Pool 25 between River Miles (RM) 248 and 245. Project features would be located entirely below the Ordinary High-Water Mark (OHWM); therefore, the construction of this project would be 100 percent federal and does not require a Sponsor. The approximate 386-acre aquatic area consists of side channels and connected backwaters in the vicinity of Hausgen and Jim Crow Islands.

Problem Identification: Between RM 248 and 245 in UMR Pool 25, the quantity and quality of side channel habitat, including backwaters, chutes, and riffle/pool complexes, have degraded due to sedimentation related to the impoundment and operations of the Upper Mississippi River – Illinois Waterway (UMR-IWW) (and resulting changes in hydraulics and hydrology), land use changes, and changing environmental conditions. The loss of side channel depth and flow diversity, structural diversity, and aquatic connectivity has decreased habitat function, extent, and availability for native aquatic species. This project area is also characterized by a loss of fish and mussel habitat, and the natural hydrologic processes necessary to sustain native aquatic plant species. Shoreline erosion is also present in the project area.

Project Objectives: Increase depth and flow diversity of aquatic side channels throughout the project area to:

- restore side channel sediment transport and geomorphic diversity.
- increase side channel habitat quantity and quality for native fish and mussel species.
- increase side channel habitat quality for native fish spawning, rearing, juvenile, or overwintering habitat.
- increase side channel area, flow diversity, quality, and clarity for native mussel species habitat.
- reduce sediment deposition within side channel flowing water habitats to maintain and restore main channel connectivity and increase quality of habitat for riverine dependent native fish.

Plan Formulation, Evaluation, and Comparison: The USACE planning process is a structured systematic and repeatable planning approach to ensure sound decisions are made in accordance with the processes laid out in the Planning Guidance Notebook (Engineer Regulation (ER) 1105-2-103) and the Principles and Guidelines for Federal Water Resource projects. This report describes the development, screening, and evaluation of management

measures and alternative plans. The project delivery team (PDT), which includes biologists, engineers, economists, and planners from the USACE and partners, developed a series of alternatives for consideration.

Plan Selection: The TSP for the Hausgen Island Complex side channel restoration NESP Project (Alternative 2 – Maximum - mussel enhancement, flow / depth diversity, connectivity) is shown in Figure ES-1. It consists of multiple measures to improve the side channel ecosystem structure and function by implementation of the following:

- Partial degradation / notching of river training structures
- Creation of hard points within side channel
- Rock – gravel substrate enhancement for mussel habitat
- Bank stabilization utilizing gradual slope revetment (GSR) for mussel habitat

The TSP was identified as the National Ecosystem Restoration (NER) Plan. For ecosystem restoration projects, the plan that maximizes ecosystem benefits compared to costs is selected as the NER Plan. The TSP is a best buy alternative that yields 92 net average annual habitat units (AAHUs) at an average annual cost of $1,786 per AAHU (FY2025 price level; FY2025 federal discount rate of 3.0 percent). The TSP best meets the identified planning objectives and has support from partners and consulting agencies. Implementation of the Plan would increase the quality and quantity of ecosystem resources and meet the needs of a large variety of native aquatic and terrestrial species. Maintaining side channel depth diversity would improve aquatic habitat for native fishes such as the state listed Lake Sturgeon. Maintaining the current shoreline biota would continue to provide habitat for the state listed American Bittern. Improved mussel habitat would enhance vital habitat for mussel species, including the state listed Ebonyshell within the proposed project area and the upper Mississippi River. The improved habitat is anticipated to provide enhanced opportunities for the recruitment of federally protected mussel species as well. The project outputs are also consistent with the goals and objectives of the NESP.

All proposed project measures would be located below the ordinary high-water mark (OHWM); therefore, project first cost funding for restoration measures would be 100 percent federal; and responsibility for the operation, maintenance, rehabilitation, replacement, and repair (OMRR&R) of the project would also be the responsibility of the USACE.

The St. Louis District Engineer has reviewed the proposed project outputs, a gain of 92 net AAHUs, and determined that the implementation of the TSP is in the Federal interest. Therefore, the District Engineer recommends construction approval for the Hausgen Island Complex NESP side channel restoration project. The current estimated project first cost (FY2025 price level), including contingencies, is estimated at $3.49M. The total average annual cost based on the project first cost is $137,000 and the total average annual cost is $164,000. The fully funded project cost estimate is $4,339,000. The USACE would be responsible for the project OMRR&R at an estimated average annual cost of $4,000 (including contingencies).

For NESP program management accounting purposes, the Hausgen Island Complex side channel restoration project accounts for one distinct NESP “side channel” restoration project. NESP programmatic accounting is necessary for alignment with the greater NESP ecosystem restoration recommended plan authorized by Congress in 2007.

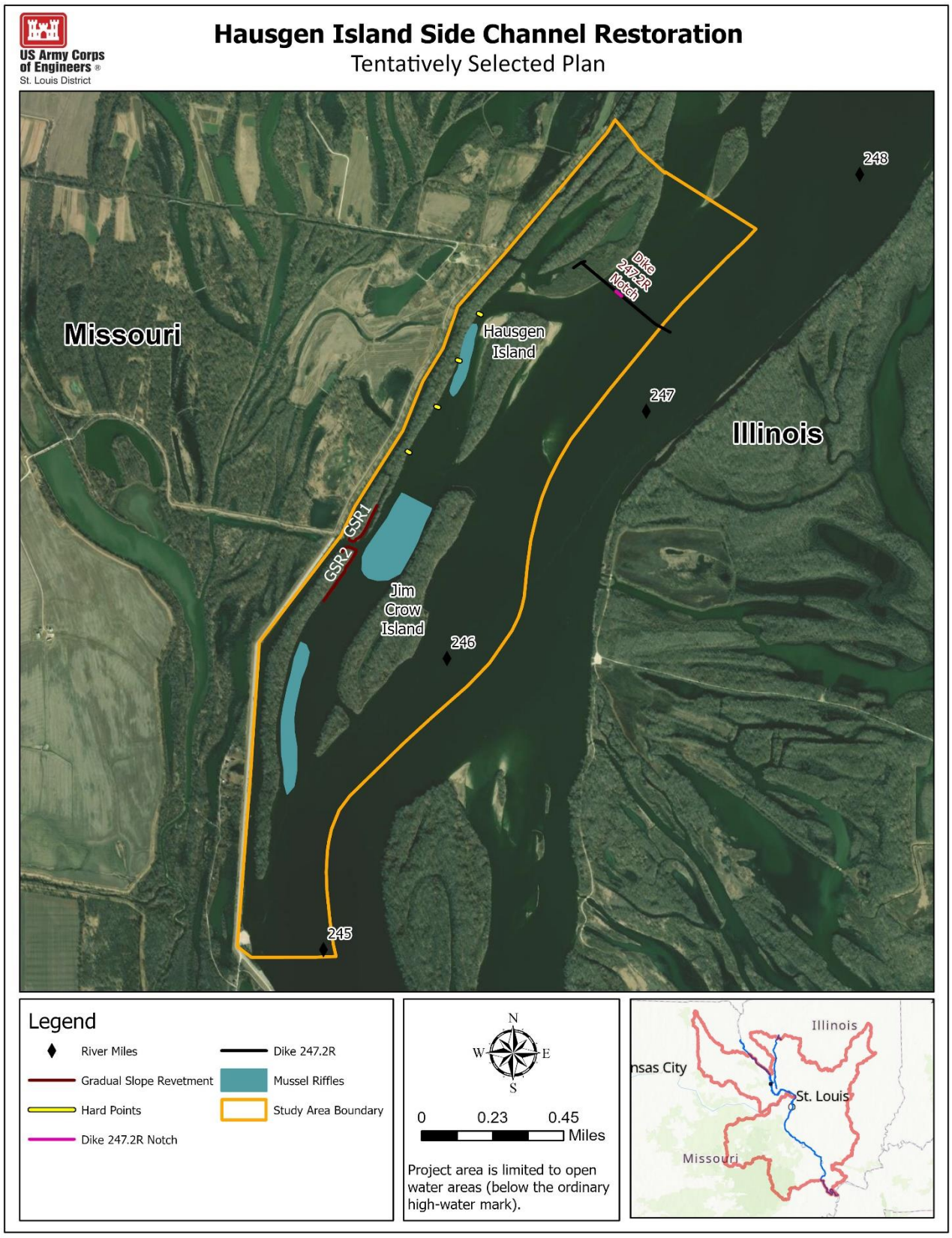


Figure ES-1. Tentatively Selected Plan

ACRONYMS

Average Annual Habitat Unit	**AAHU**	USACE, Mississippi Valley Division	**MVD**
Area of Potential Effect	**APE**	North American Vertical Datum of 1988	**NAVD 88**
Cost Effectiveness & Incremental Cost Analyses	**CE/ICA**	National Environmental Policy Act	**NEPA**
Cubic Yards	**CY**	National Register of Historic Places	**NRHP**
Conceptual Ecological Model	**CEM**	Navigation and Ecosystem Sustainability Program	**NESP**
St. Louis District	**District**	Operation and Maintenance	**O&M**
Dissolved Oxygen	**DO**	Plans & Specifications	**P&S**
Environmental Protection Agency	**EPA**	Project Delivery Team	**PDT**
Engineer Regulation	**ER**	Project Implementation Report with Integrated Environmental Assessment	**PIR/EA**
Engineering Research and Development	**ERDC**	River Mile	**RM**
Endangered Species Act	**ESA**	River Resources Action Team	**RRAT**
Fish and Wildlife Coordination Act	**FWCA**	River Resources Coordinating Team	**RRCT**
Gradual Slope Revetement	**GSR**	Side Channel Enhancement Dike	**SCED**
Habitat Evaluation Procedures	**HEP**	State Historic Preservation Office	**SHPO**
Habitat Needs Assessment-II	**HNA-II**	Ton	**TN**
Habitat Rehabilitation and Enhancement Project	**HREP**	Tentatively Selected Plan	**TSP**
Habitat Suitability Index	**HSI**	Upper Mississippi River	**UMR**
Hazardous, Toxic, and Radioactive Waste	**HTRW**	Upper Mississippi River Restoration	**UMRR**
Illinois Department of Natural Resources	**IDNR**	Upper Mississippi River System	**UMRS**
Lock and Dam	**L&D**	U.S. Fish and Wildlife Service	**USFWS**
Long Term Resource Monitoring	**LTRM**	Water Resources Development Act	**WRDA**
Migratory Bird Treaty Act	**MBTA**	Upper Mississippi – Illinois Waterway	**UMR-IWW**
Ordinary High Water Mark	**OHWM**	U.S. Geological Survey	**USGS**

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***Denotes National Environmental Policy Act required sections**

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1 INTRODUCTION*

The U.S. Army Corps of Engineers (USACE), St. Louis District (District), has prepared this Project Implementation Report (PIR) with Integrated Environmental Assessment (PIR/EA) to present a detailed account of the planning, engineering, construction considerations, and environmental considerations that resulted in the Tentatively Selected Plan (TSP) for the Hausgen Island Complex Side Channel Restoration (Project). The PIR/EA also meets applicable USACE guidance and documents and evaluates environmental effects of the recommended plan and alternatives in compliance with the National Environmental Policy Act (NEPA) of 1969.

1.1 Authority

NESP is a dual-purpose navigation and ecosystem restoration program for the Upper Mississippi River (UMR) and Illinois Waterway (IWW) System (UMR-IWW system) authorized by Title VIII (Sections 8001-8005) of the Water Resources Development Act (WRDA) of 2007 (Public Law (PL) 110-114, 33 USC 652 statutory note), substantially in accordance with the Report of the Chief of Engineers dated 15 December 2004 (Chief's Report). NESP is a regional program that includes geographic areas within the boundaries of the USACE St. Paul, Rock Island, and St. Louis Districts. The navigation portion of the NESP includes both small- and large-scale navigation improvements and mitigation. The ecosystem restoration portion of the NESP includes large projects at specific locations and a programmatic authorization for projects with a total single project cost not to exceed $25 million. Under the ecosystem restoration portion of NESP, a project would be implemented at 100 percent Federal expense if it (i) is located below the ordinary high-water mark (OHWM) or in a connected backwater; (ii) modifies the operation of structures for navigation; or (iii) is located on federally owned land. All other ecosystem restoration projects under the NESP are implemented with cost sharing of 65 percent Federal, 35 percent non-federal. (PL 110-114, Section 8004(b)(3)).

For this project, all proposed project measures would be located below the ordinary high-water mark (OHWM); therefore, project first cost funding for restoration measures would be 100 percent federal; and responsibility for the operation, maintenance, rehabilitation, replacement, and repair (OMRR&R) of the project would also be the responsibility of the USACE. For the purposes of this study, the ordinary high-water mark is defined by USACE, Operations Division, Regulatory Branch, where the water surface elevation corresponds to the Annual Exceedance Probability (AEP) frequency (2-year) flood event (2004 Upper Mississippi River System Flow Frequency Study). The OHWM can be visually defined by the "vegetative line" within the riparian zone, usually considered at the bank full elevation. The OHWM can also be distinguished during field observation for verification. For this study, the hydrologic and hydraulic (H&H) modeling is calibrated to this OHWM definition.

NESP programmatic accounting is necessary for alignment with the greater NESP ecosystem restoration recommended plan authorized by Congress in 2007. Table 1 shows how the Hausgen Island Complex project accounts for one side channel restoration project as part of the programmatic NESP ecosystem restoration efforts.

Table 1. Alignment with the Authorized NESP Recommended Plan for Ecosystem Projects

Type of NESP Ecosystem Project	Number of Projects	Acres Benefitted
Side Channel Restoration	1	187

1.2 NEPA Tiering

The Chief's Report, supported by the Integrated Feasibility Report and Programmatic Environmental Impact Statement for the Upper Mississippi River and Illinois Waterway System Navigation Feasibility Study (USACE, 2004) (2004 IFR/EIS), describes the framework for the ecosystem restoration component of NESP, including establishing the Federal interest, establishing the justified scope of the plan, and identifying preliminary locations of projects. The remaining requirement for implementation on a project-specific basis is detailed formulation and description of recommended project plans. Pursuant to implementation guidance for the NESP issued by the Assistant Secretary of the Army (Civil Works) (ASA(CW)) dated 2 July 2008, the site-specific assessments are accomplished by preparation of PIRs. The 2008 implementation guidance identifies the specific items to be included in each PIR. This PIR/EA is intended to fulfill those requirements.

The 2004 IFR/EIS includes the purpose, need, plan formulation, benefits, and effects of the NESP in compliance with NEPA. For the ecosystem restoration program, the 2004 IFR/EIS provided analyses at a program level. The conditions and environmental effects described in the 2004 IFR/EIS are still valid to support the ecosystem restoration project evaluated in this PIR/EA. This PIR/EA tiers off of the 2004 IFR/EIS and provides project-specific analysis consistent with the Department of Defense National Environmental Policy Act Implementing Procedures dated 30 June 2025. When the analysis presented in the 2004 IFR/EIS is adequate, no additional analysis is provided and instead the 2004 IFR is incorporated by reference.

1.3 NESP Partnership

Participants in the planning of the Project included St. Louis District and Regional Planning and Environment Division North (RPEDN) staff and Project partners. There is no Sponsor for this project. Development of this *draft* PIR/EA was actively coordinated with the participants during team meetings, phone conversations, and a site visits to the Project area. This PIR/EA summarizes the multidisciplinary efforts of the Project Delivery Team (PDT), which includes the District and Project partners. The Corps also consulted with Tribal Nations.

U.S. Army Corps of Engineers, St. Louis District. The District is responsible for Project management and coordination with the Project partners and other affected agencies. The District will submit the PIR/EA, program funds, finalize Plans & Specifications (P&S), complete all NEPA requirements, advertise and award a construction contract, and perform construction contract supervision and administration (S&A).

Sponsor. The Project is located 100 percent below the OHWM; therefore, the construction of this project would be 100 percent federal and does not require a sponsor.

Partners. The River Resources Action Team (RRAT) was instrumental in the planning of this project. The RRAT is an interagency committee that provides an effective forum to address natural resource issues in the Mississippi River within the District. Members of the PDT included natural resource managers with the U.S. Fish and Wildlife Service (USFWS), Illinois Department of Natural Resources (IDNR), and Missouri Department of Conservation (MDC).

1.4 Purpose and Need for Federal Action

The goal of the NESP is to ensure an efficient and environmentally sustainable navigation system on the UMR-IWW system. The 2004 IFR/EIS (Chapter 1) established the purpose and need for the ecosystem restoration plan, which remain valid. Section 8004(b)(1) of WRDA 2007 directs the Secretary to "carry out, consistent with requirements to avoid adverse effects on

navigation, ecosystem restoration projects to attain and maintain the sustainability of the ecosystem of the Upper Mississippi River and Illinois River in accordance with the general framework" outlined in the Chief's Report. Each PIR identifies a project-specific purpose and need, consistent with the 2004 IFR/EIS and WRDA 2007.

Within the overarching NESP purpose, the purpose[1] of the project proposed in this PIR is to attain and maintain sustainability of side channel habitat within the UMR, Pool 25, in the vicinity of Hausgen Island complex (RM 248-245). The need for restoration in the study area is based on the overall need to restore UMR side channels for important aquatic habitat for many native species including riverine fishes and freshwater mussels. Historically, the study area had freshwater mussel beds, but these beds have been impacted through time due to degraded side channel conditions. The RRAT has identified a need to restore side channels to promote freshwater mussel habitat, specifically in the Lower Impounded Reach of the Mississippi River. The District proposes to restore the functionality of the project area through construction of measures that would support quality side channel habitat for desirable native plant and animal species and emulate more natural river processes, structures, and functions for a resilient and sustainable ecosystem.

1.5 Study Area

The Hausgen Island Complex study area consists of approximately 650 acres. There is approximately 386 acres of aquatic habitat that is dominated by side and tertiary channels and connected backwater habitat along the right descending bank of the Mississippi River, Lincoln County, Missouri, between RM 248 and 245 (Figure 1**Error! Reference source not found.**). The area lies within Navigation Pool 25 of the UMR between Lock & Dam (LD) 24, in Clarksville, MO (RM 273.4) and Lock & Dam 25 (L&D 25) in Winfield, MO (RM 241.4) (Figure **2**). The project area encompasses the side channels and connected backwaters below the OHWM surrounding Hausgen Island, Jim Crow Island, and Little Stag Island. These islands are federally owned by the USACE and are included in the General Plan (GP) lands agreement with USFWS who have a cooperative agreement with MDC for fish and wildlife management in this area.

Note: This PIR/EA was prepared simultaneously with, but separately from, the Clarksville and Carroll Island Complex side channel NESP project, which is located in Pool 25, approximately 18 miles upstream (RM 273-266).

[1] Additional information on site-specific problems and study objectives are described fully in Chapter 2.

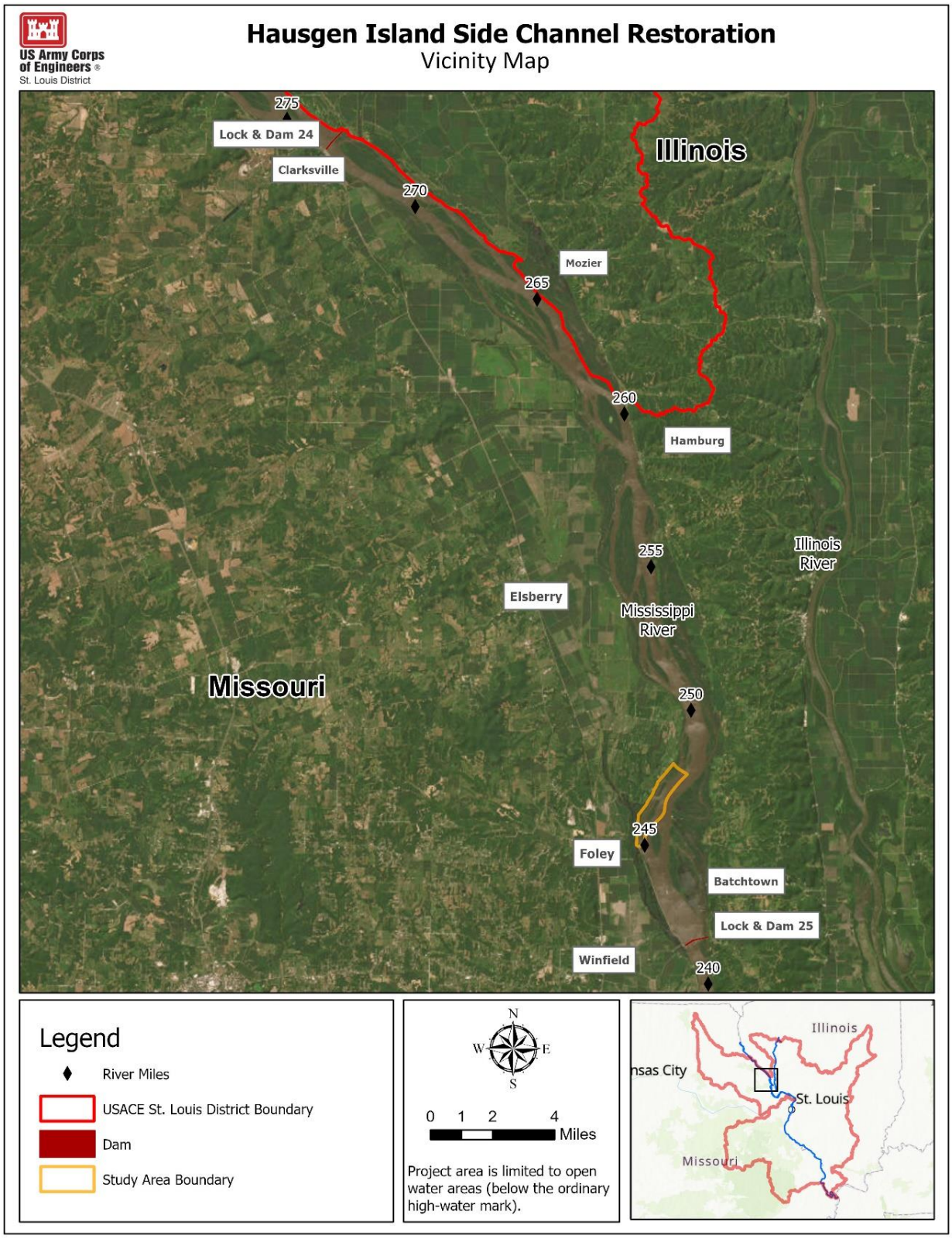


Figure 1. Project Vicinity Map

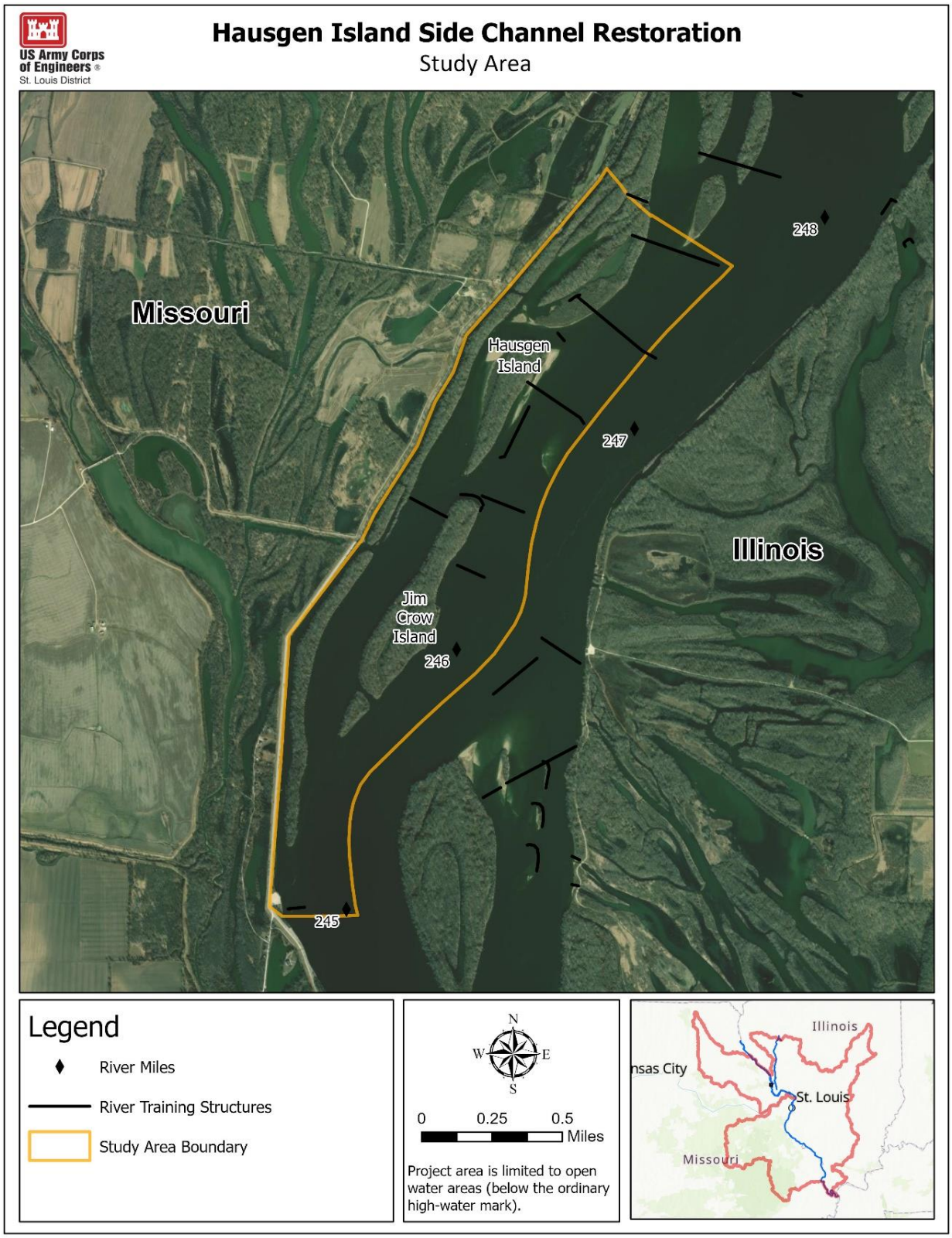


Figure **2.** Project Location Map

1.6 Prior Reports, Existing Water Projects, and Ongoing Programs*

Table 2 summarizes prior reports, existing water projects, and ongoing programs which provided valuable information, experience, or guidance in the planning of the Project. Additional literature cited can be found in References section and at the end of each Appendix.

Table 2. Prior Reports, Projects, and Programs

Project	Study/Report/Environmental Document Title	Project Relevance
1999	Tier I Biological Assessment for Operation and Maintenance of the Upper Mississippi River Navigation Project within the St. Paul, Rock Island, and St. Louis Districts.	Endangered Species Act Compliance and Actions
1999	Draft Upper Mississippi River and Illinois Waterway Cumulative Effects Study. U.S. Army Corps of Engineers, Rock Island District, Rock Island, Illinois.	
2004	Final Integrated Feasibility Report and Programmatic Environmental Impact Statement for the UMR-IWW System Navigation Feasibility Study	Basis for NESP authorization in WRDA 2007
2004	Chief's Report UMR-IWW System Navigation Feasibility Study	Basis for NESP authorization in WRDA 2007
2004	U.S. Fish and Wildlife Service. Biological Opinion for the Operation and Maintenance of the 9-foot Navigation Channel on the Upper Mississippi River System. Studies located near the study area are described in Section 1.6.1	Endangered Species Act Compliance and Actions
2012	Upper Mississippi River Environmental Design Handbook	Design elements
2018	Habitat Needs Assessment-II: Linking Science to Management Perspectives	Describes and compares historical, existing, forecasted, and desired future conditions to identify habitat needs within the UMRS.
2022	Ecological Status and Trends of the Upper Mississippi and Illinois Rivers.	Summarizes ecological health of UMR based on trends identified in Long Term Resource Monitoring (LTRM) data.
2023	NESP Environmental Design Tool Kit	Set of project measure design examples developed specifically for habitat restoration projects under the NESP program.

1.6.1 Environmental Pool Management (EPM)

Environmental Pool Management (EPM) was first implemented in 1994 in an attempt to create thousands of acres of critical wetland vegetation in the navigation pools, while still maintaining a safe and dependable navigation channel. The St. Louis District, in coordination with local, state, and Federal natural resource managers, completed the first pool level drawdown on the Upper

Mississippi River. This experiment, in Pool 25, consisted of holding the pool level approximately 2 feet lower than in previous years, for a period of about 30 days during the growing season. This "drawdown" was followed by a slow rise back to "full pool". What resulted was an expanse band of moist soil plants, that when flooded, provided habitat and food for both fish and wildlife. All work was done within the existing USACE operating range and authority. Because USACE was working within their existing range, there were no impacts to infrastructure, such as marinas, boat landings and commercial fleeting sites, which had to be built to accommodate the entire operational range (about 5 feet). Following the success in 1994, "Environmental Pool Management" was expanded to all three pools (24, 25, 26) within the St. Louis District.

EPM goals change each year based expected flow conditions and input from the natural resource managers. In some years the pools are held near the top of the operating range to improve to fish spawning opportunities while in other years the pools are held low to allow for maximum vegetation growth. Other years are somewhere in-between.

Research in Pool 25 helped engineers and biologists further understand in the impacts of EPM. Outcomes showed that varying the timing of a drawdown results in very different plant communities (and seed crops for waterfowl), and that extended drawdowns can actually be detrimental by creating too much vegetation, resulting in serious oxygen depletion problems in some re-flooded areas. Late summer and fall fish use of vegetation also varied in relation to the length of the drawdown, and resultant plant growth. The research in Pools 24-26 also showed extensive use of residual vegetation providing cover and nursery habitat for a large number of larval and juvenile fish species (USACE, 2018). In addition to producing moist soil plants, the yearly drawdowns result in the appearance of submerged and emergent aquatic plants as well, through the compaction and drying of the soil in these shallow areas.

The EPM water level period occurs between May 1 through September 30 and when the pool is between 0.5 and 2.0 feet below maximum regulated pool as conditions allow. The growth of moist soil vegetation benefits wildlife by providing food, shelter, and cover for a wide range of organisms, including fish, waterfowl, macroinvertebrates, and others.

1.6.2 Biological Opinion

The NESP Biological Opinion (NESP BO) is a programmatic (Tier I) consultation which considers the systemic impacts of implementing the recommended plan (project) described in the "*Draft Integrated Feasibility Report and Programmatic Environmental Impact Statement (EIS) for the Upper Mississippi River-Illinois Waterway System Navigation Feasibility Study, dated 29 April 29 2004*" (IFR/EIS) (USFWS, 2004), on listed species as projected over a 50 year period of analysis. To ensure that the anticipated level of incidental take is commensurate with the take that occurs per the proposed action, USACE and USFWS implemented a tiered programmatic consultation approach. All subsequent projects will use Tier II consultations with Tier II biological opinions issued as appropriate (i.e., whenever the proposed project would result in unavoidable adverse effects to threatened and endangered species).

In the NESP Tier I BO, the USFWS determined that implementation of the recommended plan described in the "*Draft Integrated Feasibility Report and Programmatic Environmental Impact Statement (EIS) for the Upper Mississippi River-Illinois Waterway System Navigation Feasibility Study, dated April 29, 2004*", would not jeopardize the continued existence of the Indiana bat (*Myotis sodalis*), decurrent false aster (*Boltonia decurrens*), pallid sturgeon *(Scaphirynchus albus*) and Higgins eye pearlymussel (*Lampsilis higginsii*), but would result in incidental take of these species. The Service provided Incidental Take Statements (animals only), Reasonable

and Prudent Measures, and Terms and Conditions/Conservation Recommendations for these species. By letter dated 28 May 2004 the Service concurred with the USFWS Biological Assessment findings that the project is not likely to adversely affect the bald eagle (*Haliaeetus leucocephalus*), interior least tern (*Sterna antillarum*), or winged mapleleaf (*Quadrula fragosa*), because project impacts either would be offset by management actions proposed by the Corps, or would be negligible (USFWS, 2004).

Ecosystem restoration projects in Pool 25 include:

- Hausgen Island Side Channel Restoration
- Pool 25 Mason Island Forestry Inventory
- Pool 25 Slim Island Forestry Inventory
- Clarence Cannon National Wildlife Refuge Habitat Enhancement and Restoration
- Pools 25 and 26 Islands Habitat Rehabilitation and Enhancement Project
- Red's Landing Wetlands Habitat Rehabilitation and Enhancement Project
- Gilead Slough Habitat Rehabilitation and Enhancement Project
- Stag and Keaton Islands Habitat Rehabilitation and Enhancement Project
- Batchtown Habitat Rehabilitation and Enhancement Project

In addition to the ecosystem restoration projects listed above, a new 1,200-foot lock is being constructed at the existing Lock and Dam 25, which separates Pools 25 and 26. This is part of NESP navigation efforts.

2 NEED FOR AND OBJECTIVES OF ACTION

This chapter describes the development of Project objectives, including the identification of problems and opportunities, assessment of resource significance of the Project area, consideration of the goals and recommendations of overarching programs, and identification of constraints and considerations. For planning purposes, the period of analysis was established as 50 years starting in 2028.

2.1 Specific Problems and Opportunities

The problems and opportunities for the NESP are described in the 2004 IFR/EIS, *Chapters 1. Purpose and Need for Action and 4. Inventory and Forecast Resource Conditions.* As described in the 2004 IFR/EIS, the principal problems addressed by all NESP ecosystem projects are the adverse changes to ecosystem structure, function, and dynamic processes that have occurred over many years from many causes, but especially since initiation of the operation and maintenance of the existing Nine-Foot Channel Navigation Project.

Problems. Large river ecosystems support a variety of habitats, of which side channels and connected backwaters are integral components. Side channels and backwater habitats support a broad range of fish species, waterfowl, shorebirds, and wading birds. These areas are also quiet areas off the main channel where people and animals alike can seek refuge. Because of the widespread loss of backwater and secondary channel depth and depth diversity due to the high rates of sedimentation, fish habitat quality has decreased, especially in the winter when such areas provide refuge from harsh conditions in main channel areas. Many UMR backwaters have been degraded by excessive amounts of sediment emanating from the basin, tributaries, and mainstem sources. This degradation is in the form of loss of depth, poor sediment quality, poor water quality, and sediment resuspension that blocks light required by aquatic plants (USACE, 2023).

Between UMR 248 and 245 in Pool 25, increased erosion and sedimentation has degraded the quantity and quality of flowing water (lotic) side channel habitat, including backwaters, chutes, and riffle/pool complexes. This degradation is due to changes in hydraulics and hydrology from implementation and operation of the nine-foot navigation channel, land use changes, and changing environmental conditions. The loss of side channel depth and flow diversity, structural diversity, and aquatic connectivity has decreased habitat function, extent, and availability for native aquatic species. This project area is characterized by a lack of native fish species, mussel habitat, and the natural hydrologic processes necessary to form new side channel habitat. Shoreline erosion is also present in the project area.

Opportunities. The opportunities evaluated by the overarching NESP are described in the 2004 IFR/EIS*, Chapters 1. Purpose and Need for Action and 4. Inventory and Forecast Resource Conditions*. The primary opportunities of NESP are to reduce or eliminate commercial navigation traffic delays and improve the national and regional economic conditions while restoring, protecting, and enhancing the environment. Within the project area the following opportunities have been identified:

- Establishment of native aquatic plant communities
- Improve the resiliency of the habitat within the study area to the effects of changing conditions and hydrologic variability
- Contribute to the management goals of the USFWS and state natural resource agencies
- Expand or protect native fisheries spawning and rearing habitat within the study area

- Reduce shoreline erosion within the study area
- Avoid adverse impacts to recreational opportunities, such as fisheries, boating, hunting, etc.

2.2 Conceptual Model(s).

Conceptual ecological models (CEM) are helpful planning tools used to identify the major drivers and stressors on natural systems, the ecological effects of these stressors, and the best biological attributes or indicators of these ecological responses (Rudnick et. al., 2005). By describing general relationships among ecosystem components, these models allow teams to tell the story of how complex systems work in a more simplified and easily understood way.

The US Geological Survey (USGS) and USACE, in cooperation with partners, have developed CEMs that describe the UMRS as three interacting sub-systems shown in Figure **3** (flowing channels (lotic), backwaters and floodplain lakes (lentic), and floodplain)) (Bouska et al, 2018). For this study area, the flowing channels and backwater models are useful to understand the major ecological resources of the Hausgen Island side channel complex more generally with the controlling variables that govern those resources (Figure **4**, Figure **5**). The PDT used the CEM to identify the major problems, develop objectives addressing those problems, and identify any additional opportunities for restoration within the study area.

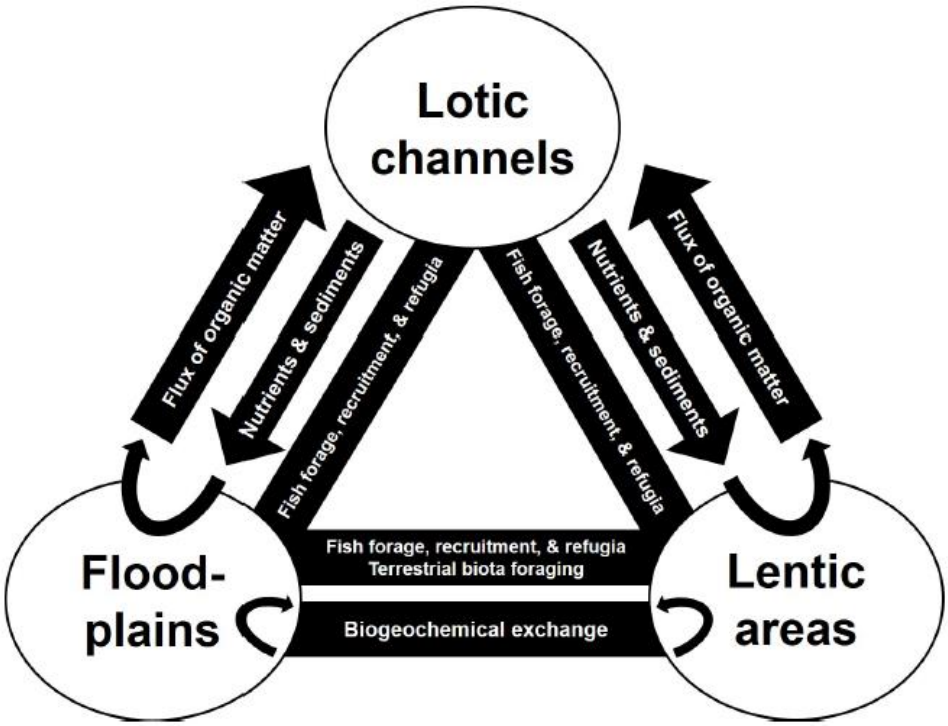


Figure **3.** UMR Conceptual Ecological Model describing the relationships between three interacting sub-systems (flowing channels (lotic), still-water backwaters, and floodplain lakes (lentic), and floodplain (Bouska et al, 2018).

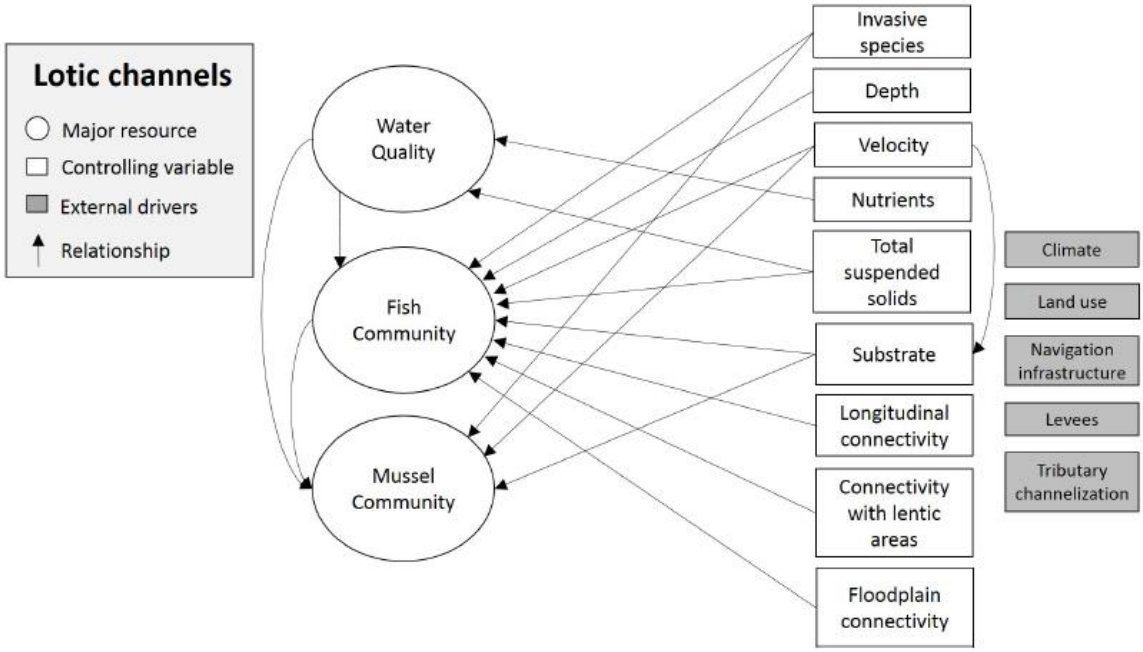


Figure **4.** UMR Conceptual Ecological Model describing major drivers and stressors on the resources of flowing channels (lotic habitat) (Bouska et al, 2018).

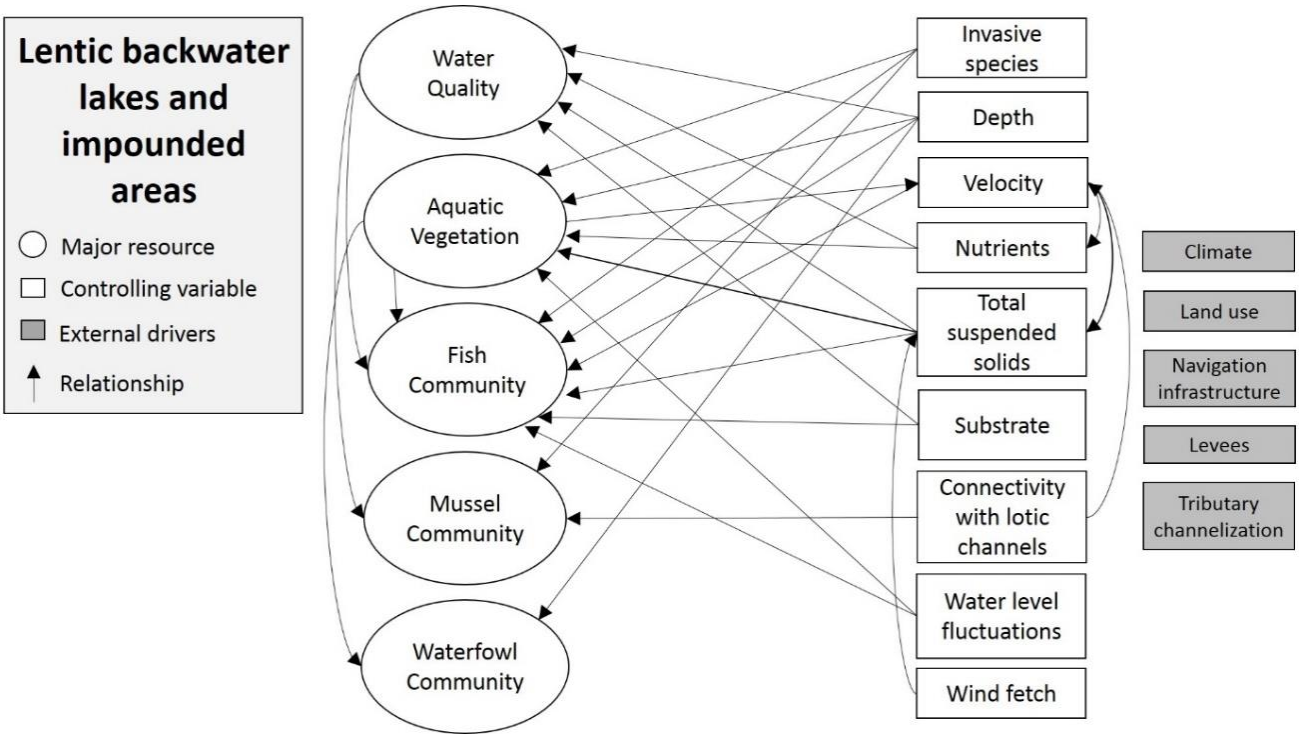


Figure **5.** UMR Conceptual Ecological Model describing major drivers and stressors on the resources of floodplain lakes (lentic habitats) (Bouska et al, 2018).

2.3 Resource Significance

Resource significance of the UMR is fully described in the Chief's Report and 2004 IFR/EIS, (Chapter 1). Site-specific resource significance, where relevant, is described below. See Table 3.

1. **Institutional Recognition:** Institutional recognition means the importance of an environmental resource is acknowledged in the laws, adopted plans and other policy statements of public agencies, tribes, or private groups. The formal recognition of the UMR Basin in laws, adopted plans, and other policy statements of public agencies and private groups illustrates the significance of the basin. The U.S. Congress recognized the UMR as a unique, "…nationally significant ecosystem and a nationally significant commercial navigation system…" in Section 1103 of the WRDA of 1986. Hausgen Island, Jim Crow Island, and Little Stag Island are all federally owned by USACE and are included in the GP lands agreement with USFWS who have a cooperative agreement with MDC for fish and wildlife management in this area.

2. **Technical Recognition:** Technical recognition means the resource qualifies as significant based on scientific knowledge or judgment of critical resource characteristics. Scarcity, representativeness, status and trends, connectivity, limiting habitat, and biodiversity describe technical significance. Differences across geographical areas and spatial scales may determine whether a resource is significant.

Numerous scientific analyses and long-term evaluations of the UMRS have documented its significant ecological resources. Since the early 20th century, researchers, government agencies, and private groups have studied the larger river floodplain system and proposed ecosystem restoration in the UMRS. Numerous scientific analyses and long-term studies through the USACE's Upper Mississippi River Restoration (UMRR) Long Term Resource Monitoring (LTRM) program have documented the significance of the resources in the UMR basin.

In a 1995 report, the U.S. Department of Interior (DOI) listed large streams and rivers as endangered ecosystems in the United States. The DOI documented an 85 to 98 percent decline in this ecosystem type since European settlement. Large floodplain-river ecosystems have become increasingly rare worldwide. Two large floodplain-river ecosystems lay within the UMRS, namely the Upper Mississippi and Illinois Rivers. These two ecosystems still retain some seasonal flood pulses, and half of their original floodplains remains un-leveed and open to the rivers (Sparks, J.C., & Yin, 1998). The UMRS is one of the few areas in the developed world where ecosystem restoration can be implemented on large floodplain-river ecosystems (Sparks R. , 1995).

In addition, technical resource agencies (federal, state, and non-profit) view the resources in the UMR as significant. The UMRS Habitat Needs Assessment II (McCain et. al 2018) has also technically recognized the need to restore floodplain habitat and connectivity to the main river channel, restore islands, restore diversity of aquatic habitat types (deep lentic backwaters and shallow lotic channel areas), restore aquatic vegetation in backwaters, restore floodplain forest diversity, restore floodplain vegetation diversity, enhance topographic diversity, restore water level fluctuation to mimic pre-dam conditions, and improve water clarity.

3. **Public Significance:** Public recognition means some segment of the public recognizes the importance of an environmental resource, as evidenced by people engaged in activities reflecting an interest or concern for that resource. As the nation's second-longest river,

behind only the conjoining Missouri, the Mississippi provides drinking water for millions and supports a $12.6 billion shipping industry, with 35,300 related jobs. It is one of the greatest water highways on earth, carrying commerce and food for the world. Half the nation's corn and soybeans are barged on the section above the Ohio River confluence. In addition, both food and sport-fishing are highly valued on the Upper Mississippi River. The large congregation of bald eagles in winter draws large crowds from the general public as they come to the riverfront to watch. Hausgen Island is part of the MDC Waterfowl Blind Draw Program and provides hunting opportunities within the project area.

Table 3. Resource Significance of UMR

Resource	Institutional	Public	Technical
Threatened and Endangered Species	Fish and Wildlife Coordination Act (FWCA), as amended (16 U.S.C.§ 661) Endangered Species Act (ESA) of 1973, as amended. National Wildlife Refuge Systems Biological Integrity, Diversity, and Environmental Health Policy	American Rivers, a non-governmental organization dedicated to protecting and restoring healthy, natural rivers, listed the Mississippi River as number three in America's Top Ten Endangered Rivers for 2019. Congress has recognized the Nation's rich natural heritage is of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people."	*Representativeness:* USFWS has identified the gray bat; Indiana bat; and spectaclecase (mussel) as federally endangered or threatened species that have the potential to occur within the study area. The tricolored bat, monarch butterfly, and western regal fritillary are proposed for listing, and also have the potential to occur within the study area.
Migratory Birds	Migratory Bird Conservation Act of 1929, and associated treaties Migratory Bird Treaty Act (MBTA) of 1918 EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds Bald and Golden Eagle Protection Act of 1940 North American Waterfowl Management Plan	Migratory birds provide the public with recreational opportunities, such as bird watching and waterfowl hunting. National Audubon's Mississippi River Campaign has been working to raise awareness of the importance of the Mississippi River as an internationally significant resource since 1998. The Upper Mississippi River Waterfowl Conservation Region	*Representativeness:* Numerous migratory birds utilize the study area; the following as the most relevant in the area: Bald Eagle, Great Blue Heron, waterfowl, and neotropical migratory birds. *Representativeness:* Knutson et al. (1996) found relative abundances of all birds and total numbers of neotropical migratory birds were almost twice as high in the UMR floodplain as in the adjacent uplands. *Status and Trend:* Changes in the UMR forest community have contributed to a reduction in diversity of habitat over time. These trends are likely to continue, and without

Resource	Institutional	Public	Technical
		(Region 19) is a level III Ducks Unlimited conservation priority area, providing a migration corridor for hundreds of thousands of dabbling ducks and significant numbers of divers.	intervention, the study area would cease to provide migration, dispersal, breeding, nesting, and cover habitat for a wide range of migratory birds.
Floodplain Forests	Fish and Wildlife Coordination Act, as amended (16 U.S.C.§ 661) ESA of 1973, as amended National Wildlife Refuge Systems Biological Integrity, Diversity, and Environmental Health Policy	The Upper Mississippi River Conservation Committee recognized the importance of the floodplain forest to the fish and wildlife of the UMR in the report, *Upper Mississippi and IL River Floodplain Forests* (Urich et al., 2002).	*Representativeness:* The study area contains floodplain forest habitat. *Biodiversity:* The largest concern is without intervention; the study area is likely to continue to experience forest fragmentation and limited species and structural diversity. Consequently, neotropical and other migratory birds, forest dependent bat species, and the other floodplain species that rely on the forest resources would be severely impacted. (Knutson, 1996) described the importance of floodplain forest in the conservation and management of neotropical migratory birds.
Wetlands	Executive Order No. 11990 of May 1977 (Protection of Wetlands) Water Resources Development Act of 1990, Section 307(a) National Wildlife Refuge Systems Biological Integrity, Diversity, and Environmental Health Policy.	Protecting wetlands from excessive pollution and destruction is a Mississippi River Collaborative (MRC) priority. MRC has established a Wetlands Group to address this specific issue.	*Scarcity:* In the United States, over a period of 200 years between the 1780s and the 1980s, the lower 48 states have lost an estimated 53% of the 221 million acres of original wetlands. *Scarcity:* Through land use changes, approximately 90% of pre-settlement wetlands were lost by the 1980s in Illinois.

2.4 Goals and Recommendations of Overarching Programs

2.4.1 NESP Program Objectives.

The primary goal of the NESP, as an integrated dual-purpose plan, is to ensure the economic and environmental sustainability of the UMR-IWW Navigation System. To fully address this goal, the following three planning objectives were established (2004 IFR/EIS, Chapter 1.3):

> **Objective 1.** Recommend measures to provide for a safe, reliable, efficient, and sustainable UMR-IWW Navigation System over the planning horizon.
>
> **Objective 2.** Recommend measures to address the cumulative impacts including ongoing effects of the operation and maintenance of the UMR-IWW Navigation System.
>
> **Objective 3.** Assure that any recommended measures are consistent with protecting the Nation's environment and avoiding, minimizing, or mitigating significant environmental, cultural, or social impacts.

Included in the 2004 IFR/EIS' recommended plan specifically includes actions for cultural resources preservation and mitigation as well as bank stabilization (including bankline protection).

As stated in the 2008 NESP Implementation Guidance, "The ecosystem restoration plan authorized in Title VIII of WRDA 2007 is the initial increment of a framework plan developed by identifying broad ecosystem goals to meet the planning objective of restoring the ecosystem of the UMR-IWW including addressing the cumulative impacts and ongoing effects of the navigation" system. These broad goals were further refined into systemic goals and site-specific objectives for side channel restoration projects.

2.4.2 Habitat Needs Assessment-II.

A suite of 12 indicators were developed in the Habitat Needs Assessment-II (HNA-II) to quantify aspects of ecosystem health and resilience, reflect the ability of large floodplain river ecosystems to adapt and respond to disturbances, and represent ecosystem-based management objectives developed for the UMRS (McCain, Schmuecker, & De Jager, 2018). To identify habitat needs for the UMRS, the HNA-II effort compared individual indicators to the conditions desired by the management agencies on the UMRS. An assessment of current conditions using both quantitative data analysis and qualitative management perspectives was performed at two spatial scales: navigation pool and clusters of navigation pools that shared similar ecological attributes. The information provided in the HNA-II can be useful in planning and implementing individual ecosystem restoration projects (McCain, Schmuecker, & De Jager, 2018).

Pool 25 is part of the Lower Impounded Cluster and has the following desired future conditions:

- Improve open water connectivity conditions, including island restoration.
- Restore function and diversity of aquatic habitat types by improving quality, depth and distribution of lotic and lentic habitats.
- Restore, maintain, and enhance floodplain vegetation diversity, including hard-mast (nut-producing) trees.

2.5 Project Objectives

NESP's dual-purpose (navigation and ecosystem) plan aims to ensure the economic and environmental sustainability of the UMR-IWW Navigation System to ensure it continues to be a nationally treasured ecological resource as well as an efficient national transportation system as designated by Congress in the 1986 WRDA (PL 99-662). As stated in the 2007 NESP Authorization, the goal of the NESP ecosystem restoration project as a whole is "[t]o ensure the environmental sustainability of the existing Upper Mississippi River and Illinois Waterway System… to address the cumulative environmental impacts of operation of the system and improve the ecological integrity of the Upper Mississippi River and Illinois River."

The Project fits within the larger NESP goal by aiming to maintain, enhance and restore quality side channel connectivity to benefits native riverine fish and wildlife and to improve side channel habitat, including substrate stability, to benefit native freshwater mussels. The project is classified as a "side channel restoration" project as part of the NESP EIS (USACE, 2004).

The following objective was identified to meet that goal within the study area over the 50-year period of analysis (2028-2078):

> **Study Objective**. Increase depth and flow diversity of aquatic side channels throughout the project area to:
>
> - restore side channel sediment transport and geomorphic diversity.
> - increase side channel habitat quantity and quality for native fish and mussel species.
> - increase side channel habitat quality for native fish spawning, rearing, juvenile, or overwintering habitat.
> - increase side channel area, flow diversity, quality, and clarity for native mussel species habitat.
> - reduce sediment deposition within side channel flowing water habitats to maintain and restore main channel connectivity and increase quality of habitat for riverine dependent native fish.

2.6 Study Constraints and Considerations

The following constraints and considerations were included in plan formulation:

Constraints:

- Alternatives should not increase river water surface elevations or adversely affect private property or infrastructure during a one percent annual exceedance probability (AEP) flood event.
- Alternatives should not result in adverse effects to the federally authorized UMR-IWW navigation channel (Title VII of WRDA 2007).

Considerations:

- Environmental Laws and Regulations. Construct measures consistent with Federal, state, and local laws. Therefore, the following elements are considered when analyzing alternatives:
  - Avoid disturbance of hazardous, toxic, and radioactive wastes (HTRW) in accordance ER 1165-2-132.

- Avoid/minimize the spread and introduction of invasive species associated with potential ecosystem restoration measures.
- Avoid/minimize adverse impacts to aesthetic resources.
- Avoid/minimize adverse impacts to existing Civil Works projects, such as Habitat Restoration and Enhancement Projects (HREP) and other NESP projects, as well as other Federal, State, local, or NGO-managed projects.
- Construction should be timed to reduce adverse impacts, such as timing to avoid spring Lake Sturgeon spawning, spring/fall waterfowl migration, bat roosting, and bat mating seasons in the area.
- Minimize adverse effects of drawdowns on river resources and river uses, including recreational boat access, cultural resources, and mussels.
- Avoid/minimize adverse impacts to public recreation, such as recreational boating, birdwatching, and sight-seeing.

- Project-specific Considerations:
  - Proposed project measures are located below the OHWM and connected side channels which limits the scope of potential management measures.
  - Avoid/minimize impacts to roads, utilities, such as power lines and buried pipes, and other existing private or public infrastructure.
  - Avoid/minimize adverse impacts to current water level management activities.
  - Minimize operation, maintenance, replacement, repair, and rehabilitation (OMRR&R) requirements to support sustainability and resiliency of measures.
  - Avoid/minimize adverse impacts to adjacent landowners.

3 EXISTING CONDITIONS AND MANAGEMENT OF THE STUDY AREA*

Both existing and future conditions expected to occur without a project must be characterized to clearly define the problems and opportunities for a study. The future without-project condition (FWOP) forms the basis from which alternative plans are formulated and impacts are assessed. At a broad scale, the existing and future without project conditions of the UMRS are accurately described within the 2004 IFR/EIS, Chapter 4. Inventory And Forecast Resource Conditions. Information and conditions specifically relevant to the study area are described below.

The PDT evaluated relevant resources in the study area and assessed existing and Future Without Project (FWOP) conditions in Section 5. Under the National Environmental Policy Act (NEPA), the FWOP (considered to be the No Action alternative) is necessary to provide a reference point, enabling a comparison of environmental effects of the action alternatives. The PDT focused its evaluation on resources potentially affected by the alternatives. This section briefly describes the resources' current condition. More details are covered in each of the resources below.

3.1 Management of the Study Area

3.1.1 Navigation

Since the mid-19th century, USACE has been charged by Congress to improve the Mississippi River for navigation through dredging, snagging, clearing, and channel constriction. This was accomplished by the removal of shoals and sandbars, closing off meandering sloughs and backwaters to confine flow within the main channel, and excavating rock from a series of rapids to clear passage for navigational traffic. Starting in 1866, Congress began authorization to maintain a 4-foot channel, then increased channel depth to four-and-a-half-foot channel in 1878, and again increased depth to a 6-foot channel in 1907. In 1930, Congress, authorized the 9-Foot Channel Navigation Project. Thus between 1930 and 1940, USACE constructed the UMR-IWW to provide a 9-foot navigation channel depth to a minimum width of 300 feet. As part of the construction of L&D 25 and the creation of Pool 25 in 1935, most of the islands within the study area of Pool 25 were acquired by the federal government. Construction on L&D 25 began in early November 1935, was formally initiated on July 21, 1936, and was completed on March 12, 1940. Navigation within Pool 25 is primarily maintained through river training structures (Section 3.3.1.2), dredging (Section 3.3.1.3), and controlling water elevations at L&D 25, which is described in Section 3.3.2.1. Since the 1880s, levees were constructed and continue to be maintained on the UMRS.

3.1.2 District River Training Structures

River training structures were constructed to divert flow into the main channel for navigational purposes to reduce dredging needs. The structures in the project area include closure dikes, bullnoses, chevrons, spur dikes, and trail dikes to lessen shoreline erosion (Figure 6). There are 29 river training structures located in the vicinity of the Hausgen Island complex project area (RM 248 – RM 245). A comprehensive inventory of river training structures within this reach can be found in Appendix D – Hydrology and Hydraulics.

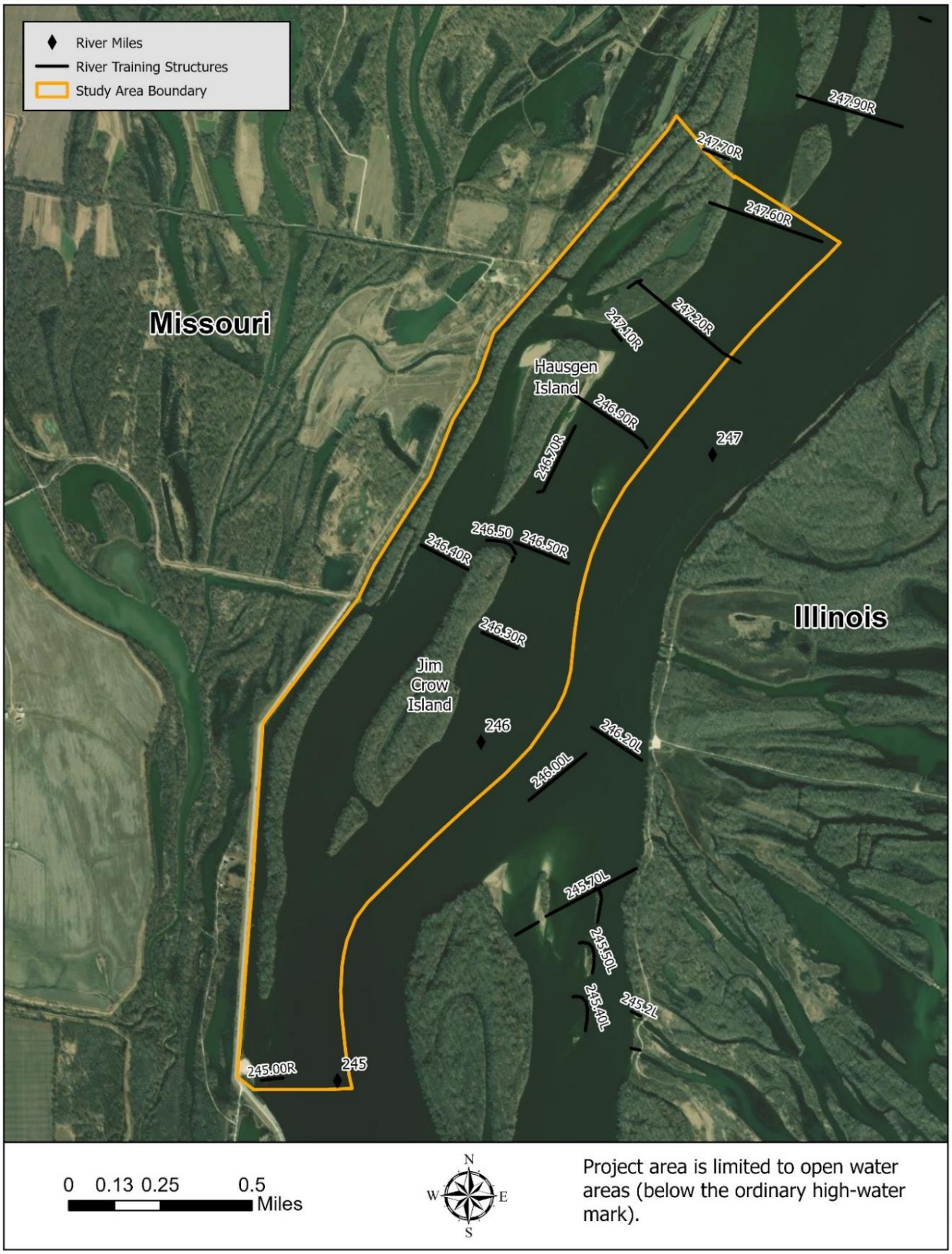


Figure 6. Hausgen Island Complex, Inventory of River Training Structures (RM 248-245)

3.1.3 Dredging Operations.

Through the enactment of a series of Rivers and Harbors Acts, Water Resources Developments Acts, and Public Laws, the St. Louis District maintains the navigation channels on the Mississippi River (Upper and Middle), Kaskaskia River, Illinois River, and the Southeast Missouri Port. A District Dredging Master Plan was formalized in 2014 to document dredging frequency and status of the navigation channel. The St. Louis District coordinates dredging efforts with partners, including USFWS, IDNR, and MDC.

The District conducts regular dredging in Pool 25 in the main channel adjacent to the project reach. Records show that the most recent dredging event near the project site was near Large Stag Island (RM 248), which occurred in 2020 with a maximum of 99,962 cubic yards per event. Dredge material was placed on the right descending bank thalweg away from the dike tips (Dike 247.6R and Dike 247.9R). Figure 7 shows the dredging efforts near Large Stag Island over a ten-year period, with green boxes representing dredging areas and red boxes respective placement areas.

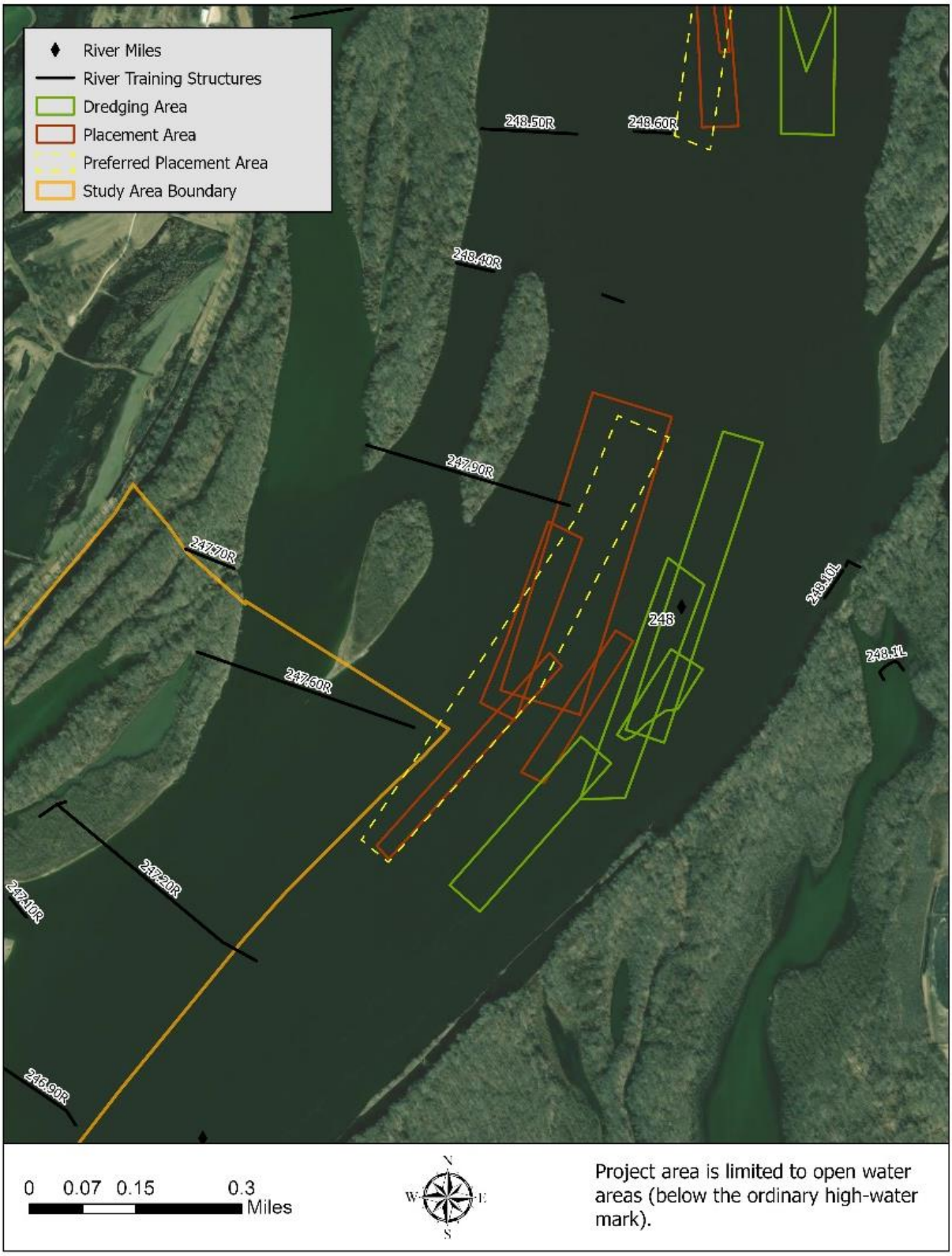


Figure 7. Large Stag Island Dredge Events (green) and placement (red) (2011-2021)

3.1.4 Hydraulics/Hydrology

Hydrologic conditions within the UMRS have been modified significantly by human alterations over approximately 200 years. Forest clearing was noted to occur as early as the mid-1830's to fuel increasing numbers of steamboats and growing populations of European settlers. Large patches of grassland and woodland were converted to agricultural production by the late 1800's. Land use change to agricultural production led to increasing rates and quantities of runoff and sediment being routed from upland sources to backwater lakes, wetlands, and the river.

L&D 25 at Winfield, MO, began operating in March of 1940. Due to the USACE-mandated 9-foot navigation channel and 300-foot channel width, on average the river levels are more than 9 feet in depth since the lock and dam system was constructed. Ongoing maintenance efforts are needed to maintain the minimum channel depth and width requirements within the river for navigation operations. Flows and water levels within the project area are dependent on L&D 24 operations on the upper boundary and L&D 25 operations on the downstream boundary. **Error! Reference source not found.** shows the bathymetric surface at the project area. Bathymetric surface is comprised of multi-beam sonar collected by USACE in 2023. More on the terrain surfaces can be found in the Hydraulics and Hydrology Appendix D.

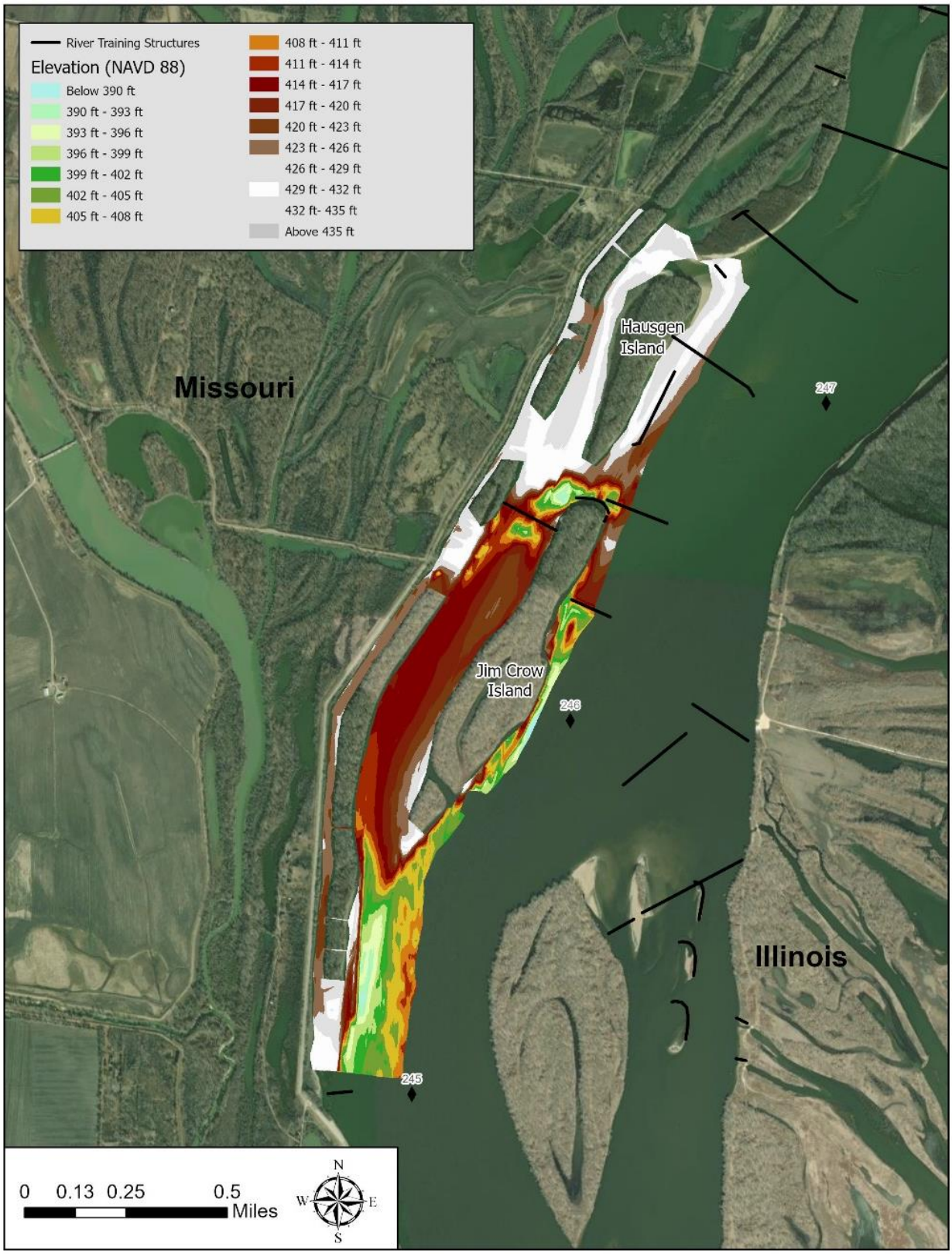


Figure 8. Bathymetric Data, Hausgen Island Complex, RM 248-245, Pool 25 (2023)

The Hydraulic Engineering Center River Analysis System (HEC-RAS) version 6.3.1 was used to construct a 2D numerical model of the Hausgen Island complex study area. The model was calibrated using the St. Louis District of USACE (MVS) Flow Frequency Study (**Error! Reference source not found.**) and the ADCP Survey. Water surface elevations were averaged along cross sections from the MVS Flow Frequency Study. Full documentation on HEC-RAS calibration can be found in Appendix D – Hydrology and Hydraulics.

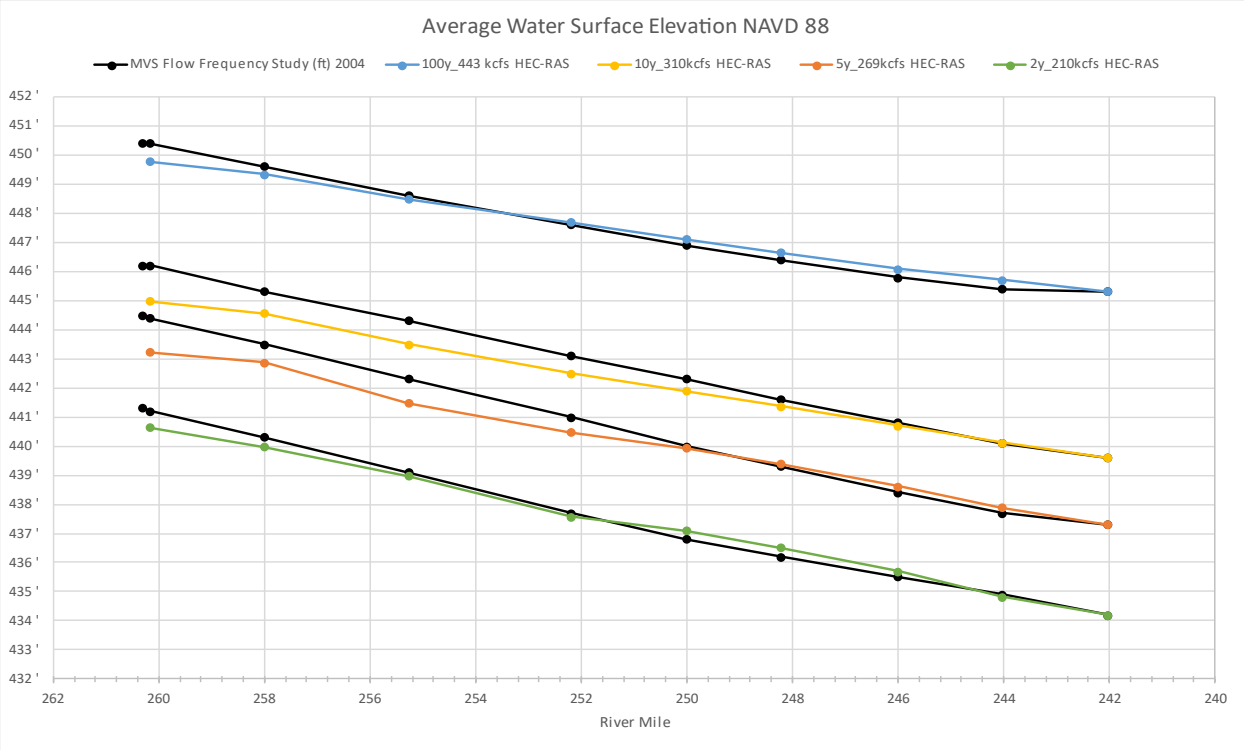


Figure 9 MVS Flow Frequency Study - HEC-RAS Calibration

Velocity within the HEC-RAS model was also calibrated to acoustic doppler current profiler (ADCP) measured flow events. The ADCP survey collection was taken by the Geospatial Branch on 5/25/2023 within the side channels of Jim Crow Island between RM 245-246 during a flow condition of approximately 206,500 cfs over a 24-hour period on the survey date. The flow data for the hydraulic model was obtained from USACE's Mosier Landing gauge on the same day as the ADCP survey. The velocities from the ADCP survey were then compared to the hydraulic model. The ADCP collection is depicted with velocity arrows and the hydraulic model velocity shading results shown underneath. **Error! Reference source not found.** shows the velocity calibration results. It is noted that both velocities in HEC-RAS and the ADCP survey are depth-averaged, meaning the velocities within the water column are averaged.

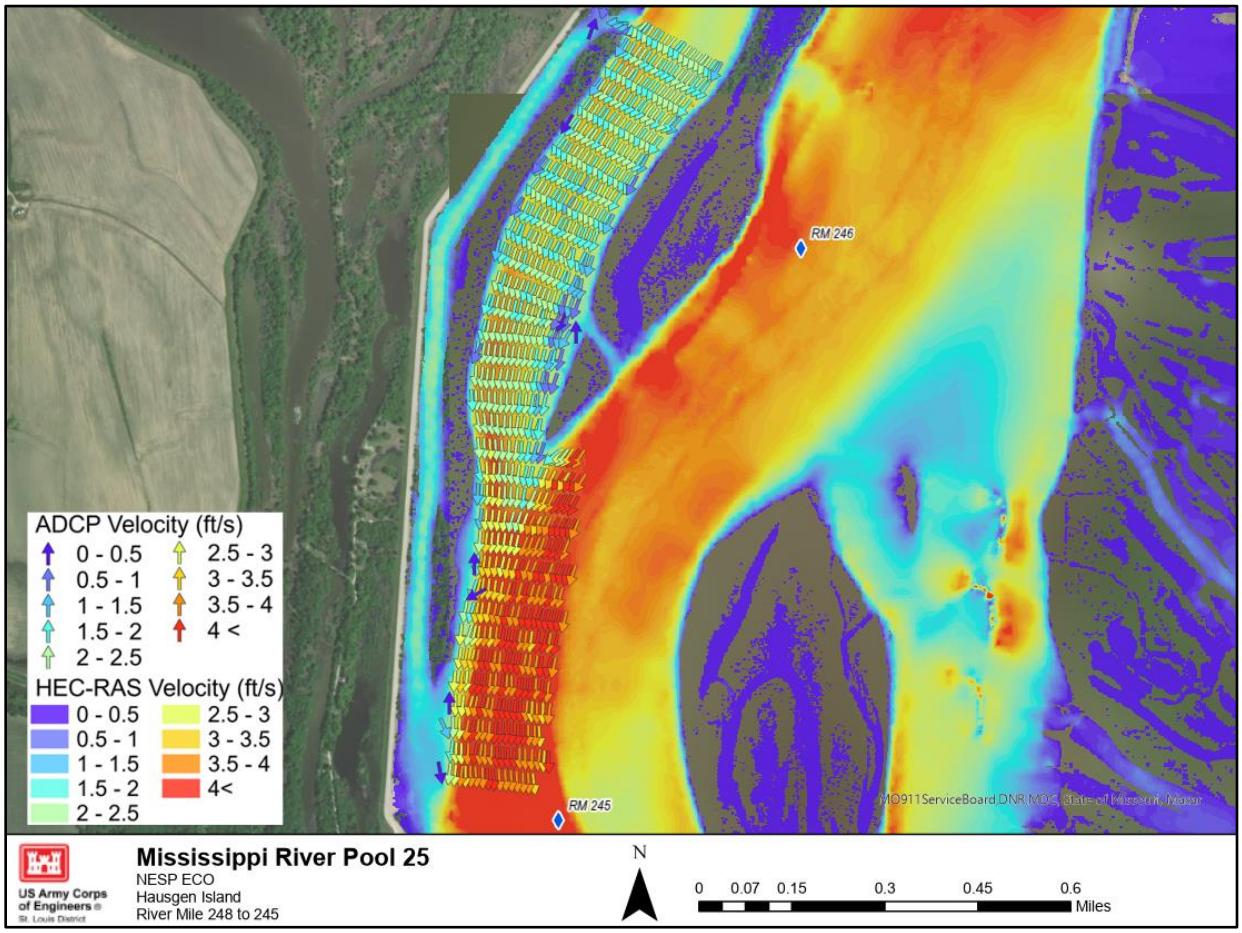


Figure 10 ADCP Model Calibration

Over the past few decades, the aggregation of sediment materials at the northern end of Hausgen Island have caused degradation of the side channels and backwater areas. Using imagery, sediment deposition in the slough along the north side of Hausgen Island can be visualized. This sedimentation causes inadequate variations in water depths and island building along the interior bank. In the connected side channels and backwaters areas around Hausgen and Jim Crow Islands, it appears the velocities and depth diversity are considered adequate and appear to be functional for aquatic habitat. From bathymetric data collection, there appears to be adequate variations in depth, however, the northern portion of Hausgen Island appears to be in an island building phase over the past decade based on past aerial imagery

Overall, the side channel in the Hausgen Island complex area has seen a reduction in areas with water by 8 percent from 2012 to 2023 and an increase in land coverage by 22 percent based on approximations from aerial imagery of the corresponding years. Sediment deposition rates within the side channels of lower Pool 25 were estimated to range from 1.8 to 2.9 inches per year. **Error! Reference source not found.** shows the accumulation of sediment around Hausgen Island between November 2012 (WSE NAVD88 434.18 ft) and September 2023 (WSE NAVD88 433.85 ft). Sediment deposition comes from a combination of factors including but not

limited to flow fluctuations, lack of normal flow velocity, aquatic barriers, flood deposition, and sand waves moving down the river. Continued deposition may occur within the side channel, lowering velocities even more, unless high flow conditions occur to scour out the area naturally.

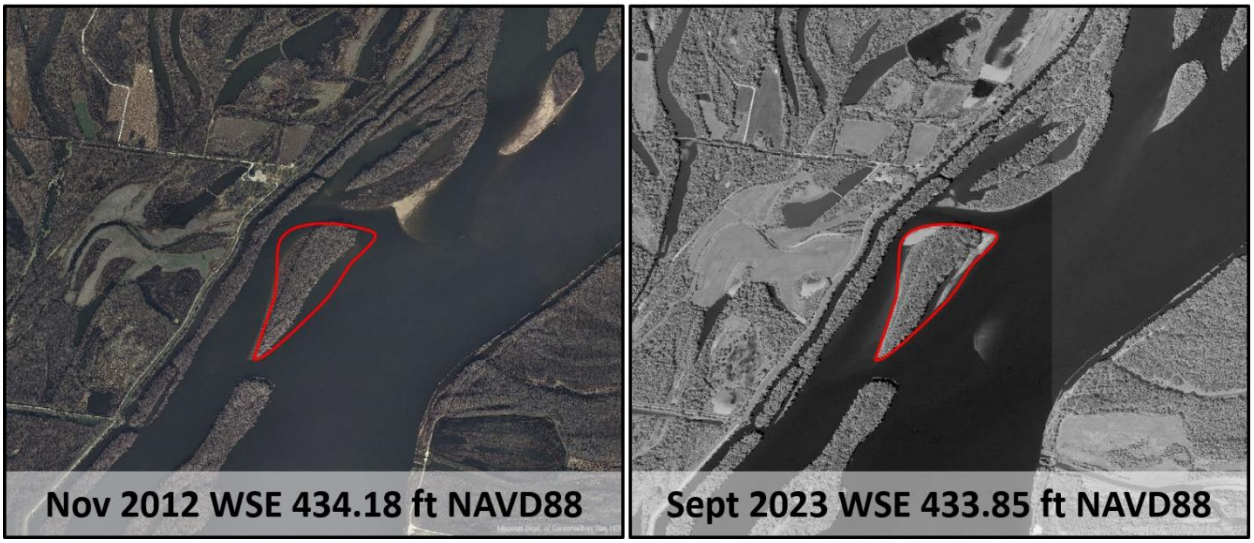


Figure 11. Hausgen Island Complex Aerial Imagery

For any project in the FEMA regulatory floodway, a 'no-rise' determination must be made to ensure adverse flooding along neighboring structures would not be impacted. A preliminary 'no-rise' determination will be conducted on the TSP with additional investigation and refinement in the design phase. Additional hydrology and hydraulics information can be found in Appendix D – Hydrology and Hydraulics.

3.2 Existing Environmental Conditions

3.2.1 Resources Not Evaluated in Detail.

The PDT considered relevant environmental resources that would potentially be impacted by the proposed alternatives and eliminated resources that were not in the area of potential effect or would not be impacted by any of the alternatives from further evaluation. These resources include Geology and Topography, Land Use, Wild and Scenic Rivers, Mineral and Energy Resources, and Soils. The PDT focused on information gathered from the study area and the area of potential effect.

3.2.2 Physical Environment

3.2.2.1 Water Quality

Consideration of water quality encompasses a wide range of watershed influences, including tributary streams, point and non-point pollution sources, flow alteration due to navigation structures, and drought and flood events. Variations in land use practices and cover types determine the level and type of sediment, nutrient, and contaminant inputs into the Mississippi River and its tributaries. The Mississippi River has a long history of water quality impairment due to contamination from industrial, residential, municipal, and agricultural sources. However, recent changes in wastewater treatment laws and technologies, regulation of point source discharges, and changes in public awareness have contributed to overall improvements in water quality.

Section 303(d) of the Clean Water Act requires that each state identify waters not meeting water quality standards related to beneficial uses of water including whole body contact (e.g., swimming), support aquatic life, and provide drinking water for people, livestock, and wildlife. The Mississippi River within the vicinity of the project area (Assessment ID #: MO_3699, a 94.4-mile reach) is not listed as a 303(d) water. This reach was listed as Good for Drinking Water Supply, Fish Consumption, Livestock and Wildlife Watering, and Human Health Protection categories in the 2020 assessment (USEAPA, 2024).

3.2.2.2 Air Quality

The Clean Air Act, as amended (40 CFR part 50), requires the US Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants which can be harmful to public health and the environment (Table 4). The Clean Air Act identifies two types of national ambient air quality standards. Primary standards provide public health protection, including protecting the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The USEPA then publishes the results of air quality monitoring, designating areas as meeting (attainment) or not meeting (nonattainment) the standards. Maintenance areas are those areas that have been redesignated as in attainment from a previous nonattainment status. A maintenance plan establishes measures to control emissions to ensure the air quality standard is maintained in these areas.

Table 4. U.S. EPA NAAQS criteria for six regulated air pollutants.

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	primary	8 hours	9 ppm	Not to be exceeded more than once per year
Carbon Monoxide (CO)	primary	1 hour	35 ppm	Not to be exceeded more than once per year
Lead (Pb)	primary & secondary	Rolling 3 mth avg	0.15 µg/m^3[(1)]	Not to be exceeded
Nitrogen Dioxide (NO_2)	primary	1 hour	100 ppb	98th percentile of 1-hour daily max concentrations, averaged over 3 years
Nitrogen Dioxide (NO_2)	primary and secondary	1 year	53 ppb[(2)]	Annual Mean
Ozone (O_3)	primary & secondary	8 hours	0.070 ppm[(3)]	Annual fourth-highest daily max 8-hour concentration, averaged over 3 years
Particle Pollution ($PM_{2.5}$)	primary	1 year	9.0 µg/m^3	Annual mean, averaged over 3 years
Particle Pollution ($PM_{2.5}$)	secondary	1 year	15.0 µg/m^3	Annual mean, averaged over 3 years
Particle Pollution ($PM_{2.5}$)	primary & secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
Particle Pollution (PM_{10})	primary & secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on avg over 3 years

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Sulfur Dioxide (SO_2)	primary	1 hour	75 ppb[4]	99th percentile of 1-hour daily max concentrations, averaged over 3 years
Sulfur Dioxide (SO_2)	secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

The project area is located within Lincoln county, MO. Lincoln County, MO, is not in attainment for most of the criteria pollutants, including carbon monoxide, nitrogen dioxide, and particle pollution (2015).

Ozone is not emitted directly into the air by specific sources. Ozone is created by sunlight acting on nitrogen oxides (NOx) and volatile organic compounds (VOC's) in the air. There are many sources of these gases. Some common sources include gasoline vapors, chemical solvents, fuel combustion products, and some consumer products.

3.2.2.3 Noise Levels

Inadequately controlled noise presents a risk for adverse impact to human and animals. Sound is measured in decibels (dB). A whisper is about 30 dB, normal conversation is about 60 dB, and a helicopter engine running is about 100 dB (Figure 12). Noise above 70 dB over a prolonged period of time may start to damage your hearing. Loud noise above 120 dB can cause immediate harm to your ears. The U.S. Environmental Protection Agency (EPA) and the World Health Organization (WHO) recommend maintaining environmental noises below 70 dBA over 24-hours (75 dBA over 8-hours) to prevent noise-induced hearing loss. Furthermore, the National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss .

The proposed project area includes primarily agricultural, industrial, transportation, and recreational areas. These areas are dispersed in pockets of varying sizes and density, and each makes its own contribution to the noise characteristics of the area. Farm tractors typically have noise levels in the range of 78-103 decibels (dB). Noise associated with transportation arteries such as highways, railroads, etc., typically range from 60-75, with train horns ranging from 96-110 dBA. Other sources of noise include operations of commercial and industrial facilities (67 dBA), operation of construction equipment (110 dBA), outboard motorboats (85 dBA), birds (60 dBA), fishing (73 dBA) and operation of construction equipment (110 dBA) (Berger, Neitzel, & Kladden, 2015).

Sensitive noise receptors are areas where occupants are more susceptible to the adverse effects of noise pollution. These include, but are not limited to, residential dwellings, hospitals, schools, day care facilities, care homes, places of worship, and public playgrounds or recreation fields. Sensitive noise receptors nearest to the proposed work area include several residences and recreational areas scattered along a few portions of the riverfront.

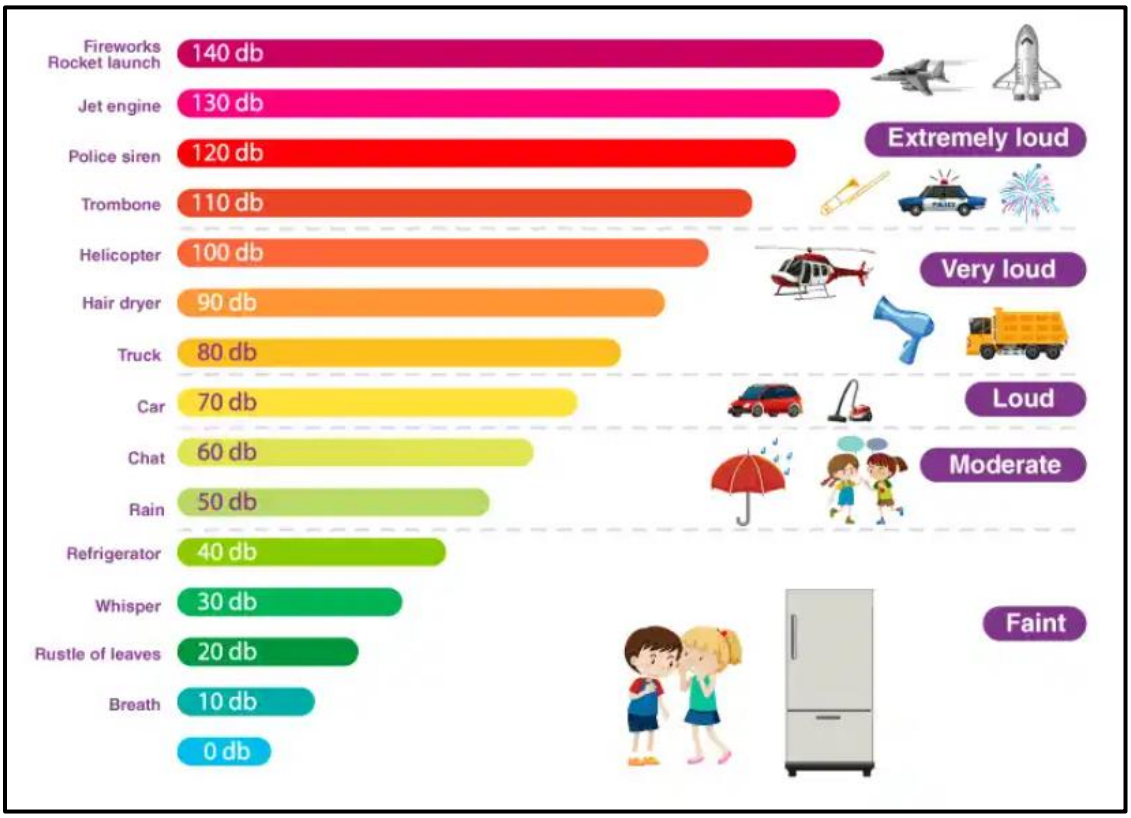


Figure 12. Example indoor and outdoor activities associated with common noise levels ranging 0-140 decibels (dB).

3.2.2.4 Historic Properties and Cultural Resources

A St. Louis District archaeologist performed a records review of the Missouri State Historic Preservation Office (SHPO) files. Two archaeological surveys (Surveys LN-115 and LN-33) have been completed adjacent to the study area and six other surveys have been completed within a mile. Three archaeological sites were identified within a mile of the project area during the LN-33 Survey. All three sites (23LN244 – 23LN246) were 19th to 20th century historic period farmsteads. One prehistoric lithic scatter was identified within a mile of the project during Survey LN-121. None of the four recorded sites have been evaluated for the National Register.

Additionally, as part of a 2003 USACE study, archival research documented 687 ships abandoned or reported lost prior to 1940 between Saverton, MO and the confluence of the Mississippi and Ohio Rivers. The information was obtained by James V. Swift from a variety of sources, including unsigned, undated wreck data in the files of the Waterways Journal (St. Louis), nineteenth century correspondence and newspaper accounts, insurance records, official government surveys and reports, private accounts, and published research (Norris 2003). Typically, losses were reported within a general location (e.g., Scudder Towhead, Brewer Point), which was researched and when possible, converted to approximate river miles. The yearly mean for reported losses was just over five and half (5.5) with a peak in the 1850s to 1860s. One vessel is recorded as being wrecked in the immediate vicinity of the project location within the main channel at mile marker 246.5. The Mollie McPike Sternwheel ship sank on November 8,1871 in the main channel, near present day Turner Landing. Dredging operations in Pool 25 have potentially destroyed any shipwreck related resources. There are no recorded historic properties reported within the Area of Potential Effect (APE) of the project study area.

3.2.2.5 Hazardous, Toxic, and Radioactive Waste (HTRW)

USACE regulations (ER-1165-2-132, ER 200-2-3) and District policy requires procedures be established to facilitate early identification and appropriate consideration of potential HTRW in feasibility, preconstruction engineering and design, land acquisition, construction, operations and maintenance, repairs, replacement, and rehabilitation phases of water resources studies or projects by conducting Phase I Environmental Site Assessment (ESA). USACE specifies that these assessments follow the process/standard practices for conducting Phase I ESA's published by the American Society for Testing and Materials (ASTM). The purpose of a Phase I ESA is to identify, to the extent feasible in the absence of sampling and analysis, the range of contaminants (i.e., RECs) within the scope of the U.S. Environmental Protection Agency's (EPA) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. Current policy is to avoid known HTRW sites. A Phase I ESA has been conducted for the study area using methods outlined by ASTM E2247-16, the full report can be reviewed in Appendix F. This included a records review, physical site visit, and communications with persons knowledgeable of the project footprint and adjoining properties. Generally, the study area contains no major sites of interest which pose significant HTRW concerns. The environmental impact for the migration of off-site contaminants into the study area is negligible. Therefore, no special considerations are being recommended for the project to proceed to construction. The USACE Environmental Quality Section should be contacted immediately if HTRW material is encountered at any point during construction activities.

3.2.3 Natural Environment

3.2.3.1 Aquatic Species and Habitat

The Mississippi River is the largest riverine ecosystem in North America and third largest in the world. It provides a mosaic of islands, side channels, and backwaters, along with the navigation channel and main channel border habitats. The wetlands on the Haugen Island complex offer aquatic habitat for a variety of aquatic insects, crustaceans, amphibians, reptiles, and mollusks. Snakes, turtles, salamanders, frogs, and toads can all be expected to occur in these wetlands. Turtle species could include snapping turtles (*Chelydra serpentina*), river cooter (*Pseudemys concinna*) and red-eared slider (*Trachemys scripta*). The northern water snake (*Nerodia sipedon sipedon*) can be expected to occur as well. Amphibians like American toad (*Anaxyrus americanus*), spring peeper (*Pseudacris crucifer*), green frog (*Lithobates clamitans*), bullfrog (*Lithobates catesbeianus*), and northern leopard frog (*Lithobates pipiens*) could occur on the island. Insects like dragonflies, midges, mosquitoes, and other aquatic invertebrates would be abundant were conditions allow.

Freshwater mussels are of ecological importance and occur in high density mussel beds in parts of the UMR (Newton, Zigler, Rogala, Gray, & Davis, 2011) above the Missouri River. A mussel survey was conducted in the fall of 2024 along Jim Crow, Hausgen, and Little Stag Islands main channel side and within the side channel. The survey effort yielded 40 live mussels of 10 species (Table 5).

Table 5. Summary of mussels observed in the Hausgen Island Complex survey area, 2024, as well as federal and state status.

Species	Federal Status	State Status	Number (Live)
Threeridge (*Amblema plicata*)	Unlisted	Unlisted	12
Paper Pondshell (*Utterbackia imbecillis*)	Unlisted	Unlisted	1
Giant Floater (*Pyganodon grandis*)	Unlisted	Unlisted	1

Species	Federal Status	State Status	Number (Live)
Fragile Papershell (*Leptodea fragilis*)	Unlisted	Unlisted	12
Threehorn Wartyback (*Obliquaria reflexa*)	Unlisted	Unlisted	1
Pink Papershell (*Potamilus ohiensis*)	Unlisted	Unlisted	1
Fawnsfoot (*Truncilla donaciformis*)	Unlisted	Unlisted	1
Wartyback (*Cyclonaias nodulata*)	Unlisted	Unlisted	3
Washboard (*Megalonaias nervosa*)	Unlisted	Unlisted	1
Mapleleaf (*Quadrula quadrula*)	Unlisted	Unlisted	7
Total			**40**

The project area contains side channel and secondary side channel lotic habitats. These habitats are being impacted by heavy sedimentation, which is disconnecting the side channel from access to the main channel and resulting in shallower depths. This study is limited to aquatic areas below the OHWM and is therefore focused on enhancing habitats specific to the fish and mussel resources within the Hausgen Island side channel complex.

3.2.3.2 Terrestrial Species and Habitat

Terrestrial Habitat – The terrestrial habitats on the Haugen Island complex would include bottomland forest. Almost the entire island is forested with the exception of the aquatic habitats in the form of emergent and wooded wetland.

Terrestrial Species – Many mammal species occur on the terrestrial habitats on the Hausgen Island complex, including white-tailed deer (*Odocoileus virginianus*), cottontail rabbit (*Sylvilagus floridus*), fox squirrel (*Sciurus niger*), gray squirrel (*Sciurus carolinensis*), river otter (*Lontra canadensis),* American mink (*Neovison vison*), muskrat (*Ondatra zibethicus*), American beaver (*Castor canadensis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), and long-tailed weasel (*Mustela frenata*). A variety of nocturnal species are also present, including marsh rice rat (Oryzomys palustris), deer mouse (*Peromyscus maniculatus*), prairie vole (*Microtus ochrogaster*), short-tailed shrew (*Blarina brevicauda*), and many bat species. The reptiles, amphibians, and frogs mentioned in the Aquatic Habitat section can also be expected to use the terrestrial habitats, where appropriate. Eastern box turtle (*Terrapene carolina*), rat snake (*Pantherophis obsoletus*), eastern racer (*Coluber constrictor*), and northern water snake (*Nerodia sipedon*) may occur.

Birds – There are a variety of species of bird that inhabit the Hausgen Island complex including, the American redstart (*Setophaga ruticilla*), indigo bunting (*Passerina cyanea*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), warbling vireo (*Vireo gilvus*), yellow-breasted chat (*Icteria virens*), cerulean warbler (*Setophaga cerulea*), red-shouldered hawk (*Buteo lineatus*), and willow flycatcher (*Empidonax traillii*). Many other bird species migrate along the Mississippi Flyway, including neotropical migrants. Neotropical migrants are bird species that breed in North America but migrate to wintering grounds in Mexico, Central and South America, and the Caribbean Islands. Floodplain complexes and the habitats they provide are highly important to migratory bird species, and the diverse array of floodplain habitat types in close proximity to the project area tend to support a high abundance of species and individuals.

Bald Eagles – The bald eagle (*Haliaeetus leucocephalus*) is protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unregulated take of bald eagles or their nests, including disturbance. The USFWS developed

the National Bald Eagle Management Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute disturbance.
Bald eagles generally nest near coastlines, rivers, large lakes, or streams that support an adequate food supply. They often nest in mature or old-growth trees, snags (dead trees), cliffs, and rock promontories. They rarely nest on the ground, and nest with increasing frequency on anthropogenic structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds (USFWS, 2007). There are no known bald eagle nests within 660 feet of proposed work sites. There are however, three known bald eagle nest locations near proposed project work site locations (Figure 13). One nest is located on the southwest shoreline of Little Stag Island. Two other nests are located along Kings Lake Rd. west of the proposed project area.

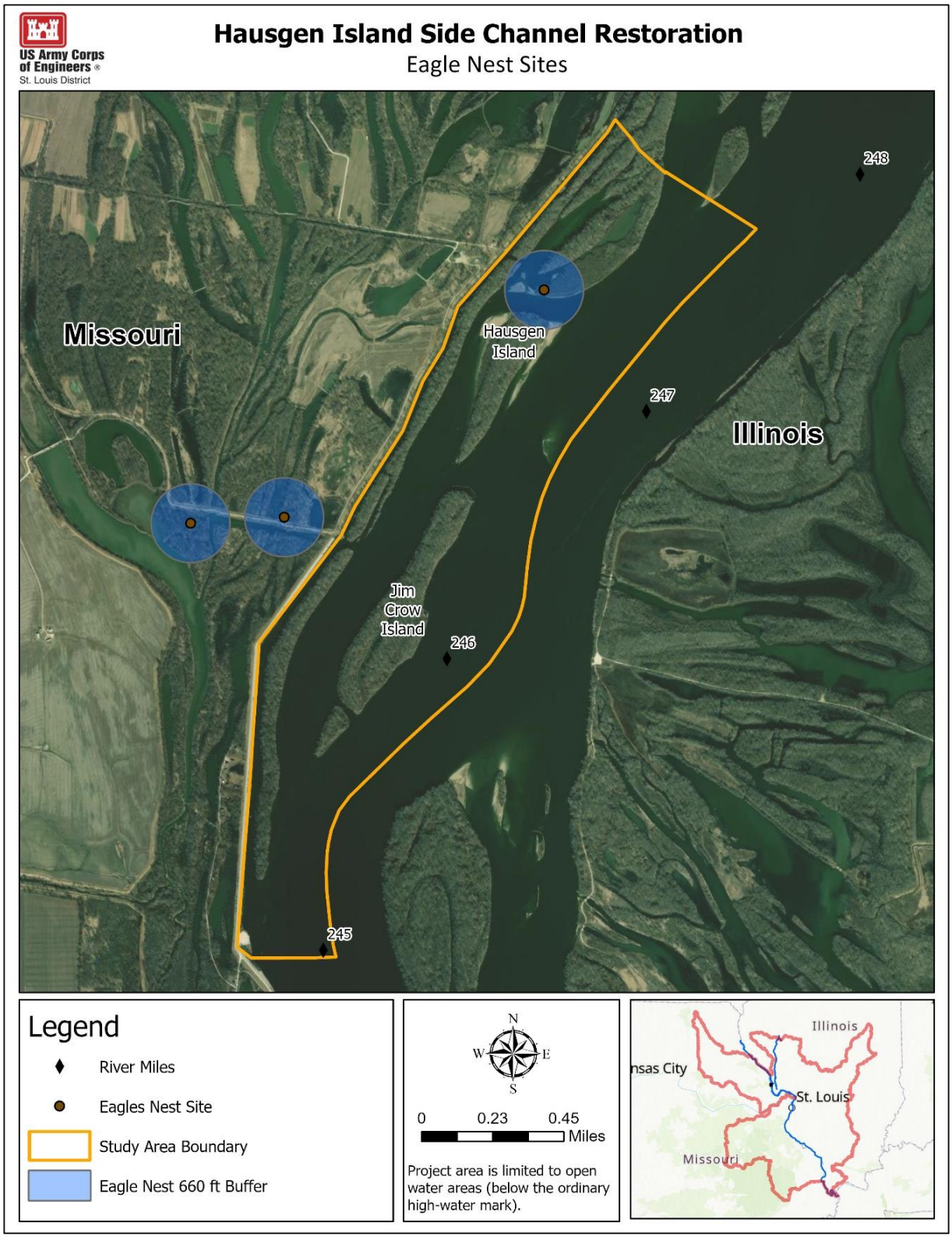


Figure 13. Eagle Nest Locations

3.2.3.3 Invasive Species

An invasive species is one that is not native to an ecosystem, and which causes, or is likely to cause, economic or environmental harm or harm to human health. Invasive Species EO 13112 aims “to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause”. To abide by this Executive Order, construction best management practices (BMP), such as cleaning equipment, would be in place and enforced to prevent the introduction of additional species transfer to and from the project.

Invasive Carp, including Bighead Carp (*Hypophthalmichthys nobilis*), Silver Carp (*Hypophthalmichthys molitrix*), Common Carp (*Cyprinus carpio*) and Grass Carp (*Ctenopharyngodon idella*), are found throughout the region and utilize habitats with low water velocity such as those found in the backwaters and side channels. Bighead and Silver Carp, species of particular management concern, were first documented in the UMRS in 1982 (Koel, Irons, & Ratcliff, 2000). Since then, populations have increased dramatically in the Upper Mississippi River (Koel, Irons, & Ratcliff, 2000) and Illinois River reaches (Irons, Sass, McClelland, & O'Hara, 2011).

Zebra Mussels (*Dreissena polymorpha*) have been identified in much of the UMRS. During the Hausgen Island Complex survey in 2024, zebra mussel infestation on native mussels was enumerated by noting their presence or absence and extent of infestation (percent of native mussel covered and number attached per mussel). Mussels were cleaned of attached zebra mussels and returned to the river near their collection point. Number of zebra mussels per unionid was relatively low with only 99 total found throughout the project area (USACE, 2024). The Zebra Mussel is a small shellfish native to eastern Europe and Western Russia, named for the striped pattern of its shell. In their introduced range they are known to clog irrigation intakes, attach in clusters to various types of watercraft reducing performance and efficiency, attach to submerged rocks, ladders, and swim rafts causing a cut hazard to swimmers, attach to and smother native mussels, while competing for the same food resources as those native bivalves. According to the USGS Nonindigenous Aquatic Species (NAS) database, Zebra Mussels have been collected just upstream of Lock & Dam 24 (L&D 24) at RM273.4, as well as multiple locations both up and downstream of the project area.

3.2.3.4 Federally Listed Species

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the USFWS was contacted via the USFWS Information for Planning and Consultation (IPaC) website on 18 March 2025, for a list of Federal threatened, endangered and candidate species that could potentially be located in the project area (Project Code: 2024-0041378; Table 6). The agency provided a list of federally threatened, endangered, or candidate species that could potentially be found in the area (Lincoln County, MO) via letter (IPAC Project Code 2024-0041378); see Appendix C, Biological Assessment, for more details. The listed species, federal protection status, and habitat descriptions can be found below in Table 6. No critical habitats are identified within the project area.

Table 6. List of Federally Threatened and Endangered Species that may occur within the project area.

Species	Status	Habitat
Gray Bat	Endangered	Roost in caves or mines year-round. Use water

Species	Status	Habitat
(*Myotis grisescens*)		features and forested riparian corridors for travel and foraging.
Indiana Bat (*Myotis sodalis*)	Endangered	Hibernates in caves and mines. Maternity & foraging habitat includes small stream corridors with well-developed riparian woods, upland & bottomland forests.
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	Roosts among live and dead leaf clusters of live or recently dead deciduous hardwood trees in summer and fall. Hibernates in caves and mines in winter.
Spectaclecase (mussel) (*Cumberlandia monodonta*)	Endangered	Found in large rivers where they live in areas sheltered from the main force of the river current. Often clusters in firm mud and in sheltered areas, like beneath rock slabs, between boulders and even under tree roots.
Monarch Butterfly (*Danaus plexippus)*	Proposed Threatened	Grassland and other herbaceous dominated habitats with Milkweed resources during the breeding life stage and similar habitats with abundant nectar resources during breeding and migration life stages. Overwintering occurs outside our region and must provide specific roosting microclimate conditions.
Western Regal Fritillary (*Argynnis idalia occidentalis*)	Proposed Threatened	Remnant native prairies, including disturbed or somewhat degraded examples and native pastures usually supporting sufficient populations of violets.

3.2.3.5 State Threatened / Endangered Species

A Missouri Heritage Review Report was initiated on April 3rd, 2025, with the Missouri Department of Conservation (MDC). MDC was invited to comment on the report on April 3rd, 2025. MDC sent a response on April 16th, 2025, addressing concern for 3 state-listed endangered species in the project area. These species were the Lake Sturgeon (*Acipenser* fulvescens), the Ebonyshell (*Reginaia* ebenus), and the American Bittern (*Botaurus* lentiginosus). The coordination with MDC can be found in (Appendix A - Coordination).

3.2.4 Socioeconomic Environment

3.2.4.1 Socioeconomics

Economic Base: According to the American Community Survey (2022) dataset (U.S. Census Bureau, 2024) for Lincoln County, Missouri, the median household income was $82,543 from 2018-2022 (in 2022 dollars), which is above the state average of $64,811. Approximately 11.5% of the population in Lincoln County, Missouri is below the poverty line, which is slightly less than the state average of 13.2%.

Education: Based on the American Community Survey (2022) dataset (U.S. Census Bureau, 2024) for Lincoln County, Missouri, an estimated 40.4% of the population is a high school graduate or higher, and 13.1% hold a bachelor's degree or higher. In comparison, the state averages are 30.1% of the population are high school graduates or higher, and 19.7% hold a bachelor's degree or higher.

Population Demographics: According to the 2020 Census (U.S. Census Bureau, 2023), Lincoln County, Missouri, has a total population of 59,574, which is an increase from the 2010 census of

52,566. Median age in the 2020 census was 37.1 years, with 6.7% of the population under 5 years old, and 14.0% of the population over the age of 65. The population within the county is approximately 92.3% white, 3.1% black, 2.7% Hispanic or Latino.

Employment and Labor Force – According to the American Community Survey (2023) dataset for Lincoln County, Missouri, the unemployment rate was 3.2 percent of those in the labor force, with most occupations being in the management, business, science and arts (32.6%); followed by production, transportation, and material moving (20.6%); sales and office (17.5%); natural resources, construction, and maintenance (15.3%); and service (14.1%) (United Stated Census Bureau, 2025).

3.2.4.2 Navigation Traffic

The UMRS is a critically important navigation corridor that provides for movement of a wide variety of commodities of local, national, and international importance. Over 63.4 million tons of cargo passed through the Mississippi River between Minneapolis, MN, and the mouth of the Missouri River in 2021, the most recent year with data available (USACE, 2022).

3.2.4.3 Recreation

The aquatic areas in the vicinity of Hausgen and Jim Crow Islands are popular recreation destinations for waterfowl hunters, as well as other forms of ecotourism such as fishing, kayaking, and wildlife viewing. There are both public and private waterfowl hunting opportunities within the study area. MDC manages a waterfowl blind hunting program with designated blind locations within the study area. There are private and public boat ramps in the area, including the USACE managed Foley public boat ramp.

3.2.4.4 Real Estate

The OHWM demarcates the lateral extent of waterways protected under Rivers and Harbors Act and Clean Water Act. The water line on the shore is established by the water fluctuations and encompasses water levels that are above the average of water line. When this occurs, Navigation Servitude allows acquisition of shore lands extending to the OHWM and may be exercised under statutory rights and powers without obligation for compensation to the riparian landowners. Navigation Servitude does apply for this project.

3.2.4.5 Aesthetics and Visual Resources

Aesthetic resources within the Hausgen Island area of the UMRS consist primarily of natural habitat interspersed with river-based navigation features. Sights include narrow riparian forests, sandy shorelines, and small islands that serve as scenery for sightseers and recreationists. The river training structures may detract from the natural views and may be considered as aesthetically unappealing to some people.

3.2.4.6 Resilience

The recent US climate and hydrology literature applicable to USACE missions report is summarized in this section. The river ecosystem within Pool 25 has been significantly affected by the impoundment of the pool along with permanently higher water tables maintained by L&D 25. Geomorphic features such as sandbar accretion and backwater deposition are forming near the project area. Restoring side channels and backwater areas are crucial to freshwater mussel habitats and riverine fish. The project area is located in 2-digit hydrologic unit code (HUC) 07, the Upper Mississippi Region and in the Fourth National Climate Assessment (NAC4) Midwest climate region. The site lies within the Sny watershed (HUC 07110004) stream segment

07000604. Several literature reviews were conducted utilizing the National Oceanic and Atmospheric Administration (NOAA) state climate summaries, the USACE Timeseries Toolbox, the USACE Climate Hydrology Assessment (CHAT), and the USACE Climate Change Vulnerability Assessment (VA) Tool.

Upper Mississippi Region 07 found that projections show an annual increase in precipitation and in the frequency of large storm events in the future of the Upper Mississippi Region (USACE, 2015). Studies of trends in streamflow collected over the past century have been performed and there appears to be a consensus among these studies that show a general increase in river flow for the Upper Mississippi Region (USACE, 2015). However past trends may no longer be a good predictor of the future. To predict future streamflow some studies used Global Climate Models (GCM's), which are widely recognized as the best available source. Clear consensus in the data is lacking, with some studies predicting an increase in future streamflow in the study region, while others project a decrease in flows (USACE, 2015). Additional Climate Change information can be found in Appendix K.

4 PLAN FORMULATION

Plan formulation is the process of building alternatives (plans) that meet planning objectives, addressing the problems while avoiding constraints. The process helps decision-makers identify water resources problems, conceive solutions to them, and compare the importance of the inevitable conflicting values inherent in any solution. This PIR/EA describes the systematic and repeatable planning approach the PDT implemented to ensure sound decisions are made in accordance with the process described in the Planning Guidance Notebook (ER 1105-2-103) and the P&G Guidelines. The USACE planning process consists of six steps including: (1.) Specify problems and opportunities, (2.) Inventory and forecast conditions, (3.) Formulate alternative plans, (4.) Evaluate effects of alternative plans, (5.) Compare alternative plans, and (6.) Select a recommended plan. The USACE planning process, as well as NEPA, requires USACE to evaluate a range of reasonable alternatives. This section describes plan formulation strategies that involve developing a wide range of potential actions or management measures. Alternative plans are a set of one or more measures functioning together to address one or more planning objectives.

4.1 Management Measures and Screening Criteria.

A management measure (measure) is a constructed feature or action implemented to achieve the planning objectives. Several measures were identified in the early planning stages; many of these were partially developed, then were determined not feasible and did not undergo further evaluation. Measures that were further evaluated to a point appropriate for planning purposes to meet the goals and objectives outlined in Section 2.5, Project Objectives, are described below. The measures discussed below were identified from similar projects, the Upper Mississippi River Restoration Environmental Management Program Environmental Design Handbook (2012), USACE (2023), subject matter experts, and meetings with state and federal resources agencies.

The PDT evaluated potential structural, nonstructural, and natural and nature-based measures. Table 7 lists the measures initially identified and able to be combined into an implementable alternative that may be in the federal interest, address the identified problems, and achieve project objectives.

Table 7. List of Initial Structural, Nonstructural, and Nature Based Measures

Structural	Nonstructural	Nature Based
River Training Structure Modifications (dikes, closure structures): • Removal • Notching • Partial degradation • Construction of new structures (hard points, bullnose, SCED) Mussel Habitat Enhancement: • Gradual Slope Revetment • Rock-Gravel Substrate Enhancement • Bank Stabilization Utilizing GSR for Mussel Habitat	Dredging Beneficial Use of Dredged Material/Island Creation	Incorporation of Woody Material (i.e., bundles)

4.2 Structural Measures

4.2.1 River Training Structure Modification

River training structures can be used to alter hydrodynamic conditions, the sediment transport regime, and ultimately habitat conditions. These structures can prevent erosion, maintain a stable channel, and create enhanced or restored habitat. River training structures redistribute the river's energy to achieve a desired result, which can include a deeper navigation channel, shoreline stabilization, and/or to increase environmental habitat through bathymetric diversity. These structures can alter hydrodynamic conditions, sediment transport regimes, water depth diversity, and habitat conditions. Section 3.1.1 includes a river training structure inventory for the Hausgen Island complex area.

Modifications to the river training structures located within the project area can potentially meet project objectives related to increasing bathymetric diversity, sediment management, and flow diversion / redirection / deflection. The following initial river training alteration types were identified that showed potential to meet side channel restoration objectives:

- **Removal:** Removal of existing river training structures to improve or reroute flow.

- **Notching:** Notching these features is a method to promote the enhancement of channel geomorphic diversity to provide suitable habitat for fish. Notching includes strategic excavation and adjacent onsite placement or reuse of the excavated rock materials and is intended to improve aquatic habitat by increasing bathymetric, flow velocity, and substrate diversity.

- **Partial Degradation:** Partial degrade and drag-back of the closing structures to create a boulder field like riffle on downstream end of the structure would provide mussel habitat and improve flow.

- **Construction of New Structures:** A new dike structure can be constructed to improve or reroute flow. The following types of structures were considered:
    - **Hard Points:** These structures divert the flow of water to protect or enhance existing shoreline and habitat. There are many different types of flow diversion

structures, and each is used in a different situation that is dependent on the goals and objectives of the project.

- **Bullnose creation or enhancement.** Bullnoses can be constructed to protect existing islands, create new islands, and as flow deflection structures to reduce velocities downstream during certain conditions. They can also be used as wave breaks.

- **Side Channel Enhancement Dike (SCED).** SCEDs are a special class of L-Dikes with the trail oriented upstream from a spur dike constructed on the island side of a side channel entrance. With the upstream-oriented trail, the SCED captures flow from the main channel and redirects it down a side channel, increasing the energy in the side channel, scouring out deposited sediment, and preventing further sedimentation in the side channel. Under the right conditions, the installation of a SCED can reopen closed side channels, once again providing aquatic habitat in areas it had previously existed. The construction of a SCED does require certain conditions to be met for a higher likelihood of success: 1) a SCED works best when it can be constructed on the channel-dominant bank, and 2) SCED design requires a careful balance of flow capture between the side channel and main channel to avoid sedimentation in either channel.



Figure 14. Example SCED, Prairie Du Rocher, Establishment Chute, RM 132.65

4.2.2 Mussel Habitat Enhancement

The two types of measures described below were identified to enhance habitat for mussel species to increase structure and side channel habitat for use by native freshwater mussels as opposed to a flow diversion structure.

- **Gradual Slope Revetment (GSR)**: A gradual slope on the interior side of a new or existing structure to minimize scouring from overtopping during high water events. Revetment incorporates various substrate sizes that allow for voids and interstitial spaces for smaller particles to settle into, and is preferential to mussel colonization, extended out along the toe and placed on top of stable bed. Figure **15** shows a traditional revetment design as compared to GSR as shown in Figure **16**.

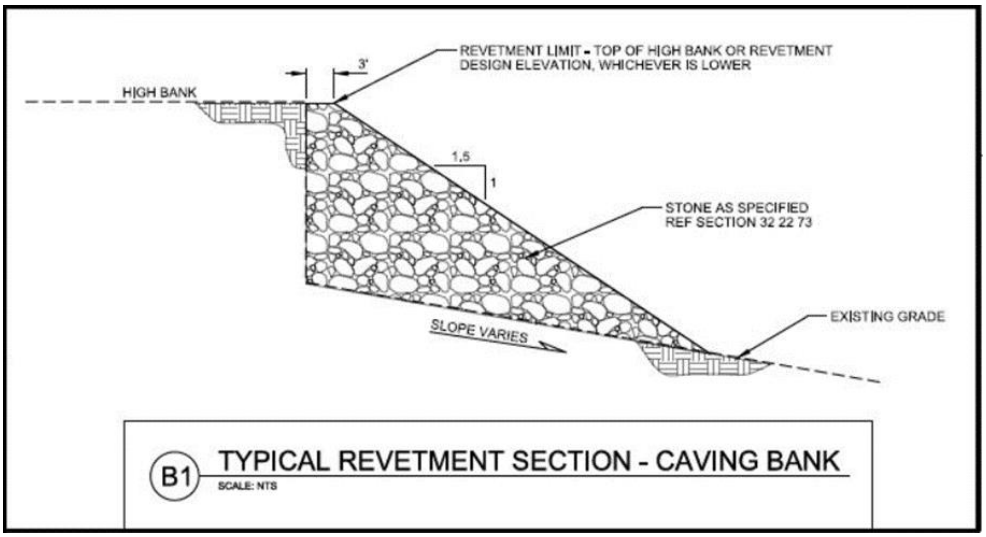


Figure **15.** Traditional Revetment diagram

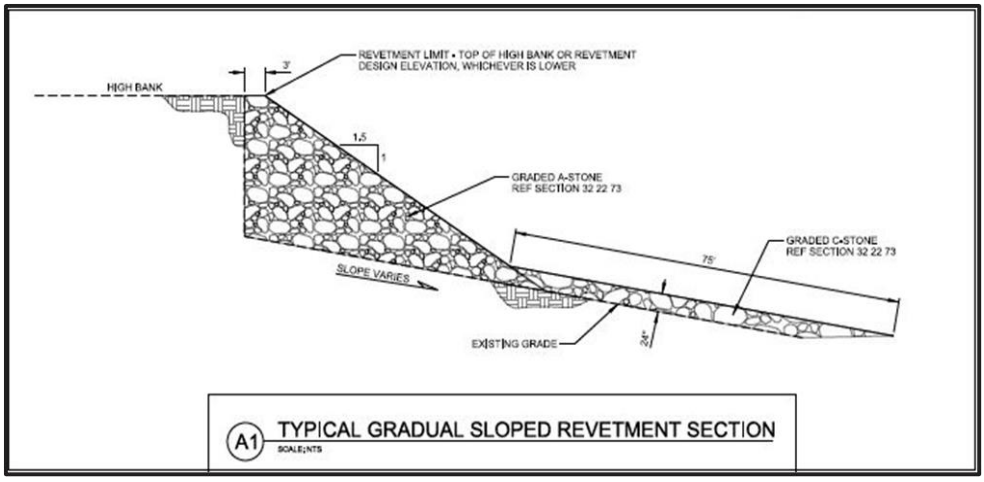


Figure **16.** Gradual Slope Revetment (GSR) diagram

- **Rock-Gravel Substrate:** This type of substrate enhancement would introduce more heterogeneity and promote mussel colonization. It consists of a combination of large cobble and rounded river stone to create interstitial spaces with stability for mussel colonization. Smaller rounded stone (2-4" or larger, depending upon velocities and shear) can be incorporated on the toe of existing dikes also. Sporadically placed, large boulder-sized material is used to create flow refugia or flow shadows for smaller particle sized sediments to shelter behind creating pockets of habitat.

- **Bank Stabilization Utilizing GSR**: USACE has utilized different techniques to stabilize/protect shoreline in locations that require more robust stabilization than vegetation alone. These techniques are designed to protect shorelines from erosive forces from wind driven wave action, river currents, ice action, and recreation and commercial traffic. The approach for this project would incorporate GSR along the toe of stabilization stone to provide mussel habitat while simultaneously protecting actively eroding banklines. The general design concept incorporates a tighter

gradation of larger stones but spread thinly to encourage natural deposition of larger gravels in lieu of highly mobile sugar sands.

4.3 Non Structural Measures

4.3.1 Dredging

Typically, the primary purpose for including dredging as a standalone feature (self-justified) is the restoration of depth in side channels and connected backwaters. Dredging depth is an important considering in meeting ecosystem restoration objectives. Often, a depth of 6 feet is considered a minimum, but this varies depending on sedimentation rates and target species. Dredging in secondary channel can improve habitat for more riverine species, and the dredging of access channel for construction can help meet some side-channel restoration objectives incidentally. However, access dredging and even backwater dredging could be counter-productive if the area dredged contains important habitat/species such as mussels, and such impacts must be considered (2012 UMMR EMP Handbook).

4.2.3 Beneficial Use of Dredged Material/Island Creation

Dredged material can be used for ecosystem restoration such as improving upland topographic diversity and for the creation of islands. However, the study scope requires all measures to be located below the OHWM; therefore, the beneficial use of dredged material is not proposed in conjunction with dredging.

4.4 Natural and Nature Based Features

4.4.1 Woody Bundles and/or anchored or locked logs

These structures provide refuge/shading for fish and enhances substrate diversity for macroinvertebrate growth and development in support of other wildlife goals (2023 NESP Environmental Design Tool Kit).

4.5 Evaluation and Screening of Measures

Screening is the process of eliminating, based on planning criteria, those measures that would not be carried forward for consideration. Criteria are derived from the specific planning study, based on the planning objectives, constraints, and the opportunities and problems of the study area. Management measures are screened by the team, the Sponsors and key technical partners throughout the formulation process utilizing the four criteria of completeness, effectiveness, efficiency, and acceptability described in Policy for Conducting Civil Works Planning Studies (ER-1105-2-103).

Completeness is the extent to which the measures or alternatives provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other federal and non-federal entities. Completeness must consider the sustainability and long-term aspects of the plans and whether all resource requirements are included. Completeness does not mean that all planning objectives are fully realized, only that the required resources and actions are included to achieve the estimated benefits.

Effectiveness is the extent to which the measures or alternative plans contribute to achieving the planning objectives. Benefit metrics reflect the effectiveness of each alternative. Effectiveness does not mean that all planning objectives need to be addressed or fully realized. The degree of effectiveness will be used to illustrate the trade-offs between plans when compared.

Efficiency is the extent to which a measures or alternative plan is a cost-effective

means of solving the problem and achieving the objectives. Efficiency is determined through a comparison of the costs and benefits of each alternative.

Acceptability is the workability and viability of the measure or alternative plan with respect to acceptance by state and local entities and the public and compatibility with existing laws, regulations, and public policies. Acceptability has two dimensions – implementability and satisfaction. Implementability means the extent to which the alternative is feasible from a technical, financial, and legal perspective. Satisfaction is the extent to which the plan is welcome from a political or preferential perspective. The measures were evaluated for acceptability based on the following criteria:

- USACE Policy Compliant and other USACE authorities– This metric evaluated the magnitude of potential policy concerns for each alternative.
- ~~Partner Satisfaction –~~ Complements the larger federal, state, and local objectives – This metric evaluated how well each alternative complemented partner management objectives in and adjacent to the study area, showing the alternatives' viability for acceptance by non-federal entities and the public.
- Impacts to Federal Purpose of maintaining Navigation – This metric documents if and how the proposed dike alterations would result in negative impacts to the USACE navigation mission.

4.5.1 Screened Measures

All measures were evaluated under the four criteria listed above. Table 8 lists the six screened measures and the screening rationale. These measures were initially considered but were not selected for alternative formulation because they were found to be ineffective or unacceptable.

Table 8. Screening of Initial Measures

Measure	Screening Rationale
River Training Structure Removal	Effectiveness - Removal is not feasible for the dikes / closure structures in this area. There are no large closing structures present.
Bullnose Creation or Enhancement	Effectiveness - Existing Condition flow is sufficient. No need to alter. Already in place at Jim Crow.
Beneficial Use of Dredged Material / Island Creation	Acceptability - Placement of material above the OHWM is not within study scope.
Side Channel Enhancement Dike (SCED)	Effectiveness - Did not significantly change flow. Partner did not prefer modifications to existing structure.
Dredging	Effectiveness - Existing bathymetric data showed a scour at upstream end of Hausgen. Depth and flow is currently satisfactory at this location, would expect little habitat benefit from dredging.
Natural and Nature-Based Features (Woody Bundles/Debris)	Completeness - Sufficient existing woody structure within the study area.

4.5.2 Summary of Retained Measures

Table 9 shows the retained measures and alignment with the problems, opportunities and objectives identified in Chapter 2.

Table 9. Retained measures and alignment with Objectives

Measure	Objective 1: Increase side channel connectivity	Objective 2: Increase side channel flow diversity	Objective 3: Increase substrate diversity	Objective 4: Increase side channel sediment transport	Objective 5: Increase depth diversity
Hard Points		x	x	x	x
Dike Alteration Partial Degradation / Notching	x	x		x	x
Bank Stabilization Utilizing GSR for Mussel Habitat		x	x		x
Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement)		x	x		x

4.6 Development of Initial Array of Alternatives

Alternative plans are a set of one or more measures functioning together to address one or more planning objectives. Alternative plan formulation strategies were developed by the PDT through a conducting a scoping charette and habitat evaluation workshop with subject matter experts, including sponsors and agency partners, referencing the restoration work previously completed within the study area, and the 2004 IFR/EIS and Environmental Pool Plan. A site visit was conducted on 3 November 2023 to verify onsite conditions and guide alternative formulation.

Alternative development is a complex and iterative process with many inputs. An initial array of alternative plans was formulated by combining measures retained after the initial screening. The H&H modelling showed that the existing conditions consist of sufficient water depths and flows to produce generally favorable conditions at the entrance to the side channel at the upper end of Jim Crow Island. In addition, these conditions are ideal for mussel habitat and the partners (MDC and USFWS) were concerned that project features would impact the existing mussel habitat. However, there is a chance that continued deposition may occur within the side channel that would lower flows and potentially degrade mussel habitat. The PDT developed two alternative formulation strategies that focused on combinations of measures for mussel enhancement and flow/depth diversity. The alternatives also considered impacts to navigation and preference of partners.

The following plans were developed as the Initial Array of Alternatives to achieve the study goal, objectives, and opportunities, while avoiding constraints. Table 10 displays the measures in each alternative in the initial array. Plan formulation was limited by the scope and available measures for a NESP study area as described in the 2004 IFR/EIS. Thus, a limited number of alternatives were developed into the initial array.

- **No Action Alternative**: The NEPA requires Federal agencies to consider the option of “no action” as one of the alternatives. The No Action plan assumes no action is taken by the USACE to achieve the planning objectives and is used to inform the FWOP condition. The No Action Plan forms the basis against which all other alternative plans are measured.

- **Alternative 1 – Minimum Habitat Benefit – Mussel Habitat Enhancement/Bank Stabilization:** This plan narrowly focuses on bank stabilization only reinforcing the shoreline utilizing GSR. This plan also adds mussel habitat enhancement by adding rock-gravel substrate to the side channel habitat within the proposed project area. The alternative includes 3 mussel riffle features and two GSR features. Alternative 1 is shown in Figure 17.

- **Alternative 2 – Maximum Habitat Benefit**: In addition to the measures included in Alternative 1, this plan includes four hard points and a dike notch to maximize environmental benefits related to side channel connectivity, flow diversity, substrate diversity, sediment transport, and depth diversity. This alternative maximizes substrate quality and flow conditions for existing mussel populations. Alternative 2 is shown in Figure 18.

Table 10. Measures included in Initial Array of Alternatives

Measure (Planning Objective)	No Action	Alt 1 Minimum	Alt 2 Maximum
Hard Points (2,3)			X
Partial Degradation/Notching of Closure Structures (1,2,4,5)			X
Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement) (2,3,5)		X	X
Bank Stabilization Utilizing GSR for Mussel Habitat		X	X

4.7 Final Array of Alternatives*

4.7.1 Evaluation and Screening of Alternatives.

The initial array of alternatives was evaluated based on the evaluation and screening criteria described in Section 4.6: the planning objectives, constraints, opportunities, and problems of the study area; and the four criteria of completeness, effectiveness, efficiency, and acceptability described in Policy for Conducting Civil Works Planning Studies (ER-1105-2-103). Table 11 Provides a summary of the evaluation of P&G criteria for the initial array of alternatives.

Completeness: The PDT determined that, at this stage of the planning process, no additional investments were needed to obtain benefits, so all alternatives are considered "complete".

Effectiveness: All of the action alternatives were considered effective at varying levels at meeting the planning objectives. In order to evaluate the effectiveness of each alternative, the PDT relied upon AdH modeling results and bathymetric survey data to assess the increased depth and flow diversity of aquatic side channels throughout the project area. To help guide plan selection, an assessment of the bed change was conducted. In addition, the modeling results indicated if there was potential for longitudinal connectivity as a result for each alternative. See Section 5 for assessment of environmental effects on existing resources under "with-project" conditions.

Efficiency: The Cost Effectiveness & Incremental Cost Analysis (CE/ICA) analysis was performed using the IWR planning suite, which is summarized in Section 6.3.1.

Acceptability: The alternatives were evaluated for acceptability based on the following criteria

and were determined to be “complete” on varying levels:

- USACE Policy Compliant and other USACE authorities– This metric evaluated the magnitude of potential policy concerns for each alternative.

- Partner Satisfaction - Complements the larger federal, state, and local objectives – This metric evaluated how well each alternative complemented partner management objectives in and adjacent to the study area, showing the alternatives’ viability for acceptance by non-federal entities and the public.

- Impacts to Federal Purpose of maintaining Navigation – This metric documents if and how the proposed project would negatively impact the USACE navigation mission.

Table 11. Alternative Evaluation to P&G Criteria

Alternative	Acceptability	Completeness	Effectiveness	Efficiency
No Action	Partial. Viable in accordance with state and local entities and laws. Provides no solution to the identified problems.	No. Does not meet objectives.	No. The alternative does not alleviate the problems identified and does not meet study objectives.	Yes. Considered a Best Buy Plan. No money is expended, no benefits are gained, problems are not alleviated.
Alternative 1	Yes. No navigation impacts. Viable and in accordance with state and local existing laws. Partner supported, but not preferred.	Yes. The alternative includes all features needed to produce the stated effects.	Yes. The alternative did not produce the greatest habitat gain.	Partial. Cost Effective and Best Buy, with lowest cost.
Alternative 2	Yes. No navigation impacts. Viable and in accordance with state and local existing laws. Full support of the partners.	Yes. The alternative includes all features needed to produce the stated effects.	Yes. The alternative produced the greatest habitat gain.	Partial. Cost Effective and Best Buy, with highest cost.

All of the action alternatives in the initial array were found to be complete, effective, efficient, and acceptable. Therefore, the team determined that all of the alternatives would be carried forward to the final array for further development. Refer to Section 4.5 for full description of each alternative:

- No Action Alternative
- Alternative 1 Minimum Habitat enhancement (Figure 17)

- Alternative 2 Maximum Habitat enhancement (Figure 18)

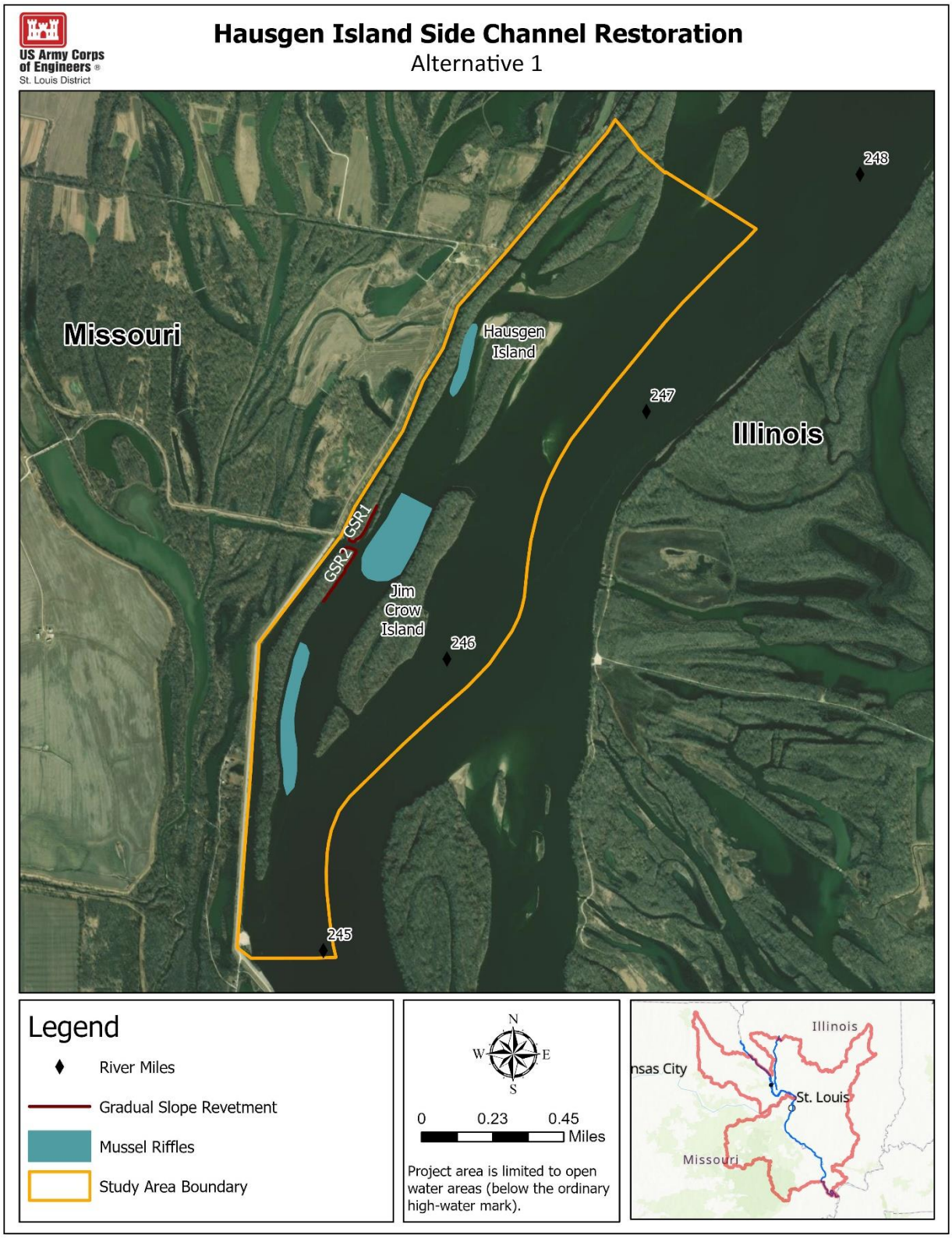


Figure 17. Alternative 1 Minimum Habitat Enhancement

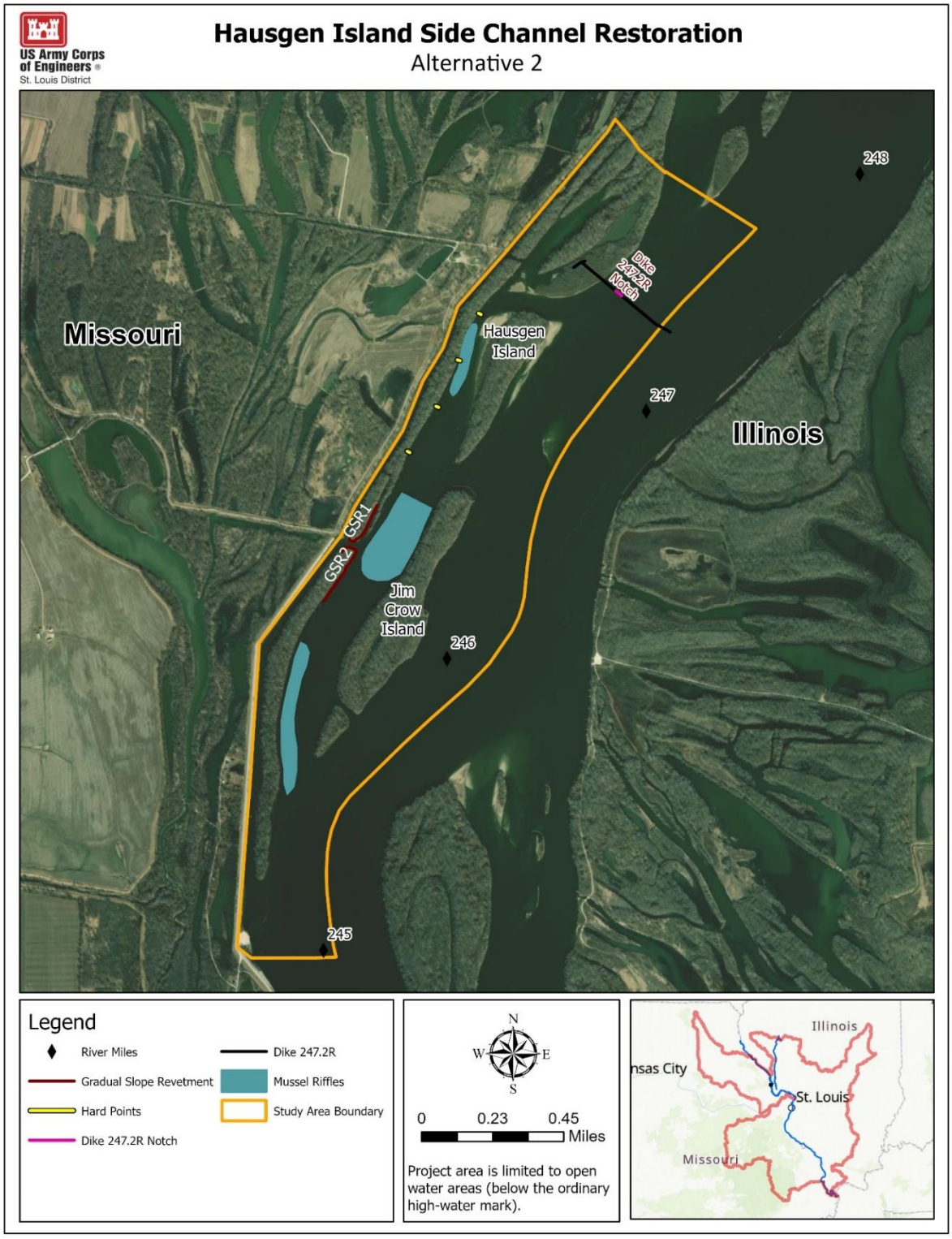


Figure 18. Alternative 2 Maximum Habitat Enhancement

5 ASSESSMENT OF EXISTING RESOURCES AND ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE AND FINAL ARRAY OF ALTERNATIVES*

The following chapter describes the anticipated environmental effects (both adverse and beneficial) of the No Action Alternative and final array of the Action Alternatives on the resources addressed in *Chapter 3, Existing Conditions*. When the analysis presented in the 2004 IFR/EIS is sufficiently comprehensive or adequate, no additional analysis is provided in this chapter.

Under the NEPA, the FWOP (considered to be the No Action alternative) is necessary to provide a reference point, enabling a comparison of environmental effects of the action alternatives. The FWOP condition is the forecasted condition of the project area for the next 50 years assuming that no significant action is taken to address the resource problems identified. The base year (the year when a proposed project is expected to be operational or, in this case, when construction is complete, and benefits begin accruing) considered for this project is 2028, and period of analysis is 50 years (2028 - 2078). The PDT focused its evaluation on resources potentially affected by the alternatives. Under the No Action Alternative, operations and maintenance of the 9-Ft Navigation Channel are not expected to change from the existing condition. In addition, this assessment only focuses on the direct, indirect, and cumulative effects of the proposed side channel restoration project. The IFR/EIS covers the systemic effects associated with the Program.

The effects described in the following sections may be temporary or long-term in duration. Minor effects are typically considered negligible, while moderate adverse effects may be either avoided or counteracted by other actions that further enhance or benefit the resource. According to NEPA guidance, the meaning of significant effects varies with the context (where the action occurs) and intensity (how much damage or improvement the action causes). Non-significant effects mean there is no substantial change to the resource, while significant effects may be beneficial or adverse. The effects of the action alternatives may furthermore occur immediately because of the action (direct), occur later in time, or removed in distance in response to the action (indirect), or may be reasonably expected to occur, given similar restoration actions within the UMRS (cumulative).

Qualitative impact descriptions are explained by accompanying text. Qualitative definitions/descriptions of impacts as used in this section of the report include:

- Intensity
    - Beneficial – Provides positive or advantageous effects to the resource
    - Negligible – No noticeable effects to the resource in the project area
    - Minor – Noticeable impacts to the resource in the project area, but the resource has slightly deviated from existing conditions
    - Moderate – The resource is impaired, so that it cannot function normally, or the resources has improved from existing conditions
    - Major – The resource is severely altered so that it is no longer functional, or has completely rebounded, in the project area
- Duration
    - Short term – Temporary effects caused by the construction and/or implementation of a selected alternative

- Long term – Lasting effects caused by an alternative after the action has been completed and/or after the action is in full and complete operation

5.1 Management of the Study Area

5.1.1 Navigation

No Action Alternative (Future Without Project Condition) – With no action, navigation and subsequent effects are predicted to remain consistent with the existing conditions. Dredging and maintenance would continue to provide a dependable navigational channel.

Action Alternative 1 (Minimum) – The proposed alterations in Alternative 1 are fully in the side channels of Hausgen and Jim Crow Islands. Introduction of proposed measures should have a negligible effect on main channel navigational activities.

Action Alternative 2 (Maximum) – Action Alternative 2 includes a notch and hard points within the side channel. Inclusion of this notch should have minimal effect on main channel navigational activities. Side channel and recreational navigation may become more accessible during lower pool elevations due to the increased flow and velocities as a result of the notching of Dike 247.2R.

5.1.2 River Training Structures

No Action Alternative (Future Without Project Condition) – If no action is taken, the existing river training structures would continue to be maintained. Other projects under other authorities may seek to modify or remove existing structures or build new ones. The No Action Alternative would thus have no effect on the existing river training structures in the project area.

Action Alternative 1 (Minimum) – There are no modifications to the river training structures in the minimum alternative, therefore, conditions would mimic the No Action Alternative.

Action Alternative 2 (Maximum) – The modification to river training structures include the notching of Dike 247.2R and the addition of four hard points located on the right descending bank of the Hausgen side channel. The notch of Dike 247.2R extends 100 feet in width and degrades the existing dike by 10 feet. Exact location of the notch is estimated at the midpoint of Dike247.2R. It is recommended for the contractor to drag the existing dike material downstream so that no material would need to be extracted and hauled to a site.

The hard points for this alternative would follow a geometry of a 10H:1V slope, 40 feet from the bankline to a hinge elevation of 430 feet, determined by the OHWM (50% AEP), and then follow a 5H:1V slope down to the existing channel elevation.

With these modifications, flow and velocity are predicted to increase and push sediment through the side channel. The hard points would help minimize bank erosion from the increased velocities.

5.1.3 Dredging Operations

No Action Alternative (Future Without Project Condition) – If no action is taken, existing navigation channel dredging would continue as needed. Dredged material from the main channel would continue to be placed along the right descending bank thalweg away from dike tips according to the Dredge Masterplan.

Action Alternative 1 (Minimum) – There are no dredging measures or alterations to existing river training structures in the minimum alternative, therefore, conditions would mimic the No Action Alternative.

Action Alternative 2 (Maximum) – With the introduction of the notch of Dike 247.2R, additional flow is expected to travel through the side channel which would divert more sediment from the main channel to the Hausgen side channels. This has the potential to lessen the district's need for dredging in the main channel.

5.1.4 Hydraulics/Hydrology

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, actions to restore the side channel would not take place. It is anticipated that the upper side channel of the Hausgen Island complex would continue to degrade. As sedimentation continues and causes the side channel to eventually close off completely, a once thriving aquatic habitat would turn into a low quality, terrestrial area comprised almost completely of sand that allows for only a few species such as willow and cottonwood to establish. Eventually over time, Jim Crow Island would experience the same degradation as sediments move further downstream.

The hydraulics in the area would be similar to existing conditions into the future, and high suspended sediment is expected to continue. Island building would continue at the upper end of Hausgen Island and lower portion of Little Stag Island until eventually the two islands combine into one, cutting off the side channel completely. Other negative impacts include lock and dam operations, navigation, and dredging. L&D 25 operations are not expected to change from the existing condition and will continue to function according to congressional directives and environmental pool management criteria. Navigation along the main channel would continue to have adverse effects and impacts on important habitats within side channel and backwaters within Pool 25 of the Mississippi River. Navigation induced shoreline erosion would continue degrading both islands and aquatic habitats. If routine dredging was not performed, habitats within the study area would be impacted even further with sediments and lose connectivity.

Cross sections were chosen throughout the Hausgen and Jim Crow backwaters to determine changes in velocity and flow between the design alternatives (Figure 19). Each cross section was determined to capture terrain changes between the different alternatives and were drawn from left descending bank to the right descending bank. Hausgen 1 was located to analyze the effects on including the notch at Dike 247.2R, Hausgen 2 captures most of the side channel inflow, and Hausgen 3 captures the side channel flow downstream of the sandbar. Jim Crow 1 shows the initial effects after the Cross Dike 246.2R, Jim Crow 2 represents the entrance to the tertiary channel, and Jim Crow 3 represents the most downstream portion of the project limits. The results for each design alternative were then compared to the existing conditions model.



Figure 19 Design Alternative Cross Sections

Action Alternative 1 (Minimum) – The introduction of mussel riffles and GSR show minimal changes in velocity and flow. The additional rock features may slow velocities slightly down, which could lead to sedimentation, but the decrease in velocity and flow were not enough to justify screening.

Action Alternative 2 (Maximum) – Along with the effects of Alternative 1, the maximum alternative, consists of introducing a notch. This notch would introduce flow and velocity in the side channel which would transport sediments through the system and create more bathymetric diversity for aquatic habitat. Hard points and GSR would allow for bank stabilization from the increased flows and provide aquatic habitat.

A preliminary 'no-rise' determination was conducted on the TSP and resulted in minimal to no rise in water surface elevation based on the criteria of a less than 0.1-foot increase within the project area. Additional investigation and refinement will occur in the design phase. A full hydraulic analysis of the alternatives can be found in the Hydraulics and Hydrology Appendix D.

5.2 Environmental Conditions

5.2.1 Physical Environment

5.2.1.1 Water Quality

No Action Alternative (Future Without Project Condition) – Under the No Action alternative, sedimentation build up and lack of flow velocity would result in elevated water temperatures during the summer. This would lead to lower dissolved oxygen levels in the project area which are anticipated to decrease to lethal or sublethal levels for aquatic organisms.

Action Alternative 1 (Minimum) – Under Alternative 1, the proposed GSR and mussel rock-gravel substrate enhancement are designed to help reduce erosion as well as create suitable habitat for mussels. This may result in some minor temporary changes in the suspended sediment concentration in the immediate area. Limestone material used for construction could potentially affect local water chemistry (e.g., alkalinity, hardness, and pH). However, given the prevalence of limestone in the watershed geology and the quick dissipation of any associated fine materials in the water column, the impact is likely to be negligible. Overall impacts to water quality are anticipated to be negligible and short term.

Action Alternative 2 (Maximum) – In addition to effects associated with Alternative 1, the proposed dike notch and hard points are designed to increase side channel flow diversity, sediment transport, and/or substrate diversity. Therefore, this may result in some minor temporary changes in the suspended sediment concentration in the immediate area. Additionally, oxygen levels are anticipated to increase. Overall impacts to water quality are anticipated to be negligible and short term.

Permits – Nationwide Permit 27 Aquatic Habitat Restoration, Enhancement, and Establishment Activities will be utilized. See Appendix L – Clean Water Act for more details.

National Pollutant Discharge Elimination System (NPDES) - A storm water discharge or NPDES permit for construction activities may be required. Effective March 10, 2003, the NPDES storm water discharge permit is required when a construction activity disturbs more than one acre. The construction contract for the study area may trigger the need for the contractor to apply for this permit. The contractor would be required to prepare an erosion control plan to ensure that unprotected soil is not allowed to leave the study area work limits. The contractor would be required to comply with all local codes and permit requirements.

5.2.1.2 Air Quality

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, air quality is expected to remain similar to the existing condition. Attainment status for Lincoln County, MO, is currently in attainment status and is not anticipated to change *in the Future Without Project Condition*. Control strategies targeted at physical improvements in regional transportations systems, resulting in reduced emissions, have been implemented across the region and could improve air quality over time.

Action Alternatives – Emissions from construction equipment may minimally increase carbon monoxide, suspended airborne particulates, and carbon dioxide levels in the vicinity of the construction site. Because the area is in attainment for all criteria pollutants, and the relatively small scale of the work would lead to emissions that are plainly *de minimis*, a conformity determination is not required. The Contractor shall comply with all applicable federal, state, and local laws and regulations. Care would be taken to minimize all impacts on air quality, such as running equipment only as needed, and ensuring that the contractor provides environmental protective measures and procedures to prevent and control emissions during construction. Effects to air quality from any of the action alternatives would be negligible and short term, limited to the hours and site of construction, and not expected to have long term impacts.

5.2.1.3 Noise Levels

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, noise levels are expected to remain similar to the existing condition. Noise levels associated with navigation, construction, transportation, recreation, and agricultural practices in the project

area would not be expected to change.

Action Alternatives – Noise levels at the work sites would increase due to construction equipment use during implementation of the action alternatives. Understandably, more project features would require a longer construction duration and potentially more equipment, thus increasing the sources of noise. Most construction activities are classified as point source noise, which is usually associated with a source that remains in one place for extended periods of time (WSDOT 2020). Construction point source noise is commonly measured by maximum decibel level (Lmax), or the highest value of a sound pressure over a stated time interval. Equipment such as cranes, boats, and pile hammers range from about 85 to 101 dBA average maximum noise levels (Lmax) at 50 feet. However, noises would attenuate outside of the immediate construction zone. Attenuation of 95 dBA at 400' is estimated to reduce the noise to 77 dBA (WSDOT, 2020). Attenuation to 800' is approximately 71 dBA; while the noise level at 1600' is reduced to approximately 65 dBA (WSDOT, 2020). The project features would not contribute to noise levels during operation.

Sensitive noise receptors in the area include residences and recreation areas (nearest is estimated at 550'). Additionally, fishing, boating, and hunting occur within the river, side channel, and islands. Each immediate work site would be off-limits to recreationists for safety purposes during construction. Thus, impacts to noise levels due to construction of project features would be minor and short term.

5.2.1.4 Historic Properties and Cultural Resources

No Action Alternative (Future Without Project Condition) – No impacts to historical or cultural resources are anticipated in the No Action condition. If unknown cultural resources are within the study area, continued sediment deposition caused by a combination of factors described in the *Hydraulics/Hydrology* section would bury them deeper and thus preserve them.

Action Alternatives – Given that all planned work for the project would occur below the OHWM and construction would be conducted by floating barge, SHPO and tribal coordination was sent on 25 April 2025 requesting concurrence with the St. Louis District determination that no historic properties would be affected by this project. No response was received by from the Missouri SHPO, whereas, four tribes sent letters concurring with our findings. Additionally, if it is deemed necessary the District plans to utilize the June 25, 2024, implemented, Programmatic Agreement (PA) regarding the Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program for any additional compliance with Section 106. The USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Program undertaking.

5.2.1.5 Hazardous, Toxic, and Radioactive Waste

No Action Alternative (Future Without Project Condition) – The Phase I Environmental Site Assessment did not identify any major sites of interest which pose significant HTRW concerns. Any existing HTRW concerns would remain present in the study area. HTRW concerns would not be affected by the No Action alternative.

Action Alternatives – Since the Phase I Environmental Site Assessment did not identify any major sites of interest which pose significant HTRW concerns The environmental impact for the migration of off-site contaminants into the study area is negligible., The action alternatives would not disturb any known HTRW sites, and no special considerations are being recommended for

the project to proceed to construction. However, if any project activities reveal a site of interest, then the USACE Environmental Quality Section should be contacted immediately. Thus, impacts from HTRW concerns are anticipated to be negligible. See Appendix F for additional HTRW information.

5.2.2 Natural Environment

5.2.2.1 Aquatic Species and Habitat

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, it is anticipated that the habitat in the side channel would continue to degrade due to deposition across the projected 50 year timespan, causing shallower depths, higher water temperatures, and decreased dissolved oxygen levels as it further disconnects from the main channel and slowly transitions to sandy terrestrial habitat. Improvements to bathymetric and velocity diversity as well as longitudinal connectivity of the side channel would not occur under the No Action Alternative.

Action Alternative 1 (Minimum) – Under Alternative 1, construction of the mussel habitat enhancement features is anticipated to result in more areas of suitable substrate and flow velocities where mussels could further colonize within the project area. The installation of GSR would slow bank erosion in the side channel which is vital for local aquatic organism habitat. Impacts to aquatic resources are anticipated to be beneficial and long term.

Action Alternative 2 (Maximum) – In addition to the benefits described for Alternative 1, placement of hardpoint structures would increase structural complexity and result in areas with heterogeneous flows and substrates, thereby increasing its attractiveness to invertebrates (including mussels), fishes, reptiles, and amphibians. Impacts to aquatic resources are anticipated to be beneficial and long term.

5.2.2.2 Terrestrial Species and Habitat

No Action Alternative (Future Without Project Condition) – Under the No Action alternative, sedimentation is anticipated to result in further conversion of vital side channels into more terrestrial habitat. This would have long term adverse impacts to the aquatic wildlife that rely on these backwaters and side channels for spawning, rearing, and foraging. Impacts to existing terrestrial habitat, including that used by Neotropical migrants and bald eagles, is not anticipated.

Action Alternative 1 – The construction of GSR and placement of mussel riffle habitat further supports terrestrial wildlife by providing habitat and increased recruitment for a variety of prey items consumed by terrestrial organisms. Retaining the side channel would provide essential habitat for terrestrial species such as bald eagles, otters and beavers, as well as amphibians and reptiles such as snakes, turtles, frogs, toads, and salamanders. Under alternative 1, any adverse impacts to existing terrestrial habitat would be negligible and short term.

Action Alternative 2 – In addition to the effects associated in alternative 1, the construction of hard points and the dike notch would help to restore flow within the side channel habitat. The increased amount of flow within the side channels would prevent encroachment from terrestrial habitat as well as increase the water quality. Diverting the flow away from shoreline would also assist in preventing erosion form occurring increasing the amount of suitbale mussel habitat

All construction activity and equipment staging would stay outside of the 660 feet buffer zone of all active bald eagle nests.

5.2.2.3 Invasive Species

No Action Alternative (Future Without Project Condition) – Under the No Action alternative, it is anticipated that the invasive aquatic species previously identified would retain ample opportunity to establish and proliferate in the project area. This would be a detriment to the native species within the area. Additionally, the No Action Alternative would not involve the placement of any materials into the river; thus, any introduction or range expansion would not be the result of the No Action Alternative.

Action Alternative 1 (Minimum) – Under Alternative 1, it is anticipated that the invasive aquatic species previously identified would retain ample opportunity to establish and proliferate in the project area. However, the installation of GSR and mussel riffles would enhance the habitat in the area for native fish and mussel species as well. All material used for these measures is required to be clean and free of invasive species. Best management practices regarding the transport of invasive species by vessels and equipment would be implemented. Thus, any introduction or range expansion would not result from Alternative 1.

Action Alternative 2 (Maximum) – Under Alternative 2, it is anticipated that the invasive aquatic species previously identified would retain ample opportunity to establish and proliferate in the project area. The installation of hard points and the dike notch coupled with the GSR and mussel riffles would further increase water quality and reduce sedimentation. This would increase the native species habitat and assist them in out competing invasive species. All material used for these measures is required to be clean and free of invasive species. Best management practices regarding the transport of invasive species by vessels and equipment would be implemented. Thus, any introduction or range expansion would not result from Alternative 2.

5.2.2.4 Federally Listed Species

In accordance with Section 7(c) of the Endangered Species Act (ESA) of 1973 (as amended), the U.S. Fish and Wildlife Service (USFWS) was contacted via USFWS Information for Planning and Consultation (IPaC) website on 18 March 2025, for a list of Federal threatened, endangered and candidate species that could potentially be located in the project area (Project Code: 2024-0041378; Table 6). There are no designated Critical Habitat locations in the project area.

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, the side channel is anticipated to become shallower as a result of sedimentation due to slower flows and velocities. Shallower depths would result in increased summer temps, lower dissolved oxygen levels, and reduced connectivity between the main channel and side channel throughout the year. The general trend toward the conversion from aquatic to terrestrial habitat at the Hausgen Island complex throughout the side channel would continue. Improvements to bathymetric and velocity diversity as well as longitudinal connectivity of the side channel would not occur under the No Action Alternative. Thus, the No Action Alternative would be detrimental to the Spectaclecase mussel due to the lack of suitable structure to provide sheltered areas that are attractive to Spectaclecase colonization, as well as loss of aquatic habitat. Furthermore, mussel beds may be covered by sediment and/or sediment may impede filter feeding and reproduction. Additionally, fish hosts may use the area less frequently or not at all as the side channels transition from aquatic to terrestrial habitat. Bat species which utilize these areas for foraging may experience decreased areas of open foraging habitat and fewer prey items. The No Action Alternative is not anticipated to adversely impact the monarch butterfly, western regal fritillary butterfly, or decurrent false aster.

Action Alternatives – USACE prepared a biological assessment (Appendix C – Biological Assessment) that will be made available to USFWS for concurrent review during the public comment period. For each species listed on the IPaC, the Biological Assessment (BA) describes the species status, site specific presence and use, as well as a discussion of the impacts of the No Action Alternative and the direct, indirect, and cumulative impacts of the proposed federal action. The BA also includes conservation measures proposed for the action alternative to help minimize effects to currently listed species within the proposed project area. The conservation measures include:

1. If tree clearing is necessary, all tree clearing resulting from the USACE action would occur during the inactive season from November 1 to March 31 unless negative presence/probable absence survey results were obtained for the action area through appropriate surveys approved by the U.S. Fish and Wildlife Service (USFWS).
2. During clearing, dead trees, split trees, trees that have cavities, and trees with exfoliating bark would be favored for retention where possible.
3. Best management practices would be utilized according to NWP 27 conditions to reduce impacts to wetlands, sediment movement, and water movement patterns.
4. Herbicides used to control invasive species would follow EPA product label instructions.
5. Appropriate buffer distances around potential eagle nests would be coordinated with the USFWS prior to or during construction to account for any changes in conditions from existing resources.

Based on the information obtained, USACE has determined the proposed project "*May Affect, but is Not Likely to Adversely Affect*" for the Spectaclecase mussel and a "No Effect" for the Gray Bat, Indiana Bat, Tricolored Bat, Monarch butterfly, and Western Regal Fritillary butterfly.

5.2.2.5 State Listed Species

No Action Alternative (Future Without Project Condition) – Under the No Action alternative, sedimentation is anticipated to result in further conversion of side channels into more terrestrial habitat which could have long-term adverse impacts to any state T&E species that may utilize these backwaters and side channels for spawning, rearing, foraging, or shelter including the state listed Lake Sturgeon, Ebonyshell, and American Bittern. Without the proposed project, adverse impacts are anticipated as the side channels fill in with sediment. Fish hosts may use the area less frequently or not at all as the side channels transition from aquatic to terrestrial habitat. Additionally, mussel beds may be covered by sediment and/or sediment may impede filter feeding and reproduction.

Action Alternative 1 (Minimum) – Under Alternative 1, erosion would decrease in the side channel significantly utilizing GSR which would enhance the habitat for aquatic organisms such as the state listed Lake Sturgeon. GSR would also help prevent the shoreline from converting into a terrestrial habitat. Maintaining the current habitat is valuable to the state listed Interior American Bittern due to the use of sand, gravel, and sparsely vegetated areas to breed. Construction of the mussel habitat enhancement features are anticipated to result in more areas of suitable substrate and flow velocities where mussels such as the state listed Ebonyshell could further colonize within the project area. Impacts to state listed species in the area are anticipated to be beneficial and long term.

Action Alternative 2 (Maximum) – In addition to the impacts and benefits described for Alternative 1 above, placement of hardpoint structures would increase structural complexity and

result in areas with heterogeneous flows and substrates, thereby increasing its attractiveness to invertebrates (including mussels), fishes, reptiles, and amphibians. Structures would be placed at locations that benefit state listed species, in a manner that does not disrupt the existing habitat, mussel beds, and/or aquatic organisms. Impacts to state listed species in the area are anticipated to be beneficial and long term.

MDC requested BMPs be utilized for any construction work within the project area.

5.2.3 Socioeconomic Environment

5.2.3.1 Socioeconomic

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, typical activities such as navigation and recreation would continue to occur in in this section of the river. No major impacts to the socioeconomics of the region, including population demographics, education, economic base, and/or employment and labor force are anticipated as a result of taking no action. USACE continues to incorporate the needs and considerations of all communities, including those at risk.

Action Alternatives – Each of the action alternatives would continue to provide employment for workers. The larger the project, the more work would be involved. No adverse impacts to the socioeconomics of the region, including population demographics, education, economic base, and/or employment and labor force are anticipated as a result of any of the action alternatives. Positive economic benefits are anticipated as a result of the proposed work and continued recreational opportunities. USACE continues to incorporate the needs and considerations of all communities, including those at risk. Thus, overall impacts to socioeconomic resources are anticipated to be beneficial and short term.

5.2.3.2 Navigation Traffic

No Action Alternative (Future Without Project Condition) – Under the No Action Alternative, no ecosystem restoration activities would occur within the Hausgen complex side channel, and no impacts to navigation traffic would occur.

Action Alternatives – The proposed project is located on the opposite side of the Mississippi River from the navigation channel. Thus, none of the action alternatives are anticipated to result in adverse impacts to navigation. Accordingly, overall impacts to navigation traffic are anticipated to be negligible and short term.

5.2.3.3 Recreation

No Action Alternative (Future Without Project Condition) – Recreation is expected to remain highly valued in the area. No anticipated changes to navigation operations, navigation maintenance, or channel improvements are expected. Aquatic and terrestrial diversity is expected to continue to decline as a direct result of impounding the river for navigational purposes, with Locks and Dams having altered the natural hydraulic regime. This disruption in natural river hydraulics has led to the problems observed throughout the impounded reaches of the UMR and may lead to some degree of decline in recreational access.

Action Alternative 1 (Minimum) – This alternative would be adding GSR to the side channel between mile markers 247 and 246. By adding GSR, there would be minimal shoreline degradation and have a decrease in sediment buildup in the side channel. This would allow increased boating access to continue in the project area.

Action Alternative 2 (Maximum) – This alternative would include adding GSR to the shoreline as stated in the minimum alternative as well as adding hard points and a dike notch. The installation of the hard points and dike notch between river miles 248-246 would help alleviate erosion as well as prevent sediment buildup in the side channel. This would allow for continued boat access for various types of recreational activities in the project area.

5.2.3.4 Real Estate

No Action Alternative (Future Without Project Condition) – No change in real estate interests is anticipated in the future without project condition.

Action Alternatives – No LERRDS were anticipated to construct the Project measures. Measures are below the ordinary high water mark; therefore no real estate acquisition was identified.

5.2.3.5 Aesthetics and Visual Resources

No Action Alternative (Future Without Project Condition) – Routine navigation, structure maintenance, and channel operation and maintenance activities would continue under the No Action Alternative. These activities may detract from the aesthetic value of the river experience. However, these impacts would be very localized and minor in nature.

Action Alternatives – Under the action alternatives, installing GSR and mussel riffles would require the use of construction equipment to maneuver rocks and supplies. Additionally, Alternative 2 would include adding a dike notch and hard points which would increase flow velocity to through the system, thereby reducing areas of accretion and inhibiting the transition to terrestrial habitat. From a visual perspective, these activities may appear very similar to the No Action Alternative. After completion of construction, the project area would revert to a more natural appearance since all activities are below the ordinary high water mark. Overall, the impact to aesthetics and visual resources would be minor and short term.

5.2.3.6 Climate Resilience

No Action Alternative (Future Without Project Condition) – It is anticipated that regional conditions would become more extreme as the climate continues to adjust. Without the proposed project, side channel and backwater habitats may degrade and most species which depend on those areas would be detrimentally impacted.

Action Alternatives – Under all action alternatives, impacts to climate resilience are not anticipated. Variations in climate and potential changes to hydrology have been incorporated into the design of the project features for all action alternatives.

5.3 Cumulative Effects

The Council on Environmental Quality (CEQ) regulations (40 CFR §§ 1500–1508) implementing the procedural provisions of NEPA, as amended (42 USC § 4321 et seq.) define cumulative effect as:

> which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.1(i)(3)).

Cumulative effects analysis recognizes that the most serious environmental impacts may result

from the combination of individually minor effects of multiple actions over time, rather than the direct or indirect effects of a particular action.

Analyzing cumulative effects requires identifying the environmentally relevant area and the past, present, and future actions in that area that would contribute incrementally to the overall effect. The environmentally relevant area is determined by both location and time. Future actions are those that are reasonably likely to occur. A future project is only considered in this analysis if there is sufficient information on the project to understand what its incremental contribution to cumulative effects might be.

The 2004 IFR/EIS (Chapter 9- Cumulative Effects) contains detailed identification of other past, present, and future actions throughout the UMR. Since 2004, at least nine new projects have been or will be constructed within Pool 25 and are listed in Section 1.6.1.

5.3.1 Past, Present, and Future Projects

River based projects for Pool 25 are discussed in Section 1.6 of this report - Prior Reports, Existing Water Projects, and ongoing Programs. In addition to USACE, other entities also construct and operate river-based facilities and structures in the UMRS.

5.3.2 Cumulative Effects Assessment

The 2004 IFR/EIS (Chapter 9- Cumulative Effects) contains a comprehensive analysis of cumulative effects associated with the NESP and other past, present, and reasonably foreseeable actions. The Pool 25 past, present and future actions identified above are consistent with that analysis, which remains valid. Cumulative effects are not meaningfully different than analyzed in the 2004 IFR/EIS. Area-specific cumulative effects are summarized below where relevant. The environmental consequences outlined below are organized by the resource categories discussed for the project in Section 5. There are no area-specific adverse cumulative effects anticipated as a result of the proposed side channel restoration project. Conversely, this NESP ecosystem restoration project reduces the negative cumulative impacts that have occurred because of the operation and maintenance of the 9-foot navigation channel project. Table 13 summarizes the cumulative effects of the NESP Mississippi River Hausgen Island Side Channel Restoration Ecosystem Restoration Project.

Table 12. Summary of the cumulative effects of the “No Action” and action alternatives to physical, biological, and socioeconomic resources.

No Action Alternative Future Effects Compared to Existing Conditions (Effects of Nature)							**Symbols: X = Long-Term Effect T = Temporary Effect C = Cumulative Impact**	**Proposed Alternatives, Effects of Action Alternatives to No Action Effects (Effects of Project)**						
BENEFICIAL				**ADVERSE**				**BENEFICIAL**				**ADVERSE**		
SIGNIFICANT	**SUBSTANTIAL**	**MINOR**	**NO EFFECT**	**MINOR**	**SUBSTANTIAL**	**SIGNIFICANT**	**Affected Resource**	**SIGNIFICANT**	**SUBSTANTIAL**	**MINOR**	**NO EFFECT**	**MINOR**	**SUBSTANTIAL**	**SIGNIFICANT**
							A. Physical Effects							
		X					Topography, Geology, & Soils				x			
		X					Land Use/Land Cover				x			

			X				Prime Farmland				x			
			X				Noise					T		
				X			Water Quality			X				
				X			Hydraulics & Hydrology			X				
			X				Air Quality					T		
							Hazardous Waste				X			
							B. Biological Effects							
					X		Aquatic Habitat		X					
			X				Terrestrial Habitat				X			
			X				Bald Eagle				X			
			X				Migratory Birds				X			
			X				Invasive Species				X			
					X		State-listed Species		X					
				X			Federally-listed Species		X					
							B. Social Effects							
			X				Economics			X				
			X				Aesthetics				X			
				X			Recreation			X				
			X				Cultural Resources, Historic				X			
			X				Tribal Resources				X			

6 EVALUATION AND COMPARISON OF FINAL ARRAY OF ALTERNATIVES

6.1 P&G Account Comparison

USACE is required to comprehensively evaluate and provide a complete accounting, consideration, and documentation of the total net benefits of alternatives a full array of benefit categories listed below. The economic, social, and environmental benefits, impacts, and costs are to be identified, measured, and/or qualitatively characterized using the four Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) accounts (ER 1105-2-103, Section 1-6) listed below:

- *National Economic Development (NED)* account displays changes in the economic value of the national output of goods and services.
- *Environmental Quality (EQ)* account displays non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of aquatic ecosystem restoration plans. Increases (or decreases) in the net quantity and/or quality of desired ecosystem resources are referred to as *National Ecosystem Restoration (NER)* benefits or impacts.
- *Regional Economic Development (RED)* account displays changes in the distribution of regional economic activity (for example, income and employment).
- *Other Social Effects (OSE)* account displays plan effects on social aspects such as community resilience, public health, life safety, displacement, energy conservation, and similar effects.

Taken together, the concepts behind the four P&G accounts contribute to a structured planning framework for evaluating and comparing alternatives. Alternatives are assessed to determine if they have net benefits in total and by type in collaboration with non-federal partners and in consideration of other study interests and stakeholders, using available data, analysis, input from peer review, and professional judgment. This chapter describes the evaluation of the final array of alternatives by documenting the process used to determine the potential costs and habitat. The comparison of costs and habitat benefits is described below.

6.1.1 National Economic Development (NED)

The NED account displays changes in the economic value of the national output of goods and services. The No-Action Alternative would result in no project expenditure and would have no positive or negative impact on national output of goods and services. All the action alternatives provide similar and minimal direct economic benefits. An NED plan is not required to be identified for this study.

6.1.2 Environmental Quality Account

For ecosystem restoration projects such as this one, contributions to the EQ account are detailed both through NEPA compliance and through calculation of net ecosystem benefits. The EQ accounts for non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of ecosystem restoration plans.

6.1.2.1 National Ecosystem Restoration Benefits

The USACE's objective in ecosystem restoration is to contribute to national ecosystem restoration, or NER outputs, via increases in the net quantity and/or quality of desired ecosystem resources. The credit for the EQ account is the quantified benefits resulting from the project (AAHUsS). Intangible and or non-quantifiable environmental benefits associated with the

alternatives are assumed to increase proportionally relative to the AAHU outputs associated with each alternative.

For aquatic ecosystem restoration projects, a plan that reasonably maximizes aquatic ecosystem restoration benefits compared to costs, consistent with the Federal Objectives and Guiding Principles, must be identified. The NER account identifies quantified habitat benefits against project costs to determine cost per AAHU; this is determined via alternatives found to be Best Buy under CE/ICA as described in Section 6.3.1. The NER plan is the alternative plan that reasonably maximizes ecosystem restoration benefits compared to cost.

Based on the cost benefit analysis described in this section, the PDT identified Alternative 2 Maximum mussel habitat as the NER Plan as it reasonably maximizes the average annual cost per habitat unit benefits over the 50-year period of analysis over the other alternatives.

6.1.2.2 Habitat Benefits

NEPA compliance is achieved by integrating an EA into this feasibility report, with a qualitative summary of environmental effects detailed in Section 5 of this report. A calculation of net ecosystem benefits was completed through the use of Habitat Evaluation Procedures (HEP; USFWS 1980a), and the application of HSI models. The quantitative results of the evaluation are contained in Appendix B – Habitat Benefits Evaluation.

This assessment includes a summary of the existing biological conditions used in the evaluation, as well as a forecast for future conditions under the No Action Alternative and each potential Project alternative. The evaluation was conducted by a multi-agency team that included representatives from the District and Project partners. Aquatic benefits were quantified using the Habitat Evaluation Procedures (HEP) (HEP; USFWS 1980a), a habitat-based evaluation methodology used in project planning. The procedure documents the quality and quantity of available habitat for selected wildlife species. The HEP assume that habitat for selected wildlife species can be described by a Habitat Suitability Index (HSI). This index value (from 0.0 to 1.0) is multiplied by the area of applicable habitat to obtain Habitat Units (HUs).

Changes in HUs occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HUs derived over the period of analysis (50 years). HUs are calculated for select target years and annualized using the IWR Planning Suite II tool annualizer over the period of analysis to derive a net Average Annual Habitat Unit (AAHU) quantity. By using target years, AAHUs were annualized using a linear interpolation approach, essentially drawing a straight line between target years, and then calculating the area under the curve for the resulting planning horizon benefit curve. Resulting net AAHUs are used as the output measurement to compare alternatives for the proposed Project. A summary of the habitat analysis is provided in Table 14. The PDT used the *General Freshwater Mussel Habitat Model*, which is a USACE-approved habitat evaluation methodology for use in analyses.

Table 13. Habitat Types and Areas Evaluated

Habitat Type	Evaluation Area	Area (acres)	Habitat Suitability Index Model
Lotic side channel	Hausgen Is. Complex Side Channel	187	Freshwater Mussel
TOTAL		187	

Table 15 summarizes the benefits for each alternative for cost effectiveness and incremental cost analysis. The net average annual habitat benefits by habitat type for the final array of

alternatives are displayed below. Alternative 2 provides the highest amount of total AAHU's. There are minimal adverse effects on cultural and aesthetic resources as result of the proposed alternatives, therefore, these factors were not considered useful for comparison criteria.

Table 14. Environmental Outputs (Net AAHU)

Alternative Name	Area (acres)	Total AAHU
No Action	187	0
Alternative 1 – Minimum	187	74
Alternative 2 - Maximum	187	92

6.1.3 Regional Economic Development (RED) Account

The RED account registers changes in the distribution of regional economic activity that result from each alternative plan. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population. USACE and Michigan State University have developed a regional economic impact modeling tool, RECONS (Regional ECONomic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities The RECONS model was run for the final array of action alternatives. As the costs of action alternatives varied, regional benefits would also vary. However, the percentage of Federal expenditure to regional benefits would be largely equivalent and not useful as criteria for comparison. See Appendix H, RECONS Analysis for the final array of alternatives.

The No Action Alternative would result in no project expenditure and would have no positive or negative regional impact. Table 16 displays the comparison of local impacts for all alternatives. All of the action alternatives would positively impact the regional economy and increase respective to each alternative relative to the number and size of the measures implemented.

Table 15. Local Total Impact of Final Array of Alternatives ($ Million)

Alternative	Local Capture	Output	Jobs*	Labor Income	Value Added
Alt 1 Minimum	$1.71	$2.64	28	$1.43	$1.24
Alt 2 Intermediate	$2.29	$3.53	37.4	$1.91	$1.66

* Jobs are presented in full-time equivalence (FTE)

6.1.4 Comprehensive Benefits

6.1.4.1 Other Social Effects Account

The OSE account addresses plan effects from perspectives that are relevant to the planning process but are not reflected in the other three accounts. Per the recent Policy Directive "Comprehensive Documentation of Benefits in Decision Document" (5 January 2021) the PDT relied on the expertise of the interagency team and other local experts to determine OSE. Per guidance, teams can, at a minimum, consider urban, rural and community impacts; life, health, and safety factors; displacement; and long-term productivity under OSE.

The PDT evaluated the study area for factors that could potentially produce non-monetized benefits or impacts (positive and negative) across the array of alternatives. When evaluating the socioeconomic status included in the 2022 U.S. Census data, Lincoln County, MO is classified as having a "low to low-medium" status, meaning there are minimal at risk communities within

the vicinity of the project. Also, the study scope is narrowly focused on implementation of project measures under below OHWM and it is anticipated that there is minimal life safety risk associated with all the plans. Therefore, it was determined that the effects captured under the OSE account would be minimal and this evaluation did not significantly contribute to the plan comparison process.

6.2 Cost Estimates

Cost estimates for alternative comparison were prepared using October 2024 (FY25) price levels; annualized costs include construction costs, contingency costs, interest during construction, monitoring and adaptive management (M&AM) costs, and O&M costs. Contingencies were developed based on project risks and determined to be 36.2 percent construction contingency. The total project contingency is 34.5 percent. A 24.7 percent contingency was applied to planning, engineering, and design (PED), and a 32.2 percent construction management contingency. Quantities and costs may vary during final design. All project measures are located under OWHM; consequently, there are no lands and damages or relocation costs. Project costs used in the CE/ICA were annualized based on the 2025 Federal discount rate of 3.0 percent and a 50-year period of analysis. Interest During Construction (IDC) was calculated using mid-year compounding based on a one-year period of construction, using the FY25 discount rate of 3.0 percent.

Table 17 shows the estimated cost of Project alternatives as of completion of the habitat analysis and for use in the comparison of alternatives, prior to selection, refinement, and developing a full cost estimate of a TSP. A full description of the cost estimate, including all related elements, can be found in Appendix J, Costs.

Table 16. Cost Estimates (FY25 Price Level)

Name of Alternative	First Cost (Million)	Interest During Construction	Average Annual Construction	Average Annual O&M and M&AM	Average Annual Cost
No Action	$ -	$ -	$ -	$ -	$ -
Alt 1 Minimum	$2.46	$36,553	$96,835	$18,125	$114,961
Alt 2 Maximum	$3.28	$48,896	$129,535	$26,863	$156,398

Note: Costs are shown at the October 2024 price level and were annualized using the current FY25 Federal discount rate of 3.0 percent over a 50-year period of analysis.

6.3 Comparison of Final Array of Alternatives

6.3.1 Cost Effectiveness & Incremental Cost Analysis

IWR Planning Suite II software was used to complete a CE/ICA for the three alternatives (including the No Action Alternative), using the AAHUs and annualized costs described in this section. The CE/ICA is used when project benefits are not measured in dollars and is used to ensure the least cost alternative is identified for each possible level of environmental output, and the maximum level of output is identified for any level of investment. Cost Effectiveness evaluation is used to identify the least costly solution to achieve a range of project benefits; the Incremental Cost Analysis identifies the subset of cost-effective plans that are superior financial investments, called “Best Buys,” through analysis of the preliminary incremental costs. Best Buys are the plans that are the most efficient at producing the output variable or provide the greatest increase in AAHUs for the least increase in preliminary cost. The first Best Buy is the most efficient plan, producing output at the lowest incremental cost per unit. If a higher level of output is desired than that provided by the first Best Buy, the second-Best Buy is the most

efficient plan for producing additional output, and so on.

The CE/ICA analysis evaluated three possible plans. Table 18 and Figure 20. Final Array of Alternatives Differentiated by Cost Effectiveness. Figure 20 show the resulting alternatives differentiated by cost effectiveness. From this list of three alternatives, three cost effective plans and three Best Buy Plans were identified (Table 18 and Figure 20).

Table 17. Final Array of Alternatives Differentiated by Cost Effectiveness

Alternative Name	Annualized Cost ($)	Annualized Output (AAHU)	Average Cost/Output ($/AAHU)	Cost Effective?
No Action	$0	0	$-0	Yes (Best Buy)
Alt 1 Minimum	$114,961	74	$1,554	Yes (Best Buy)
Alt 2 Maximum	$156,398	92	$1,700	Yes (Best Buy)

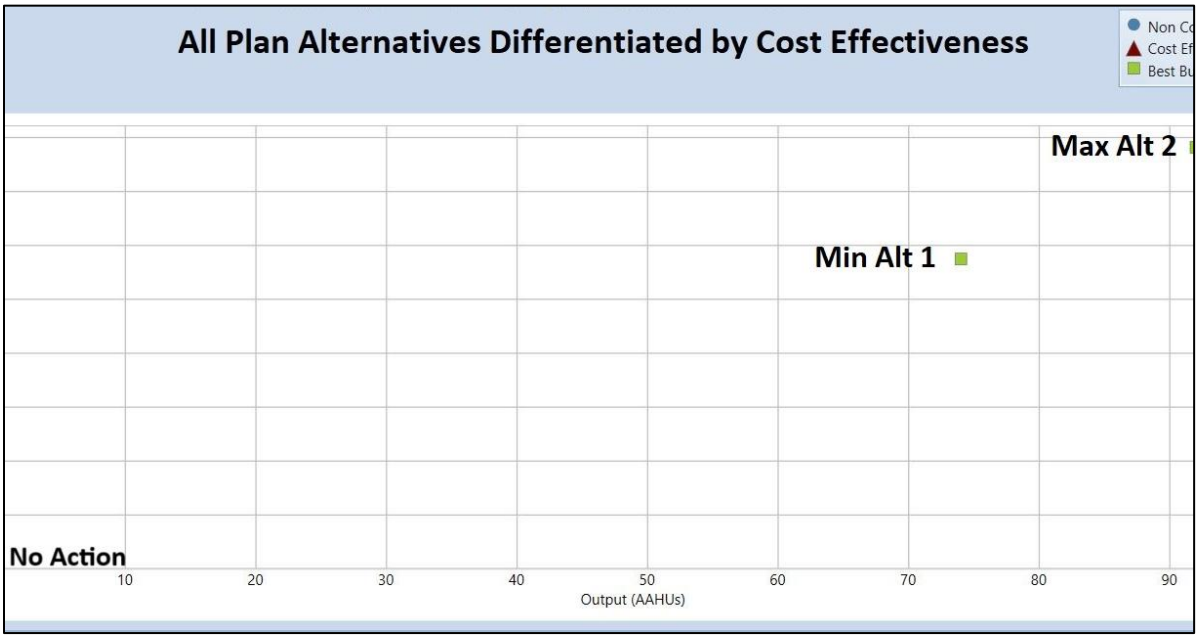


Figure 20. Final Array of Alternatives Differentiated by Cost Effectiveness

All of the alternatives were identified as Best Buy plans and carried forward for further analysis to determine the incremental cost for each additional increment of output. Table 19 displays the expected environmental outputs in terms of average annual habitat units along with the total first cost, interest during construction, and total average annual cost for the final array of alternatives. Table 19 presents the incremental costs per habitat unit for the final array of alternatives. Table 20 and Figure 19 present the alternatives' incremental cost and benefits information.

Table 18. Summary of Outputs (AAHUs) and Costs

Alternative	First Cost	Interest During Construction	Average Annual Construction	Average Annual O&M & MAM	Average Annual Cost	AAHUs	Cost Effective or Best Buy
No Action	$ -	$ -	$ -	$ -	$ -	-	**Best Buy**
Min Alt 1	$2,455,000	$ 36,553	$96,835	$18,125	$114,961	74.00	**Best Buy**
Max Alt 2	$3,284,000	$48,896	$129,535	$26,863	$156,398	92.00	**Best Buy**

Table 19. Best Buy Plans and Incremental Costs (AAHUs)

Alternative	AAHUs	First Cost (Million)	Interest During Construction	Average Annual Cost	Average Annual Cost per AAHU	Additional Average Annual Cost	Additional Output (AAHUs)	Incremental Cost (per AAHU)
No Action	-	$ -	$ -	$ -	$ -	$ -	-	$ -
Min Alt 1	74.00	$2.46	$36,553	$114,961	$1,554	$114,961	74.00	$1,554
Max Alt 2	92.00	$3.28	$48,896	$156,398	$1,700	$41,437	18.00	$2,302



Figure 21. Incremental Cost Analysis of Best Buy Plans

All of the alternatives are considered to be Best Buy plans. The first Best Buy, the No Action Plan, is the lowest average annual cost but produces no benefit. The No Action Alternative does not include any measures or provide any additional AAHUs. The No Action Alternative would have no financial cost to the federal government but does not meet any of the project objectives. The study area would continue to degrade as discussed in Section 3.0.

The second Best Buy is Alternative 1 Minimum and has an average annual cost of $1,554 per AAHU. This alternative would provide a net 74 AAHU benefit gain over the No Action Alternative. Alternative 2 Maximum has an average annual cost of $2,302 per AAHU with a net of 92 AAHU, which is 18 AAHU incremental benefit over Alternative 1. Although Alternative 2 is not the plan with the lowest incremental cost, it maximizes habitat benefits, specifically for mussel colonization. The Maximum alternative includes the measures to meet all planning objectives that maximize flow diversity, substrate diversity, and sediment transport, which all maximize mussel colonization. Also, when looking at total project costs, the costs for this project seems to be minimal compared to other, so the difference of annualized $41K, is a reasonable trade off.

6.3.2 Summary of Comprehensive Benefits

Per Section 2-3 of ER 1105-2-103, USACE is required to comprehensively evaluate alternatives to determine if they have net benefits in total and type in each benefit category. As previously described in Sections 4.5 and 4.7, the review of the four formulation criteria suggested by the P&G and resource significance (institutional, public, and technical) were used to aide in the selection of a TSP. To facilitate discussion and evaluation of the trade-offs among the four P&G accounts the array of alternatives must include, at a minimum, the following plans for evaluation

for ecosystem restoration studies:

- "No Action" alternative - The No Action plan assumes no action is taken by the USACE to achieve the planning objectives and used to inform the FWOP condition. The No Action Plan forms the basis against which all other alternative plans are measured.
- National Ecosystem Restoration (NER) plan - Alternative 2 provides a total of 92 AAHUs, which is the highest benefit gain. Although Alternative 1 is also a Best Buy plan, Alternative 2 provides additional benefits of 18 AAHUs, with an incremental cost of $2,302 per AAHU. This plan includes the addition of mussel habitat enhancement through dike notching and creation of hard points to increase flow into the side channel, which increases the flow / depth diversity. Based on evaluation of habitat units, CE/ICA, and consideration of the significance of proposed ecological benefits, Alternative 2 has been identified as the NER Plan.
- Total Net Benefits Plan, which is a plan that reasonably maximizes total net benefits across all benefit categories including monetized and non-monetized benefits. As previously stated, there are minimal OSE benefits to produce non-monetized benefits, therefore the total net benefits plan is the NER plan. Alternative 2 has been identified as the Total Net Benefit Plan as it reasonably maximizes the average annual cost per habitat unit benefits over the 50-year period of analysis over the other alternatives.
- Least environmentally damaging practicable alternative (LEDPA), NWP 27 requires activities result in a net increase in aquatic resource functions and services. The analysis contained in the main report and Appendix documents compliance with that requirement and all associated NWP conditions. This analysis, combined with the NEPA analyses contained in the 2004 Integrated Feasibility Report, illustrate that the Maximum plan is not environmentally damaging, and thus the Maximum Alternative meets the requirements to identify the Least Environmentally Damaging Practicable Alternative as specified in ER 1105-2-103. Based on analysis of impacts covered under the CWA (see Appendix L), the LEDPA was identified based on the alternative that provides the greatest habitat benefits (92 AAHUs), which is Alternative 2.

The performance of each alternative, relative to the baseline, the study objectives, the four formulation and evaluation criteria, and other screening criteria used is included below. Comprehensive benefits evaluation across these four categories for each of the alternatives are summarized below in Table 21. The table displays the results of the plan selection evaluation process in a table of effects by summarizing the contributions of each alternative, including the no action alternative, to the Federal Objectives and each of the Guiding Principles.

Table 20.Table of Effects

FEDERAL OBJECTIVES	Maximize Economic Development		Protect and Restore Natural Systems										
GUIDING PRINCIPLES	Sustainable Economic Development		Healthy & Resilient Ecosystems	Healthy & Resilient Ecosystems	Healthy & Resilient Ecosystems	Healthy & Resilient Ecosystems	Healthy & Resilient Ecosystems	Healthy & Resilient Ecosystems	Healthy & Resilient Ecosystems	Local Community Benefits			
P&G ACCOUNTS	NED	RED	EQ	EQ	EQ	EQ	EQ	EQ	EQ	OSE			
PLANNING OBJECTIVES			All Objectives	All Objectives	Increase side channel connectivity	Increase side channel flow diversity	Increase substrate diversity	Increase side channel sediment transport	Increase depth diversity				
EVALUATION CRITERIA		Effectiveness	Efficiency	Effectiveness	Effectiveness	Effectiveness	Effectiveness	Effectiveness	Effectiveness	Effectiveness	Acceptability	Acceptability	Completeness
METRICS (QUANTITATIVE and QUALITATIVE)	Cost ($) / Cost Effective	Annual RED Benefits ($Million)	Cost ($) / AAHU	AAHUs (Net Annual)	Meet Planning Objectives (Inclusion of measures)					Local Community Benefits	Risk to Navigation	Partner Satisfaction	Complete
No Action	$0 /Yes	$0.00	$0	0	No	No	No	No	No	No	No anticipated impacts	No	No
Alternative 1	$114,961 / Best Buy	$1.71M	1,554	74	No	Yes	Yes	Yes	Yes	No	No anticipated impacts	Yes, but not preferred	Yes
Alternative 2 (T,R,L)	$156,398 / Best Buy	$2.3M	$1,700	92	Yes	Yes	Yes	Yes	Yes	No	No anticipated impacts	Highest preferred	Yes

(T) = Total Net Benefits Plan
(R) =NER Plan
(L) = LEDPA

6.4 Selection of the Tentatively Selected Plan/Recommended Plan.
As previously described in Section 6, the PDT considered the total benefits of project alternatives, including equal consideration of economic, environmental, and social categories. Review of the four formulation criteria suggested by the P&G (completeness, effectiveness, efficiency, and acceptability), CE/ICA, and resource significance (institutional, public, and technical) were used to aid in the selection of the TSP. Resource partners were involved in each planning step and support the TSP.

The alternative plan that reasonably maximizes benefits in relation to cost and meets the overall project goals and objectives is the Alternative 2, Maximum Alternative, which was identified as the NER Plan, total net benefits plan, and LEDPA and was approved by Mississippi Valley Division during the TSP milestone briefing held on 18 February 2025. The TSP is consistent with regional plans for the area. Alternative 2 is the plan that best meets the overall NESP and study specific goals and objectives. The plan reasonably maximizes ecosystem restoration benefits related to side channel restoration.

The plan is justified as a best buy alternative with a relatively low incremental cost. When evaluating total project cost, the cost for this project seems to be minimal compared to other alternatives, so the difference of annualized $41K is a reasonable tradeoff. This plan avoids study constraints. It is considered to pose minimal risk to USACE's Navigation mission as H&H modeling did not indicate increased deposition within the navigation channel. Additionally, Alternative 2 is endorsed by the RRAT and aligns with federal and state natural resource agency goals and objectives.

7 TENTATIVELY SELECTED PLAN

7.1 Description of Plan.

The Tentatively Selected Plan was developed following an analysis of project alternatives, including a CE/ICA. The TSP is shown on Figure 22 and described as follows:

Alternative 2 - Maximum mussel habitat enhancement includes measures to maximize mussel habitat, flow/depth diversity and connectivity. This plan consists of the following measures:

- Partial Degradation/Notching of Dike at RM 247.2
- Creation of a series of hard points within main side channel
- Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement)
- Bank Stabilization utilizing GSR

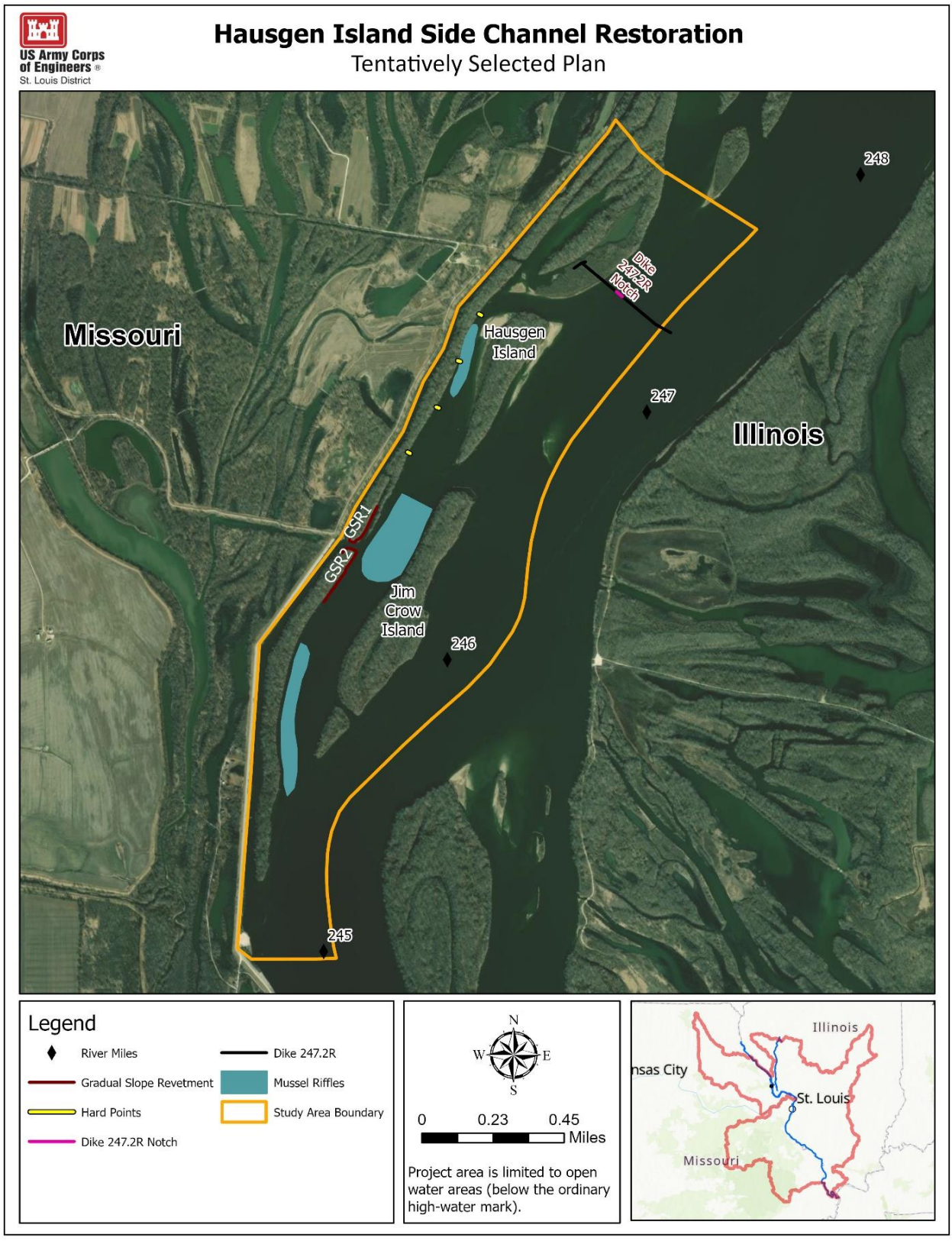


Figure 22. Tentatively Selected Plan

The Plan is consistent with the NESP ecosystem restoration program authorization in WRDA 2007 Section 8004 and would, in concert with other NESP ecosystem projects, ensure the environmental sustainability of the existing Upper Mississippi River and Illinois Waterway and address the cumulative environmental impacts of operation of the system and improve the ecological integrity of the Upper Mississippi River and Illinois River. The proposed project fits within the general framework of the larger NESP Recommended Plan as described in Table 22, below.

Table 21. Alignment with the Authorized NESP Recommended Plan for Ecosystem Projects

Type of Ecosystem Project	Number of Projects	Acres Benefitted
Side Channel Restoration	1	187

Table 23 presents the Project Implementation Schedule. While these dates are accurate as of this report, they are subject to change in the future.

Table 22. Project Implementation Schedule

Event	Scheduled Date
Public Review of Draft Report	27 June – 16 July 2025
Approve Final PIR/EA	08 September 2025
Submit Final PIR/EA to MVD	09 September 2025
Complete Design	June 2027
Initiate Construction	July 2027
Complete All Construction Stages	October 2027

Details of quantities and design for the TSP can be found in Appendix J, Costs. A summary of quantities is presented in Table 23.

Table 23. Summary of Quantities for the TSP

Measure	Stone Materials (TN)
Bank Stabilization	24,705
River Training structure modifications	2,444
Mussel substrate	1,508
Total	**28,658**

7.2 Cost Estimates.
Table 25 presents the Project First Cost including contingencies. Contingencies were developed based on project risks and determined to be 36 percent construction contingency. The total project contingency is 34 percent. A 25 percent contingency was applied to planning, engineering, and design (PED), and a 32 percent construction management contingency. Quantities and costs may vary during final design. A full description of the cost estimate, including all related elements, can be found in Appendix J, Cost.

Table 24. Project Design and Construction Cost Estimates (October 2024 (FY25) Price Level)

Account	Measure	Project First Cost
01	Lands and Damages	$0
06	Fish and Wildlife Facilities	$2,495,000
30	Planning, Engineering and Design	$346,000
31	Construction Management	$244,000
TOTAL		**$3,085,000**

The annualized costs and AAHUs were used to calculate a total annual cost per average annual habitat unit (Table 26). The total cost per habitat unit is $1,786. The costs used for analysis purposes include total construction costs, IDC, and annualized O&M, adaptive management, and monitoring costs. Costs for Monitoring and Adaptive Management are included in Appendix C. Performance monitoring and adaptive management are funded by the NESP Program.

Table 25. Total Annual Cost per Average Annual Habitat Unit ($1,000's) (October 2024, FY25 Price Level, 3.0 percent discount rate)

Analysis Element	Cost	Total
Project First Cost ($)	$3,085	
IDC ($)	$52	
Total Economic First Cost ($)		$3,137
Annualized Economic First Cost ($)	$137	
Annual O&M ($)	$4	
Annual Adaptive Management and Monitoring Costs ($)	$23	
Total Annual Costs ($)		$164
AAHUs		92
Total Annual Cost/AAHU ($)		$1,786

7.3 OMRR&R Considerations.

Operation and maintenance of ecosystem restoration projects is similar to that undertaken by the partner agencies in day-to-day management of parks, boat ramps, wildlife management areas, and other public use areas. O&M is the responsibility of USACE. Upon completion of the construction as determined by the District Engineer, USACE shall operate and maintain the Project as defined in this PIR/EA and in the Project's O&M manual; 100 percent of all costs associated with the O&M of the Project would be borne by USACE. Table 26 lists the major O&M components, their associated frequencies, and costs.

Table 26. O&M Considerations

O&M Component	Frequency	Cost
Restore Hardpoints	Every 20 Years	$26,884
Restore Gradual Slope Revetment	Every 20 Years	$197,640

Replacement stone for the hard points and GSR are anticipated to be replenished at 20-year intervals, due to the projected flood frequency over the life of the project. Replenishment of this stone will ensure that adequate flows are observed through the side channel complex and

ensure the predicted habitat uplift remains in place through the life of the project. These training structures are vital to providing adequate velocities and proper substrate, which will assist in maintaining a free-flowing side channel with proper velocities to enhance habitat for aquatic organisms within the project area. If losses are noted within the first 10 years post construction, these will be covered under Adaptive Management actions.

7.4 Design Considerations.

7.4.1 Overview

Design for the side channel complex is anticipated to be initiated for the entire project up to approximately the 35% level of design. This will be used to develop and refine the contract acquisition plan, validate assumptions from feasibility, and otherwise determine the path forward for major design decisions. After the Plan is refined, the design refinements will likely be broken up by contract, and the first contract will proceed with the remainder of design, and then into contract acquisition. Once the first contract package is submitted to contracting, the subsequent contract package is assumed to commence with the remaining design tasks. If broken into more than two contract packages, subsequent contract packages will follow the same process. Any lessons learned during early construction stages will be applied to subsequent design packages, and/or result in implementation of one or more Adaptive Management strategies.

7.4.2 Surveys

Collection of mussel survey data has been conducted during the Planning phase and will be used to inform design. Determination of additional survey needs are ongoing. Bathymetry will be collected using a combination of single-beam and multi-beam sonar, with acquisition occurring when adequate water levels are present.

7.4.3 Geotechnical and Environmental Explorations

The PDT does not anticipate the need for either Geotechnical or Environmental Exploration and testing. HTRW and Clean Water Act compliance are likewise not anticipated to require exploration and testing at this time, but if construction activities are not determined to fall under Nationwide Permits and/or existing environmental permits/NEPA coordination, additional information may be needed. Design estimates included a conservative estimate of the cost for conducting these activities, if necessary.

7.4.4 Hydraulics and Hydrology

The aquatic features implemented in the Plan include placing suitable substrate for mussel riffle habitats and GSR. Design of these measures will require input from hydraulic engineers. Additional hydraulic modeling may also be utilized to inform design.

7.4.5 Civil Design

Planning Level of Design

The Planning process did not include Civil design of any measures beyond a conceptual level. Measures were quantified using a combination of 2-dimensional lines and shapes, along with combination of H&H models, and by manipulation of the existing conditions terrain to mimic stone placement. Quantities were extrapolated from this minimal information to provide an approximation of 10%-20% level of design. The remaining measures will also be designed and adjusted as needed to reduce impacts, manage construction costs, and maximize potential habitat benefits.

Alternatives are anticipated to have minimal staging area requirements. Hausgen boat ramp

access could be at the southern edge of limits (River mile 245.0R). The requirements of establishing reliable access for crews to conduct TSI and OMRR&R activities will be determined during PED.

Scope of Design Phase

After additional survey data is collected, an updated Existing Conditions Terrain model will be created for use by Civil Design and Hydraulics. This data will be used to model the proposed measures for use in the hydraulics model(s), develop detailed quantity estimates, and for generating construction drawings.

All measures from the Plan will be designed based on this terrain, aerial imagery, and site visits to the measure locations to identify potential design conflicts and opportunities. All measures will be designed in detail, and adjusted as needed from Planning to reduce impacts, manage construction costs, and maximize potential habitat benefits during Design.

Details on draft limitations for floating plant, and equipment assumptions and associated water surface elevations for establishing reliable access will also need to be determined during Design.

7.4.6 Cultural

Given that all planned work for the project would occur below the OHWM and construction would be conducted by floating barge, SHPO and tribal coordination was sent on 25 April 2025 requesting concurrence with the St. Louis District determination that no historic properties would be affected by this project. No response was received by from the Missouri SHPO, whereas four tribes sent letters concurring with our findings. Additionally, if it is deemed necessary the District plans to utilize the June 25, 2024, implemented, Programmatic Agreement (PA) regarding the Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program for any additional compliance with Section 106. The USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Program undertaking. All correspondence and meeting minutes are included in Appendix A – Coordination.

7.5 Construction Considerations.

The District identified several construction considerations in the study area. A summary of critical construction considerations is provided in the following sections.

7.5.1 Protected Species

7.5.1.1 Bald Eagles

Consideration (in coordination with the USFWS) would be given during design preparation to sequence construction activities in a manner that minimizes impacts. No forestry measures would be utilized within a buffer of at least 100 feet of a known Bald Eagle nest location. At least a 330 feet buffer would be utilized during the nesting season for Timber Stand Improvement (TSI) in locations where the eagle nest is not visible through a forested buffer. A 660 feet buffer would be utilized under instances of direct line of site during the active nesting season according to the National Bald Eagle Management Guidelines. Staging of equipment would not be allowed within a 660 feet buffer of a known active nest. Additional coordination with the USFWS would be conducted during the design phase to account for changes in conditions in the study area relative to proposed project measures prior to or during construction.

7.5.1.2 Gray Bat, Indiana Bat, Northern Long-Eared Bat, and Tricolored

Bat.

Any construction work requiring tree clearing activities must have tree clearing operations scheduled within the bats inactive season from November 1 to March 31. Continued coordination with USFWS will occur through future project phases if tree clearing would be done during the roost season. During clearing, dead trees, split trees, trees that have cavities, and trees with exfoliating bark would be favored for retention where possible. Design of forestry measures would aim to improve foraging habitat and promote development of long-term roost tree sites. With the entirety of this project falling below the OHWM, no impacts to T&E bat species are anticipated.

7.5.1.3 Migratory Wildlife

In accordance with Executive Order 13186, take of migratory birds protected under the Migratory Bird Treaty Act should be avoided or minimized, to the extent practicable, to avoid adverse impact on migratory bird resources. Tree clearing during winter would avoid impacts to nesting migratory wildlife.

7.5.1.4 Air Quality

Diesel emissions and fugitive dust during project construction may pose environmental and human health risks and should be minimized. Applicable protective measures as outlined in USEPA's "Construction Emissions Control Checklist" would be followed.

7.5.1.5 Permits

Laws of the United States and State of Missouri have assigned the USACE and Missouri with specific and different regulatory roles designed to protect the waters within and on the State's boundaries. Protecting Missouri waters is a cooperative effort between the applicant and regulatory agencies.

7.5.1.6 Section 404/401 Compliance

The District is compliant with Section 404 and 401 of the Clean Water Act. See the 404(b)1 evaluation (Appendix L – Clean Water Act) for more details. Based on this evaluation, the project qualifies for a Nationwide 27 permit for Ecosystem Restoration. The Nationwide 27 permit includes general conditions that meet MoDNR Section 401 water quality certification requirements. Therefore, the necessary Section 401 water quality certification would be achieved through the associated Nationwide 27 permit conditions.

7.5.1.7 National Pollutant Discharge Elimination System (NPDES)

Effective March 10, 2003, the NPDES storm water discharge permit is required when a construction activity disturbs more than one acre. A storm water discharge or NPDES permit for construction activities is not likely required due to the project being completely under the OHWM.

7.5.2 Construction Schedule Constraints

Scheduling of construction contracts would depend on availability of funds. The following documents constraints related to construction:

- Flooding has the potential to limit site access.
- No clearing of trees shall be allowed between April 1 and October 1, to avoid impacts to bat summer roosting habitat.
- During waterfowl season construction activities may be limited to certain areas.
- Any potential construction staging and access points to project measures would be defined during Plans and Specifications to avoid and minimize potential impacts to wetland resources.

- Coordination with MDC personnel is required prior to working during hunting seasons.
- No clearing of trees where roosting or occupied nests exist shall be allowed when bald eagles are present in the area. There are known active bald eagle nests near the study area. Construction activities and other sources of disturbance would be avoided within a 660-foot buffer area from the nest, when active. See section 3.2.3.2 for more detail.
- In accordance with Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, take of migratory birds protected under the MBTA should be avoided or minimized, to the extent practicable, to avoid adverse impact on migratory bird resources.

7.6 Real Estate Considerations.
No LERRDS are anticipated to construct the Project measures. Measures are below the ordinary high water mark. There are no proposed PL 91-646 relocations, as there are no real estate acquisitions required or identified. All access to the Project would be by water. Boat ramps in the Project vicinity are public boat ramps, which the contractor may use. The Contractor would need to abide by local boat ramp usage regulations. All placement materials would be excavated from within navigational servitude and Project waters and from existing topsoil within the Project area.

7.7 Monitoring and Adaptive Management.
Per Section 2039 of WRDA 2007, monitoring for ecosystem restoration studies would be conducted to determine Project success. “Monitoring includes the systematic collection and analysis of data that provides information useful for assessment of Project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain Project benefits.”

This section summarizes the post-construction evaluation plan, which includes performance monitoring, adaptive management, and long-term performance reporting, described in Table 28. See Appendix E, Monitoring and Adaptive Management, for a full description of post-construction evaluation, including performance monitoring, adaptive management activities, and long-term performance reporting. Table 28 presents the post-construction evaluation plan, which displays several specific parameters and the levels of restoration that the Project hopes

Table 27. Post-Construction Evaluation Description

Monitoring Stage	Length of Time	Description	Funding Source
Performance Monitoring	10 years	For entire Project, determine the degree to which the Project is meeting the success criteria and for informing potential adaptive management decisions	NESP Programmatic Cost
Adaptive Management	10 years	Provides a process for making decisions in the face of uncertainty and learning from outcomes of management actions; may improve the performance of a designed construction measure that is not meeting performance criteria	NESP Programmatic Cost

The 2008 Implementation Guidance for Upper Mississippi River and Illinois Waterway System also indicates that NESP PIRs must consider the “degree to which the project contributes to learning in an adaptive management context…” Hausgen Island Complex side channel

restoration study contributes to learning in an adaptive management context by establishing monitoring of aquatic habitats for flow diversity and mussel habitat quality. Other factors may be considered to evaluate Project performance and success.

7.8 Environmental Operating Principles (EOPs).
The EOPs outline the USACE's role and responsibility to sustainably use and restore our natural resources in a world that is complex and changing. The TSP meets the intent of the EOPs. The PDT proactively considered the environmental consequences of the proposed Project, as well as the benefits of the TSP. The Project would be constructed in compliance with all applicable environmental laws and regulations. In accordance with the EOPs, the District has proposed a Project that supports economic and environmentally sustainable solutions.

7.9 Risk and Uncertainty.
Areas of risk and uncertainty have been analyzed and were defined so that decisions could be made regarding the reliability of estimated benefits and the costs of alternative plans. Risk is defined as the probability or likelihood for an outcome. Uncertainty refers to the likelihood that an outcome results from a lack of knowledge about critical elements or processes that then contributes to risk or natural variability in the same elements or processes.

The PDT worked to manage risk in developing measures by expanding on and referencing successful similar work completed by previous UMRS restoration projects and the Upper Mississippi River Restoration Environmental Management Program Environmental Design Handbook (Corps, Rock Island District, Rock Island IL), 2012. The PDT used that experience and information to identify possible risks and decrease uncertainty in plan formulation. No measures in the TSP are believed to be burdened by significant risk or uncertainty regarding the eventual success of the proposed measures. Significant risk would be avoided by proper design, appropriate selection, and correct seasonal timing of applications.

Table 28. Summary of Risk and Uncertainty

Risk	Driver	Consequence	Risk Type	Risk Level	Risk Management
Internal takings analysis could impact project scope, schedule, & implementation	USACE Guidance on takings analysis is not finalized, may become hyper conservative due to recent litigation. Takings analysis may have to be approved at HQ.	Project schedule could be delayed. Findings may not be compliant with USACE guidance and effect implementation of the project.	Study, Implementation	High	H&H modeling refinement, internal coordination. Preliminary analysis shows minimal to no rise in water surface. Further refinement and check on no rise would occur during PED. Coordination with Office of Counsel.

Risk	Driver	Consequence	Risk Type	Risk Level	Risk Management
Project features could cause an increase to water surface elevations or adversely affect private property	Preliminary analysis of TSP shows minimal or no rise with the addition of the proposed features (Hard Points, notching, etc.)	Expected rise is <0.1'. Expected to be compliant / obtain permit from State of Illinois.	Study	Low	Continue H&H modeling and external coordination with IDNR. (Missouri does not require permit)
Project features cause adverse effects to the federally authorized UMR-IWW Navigation channel	Measures include potential for siltation to encroach in adjacent channel.	Decreased depth of authorized navigation channel causing additional dredging (costs).	Study	Low	Alternatives were H&H modelled and shown to not cause impacts to Navigation channel. Monitoring and Adaptive Management Plan would be in place to monitor navigation impacts.

7.10 Compliance with Environmental Statutes.

Status of compliance activities with environmental protection statutes, regulations, and guidelines is listed in below in Table 30. Remaining compliance activities would be completed as construction limits and timelines develop with enough detail to properly coordinate any potential effects related to the TSP within and/or adjacent to the study area.

Table 29. Environmental Protection Statutes and Other Environmental Requirements

Federal Environmental Protection Statutes and Requirements	Applicability/ Compliance[1/2/3]
Federal Statutes	
Bald and Golden Eagle Protection Act of 1940, as amended	FULL
Clean Air Act, as amended	FULL
Clean Water Act, as amended	FULL
Coastal Zone Management Act, as amended	NA
Endangered Species Act of 1973, as amended	FULL
Federal Water Project Recreation Act, as amended	FULL
Fish and Wildlife Coordination Act, as amended	FULL
Land and Water Conservation Fund Act of 1965, as amended	FULL
Migratory Bird Treaty Act of 1918, as amended	FULL
National Environmental Policy Act of 1969, as amended	PARTIAL
National Historic Preservation Act of 1966, as amended	FULL
National Wildlife Refuge Administration Act of 1966	FULL
Noise Pollution and Abatement Act of 1972	FULL
Watershed Protection and Flood Prevention Act	FULL
Wild and Scenic Rivers Act of 1968, as amended	NA
Farmland Protection Policy Act of 1981	NA
Executive Orders, Memoranda	
Floodplain Management (E.O. 11988)	FULL
Protection of Wetlands (E.O. 11990)	FULL
Safeguarding the Nation from the Impacts of Invasive Species (E.O. 13112)	FULL
Protection and Enhancement of Environmental Quality (E.O. 11514)	FULL
Protection and Enhancement of the Cultural Environment (E.O. 11593)	FULL
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, Aug 1976)	NA
Consultation and Coordination with Indian Tribal Governments (E.O. 13175)	FULL

[1] Full Compliance = having met all requirements of the statute for the current stage of project
[2] Partial Compliance = having met some requirements of the statute for the current stage of project or anticipate full compliance at completion of current state of project (additional information in Section VI.H)
[3]Not Applicable = no requirements for the statute or Project does not contain resources applicable to the law

ESA and FWCA would be fully complied with after USFWS reviews the BA during the Public Notice Period. All other partially complied sections will be fully complied prior to FONSI signature.

8 PUBLIC INVOLVEMENT, COORDINATION, AND CONSULTATION*

Scoping is an early and open process for determining the range of issues to be addressed and for identifying the significant issues related to a proposed action. Scoping was conducted during the planning process using a variety of communication methods with the affected public, agencies, and organizations. Scoping and coordination have been conducted with the following state and federal agencies, and other interested parties: RRAT, USFWS, MDC, and Missouri State Historic Preservation Office.

8.1 Coordination Meetings.

This draft PIR/EA is a reflection of a collaboration of key partners and stakeholders. Numerous coordination and stakeholder meetings, as well as site visits, were conducted to discuss problems, opportunities, project goals and objectives, potential restoration measures, and expected outcomes with and without the proposed project. A scoping charrette was held 03 November 2023, prior to the development of the study. A full copy of the charrette report is available upon request. In addition, development of this report was actively coordinated throughout the planning process with the RRAT as well as other resource agencies.

8.2 Coordination by Correspondence.

8.2.1 Public Views and Comments.

In accordance with NEPA, the draft report with integrated EA will be available to interested members of the public during a 30-day public review period, yet to be scheduled. The report will be on the St. Louis District website and a letter will be mailed to interested members of the public identifying where to find the report, how to provide comments, and the date of the public meeting/open house to be held. Comments received during public review will be incorporated into the report where appropriate prior to finalizing the design.

8.2.2 Historical Preservation and Tribal Coordination

The National Historic Preservation Act of 1966, as amended (NHPA), requires federal agencies to consider the effects of “undertakings”, or projects, on significant historical or archaeological sites (“historic properties”). To ensure that agencies consider the effects they are required to provide the State Historic Preservation Office (SHPO) an opportunity to review and comment on the plans and the agency’s assessment of the potential risk to historic properties through the process of consultation. Coordination is included in Appendix A.

The United States government has a unique legal relationship with federally recognized Indian tribes based on recognition of inherent powers of Tribal sovereignty and self-government. Federal agencies are required to provide tribes the opportunity to comment on projects that may affect areas that hold significance for their tribe. The St. Louis District consults with 19 Tribes that have an interest within this area. Coordination is included in Appendix A.

8.2.3 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act directs the Service to investigate and report on proposed Federal actions that affect any stream or other body of water and to provide recommendations to minimize impacts on fish and wildlife resources (16 U.S.C. 661-666(e)). The PDT has been in communication with the USFWS regarding the Fish and Wildlife Coordination Act prior to the development of the study. The USFWS, as a member of the RRAT, has been fully involved with the project and has provided guidance during the development of the TSP. USFWS Ecological Services Office provided a Draft Fish and Wildlife Coordination Act Report (DCAR) for the project on 17 April 2025 (Appendix A – Coordination). Coordination regarding the Fish and

Wildlife Coordination Act is ongoing.

9 RECOMMENDATION

The Recommended Plan is Alternative 2, which includes measures to maximize environmental benefits related to side channel connectivity, flow diversity, substrate diversity, sediment transport, and depth diversity. The estimated Project first cost of the Recommended Plan is $3,085,000 (October 2024 (FY25) price level). The project is 100 percent Federally funded. Upon completion, USACE is responsible for O&M at an estimated annual cost of $4,000.

The expected outputs of the Recommended Plan include restoration of 187 acres of habitat. The Recommended Plan would contribute 92 average annual habitat units of side channel habitat over the 50-year period of analysis.

The Recommended Plan is consistent with the NESP ecosystem restoration program authorization in WRDA 2007 Section 8004 and would, in concert with other NESP ecosystem projects, ensure the environmental sustainability of the existing Upper Mississippi River and Illinois Waterway and address the cumulative environmental impacts of operation of the system and improve the ecological integrity of the Upper Mississippi River and Illinois River.

I have weighed the outputs to be obtained from the full implementation of the Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. I recommend that the Hausgen Island Complex Side Channel Restoration Project be implemented as generally described in this report.

The recommendations herein reflect the information available at the time and current Department of the Army policies governing the formulation of individual projects. They do not reflect programming and budgeting priorities inherent in the formulation of national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are approved for implementing funding. However, prior to approval, the state, Federal agencies and other parties will be advised of any modifications and afforded the opportunity to comment.

Andy J. Pannier COL,
U.S. Army Corps of Engineers
District Commander

10 ACKNOWLEDGEMENTS*

Name	Role	Education	Years of Experience
Shane Simmons	Project Manager	BS Fisheries and Wildlife MS Biology	10
Justin Garrett	Biologist, Environmental Planning; Co-Lead Report Writer; National Environmental Policy Act (NEPA) Compliance	BS Ecology, Evolution, and Systematics MS Biology	11
Zachary Day	Biologist, Environmental Planning; Co-Lead Report Writer; National Environmental Policy Act (NEPA) Compliance; ESA; FWCA; CWA	BS Ecology and Evolution	3
Katy Fechter	Plan Formulator; Report Writer	BS Ecology, Evolution, and Environment	
Matt Voss	Hydraulic Engineer Engineering Technical Lead	BS Civil Engineering	19
Maude Wilkinson	Hydraulic Engineer	BS Civil Engineering	4
Ryan Holland	Cost Engineering Technician	BS Accounting & Finance	11
Kaleb Rakers	Environmental Specialist	BS Environmental Science	2
Lara Andersen	Cultural Resources & Tribal Liaison	BA Anthropology MA Anthropology	30
Joie Lyerla	Realty Specialist	BS Business Administration	16
Jen Backer	GIS	BS Biology/Psychology MA Biology MS Geography	3
Brandon Belt	Office of Legal Counsel	BS Biological Sciences Juris Doctor Certificate of Health Law	7
Doug Reilly	Civil Engineer	BS Civil Engineering	16

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12 DRAFT FINDING OF NO SIGNIFICANT IMPACT*

NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM
PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION
ECOSYSTEM RESTORATION PROJECT

POOL 25, UPPER MISSISSIPPI RIVER MILES 248-245
LINCOLN COUNTY, MISSOURI

The U.S. Army Corps of Engineers (USACE), St. Louis District (District) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final Integrated Project Implementation Report and Environmental Assessment (PIR/EA) dated **DATE OF PIR/EA**, for the **HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION ECOSYSTEM RESTORATION PROJECT** addresses **ECOSYSTEM RESTORATION** opportunities in **LINCOLN COUNTY, MISSOURI** The final recommendation is contained in the Final Project Implementation Report, dated **DATE OF FINAL PIR**.

The Final PIR/EA, incorporated herein by reference, evaluated various alternatives that would **maintain, enhance, and restore side channel connectivity to benefit native riverine fish and wildlife and to improve side channel habitat, including substrate stability, to benefit native freshwater mussels** in the study area. The recommended plan is the **National Ecosystem Restoration (NER) Plan** and includes:

In addition to a “no action” plan, **two** alternatives were evaluated. The alternatives included:

- **Alternative 1 – Minimum Habitat Benefit – Mussel Habitat Enhancement/Bank Stabilization:** This plan narrowly focuses on bank stabilization only reinforcing the shoreline utilizing GSR. This plan also adds Mussel Habitat enhancement by adding rock-gravel substrate to the side channel habitat within the proposed project area. (Figure 13)

- **Alternative 2 – Maximum Habitat Benefit**: Along with the benefits from Alternative 1, this plan includes measures to maximize environmental benefits related to side channel connectivity, flow diversity, substrate diversity, sediment transport, and depth diversity. This plan also consists of all measures included in Alterative 1. (Figure 14)

SEE SECTION 4 FOR MORE DETAILS REGARDING ALTERNATIVE FORMULATION AND SELECTION.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation	Resource unaffected by action	Positive effects
Aesthetics	X			
Air Quality	X			
Aquatic resources/wetlands				X
Invasive species	X			
Fish and wildlife habitat				X
Threatened/Endangered species /critical habitat				X
Historic properties	X			
Other cultural resources	X			
Floodplains	X			
Hazardous, toxic, & radioactive waste	X			
Hydrology	X			
Land use	X			
Navigation	X			
Noise levels	X			
Public infrastructure	X			
Socio-economics				X
Soils			X	
Tribal trust resources	X			
Water quality				X

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the PIR/EA would be implemented, if appropriate, to minimize impacts. All river-based construction Best Management Plans shall be taken to avoid and minimize impacts to the environment.

No compensatory mitigation is required as part of the recommended plan.

Public review of the draft PIR/EA and FONSI was completed on **DATE DRAFT EA AND FONSI REVIEW PERIOD ENDED**. All comments submitted during the public review period were responded to in the Final PIR/EA and FONSI.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the recommended plan would have no effect on federally listed species or their designated critical habitat: Based on the information obtained, USACE has determined the proposed project would have “No Effect” for the Gray Bat, Indiana Bat, Tricolored Bat, Monarch butterfly, and Western Regal Fritillary butterfly.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the recommended plan may affect but is not likely to adversely affect the following federally listed species or their designated critical habitat: Based on the information obtained, USACE has determined the proposed project “*May Affect, but is*

Not Likely to Adversely Affect" for the Spectaclecase mussel. The U.S. Fish and Wildlife Service (FWS) concurred with the Corps' determination on **DATE OF CONCURRENCE LETTER**

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that the recommended plan has no potential to cause adverse effects on historic properties.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with NWP 27. The Clean Water Act Section Guidelines evaluation is found in **APPENDIX L** of the PIR/EA.

A water quality certification pursuant to section 401 of the Clean Water Act was included with Nationwide Permit 27 – Aquatic Habitat Restoration, Enhancement, and Establishment Activities from the **STATE OF MISSSOURI**. All conditions of the water quality certification would be implemented in order to minimize adverse impacts to water quality.

Technical, environmental, economic, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives.[2] Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.[3]

Date

Andy J. Pannier
Colonel, U.S. Army
District Commander

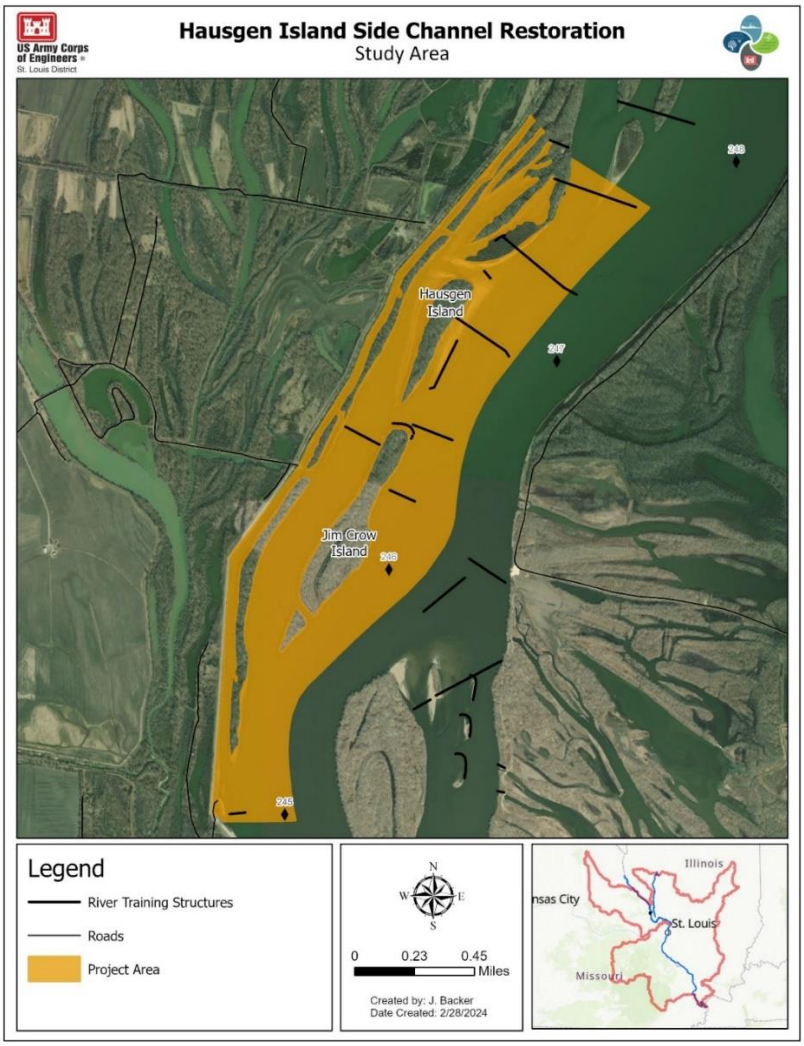
[2] 40 CFR 1505.2(B) requires identification of relevant factors including any essential to national policy which were balanced in the agency decision.
[3] 40 CFR 1508.13 stated the FONSI shall include an EA or a summary of it and shall note any other environmental documents related to it. If an assessment is included, the FONSI need not repeat any of the discussion in the assessment but may incorporate by reference.

NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION
ECOSYSTEM RESTORATION PROJECT

POOL 25, UPPER MISSISSIPPI RIVER MILES 248-245
LINCOLN COUNTY, MISSOURI



Appendix A: Coordination

US Army Corps of Engineers ®
St. Louis District

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1 COORDINATING AGENCIES

Scoping and coordination have been conducted with the following State and Federal Agencies and other interested parties:

Missouri Department of Natural Resources (MoDNR)

US Fish and Wildlife Service (FWS)

Missouri Department of Conservation (MDC)

Illinois Department of Natural Resources (IDNR)

2 COORDINATION MEETINGS

A scoping charrette was held on 03 November, 2023 at the Clarence Cannon National Wildlife Refuge prior to the development of the study. RRAT representatives from each of the four organizations attended and provided input on project objectives, potential management measures, future conditions of the site, and identified resource issues. A full copy of the Planning Charrette report is available upon request. In addition, development of this report was actively coordinated throughout the planning process with the RRAT as well as other resource agencies.

Additionally, numerous coordination and stakeholder meetings, as well as site visits, were conducted to discuss problems, opportunities, project goals and objectives, potential restoration measures, and expected outcomes with and without the proposed project.

3 FISH AND WILDLIFE SERVICE

3.1 Endangered Species Act

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

In Reply Refer To: 03/18/2025 15:25:40 UTC
Project Code: 2024-0041378
Project Name: NESP Eco - Hausgen Island Side Channel Restoration Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).
New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. **Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days.** The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Refer to the Midwest Region S7 Technical Assistance website for step-by-step instructions for making species determinations and for specific guidance on the following types of projects:

projects in developed areas, HUD, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

Federally Listed Bat Species

Indiana bats, gray bats, and northern long-eared bats occur throughout Missouri and the information below may help in determining if your project may affect these species.

Gray bats - Gray bats roost in caves or mines year-round and use water features and forested riparian corridors for foraging and travel. If your project will impact caves, mines, associated riparian areas, or will involve tree removal around these features – particularly within stream corridors, riparian areas, or associated upland woodlots –gray bats could be affected.
Indiana and northern long-eared bats - These species hibernate in caves or mines only during the winter. In Missouri the hibernation season is considered to be November 1 to March 31. During the active season in Missouri (April 1 to October 31) they roost in forest and woodland habitats. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥5 inches diameter at breast height (dbh) for Indiana bat, and ≥3 inches dbh for northern long-eared bat, that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Tree species often include, but are not limited to, shellbark or shagbark hickory, white oak, cottonwood, and maple. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, Indiana bats or northern long-eared bats could be affected.
Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas;
- Trees found in highly-developed urban areas (e.g., street trees, downtown areas);
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees; and
- A stand of eastern red cedar shrubby vegetation with no potential roost trees.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example "No Effect" document also can be found on the S7 Technical Assistance website.

2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see #3 below) – then project proponents can conclude the proposed activities **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species through the Species website.
3. If IPac returns a result that one or more federally listed bat species (Indiana bat, northern long-eared bat, or gray bat) are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** these bat species **IF** one or more of the following activities are proposed:
    a. Clearing or disturbing suitable roosting habitat, as defined above, at any time of year;
    b. Any activity in or near the entrance to a cave or mine;
    c. Mining, deep excavation, or underground work within 0.25 miles of a cave or mine;
    d. Construction of one or more wind turbines; or
    e. Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on listed bat species. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example "No Effect" document also can be found on the S7 Technical Assistance website.
If any of the above activities are proposed in areas where one or more bat species may be present, project proponents can conclude the proposed activities **may affect** one or more bat species. We recommend coordinating with the Service as early as possible during project planning. If your project will involve removal of over 5 acres of suitable forest or woodland habitat, we recommend you complete a Summer Habitat Assessment prior to contacting our office to expedite the consultation process. The Summer Habitat Assessment Form is available in Appendix A of the most recent version of the Range-wide Indiana Bat Summer Survey Guidelines.

Other Trust Resources and Activities

Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. Should bald or golden eagles occur within or near the project area please contact our office for further coordination. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA

to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

Next Steps

Should you determine that project activities **may affect** any federally listed species or trust resources described herein, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

If you have not already done so, please contact the Missouri Department of Conservation (Policy Coordination, P. O. Box 180, Jefferson City, MO 65102) for information concerning Missouri Natural Communities and Species of Conservation Concern.
We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

John Weber

Attachment(s):

- Official Species List

Project code: 2024-0041378 03/18/2025 15:25:40 UTC

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
(573) 234-2132

PROJECT SUMMARY

Project Code: 2024-0041378
Project Name: NESP Eco - Hausgen Island Side Channel Restoration Project
Project Type: Restoration / Enhancement of Waterbody
Project Description: Restore aquatic area below OHW in Hausgen Side Channel Complex.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.06960075,-90.70850242629967,14z



Counties: Lincoln County, Missouri

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Project code: 2024-0041378 03/18/2025 15:25:40 UTC

MAMMALS

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/H7GN6KP7ZFHUHPQ3UG5YIQSM4I/documents/generated/7280.pdf	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

CLAMS

NAME	STATUS
Spectaclecase (mussel) *Cumberlandia monodonta* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7867	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Western Regal Fritillary *Argynnis idalia occidentalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/12017	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Zachary Day
Address: 1222 Spruce St
City: St. Louis
State: MO
Zip: 63103
Email zachary.a.day2@usace.army.mil
Phone: 3143318027

3.2 Fish and Wildlife Coordination Act

United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Illinois - Iowa Field Office
1511 47th Avenue
Moline, Illinois 61265

In Reply Refer To:
FWS/SISO
Consultation Code: 2024-0041378

April 17, 2025

Colonel Andy J. Pannier
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

Attn: Zachary Day, CEMVP-PD-C

Dear Colonel Pannier:

This letter constitutes our Draft Fish and Wildlife Coordination Act Report (Report) for the Hausgen Island Complex Side Channel Restoration Navigation and Ecosystem Sustainability Program (NESP) Project located between Upper Mississippi River miles 245 and 248, Lincoln County, Missouri. This report is intended to provide partial compliance with Subsection 2(b) of the Fish and Wildlife Coordination Act and compliance with the Endangered Species Act of 1973, as amended, and the National Environmental Policy Act, as amended. This Report has not been reviewed by the Missouri Department of Conservation or the Illinois Department of Natural Resources and additional coordination with those agencies may be warranted.

Introduction

The Hausgen Island Complex Side Channel Restoration Project (Project) is a component of NESP Ecosystem Restoration, authorized by Sections 8004 of the Water Resources Development Act (WRDA) of 2007. NESP is a long-term program of ecosystem restoration and navigation improvements for the Upper Mississippi River System (UMRS) and the primary goal of the program is to increase the capacity and improve the reliability of the inland navigation system while restoring, protecting, and enhancing the environment. The proposed Project involves ecosystem restoration, and the project area consists of 250 acres of side channels and connected backwater habitats.

Resource Problems and Opportunities

The quantity and quality of aquatic habitats have degraded within the project area due to sedimentation related to the impoundment and operations of the Upper Mississippi River System and resulting changes in hydraulics and hydrology. The loss of side channel depth and flow diversity, structural diversity, and aquatic connectivity has decreased habitat function, extent, and availability for native aquatic species including fish and mussel resources. The stressors are likely to continue and cause further decline in the quality of habitats within the project area.

The primary problems to be addressed by this project include:

- Substrate Homogenization
- Reduced Side Channel Connectivity
- Homogenized Side Channel Morphology (bathymetric and hydraulic diversity).

The degraded state of the project area, however, provides an opportunity to restore side channel and aquatic habitat, function, and process for the benefit of fish and wildlife resources.

Goals and Objectives

The goal of the Project is to increase depth and flow diversity of aquatic side channels throughout the project area. To achieve this goal a planning team of biologists, foresters, engineers, and planners from the U.S. Army Corps of Engineers (USACE), state resource agencies, and USFWS developed the objectives for the project. The objectives include the following:

- Increase side channel connectivity
- Increase side channel flow diversity
- Increase substrate diversity
- Increase side channel sediment transport
- Increase depth diversity

The goals and objectives of the Project work towards achieving the desired future conditions identified in HNA-II for the Lower Impounded cluster of UMR pools (McCain et al. 2018):

- Restore diversity of aquatic habitat types with desire for more lentic and backwater habitats, preferably shallow lotic areas and deep lentic areas

Proposed Project Features

To achieve the project objectives, several project plans/features were evaluated. The tentatively selected plan (TSP) Alternative 2 consists of the following:

- Rock – Gravel Substrate enhancement
- Bank Stabilization utilizing Gradual Slope Revetment
- Notching / Partial degradation of dike at RM 247.2
- Creation of Hard Points within side channel

This plan restores approximately 250 acres of side channels and connected backwater habitats within the Project area.

Methodology to Evaluate Alternatives

The Project was analyzed using the General Freshwater Mussel Habitat Model. Existing conditions, future without project conditions and future with project conditions were examined.

This analysis was conducted with team members representing the USACE, state resource agencies, and USFWS.

The utilized evaluation model produced a rating of habitat quality for each respective habitat type. This rating is referred to as a Habitat Suitability Index (HSI). The HSI, a value ranging from 0.1 to 1.0, measures the existing and future habitat conditions compared to optimum habitat, which is 1.0. This value, when multiplied by the available habitat within the project area, will provide a measure of available habitat quality and quantity known as habitat units (HUs). Average annual habitat units (AAHUs) for each species are typically calculated to reflect expected habitat conditions over a 50-year project life. Target years for evaluation included 0 (existing condition), 1, 5, 10, 25, and 50 years.

Existing, Future without, and Future with Project Conditions

Several general and site-specific assumptions were made as to what the project area and vicinity would be like 50 years in the future with and without the project and can be found in the Habitat Evaluation Appendix of the Project Implementation Report (USACE 2024).

Existing, Future without, and Future with Project Conditions

Side Channel/Substrate Enhancement

Habitat suitability within the side channel and substrate enhancement areas improved with the project, while without the project the habitat declined over time (Table 1). Habitat quality for mussels improved with the project due to improved aquatic cover, substrate heterogeneity, flow at depth, side channel connectivity, and fish richness. Over time it was assumed that the quality of habitat with the project would eventually decline due to sedimentation and reduced flow but would remain suitable. Without the project, the habitat quality would continue to degrade over time due to sedimentation and lack of flow. Habitat quality for mussels would decline due to reduced substrate diversity, water depth, channel flow/connectivity, fish richness, and aquatic cover.

Table 1. Habitat Suitability Index (HSI) scores; Existing, Future with Project (Year 5,10,25 and 50) and Future without Project (Year 0, 5,10,25 and 50), Hausgen Island NESP.

Habitat Type /Measure	Model	Existing	Future Without					Future With				
		Year 0	1	5	10	25	50	1	5	10	25	50
Side Channel	Mussel	0.68	0.68	0.66	0.45	0.38	0.28	0.96	0.96	0.95	0.93	0.81

Summary

The habitat analysis indicates that side channel restoration and mussel substrate enhancement features in the preferred alternative results in a net increase of 92 AAHUs over the future without - no action alternative.

Conclusions and Recommendations

According to the Incremental Cost Analysis, the preferred alternative ranks 3 out of 3 in cost per AAHU output compared to the other alternatives including the no action alternative. It is very difficult to capture the full benefits associated with these types of restoration projects. For purposes of the Incremental Cost Analysis, the model was only able to capture habitat unit benefits associated with the limited acreage evaluated within the project area. However, we believe that the ecosystem benefits of aquatic habitat restoration extend beyond the project area and limits for both aquatic and terrestrial species. These habitats are critical to migratory fish and birds and provide habitat for a variety of other wildlife resources. We support the preferred alternative as it will restore a large component of habitat diversity in this portion of the Mississippi River System.

Overall, the proposed project will be beneficial to the Mississippi River System and biota dependent upon them by improving habitat quality in this portion of the river. The project will improve the quality and diversity of aquatic habitats within the project area. Large river fish and other aquatic organisms will gain improved access to important habitats for several life stages, such as spawning, rearing and over wintering. These areas will also provide an important feeding area for aquatic organisms and serve as a production area for small fish and invertebrates that other terrestrial organisms feed upon. In addition, mussel resources will gain improved habitat conditions for colonization and survival. The proposed Project will be beneficial to a variety of wildlife resources and is supported by the Service.

Threatened and Endangered Species

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service (Service) information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action. You can visit our Information, Planning, and Conservation System (IPaC) at the following link below to obtain an updated official U.S. Fish and Wildlife species list.

https://ipac.ecosphere.fws.gov

Although the bald eagle has been removed from the threatened and endangered species list, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). The Service developed the National Bald Eagle Management Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. The Service is unaware of any bald eagle nests in the proposed project area; however, if a bald eagle nest is found in the project area or vicinity of the project area then our office should be contacted, and the guidelines implemented. A copy of the guidelines is available at:

https://www.fws.gov/media/national-bald-eagle-management-guidelines-0

Thank you for the opportunity to provide this Draft Fish and Wildlife Coordination Act Report. If you have questions, please contact me at (618) 998-5945.

Sincerely,

MATTHEW MANGAN Digitally signed by MATTHEW MANGAN
Date: 2025.04.17 16:25:25 -05'00'

Matthew T. Mangan
Fish and Wildlife Biologist

Enclosures: Appendix A – Literature Cited

cc: IDNR (Atwood, Glover)
MDC (Vitello)

APPENDIX A

LITERATURE CITED

McCain, K.N.S., S. Schmuecker, and N.R. De Jager *2018.* Habitat Needs Assessment-II for the Upper Mississippi River Restoration Program: Linking Science to Management Perspectives. U.S. Army Corps of Engineers, Rock Island District, Rock Island, IL

USACE (U.S. Army Corps of Engineers). 2024. Navigation and Ecosystem Sustainability Program, Draft Project Implementation Report with Integrated Environmental Assessment, Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project. U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO.

4 MISSOURI DEPARTMENT OF CONSERVATION

Missouri Department of Conservation

Natural Heritage Review Report

May 6, 2025

Science Branch
P. O. Box 180
Jefferson City, MO 65102
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NaturalHeritageReview@mdc.mo.gov
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Zachary Day
USACE
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NHR ERT ID:	16607	NHR ERT Level:	3
Project type:	Habitat Conservation and Restoration, In-stream habitat restoration (habitat improvement structures)		
Location/Scope:	Between RM 248 and 245		
County:	Lincoln		
Project Title:	NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM HAUSGEN ISLAND		
Query received:	4/3/2025		

This NATURAL HERITAGE REVIEW is not a site clearance letter. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. These records serve as one reference and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Look for additional information about the biological and habitat needs of records listed to avoid or minimize impacts. More information is at Natural Areas | Missouri Department of Conservation (mo.gov) and Missouri Fish and Wildlife Information System (MOFWIS).

Level 3: Records of federal-listed (also state-listed) species or critical habitats near the project site:

Natural Heritage records identify the Mississippi River within the project area:

- **Mississippi River:** The Mississippi River (together with its tributary mouths) is home to many aquatic species of state and federal concern, including federal-listed Pallid Sturgeon, several mussel species in the pooled reaches upstream of the Missouri confluence and mainstem; and state-listed Lake Sturgeon, and Flathead Chubs; and Interior least terns in the lower Mississippi. All these are sampled at points but must be assumed to be present in suitable habitats through extended river reaches. Bluffs, banks, and floodplains may also include habitat used by listed Gray bats, Indiana bats and Bald Eagles.
  - Terrestrial projects that manage construction and include operation plans to avoid runoff of sediment or pollutants are unlikely to affect the aquatic species.
  - Regulations enforced by other agencies to protect water quality and human health are generally adequate to protect the needs of wildlife as well.
  - Projects that place fill in or discharge water to the river are subject to federal permits, and strict observance of conditions required in those permits is important to minimize risk of damage to endangered species.

  See General Recommendations for additional information on minimizing impacts to aquatic resources.

Natural Heritage records identify Bald Eagles within 1 mile of the project area and Fat Pocketbook Mussels within 2 miles of the project area:

- **Bald Eagles:** Bald Eagles (*Haliaeetus leucocephalus*) nest near streams or water bodies in the project area. Nests are large and fairly easy to identify. While no longer listed as endangered, eagles continue to be protected by the federal government under the Bald and Golden Eagle Protection Act. Work managers should be alert for nesting areas within 1500 meters of project

activities, and follow federal guidelines at: Do I need an eagle take permit? | U.S. Fish & Wildlife Service (fws.gov) if eagle nests are seen.

Following USFWS Incidental Take Guidelines: To avoid the incidental take of bald eagles we recommend:

- a buffer of at least 660 feet between project activities and the nests (including active and inactive nests).
- If project activities are within 660 feet of the nest, please restrict activities to outside the nesting season. The nesting season in Missouri is January 1 – July 15.
- If these recommendations cannot be implemented, incidental take of bald eagles may occur and a permit from USFWS may be necessary.
- Do not clear nests or nest trees.

➢ **Mussels:** Mussels are relatively immobile animals that are vulnerable to pollutants, sediment discharges, channel alterations and other activities destructive to mussel habitat. Activities that alter or destabilize stream bottoms or banks or introduce silt, chemical or organic pollutants should be avoided. Avoid crossing flowing water but, if unavoidable, minimize crossing distance and use temporary crossings that do not restrict water flow. Please see Best Management Practices for Construction and Development Projects Freshwater Mussels (mo.gov).

FEDERAL LIST species/habitats are protected under the Federal Endangered Species Act. **Contact U.S. Fish & Wildlife Service** (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; 573-234-2132) for Endangered Species Act coordination and concurrence information).

Level 2: Records of state-listed (not federal-listed) endangered species AND / OR state-ranked (not state-listed endangered) species and natural communities of conservation concern. The Department tracks these species and natural communities due to population declines and/or apparent vulnerability.

Natural Heritage records Identify the following State Endangered Species near the project area:

Scientific Name	Common Name	State Rank	Proximity (miles)	Primary Habitat
Reginaia ebenus	Ebonyshell	S1	<5	River/stream
Botaurus lentiginosus	American Bittern	S1	<5	Marsh, Wet prairie/meadow, Shrub swamp, Grassland native prairie
Acipenser fulvescens	Lake Sturgeon	S1	<4	River/stream

➢ **American Bitterns** (*Botaurus lentiginosus*) nest in permanent wetlands with tall, emergent vegetation such as bur-reed and bulrush. Breeding occurs between April and July. Protection and restoration of quality wetlands are important for many species, including the American Bittern. Project activities should not occur within 100 feet of wetland habitat between April 1 and July 31 to prevent disturbing nesting birds. Erosion and sediment controls should be implemented, maintained and monitored for the duration of the project. Disposal of wastes and garbage should be done in designated areas far from wetlands. Draining or destroying permanent, emergent wetland habitat should be avoided. See https://mdc.mo.gov/sites/default/files/2020-06/AmericanBitternBMP.pdf for best management practices regarding this species.

- **Lake Sturgeon:** Lake Sturgeon (*Acipenser fulvescens*) are widely distributed in North America. In Missouri, they are found in the Mississippi and Missouri Rivers but have also been known to occur in the larger tributaries of those two rivers. Lake Sturgeon are listed as either threatened or endangered throughout most of its original range in the United States. Over-harvest appears to have been responsible for the greatest decline in abundance of the Lake Sturgeon. Pollution and restriction of migratory movements due to construction of dams have compounded the problems of over- exploitation. Although Lake Sturgeon are not expected to occur at the project site, any project that impacts water quality should consider the possible impact to Lake Sturgeon that occur nearby in downstream-connected rivers. Please see Best Management Practices for Construction and Development Projects Lake Sturgeon (mo.gov).

Natural Heritage records indicate the following state-ranked species near the project area:

Scientific Name	Common Name	State Rank	Proximity (miles)	Primary Habitat
Aralia nudicaulis	Wild Sarsaparilla	S2	<4	Bluff
Persicaria glabra	Dense-flower Smartweed	S1S2	<4	Forest bottomland, Swamp
Neogale frenata	Long-tailed Weasel	S3	<5	Habitat generalist, Savanna/Shrub/Woodland matrix, Forest matrix, Grassland matrix
Ammocrypta clara	Western Sand Darter	S2S3	<1	River/stream
Arcidens confragosus	Rock Pocketbook	S3	<1	River/stream
Carpiodes velifer	Highfin Carpsucker	S2	<4	River/stream
Cyclonaias nodulata	Wartyback	S3	<1	River/stream
Hybognathus nuchalis	Mississippi Silvery Minnow	S3S4	<1	River/stream
Ligumia recta	Black Sandshell	S2	<2	River/stream
Notropis buchanani	Ghost Shiner	S2	<4	River/stream
Obovaria olivaria	Hickorynut	S3	<1	River/stream
Percina shumardi	River Darter	S3	<1	River/stream
Botaurus exilis	Least Bittern	S3	<4	Marsh
Porzana carolina	Sora	S2	<4	Marsh, Moist edge/mudflat
Rallus limicola	Virginia Rail	S2	<4	Marsh, Moist edge/mudflat
Mecardonia acuminata	Water Hyssop	S1	<2	Shallow oxbow/slough, Moist edge/mudflat, Wet prairie/meadow
Ardea alba	Great Egret	S3	<4	Wetland matrix, Forest bottomland

State Rank Definitions:

- S1: Critically imperiled in the state because of extreme rarity of or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically, 5 or fewer occurrences or very few remaining individuals (<1,000).
- S2: Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (6 to 20 occurrences or few remaining individuals).
- S3: Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
- S4: Uncommon but not rare, and usually widespread in the nation or state. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals.

- S#S#: Range Rank: A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status.
- ?: Denotes inexact or uncertain numeric rank.
- SU: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

There are no regulatory requirements associated with this status, however we encourage voluntary stewardship to minimize the risk of further decline that could lead to listing.

STATE ENDANGERED species are protected under the Wildlife Code of Missouri (3 CSR10-4.111).
See the Missouri Species And Communities Of Conservation Concern Checklist (mo.gov) for a complete list.

General recommendations related to this project or site, or based on information about the historic range of species (unrelated to any specific Natural Heritage records):

- **Streambank stabilization:** Channel modification, flow interruption or bank modification should occur only in compliance with conditions established in permits required under the federal Clean Water Act. Streams in the area should be protected from soil erosion, water pollution and in-stream activities that modify or diminish aquatic habitats. Best management recommendations relating to streams and rivers may be found at Best Management Practices for Construction and Development Projects Affecting Missouri Rivers and Streams (mo.gov).
  - Grade and seed disturbed areas as soon as possible to minimize erosion. Native grasses and wildflowers are recommended for plantings compatible with the local native landscape and wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza.
  - All temporary in-channel fills that could impound water should be culverted. Culverts should (a) maintain at least six inches of water and (b) not create water velocities in excess of two feet per second during average annual discharges. A drop between the downstream end of the culverts and the downstream water surface should not occur at any time. Conditions provided within the USACE Clean Water Act Section 404 permit, if required (Kansas City District > Missions > Regulatory Branch > Nation Wide Permits (army.mil)), should help minimize impacts to the aquatic organisms within the area.

- **Contact Area Manager:** This project is near/within Upper Mississippi Conservation Area. Please contact area manager, Tim Brown ((636) 456-3368 ext.1884) if project activities will impact this CA.

- **Indiana Bats, Northern Long-eared Bats, and Little Brown Bats** occur in Lincoln County and could occur in the project area. These species have been significantly impacted by White-nose syndrome. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor these species, especially from September to April. **If any trees need to be removed by your project, please contact the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100) for further coordination under the Endangered Species Act.**
  - Indiana Bats *(Myotis sodalis*, federal and state-listed endangered) and Northern Long-eared Bats (*Myotis septentrionalis*, federal-listed endangered) hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in riparian forests and upland forests near perennial streams.

- **Gray Bats:** Gray Bats (*Myotis grisescens*, federal and state-listed endangered) occur in Lincoln County and could occur in the project area, as they forage over streams, rivers, and reservoirs. Avoid entry or disturbance of any cave inhabited by gray bats and when possible retain forest vegetation along the stream and from the gray bat cave opening to the stream. Please see Best Management Practices for Construction and Development Projects Gray bat (mo.gov).

- **Karst:** Lincoln County has known karst geologic features (e.g. caves, springs, and sinkholes, all characterized by subterranean water movement). Few karst features are recorded in Natural Heritage records, and ones not noted here may be encountered at the project site or affected by the project. Cave fauna (many of which are species of conservation concern) are influenced by changes to water quality, so maintaining a buffer zone of at least 100 feet on all sides of any karst features within the project area will mitigate impacts to these species. Please see Management Recommendations for Construction and Development Projects Affecting Missouri Karst Habitat (mo.gov)

- **Conservation Opportunity Areas:** The project is within Missouri\Mississippi River Confluence Wetlands Conservation Opportunity Area. COAs are key landscapes that represent the greatest opportunities for sustainable conservation of the Missouri's diverse flora and fauna and the natural communities they depend upon, including: grasslands (including prairie and savanna), glades, forests and woodlands, wetlands, caves and karst, and rivers and streams. COAs have been identified based on several factors, including the diversity and rarity of species and natural communities present, and the comparative likelihood/importance of projects to maintain them in the area over time. COAs have no regulatory role, but do reflect interest as a planning tool from multiple government agencies, non-governmental organizations and citizen groups to facilitate conservation in the area. Maintenance of high quality natural terrestrial and aquatic communities will help provide important habitat for the COA's biodiversity. Funding might be available to manage for important habitats within the COA. Please contact Missouri Department of Conservation for more information.

- Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, larvae, and aquatic plant material may be moved to new sites on boats or construction equipment, so inspect and clean equipment thoroughly before moving between project sites.
  - Remove any mud, soil, trash, plants (or plant material) or animals from equipment before leaving any water body or work area.
  - Drain water from boats and machinery that has operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
  - When possible, wash and rinse equipment thoroughly with hard spray or HOT water (≥140° F, typically available at do-it-yourself carwash sites), and dry in the hot sun before using again.

These recommendations are ones project managers might prudently consider based on a general understanding of species needs and landscape conditions. Natural Heritage records largely reflect sites visited by specialists in the last 30 years. Many privately owned tracts have not been surveyed and could host remnants of species once but no longer common.

Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Three Report: Species Listed Under the Federal Endangered Species Act

There are records of species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this report is to provide information to federal, state and local agencies, organizations, municipalities, corporations, and consultants regarding sensitive fish, wildlife, plants, natural communities, and habitats to assist in planning, designing, and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION ECOSYSTEM RESTORATION PROJECT #16607
Project Description: USACE proposes to restore the functionality of the project area through construction of measures that would support quality side channel habitat for desirable native plant and animal species and emulate more natural river processes, structures, and functions for a resilient and sustainable ecosystem. The Hausgen Island Complex project area consists of approximately 250 acres of side channel and connected backwater habitat along the right descending bank of the Mississippi River, Lincoln County, Missouri, between RM 248 and 245. The area lies within Navigation Pool 25 of the UMR between Lock & Dam (LD) 24, just upstream in Clarksville, MO (RM 273.4) and Lock & Dam 25 (L&D 25) in Winfield, MO (RM 241.4).
Project Type: Habitat Conservation and Restoration, In-stream habitat restoration (habitat improvement structures)
Contact Person: Zachary Day
Contact Information: zachary.a.day2@usace.army.mil or 3143318027

Disclaimer: This NATURAL HERITAGE REVIEW REPORT identifies if a species or natural community tracked by the Natural Heritage Program is known to occur within or near the project area submitted, and shares recommendations to avoid or minimize project impacts to sensitive species or natural habitats. Incorporating information from the Natural Heritage Program into project plans is an important step in reducing impacts to Missouri's sensitive natural resources. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information.

This Natural Heritage Review Report is not a site clearance letter for the project. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. This report does not fulfill Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit IPaC: Home (fws.gov) to initiate USFWS Information for Planning and Conservation (IPaC) consultation. Contact the Columbia Missouri Ecological Field Services Office (573-234-2132, or by mail at 101 Park DeVille Drive, Suite A, Columbia, MO 65203) for more information.

Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or visit Home Page | Missouri Department of Transportation (modot.org) for additional information on recommendations.

Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Three Report: Species Listed Under the Federal Endangered Species Act

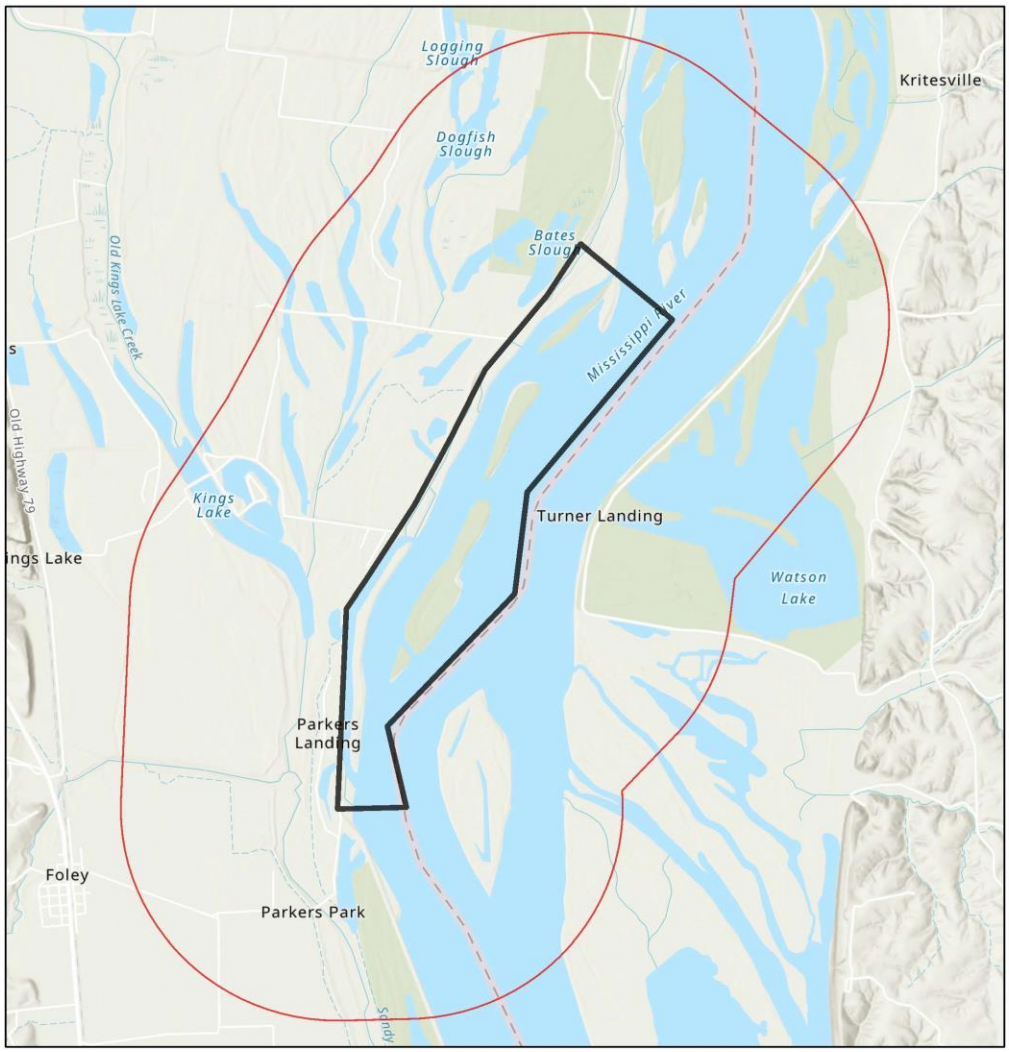
There are records of species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this report is to provide information to federal, state and local agencies, organizations, municipalities, corporations, and consultants regarding sensitive fish, wildlife, plants, natural communities, and habitats to assist in planning, designing, and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION ECOSYSTEM RESTORATION PROJECT #16607
Project Description: USACE proposes to restore the functionality of the project area through construction of measures that would support quality side channel habitat for desirable native plant and animal species and emulate more natural river processes, structures, and functions for a resilient and sustainable ecosystem. The Hausgen Island Complex project area consists of approximately 250 acres of side channel and connected backwater habitat along the right descending bank of the Mississippi River, Lincoln County, Missouri, between RM 248 and 245. The area lies within Navigation Pool 25 of the UMR between Lock & Dam (LD) 24, just upstream in Clarksville, MO (RM 273.4) and Lock & Dam 25 (L&D 25) in Winfield, MO (RM 241.4).
Project Type: Habitat Conservation and Restoration, In-stream habitat restoration (habitat improvement structures)
Contact Person: Zachary Day
Contact Information: zachary.a.day2@usace.army.mil or 3143318027

_ITY PROGRAM HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORA



April 3, 2025

1:38,975

Buffered Project Boundary

Project Boundary

0 0.33 0.65 1.3 mi
0 0.5 1 2 km

Esri, NASA, NGA, USGS, Missouri Dept. of Conservation, Missouri DNR, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

Species or Communities of Conservation Concern within the Area:

There are records of species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

Email (preferred): NaturalHeritageReview@mdc.mo.gov
MDC Natural Heritage Review
Science Branch
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Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Other Special Search Results:

The project occurs on or near public land, Leach (B K) Mem CA, Sandy Island CA, Upper Mississippi CA, please contact MDC.

Project Type Recommendations:

No recommendations have been identified for this project type.

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - If this project has the potential to alter habitat (e.g. tree removal, projects in karst habitat) or cause direct mortality of bats, please coordinate directly with U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100 for Ecological Services) for further coordination under the Endangered Species Act. Indiana bats *(Myotis sodalis*, federal- and state-listed endangered) and **Northern long-eared bats** (*Myotis septentrionalis*, federal-listed threatened) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April.

The project site submitted and evaluated is on or near Sensitive Aquatic Species Waters Mississippi River, an important stream for freshwater mussel and amphibian populations. These streams were so designated because they have highly diverse mussel communities and mussel and amphibian species identified as Species of Conservation Concern. These streams are important to maintaining, restoring, or avoiding future listing of Species of Conservation Concern. Impacts to these aquatic species and habitats can be reduced by avoiding or minimizing activities that disturb the stream substrate, including rock placement, dredging, trenching, and wetted gravel bar disturbance; and avoid introducing heavy sediment loads, chemical or organic pollutants. These streams also are included as a Missouri Nationwide Permit Regional Condition that must be considered if working under if working under a Clean Water Act Section 404 Permit issued by the U.S. Army Corps of Engineers (Kansas City District > Missions > Regulatory Branch > Nation Wide Permits (army.mil)). A list of all streams designated under this Condition is available at Missouri Regional Condition 5 Sensitive Aquatic Species Waters for 2021 NWPs (army.mil).

Bald Eagle: The project location submitted and evaluated is within the geographic range of nesting Bald Eagles in Missouri. Bald Eagles (*Haliaeetus leucocephalus*) may nest near streams or water bodies in the project area. Nests are large and fairly easy to identify. Adults begin nesting activity in late December and January and young birds leave the nest in late spring to early summer. While no longer listed as endangered, eagles continue to be protected by the federal government under the Bald and Golden Eagle Protection Act. Work managers should be alert for nesting areas within 1500 meters of project activities, and follow federal guidelines at: Do I need an eagle take permit? | U.S. Fish & Wildlife Service (fws.gov) if eagle nests are seen.

Karst: This county has known karst geologic features (e.g., caves, springs, and sinkholes, all characterized by subterranean water movement). Few karst features are recorded in Natural Heritage records, and ones not noted here may be encountered at the project site or affected by the project. Cave fauna (many of which are Species of Conservation Concern) are influenced by changes to water quality; please check your project site for any karst features and make every effort to protect groundwater in the project area. Additional information and specific recommendations are available at Management Recommendations for Construction and Development Projects Affecting Missouri Karst Habitat (mo.gov).

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See Managing Invasive Species in Your Community | Missouri Department of Conservation (mo.gov) for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (>140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit (Kansas City District Regulatory Branch (army.mil)) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification (Section 401 Water Quality Certification | Missouri Department of Natural Resources (mo.gov)), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit Wastewater Permits | Missouri Department of Natural Resources (mo.gov) for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below:

Email (preferred): NaturalHeritageReview@mdc.mo.gov
MDC Natural Heritage Review
Science Branch
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 10). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 10-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

See Missouri Species and Communities of Conservation Concern Checklist (mo.gov) for a complete list of species and communities of conservation concern. Detailed information about the animals and some plants mentioned may be accessed at Mofwis Search Results. Please contact the Missouri Department of Conservation to request printed copies of any materials linked in this document.

PRELIMINARY REPORT

5 WATER QUALITY CERTIFICATION

From: Kimbell, Cody
To: Day, Zachary A CIV (USA)
Subject: [Non-DoD Source] RE: NESP Haugen Island PIR CWA Section 401 Water Quality Certification
Date: Monday, April 7, 2025 7:47:24 AM
Attachments: image005.png
image008.png
image009.png

Good morning,

Thank you for informing us of this anticipated project.
This project should be covered by NWP 27 as described.

If you would like to jumpstart our process for when your ready to move forward, we can schedule a pre-filing.

Thank you for your time,

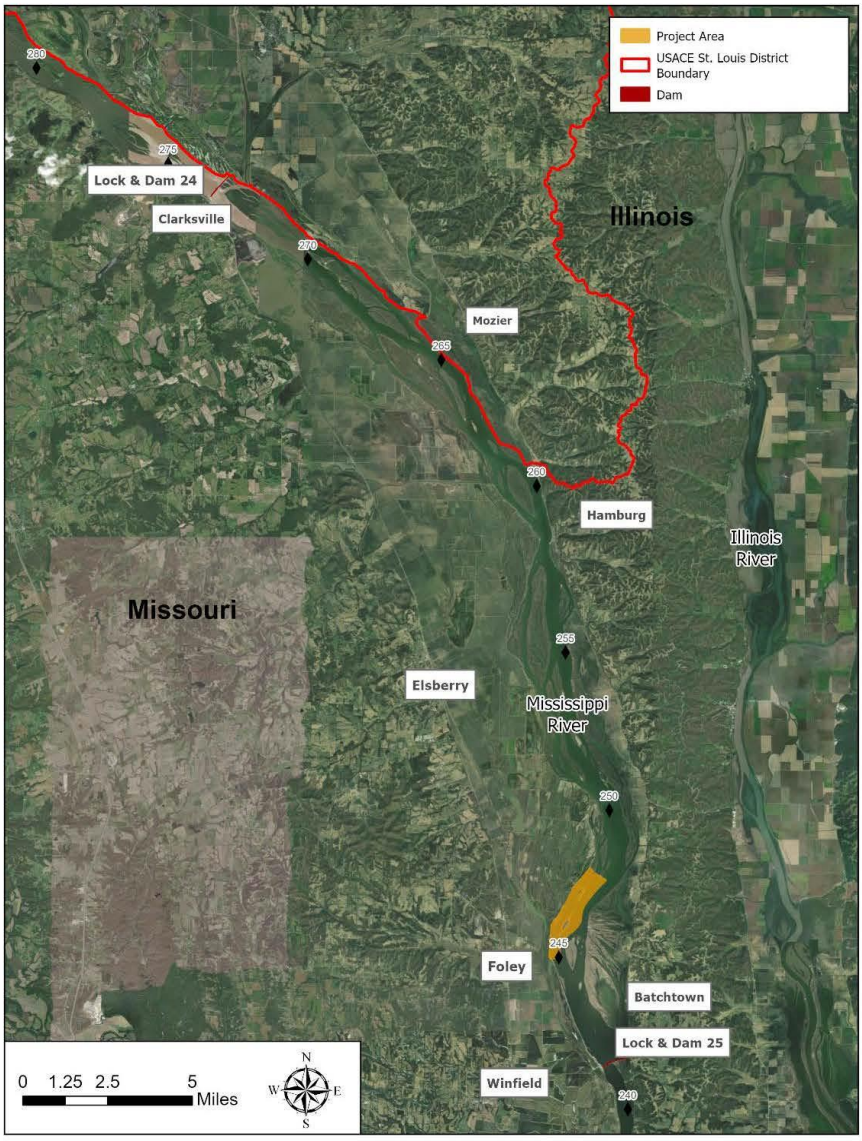
Cody Kimbell M.S.
General Permitting and 401 Specialist
Certified Wetland Hydrologist
Water Protection Program
(573)-526-3337 cody.kimbell@dnr.mo.gov

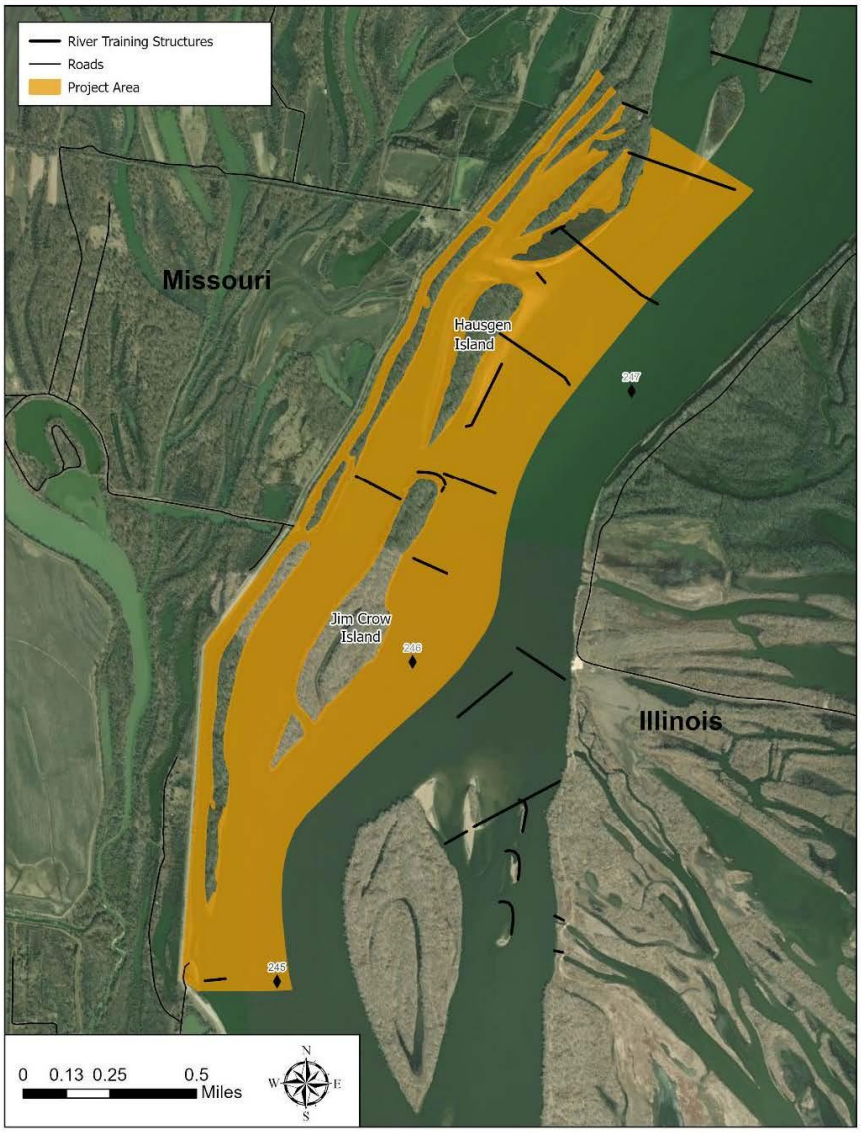
MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

From: Day, Zachary A CIV (USA) <Zachary.A.Day2@usace.army.mil>
Sent: Thursday, April 3, 2025 2:10 PM
To: Hackett, Billy <Billy.Hackett@dnr.mo.gov>
Subject: NESP Haugen Island PIR CWA Section 401 Water Quality Certification

Bill,

My name is Zachary Day, and I am a Biologist at the St. Louis Army Corps office. I am working on a NESP Project Implementation Report for Side Channel Habitat at Haugen Island in the lower portion of Pool 25. I posted a couple photos below of the project area.


Project Area
USACE St. Louis District Boundary
Dam
280
275
Lock & Dam 24
Clarksville
270
Illinois
Mozier
265
260
Hamburg
Illinois River
Missouri
255
Elsberry
Mississippi River
250
245
Foley
Batchtown
Lock & Dam 25
Winfield
240
0 1.25 2.5 5 Miles
N
W
E
S



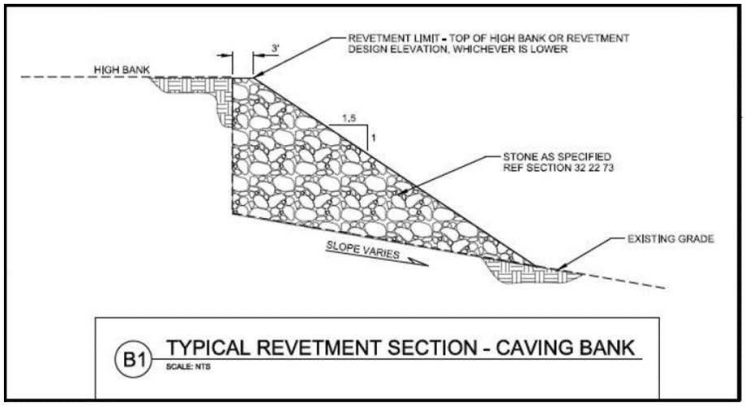
Alternatives that are being carried forward are Partial Degradation/Notching, Hard Points, Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement), and Bank Stabilization.

Degradation: Partial degrade and drag-back of closing structures to create a boulder field like riffle on downstream end of structure to provide mussel habitat.

Notching: Notching these features is a method to promote the enhancement of channel geomorphic diversity to provide suitable habitat for fishes. Notching includes strategic excavation and adjacent onsite placement or reuse of the excavated rock materials and is intended to improve aquatic habitat by increasing bathymetric, flow velocity, and substrate diversity.

Hard Points: These structures divert the flow of water to protect or enhance existing shoreline and habitat. There are many different types of flow diversion structures, and each is used in a different situation that is dependent on the goals and objectives of the project.

Mussel Habitat Enhancement: Increases structure and side channel habitat for use by native freshwater mussels as opposed to a flow diversion structure. Gradual slope revetment (GSR) is the placement of additional stone along the toe of new or existing river training structures, as well as inclusion with revetment for bank stabilization.

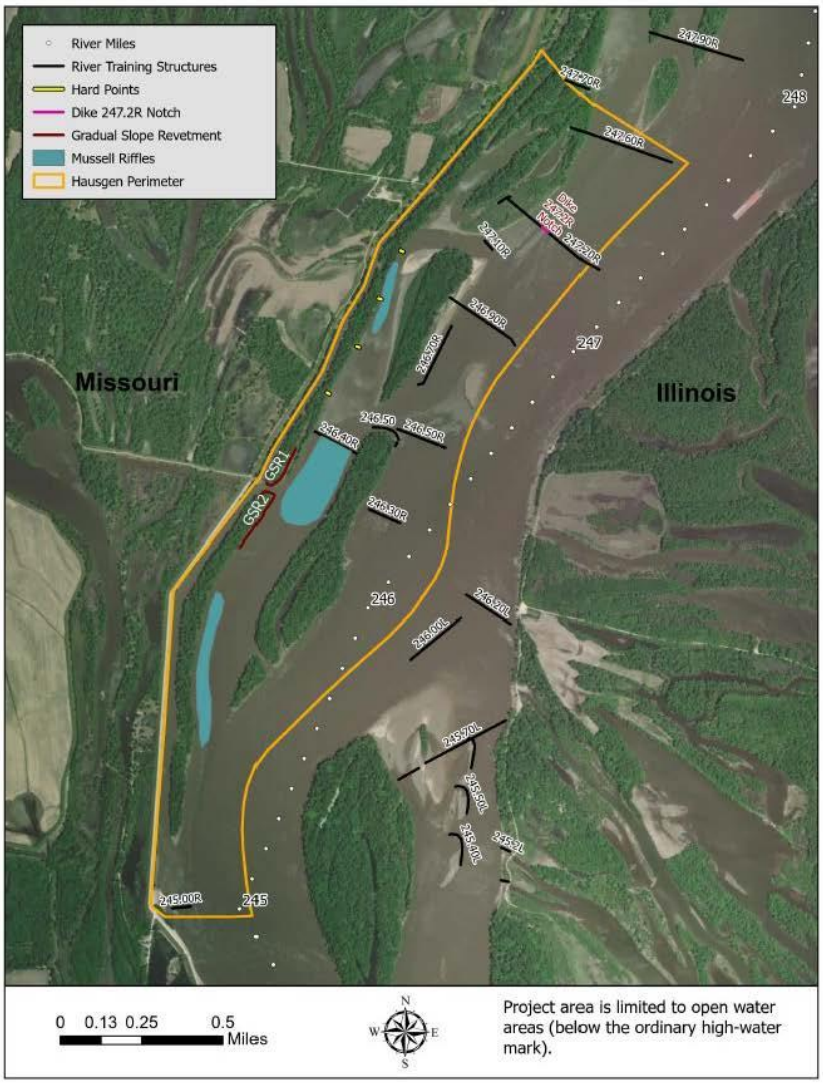


Typical Gradual Slope Revetment (GSR) diagram

Bank Stabilization: . The approach for this project would incorporate GSR along the toe of stabilization stone to provide mussel habitat while simultaneously protecting actively eroding banklines. The general design concept incorporates a tighter gradation of larger stones but spread thinly to encourage natural deposition of larger gravels in lieu of highly mobile sugar sands.

Below is a photo of the location of where the alternatives will take place in the project area at Hausgen Island. With the alternatives put into place, the water level will be staying under the OHWM. From looking at the selected alternatives, I believe this would all fall under a Nationwide Permit 27. I just wanted to verify with you and see if you agreed. Any recommendations and input you have would be greatly appreciated for the preparation of the

404(b)(1) water quality certification. Thank you for your time and I look forward to hearing back from you.



Zachary Day
Biologist
CEMVP-PDC
U.S. Army Corps of Engineers
1222 Spruce St

St. Louis, MO 63103
(Office) 314-331-8027
(Cell) 725-300-7139

6 MISSOURI STATE HISTORIC PRESERVATION OFFICE

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103

April 25, 2025

Engineering and Construction Division
Curation and Archives Analysis Branch (ECZ)

Subject: Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project

Amy Rubingh
Office of Historic Preservation
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

Dear Ms. Rubingh:

The U.S. Army Corps of Engineers, St. Louis District (District), is conducting a feasibility study to formulate alternatives to attain and maintain sustainability of side channel habitat within the Upper Mississippi River (UMR), Pool 25, in the vicinity of Hausgen Island complex (River Mile [RM] 248-245). The Hausgen Island Complex Side Channel Restoration Project has been initiated under the Navigation and Ecosystem Sustainability Program (NESP), which is authorized to ensure an efficient and environmentally sustainable navigation system on the Mississippi River. The District would like to initiate consultation for this action under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR 800.

The Hausgen Island Complex project area consists of approximately 250 acres of side channel and connected backwater habitat along the right descending bank of the Mississippi River, Lincoln County, Missouri, between RM 248 and 245. The area lies within Navigation Pool 25 of the UMR between Lock & Dam 24 (L&D 24), just upstream in Clarksville, MO (RM 273.4) and Lock & Dam 25 (L&D 25) in Winfield, MO (RM 241.4). The project area encompasses the areas below ordinary high-water mark (OHWM) surrounding Hausgen Island, Jim Crow Island, and Little Stag Island. These islands are federally owned by the USACE and are included in the General Plan (GP) lands agreement with US Fish and Wildlife Service (USFWS) who have a cooperative agreement with Missouri Department of Conservation (MDC) for fish and wildlife management in this area. The goal of the study is to increase depth and flow diversity of aquatic side channels throughout the project area.

Between RM 248 and 245 in Pool 25, increased erosion and sedimentation has degraded the quantity and quality of flowing water (lotic) side channel habitat, including backwaters, chutes, and riffle/pool complexes. This degradation is due to changes in hydraulics and hydrology from implementation and operation of the 9-foot navigation channel, land use changes, and climate change. The loss of side channel depth and flow diversity, structural diversity, and aquatic connectivity has decreased habitat function, extent, and availability for native aquatic species. This project area is characterized by a lack of native fish species, mussel habitat, and the natural hydrologic processes necessary to sustain native aquatic plant species.

The District's Tentatively Selected Plan (TSP) proposes to restore the functionality of the project area through construction of the following kinds of measures: creation of mussel riffles, notching an existing dike, bank line revetment, and the addition of aquatic hard points (map).

A review of the Missouri State Historic Preservation Office (SHPO) files revealed that two archaeological surveys (Surveys LN-115 and LN-33) have been completed adjacent to the study area and six other surveys have been completed within a mile. Three archaeological sites were identified within a mile of the project area during the LN-33 Survey. All three sites (23LN244 – 23LN246) were 19th to 20th century historic period farmsteads. One prehistoric lithic scatter was identified within a mile of the project during Survey LN-121. None of the four recorded sites have been evaluated for the National Register. There are no recorded cultural resources reported within the Area of Potential Effect (APE) of the project study area.

All planned work for this project will occur below the OHWM and construction will be conducted by floating barge. There will be no access roads or laydown areas created. Based upon this information, the District has determined that no historic properties will be affected by this project. If it is deemed necessary the District plans to utilize the June 25, 2024, implemented, Programmatic Agreement (PA) regarding the Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program for any additional compliance with Section 106. The USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Program undertaking.

Given this information, the District would like to initiate consultation regarding this NESP project and request concurrence of no Historic Properties Affected. If you have any questions regarding this project, please contact Lara Anderson (Archaeologist) at lara.anderson@usace.army.mil or call (314) 331-8779.

Sincerely,

SMITH.MARK.A.1037148934 Digitally signed by SMITH.MARK.A.1037148934 Date: 2025.04.24 13:09:34 -05'00'

For Jennifer L. Riordan
Chief, Curation and Archives
Analysis Branch

7 TRIBAL COORDINATION

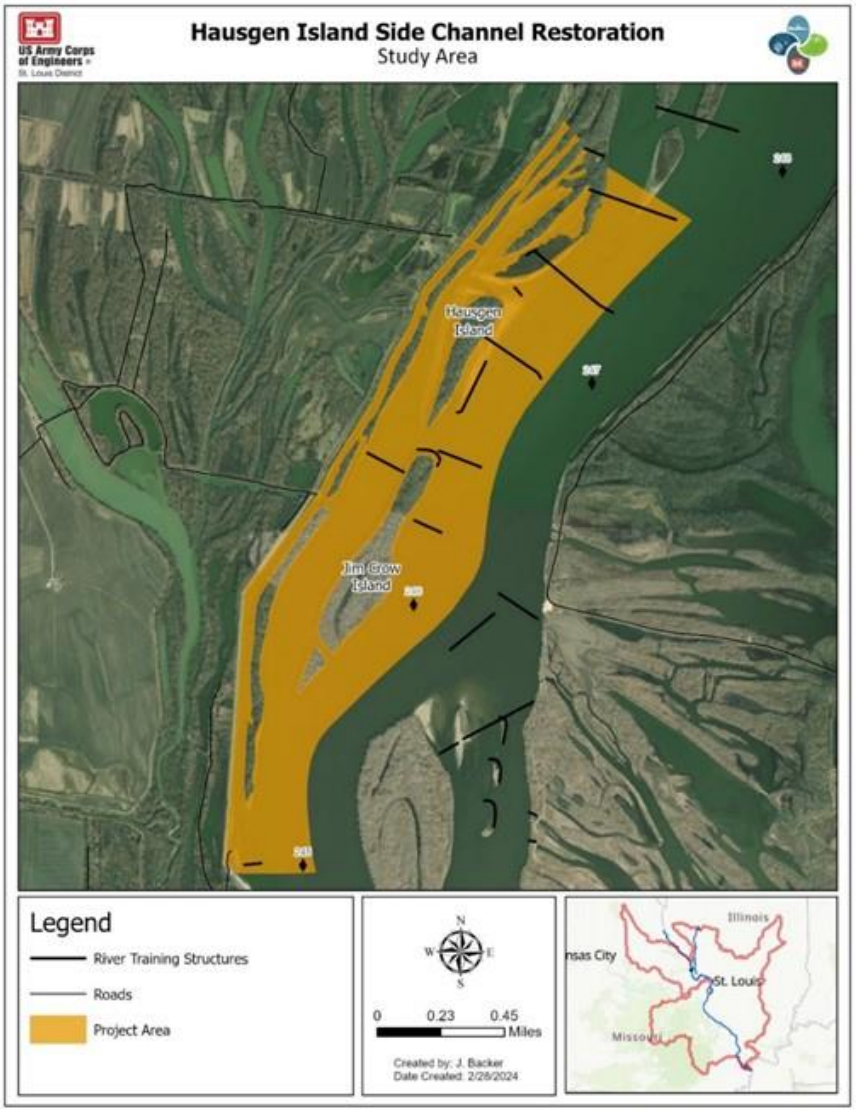
8 PUBLIC VIEWS AND COMMENTS

NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION ECOSYSTEM RESTORATION PROJECT

POOL 25, UPPER MISSISSIPPI RIVER MILES 248-245
LINCOLN COUNTY, MISOURI



US Army Corps of Engineers ®
St. Louis District

July 2025
Appendix B
Habitat Evaluation

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1. Introduction

This appendix provides the documentation of the habitat evaluation and quantification process that was conducted to evaluate the benefits of various alternatives for the Navigation and Ecosystem Sustainability Program (NESP) Hausgen Island Side Channel Complex ecosystem restoration project. The evaluation was conducted by a multi-agency team with active participants that included biologists from the St. Louis District U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service from the Southern Illinois Ecological Services Office, and fisheries biologists from the Missouri Department of Conservation and Illinois Department of Natural Resources; names and disciplines are included in Table B-1 below.

Table B-1. Team that Participated in the Habitat Benefits Analysis for the Hausgen Is. Side Channel Complex Ecosystem Restoration Project.

Team Member	Specialty	Affiliation
Justin Garrett	Biologist	USACE
Matt Mangan	Fish and Wildlife Biologist	USFWS
Charlie Deutsch	Refuge Manager	USFWS
Kirsten Schmidt	Wildlife Biologist	USFWS
Shane Simmons	Fisheries Biologist / Project Manager	USACE
Butch Atwood	Fisheries Biologist	IDNR
Travis Moore	Fisheries Biologist	MDC
Annie Hentschke	Fisheries Biologist	MDC
Sarah Peper	Fisheries Biologist	MDC

2. Habitat Benefit Evaluation Methodology

The purpose of the habitat benefits evaluation is to evaluate and quantify, to the extent possible, environmental benefits of alternative plans for the aquatic habitat improvements within the study area.

Aquatic benefits were quantified through the use of the Engineering Circular 1105-2-412, *Assuring Quality of Planning Models* and the General Freshwater Mussel Habitat Model (Herman et al., 2022). This model is certified for national use by the USACE Ecosystem Planning Center of Expertise (ECO-PCX), until February 15, 2030.

Habitat Suitability Index (HSI) spreadsheet calculators for each of these models was reviewed by the Ecosystem Restoration Planning Center of Expertise and were recommended for regional use (Memorandum for CECW-MVD; 15 September 2016; Enclosure 1). Consistent with guidance from the USACE Ecosystem Restoration Planning Center of Expertise, the Agency Technical Review (ATR) Team for the NESP Hausgen Island Side Channel Complex ecosystem restoration project will conduct an assessment of the models used for this project. This process will evaluate the technical quality and appropriateness of the models utilized.

2.1 Quantity Component

Traditionally, the USACE has used the quantity and quality of habitat jointly, in the form of habitat units, to measure the benefits provided by ecosystem restoration projects. The quantity portion is often measured as area (acres of habitat, landform, etc.) or number of species; in some systems, it is measured as length (feet of stream bank). The area associated with a given proposed feature must have a clear definition for use as guidance in estimating the area component of the ecosystem output model and must be applied consistently to all actions evaluated. Quantities of each measure varied depending on the alternative. Habitat was evaluated in the location in which each measure would be placed. Table B-4 at the end of this report provides the acres proposed for use for each alternative, and the applicable acreage for each model.

For the aquatic habitat, mussel habitat improvements will be quantified based on areas that would benefit from substrate enhancements. The mussel habitat measure found in the Minimum Alternative 1, and the Maximum Alternative 2, (see Section 4 of the main report), consist of application of Gradual Slope Revetment (GSR) near the right descending bankline in close proximity to the entrance of the tertiary channel near the head of Jim Crow Island. Sporadic placement of larger cobble sized stone will create flow diversity and substrate heterogeneity across a larger area and will provide flow refugia and many substrate transition zones over time as sands and gravels move around these larger stones. It is anticipated that these substrate enhancements should also provide areas of transitional substrates and extend areas of potential benefit as flow moves and shifts the sands and smaller gravels around and near them over time. Table B-2 below illustrates the alternatives and their associated management measures included with each.

Table B-2. Alternatives and Measures.

Measure	Obj 1: Increase side channel connectivity	Obj 2: Increase side channel flow diversity	Obj 3: Increase substrate diversity	Obj 4: Increase side channel sediment transport	Obj 5: Increase depth diversity	No Action	Alt 1 Minimum	Alt 2 Maximum	Pre TSP
Partial Degradation/Notching	X	X		X	X			X	
Hard Points		X		X	X			X	
Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement)		X	X	X			X	X	
Bank Stabilization Utilizing GSR for Mussel Habitat		X	X		X		X	X	

2.2 Quality Component

The qualitative component of the analysis is rated on a 0.0 to 1.0 scale, with higher values indicating better habitat for that species. The HSI for a particular habitat type is determined by selecting values that reflect present and future study area conditions from a series of abiotic and biotic metrics. Each value corresponds to a suitability index for each species. Future values are determined using management plans, historical conditions, and best professional judgment.

The quantitative component is the number of acres of the habitat being evaluated. From the calculated qualitative and quantitative values, the standard unit of measure, the habitat unit (HU) is calculated using the formula (HSI × Acres = HUs). Habitat units are calculated for specific target years to forecast changes in habitat values over the life of the project with- and without-project conditions. When HSI scores are not available for each year of analysis, a formula that requires only target year HSI and area estimates is used (USFWS, 1980). This formula is:

$$\int_0^T HU\ dt = (T_2 - T_1)\ x\ \left[\left(\frac{A_1H_1 + A_2H_2}{3}\right) + \left(\frac{A_2H_1 + A_1H_2}{6}\right)\right]$$

Where:

$\int_0^T HU\ dt$ = *Cumulative HUs*
T_1 = first target year of time interval
T_2 = last target year of time interval
A_1 = area of available habitat at beginning of time interval
A_2 = area of available habitat at end of time interval
H_1 = habitat suitability index at the beginning of time interval
H_2 = habitat suitability index at the end of time interval
3 and 6= constants derived from integration of HSI × Area for the interval between any two target years.

This formula was developed to precisely calculate cumulative HUs when either HSI, or area, or both change over a time interval, which is common when dealing with the unpredictable fluctuations found in nature. Habitat Unit gains or losses are annualized by summing the cumulative HUs calculated using the above equation across all target years in the period of analysis and dividing the total (cumulative HUs) by the number of years in the life of the project (i.e., 50 years). This calculation results in the Average Annual Habitat Units (AAHUs) (USFWS, 2016). The calculation of the HUs and AAHUs were completed in a Microsoft Excel spreadsheet for each model containing the formula above.

The benefits of the proposed project measures (net AAHUs) are then determined by calculating the difference in AAHUs between the with-project benefits and the without-project benefits. The effects of various habitat improvement feature combinations (alternatives) can then be evaluated by comparing the net AAHUs and their associated costs for each alternative considered.

For the purpose of planning, design, and impact analysis, the period of analysis was established as 50 years. To facilitate comparison, target years were established at 0 (existing conditions), 1, 5, 25, and 50 years for both future with and without project features. Target years are used to analyze HUs and characterize habitat changes over the estimated period of analysis. Target

years of 1 and 5 capture short-term changes following construction completion. While target years 25 and 50 capture ecological changes that would occur over a longer period of time. The period of analysis was determined to be 50 years based on the prediction that some project features (e.g., development of key ecological processes needed to restore ecosystem structure and function) would need a longer period of time to reach maximum benefits; and the accrual of benefits were predicted to level off after 50 years. HSIs and cumulative HUs for each evaluation species were calculated at each of these target years.

Corps guidance requires that the team evaluate a suite of features that can be combined in various ways to form project alternatives. The approach used to assess the benefits at the Hausgen Island study area looked at benefits of project features and their combinations as alternatives and comparatively evaluated each alternative separately. This process is called the iterations process. To determine the habitat units created by each feature, the habitat affected by the feature would be evaluated using the applicable HSI spreadsheets.

This appendix contains an HSI summary table and other data derived from the spreadsheet files not included in this appendix. These spreadsheets are available upon request. Please contact, Justin Garrett, 314-331-8047, or by email at Justin.M.Garrett@usace.army.mil if you would like an electronic copy of these files.

3. Assumptions

In preparation of using the HSI model, the evaluation team conducted a site visit, reviewed aerial photography, topographic maps, and used the results from physical and numerical hydraulic modeling as well as fisheries and mussel survey and collection data provided by IDNR, MDC, and previous USACE survey efforts. During the evaluation, assumptions were developed regarding existing conditions and projected with-project conditions relative to habitat changes over time and management practices.

3.1 Side Channel Habitat

The USACE certified (per EC 1105-2-412) General Freshwater Mussel Habitat Model (Herman et al. 2022) was used to assess the aquatic habitat benefits resulting in the proposed project measures. The model is certified for national use until February 15, 2030. The proposed measures were developed to enhance substrate stability and heterogeneity, and improved flows and aquatic connectivity resulting in increased overall availability of suitable habitat for colonization of native freshwater mussels and their host fishes. Sediment stability is necessary within water bodies since increased sedimentation inhibits feeding and reproduction as well as promotes suffocation. Mussel occurrence is often related to substrate size with optimal conditions reflected by stream bed particle size large enough to remain stable at high flows and provide sufficient interstitial spaces for juvenile refugia and feeding (Herman, et al. 2022).

The following assumptions in applying the *General Freshwater Mussel Habitat Model* were made. For more detailed descriptions of the assumptions made for each model parameter for a given alternative, the excel spreadsheet is available upon request.

Baseline Condition:

There is approximately 250 acres of aquatic habitat within the project area, dominated by side channels with tertiary channels and main channel border habitat. Out of the 250 acres, only 187 acres of aquatic habitat would be impacted during the project implementation. The project area side channels are currently characterized by having some areas of shallow depths with shifting

sands as the primary substrate type. Several river training structures are located in the side channel complex, and the main entrance at the upper end of Hausgen Island side channel has become increasingly shallow due to heavy sedimentation. This slows velocities that come through the side channel, causing sediments to drop out, further exacerbating the shallow depths and puts connectivity of backwaters to side channels and the main channel at risk of closing in.

Future Without Project Condition:

Without the project measures, it is anticipated that the side channel habitat within the project area will continue to degrade, primarily through expanding acreage of shallower depths due to sedimentation which will eventually cause areas to convert to more terrestrial habitat and further severing the connectivity of remaining aquatic habitats. These areas are also expected to experience higher water temperature and poorer water quality, with low dissolved oxygen levels making it unsuitable for most aquatic life. The shallower depths will also limit access for aquatic species to overwintering habitat as well as adequate foraging, spawning and rearing backwater habitats. The shifting sand substrate found throughout the side channel areas do not currently offer suitable habitat for freshwater mussels to colonize new areas, and recent mussel surveys reveal low densities of mussels throughout the project area.

Future With Project Condition:

With the proposed project measures of the Recommended Plan implemented, velocities and connectivity are anticipated to be enhanced such that access to backwaters for overwintering, foraging, spawning, and rearing for aquatic species will be greatly enhanced. Placed substrate for mussel riffle habitat is preliminarily designed to create large boulder fields, sporadically placed such that they provide flow refugia and shadows, allowing for gravels and other granular sediments to settle below, and provide the much needed, stable substrate areas for mussels to colonize. According to recent mussel surveys, there were 13 different species found within the project area, albeit in low densities. This is evidence that there is a great opportunity to provide suitable habitat to help expand those populations that are currently nearby but likely struggling due to lack of available habitat.

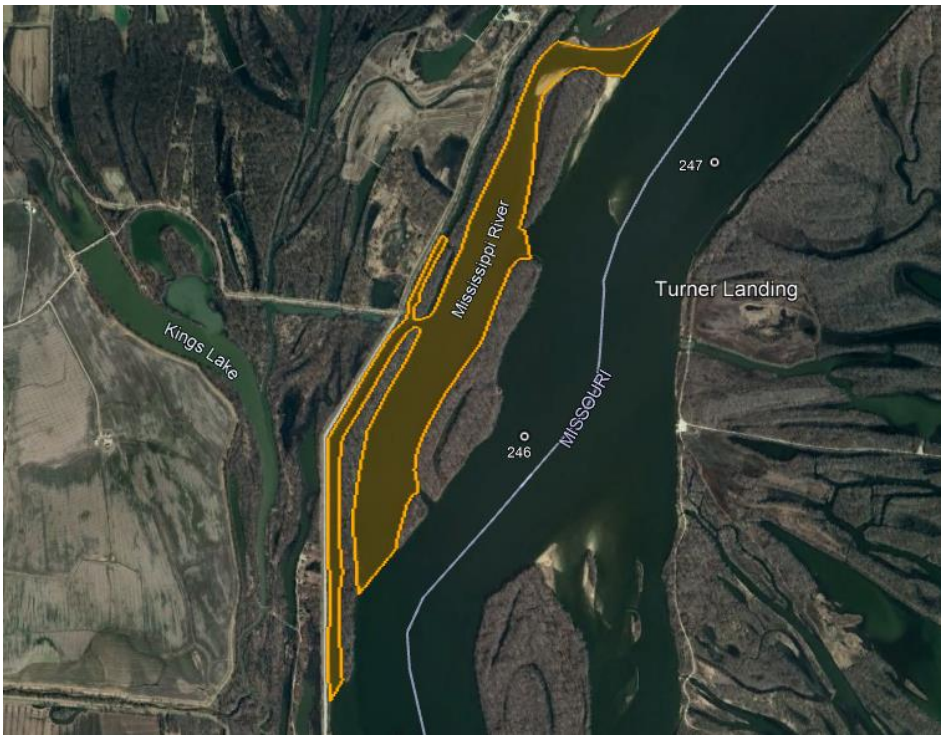
3.2 General Assumptions

It was assumed that target years of 0 (existing condition), 1, 5, 25, and 50 (future without and future with project conditions) are sufficient to analyze HUs and characterize habitat changes over the estimated period of analysis. The period of analysis was determined to be 50 years based on the prediction that some project features (e.g., development of key ecological processes needed to restore ecosystem structure and function) would need a longer period of time to reach maximum benefits; and the accrual of benefits were predicted to level off after 50 years.

3.3 Model Acreage Delineation

Acreage identified as an orange polygon was captured in the General Freshwater Mussel Model, see Figure B-1.

Figure B-1: Acreage delineation of each habitat model.



4. Results

Section 4 of the main report, *Plan Formulation*, describes each potential Project measure in detail. The Project planning team screened out several features and alternatives before this habitat quantification process began. Section 4, Table 4 displays the proposed measures, screening criteria, and which measures were retained for inclusion in the project alternatives. The results of the habitat benefit evaluations respective to habitat model that was used to evaluate each alternative by habitat type is provided below in 4.1, Table B-3.

4.1 Total Habitat Benefits

Table B-3 lists the calculated net average annual habitat benefits for the final array of alternatives. Table B-4 illustrates the acreage considered for habitat benefits, by alternative.

Table B-3:

Alternative	**Total Net AAHU**
FWOP - No Action	0
Alternative 1 – Minimum	74
Alternative 2 – Maximum	92

Table B-4:

Alternative	**Model**	**Acres per Habitat Type**
FWOP - No Action	Freshwater Mussel	187

Alternative	Model	Acres per Habitat Type
Alternative 1 – Minimum	Freshwater Mussel	187
Alternative 2 – Maximum	Freshwater Mussel	187

5. References

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Enclosure 1

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080

REPLY TO
ATTENTION OF:

CEMVD-PD-L 15 September 2016

MEMORANDUM FOR CECW-MVD (Redican)

SUBJECT: Recommendation for Regional Use Approval of 11 Spreadsheet Calculators for Application of Regionally Approved Habitat Suitability Index Models

1. References:
   a. Engineer Circular 1105-2-412: Assuring Quality of Planning Models, dated 31 March 2011.
   b. Final Planning Model Quality Assurance Review Comment Response Record for 11 Habitat Suitability Index Model Calculators, USACE (Encl 1).
   c. Ecosystem Restoration Model Library, Habitat Suitability Index Models

2. The National Ecosystem Restoration Planning Center of Expertise (ECO-PCX) evaluated spreadsheet calculators for the black capped chickadee, bullfrog, creek chub, fox squirrel, gray squirrel, least tern, smallmouth bass, smallmouth buffalo, striped bass, white bass, and wood duck habitat suitability index models following reference 1.a. Based on the review results (Encl 1), the ECO-PCX recommends Regional Use Approval of all spreadsheet calculators for use in the geographic area defined for each model. Please log in this recommendation with the Office of Water Project Review for the Model Certification Team to consider.

3. The black capped chickadee, bullfrog, creek chub, fox squirrel, gray squirrel, least tern, smallmouth bass, smallmouth buffalo, striped bass, white bass, and wood duck habitat suitability index models are approved for regional use per EC 1105-2-412 (Reference 1.c.). However, software was lacking which would allow planners to apply the models in a computational correct fashion for individual projects. Consequently, MVP, MVR, and MVS collaborated to develop a library of Microsoft Excel spreadsheet calculators. Each spreadsheet calculator is an independent spreadsheet built using the same variables, habitat suitability index curves, aggregation equations, and habitat cover types as displayed in the approved model documentation. Furthermore, all spreadsheet calculators employed a similar development scheme to include consistent use of formatting, input requirements, and output display. Each calculator includes user documentation or a link to a user's guide, and employs best spreadsheet practices.

4. The ECO-PCX and biologists from MVP, MVR, and MVS reviewed each spreadsheet calculator independently to assess the degree to which the spreadsheets meet the system quality and usability criteria in accordance with EC 1105-2-412. The spreadsheet development team and the spreadsheet reviewers included individuals with expertise in habitat benefit evaluations, Habitat Evaluation Procedures, plan formulation policies, and software/spreadsheet programming and auditing. Review results are found in the Final Planning Model Quality Assurance Review Comment Response Record for 11 Habitat Suitability Index Model Calculators, USACE (Encl 1).

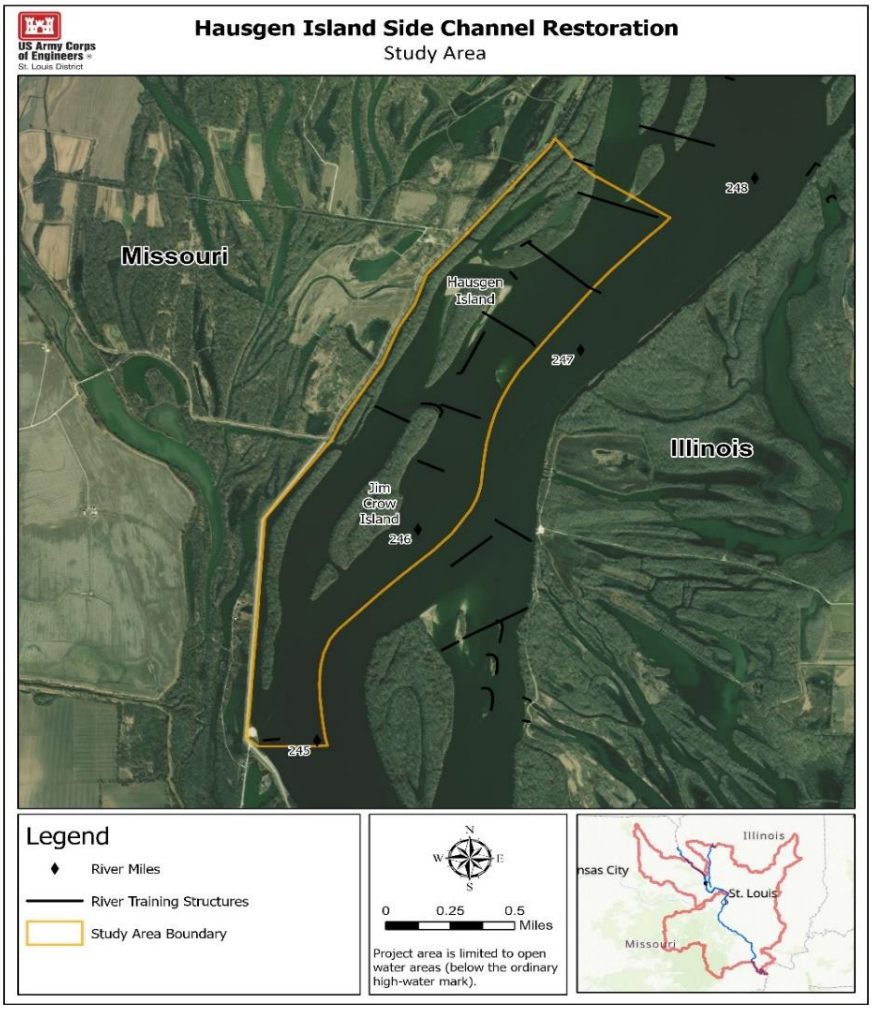
Review of the spreadsheet calculators resulted in 72 total comments. All comments were related to the system quality and usability of the model, all were of low to medium significance, and all evaluations resulted in concurrence with the comments. The ECO-PCX reviewed the comments, evaluations, and revisions made to the model. All were made to the satisfaction of the ECO-PCX and are in alignment with the requirements of assuring the quality of planning models. The following summarizes the overall review and modifications made to the spreadsheets to improve system quality and usability.

NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

POOL 25 ISLANDS – HAUSGEN

POOL 25, Upper Mississippi River, Miles 248 – 245
Lincoln County, Missouri



Appendix C: Biological Assessment

1. INTRODUCTION

1.1 Purpose

The U.S. Army Corps of Engineers (USACE), St. Louis District (District), has prepared this project implementation report (PIR) with an integrated environmental assessment (EA) to present a detailed account of the planning, engineering, construction considerations, and environmental considerations that resulted in the Tentatively Selected Plan (TSP) for the Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project (Project). This ecosystem study is an interim response to restoring the Upper Mississippi and Illinois Waterways as outlined in the Navigation and Ecosystem Sustainability Program.

The need for this Project is described fully in the draft PIR, and only briefly summarized here. Between UMR 248 and 245 in Pool 25, increased erosion and sedimentation has degraded the quantity and quality of flowing water (lotic) side channel habitat, including backwaters, chutes, and riffle/pool complexes. This degradation is due to changes in hydraulics and hydrology from implementation and operation of the nine-foot navigation channel, land use changes, and changing environmental conditions The loss of side channel depth and flow diversity, structural diversity, and aquatic connectivity has decreased habitat function, extent, and availability for native aquatic species. This project area is characterized by a lack of native fish species, mussel habitat, and the natural hydrologic processes necessary to. Shoreline erosion is also present in the project area.

Without action, overall aquatic habitat diversity, quality, connectedness, and availability would continue to decline due to excessive sedimentation. In addition, the continued degradation of forest resources would lead to conversion of floodplain forest stands to more permanently inundated swamp scrub/shrub translating to a quantitative loss of habitat for various species of migratory and resident wildlife. There is an opportunity to restore a diverse suite of habitats that have all been identified as a habitat need for the Mississippi River within the Project area. The restoration of ecosystem structure and function within the Project area would contribute to restoring ecological health and resiliency of the Upper Mississippi River System. Refer to the main report for more details.

The purpose of this Biological Assessment (BA) is to review the proposed Project in sufficient detail to evaluate whether the proposed action may affect any federally threatened, endangered, proposed, or candidate species identified by the U.S. Fish and Wildlife Service (USFWS). This BA is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (15 U.S.C. 1536 (c)) and applicable guidance documents. The BA includes the description of the project area, proposed actions, species accounts and status, effects of the proposed actions, and effects determinations.

1.2 Resource Significance

The Mississippi River is the largest riverine ecosystem in North America and third largest in the world. The UMR floodplain ecosystem supports more than 300 species of birds, 57 species of mammals, 45 species of amphibians and reptiles, 150 species of fish, and nearly 50 species of mussels. It is the backbone of the Mississippi Flyway, which is used by more than 40 percent of

North America's migratory waterfowl. The UMR also has a record of human history spanning over 12,000 years and is increasingly being documented as one of the most archeologically and historically significant regions in the country.

The river has played a significant role in the development of the modern Midwestern economy and culture, and it continues to provide many benefits to the States and local communities along the river corridor (Guyon, Deutsch, Lundh, & Urich, 2012). For years, the UMR states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin), non-governmental organizations, and other agencies have been engaged in activities that clearly demonstrate the institutional, public, and technical recognition of the resources of the UMR Basin.

1.3 Proposed Action

This Biological Assessment evaluates the impacts of the Tentatively Selected Plan for the construction, operation, and maintenance of proposed project features based on the feasibility level of design. For more details on the quantities for the feasibility level of design, see Appendix D – Hydrology & Hydraulics, and Appendix H – Economics.

1.4 Project Description

USACE is preparing to implement an ecosystem restoration project in Pool 25, in the vicinity of the Hausgen Island complex, right descending bank of the Mississippi River between River Miles (RM) 248 and 245. The approximate 650-acre area is primarily described as side channel habitat, but also includes wet meadow, sandbar habitat, shallow marsh, floodplain forest, and open backwaters. The Tentatively Selected Plan, the Maximum Mussel and Bank Stabilization (Figure C-1), has been chosen to restore and enhance side channel habitat within the Project area.

1.4.1 Management Measures

Measures are fully described in Section 5.1 of the main report. This section lists which of those management measures are applied to their corresponding location, and the assumptions and goals behind each for the Tentatively Selected Plan.

1. Partial Degradation/Notching. This measure is aimed at directly degrading the drag-back of closing structures to create a boulder field like riffle on downstream end of structure to provide mussel habitat.
2. Hard Points. These structures divert the flow of water to protect or enhance existing shoreline and habitat. There are many different types of flow diversion structures, and each is used in a different situation that is dependent on the goals and objectives of the project.
3. Mussel Habitat Enhancement. Sporadic placement of large sized stone and cobble to enhance side channel substrate for mussels. Cobble and rock substrate is missing from the project area, as recent mussel surveys show substrate to be almost entirely made up of sands. The large rock placement will provide places of flow refugia and stability to allow for those sands and smaller gravels to settle below them, creating high value habitat for mussel colonization.

4. Bank Stabilization utilizing GSR for Mussel Habitat. These techniques are designed to protect shorelines from erosive forces from wind driven wave action, river currents, ice action, and recreation and commercial traffic.

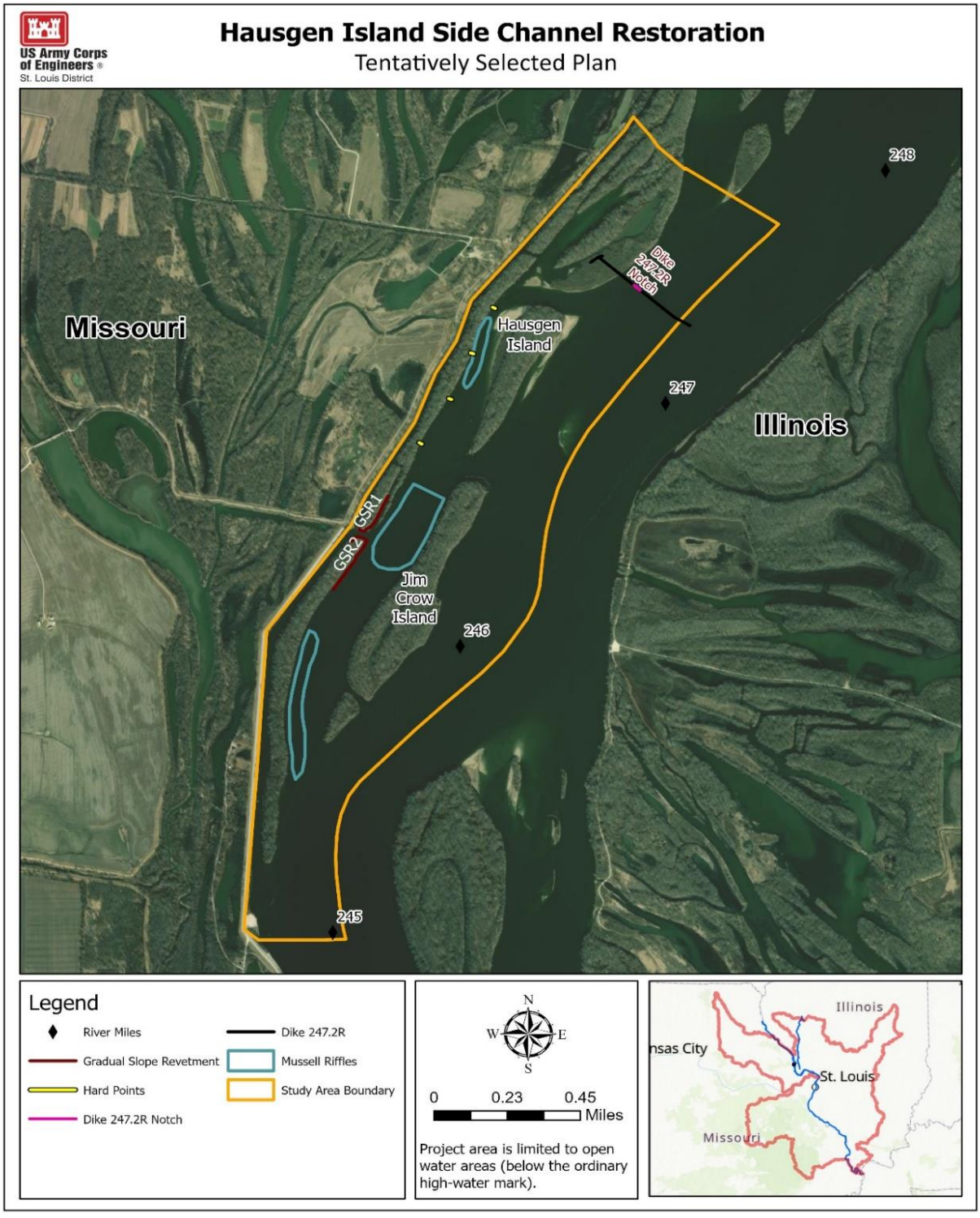


Figure C-1: Map of project area with TSP Measure

2. SPECIES AND HABITAT CONSIDERED IN THE CONSULTATION

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the USFWS provided a list of federally threatened, endangered, or candidate species that could potentially be found in the area (Lincoln County, MO) via a letter dated 18 March 2025 (IPAC Project Code 2024-0041378). The listed species, federal protection status, and habitat descriptions can be found below in Table C-1. No critical habitats are identified within the project area.

Table C-1. List of Federally Threatened or Endangered Species that may occur in the project area.

Species	Status	Habitat
Gray Bat (*Myotis grisescens*)	Endangered	Roost in caves or mines year-round. Use water features and forested riparian corridors for travel and foraging.
Indiana Bat (*Myotis sodalis*)	Endangered	Hibernates in caves and mines. Maternity & foraging habitat includes small stream corridors with well-developed riparian woods, upland & bottomland forests.
Tricolored Bat *Perimyotis subflavus*)	Proposed Endangered	Roosts among live and dead leaf clusters of live or recently dead deciduous hardwood trees in summer and fall. Hibernates in caves and mines in winter.
Spectaclecase (mussel) (*Cumberlandia monodonta*)	Endangered	Found in large rivers where they live in areas sheltered from the main force of the river current. Often clusters in firm mud and in sheltered areas, like beneath rock slabs, between boulders and even under tree roots.
Monarch Butterfly(*Danaus plexippus)*	Proposed Threatened	Grassland and other herbaceous dominated habitats with Milkweed resources during the breeding life stage and similar habitats with abundant nectar resources during breeding and migration life stages. Overwintering occurs outside our region and must provide specific roosting microclimate conditions.
Western Regal Fritillary (Argynnis idalia occidentalis)	Proposed Threatened	Remnant native prairies, including disturbed or somewhat degraded examples and native pastures usually supporting sufficient populations of violets.

3. MEASURES TAKEN TO AVOID IMPACTS TO LISTED SPECIES

During the planning process for the NESP Pool 25 Hausgen Island project, the planning team considered how project measures could impact listed species. Efforts have been made to reduce direct and indirect impacts to listed species.

3.1 Conservation Measures

Conservation measures are actions to benefit or promote the recovery of a listed species that a federal agency includes as an integral part of the proposed action and that are intended to avoid, minimize, or compensate for potential adverse effects of the action on the listed species.

As such, mandatory measures below will be incorporated into every USACE action that falls within this consultation framework.

The following conservation measures are proposed for the proposed action alternative to help minimize effects to currently listed species within the Project.

1. If tree clearing is necessary, all tree clearing resulting from the USACE action will occur during the inactive season from November 1 to March 31 unless negative presence/probable absence survey results were obtained for the action area through appropriate surveys approved by the U.S. Fish and Wildlife Service (USFWS).
2. During clearing, dead trees, split trees, trees that have cavities, and trees with exfoliating bark would be favored for retention where possible.
3. Best management practices would be utilized according to NWP 27 conditions to reduce impacts to wetlands, sediment movement, and water movement patterns.
4. Herbicides used to control invasive species would follow EPA product label instructions.
5. Appropriate buffer distances around potential eagle nests would be coordinated with the USFWS prior to or during construction to account for any changes in conditions from existing resources.

4. IMPACT ASSESSMENT

The following section includes a status description of each species and how it will be affected by proposed Project elements as well as the determination of effects for each species. The effects determination took into account implementation of the conservation measures listed above.

4.1 Gray Bat (*Myotis grisescens*)

4.1.1. Status

The gray bat is a federally listed, endangered mammal species. The gray bat occupies a limited geographic range in limestone karst areas of the southeastern United States, including Missouri. With rare exception, the gray bat roost in caves year-round. In winter, most gray bats hibernate in vertical (pit) caves with cool, stable temperatures below 10 degrees Celsius. Summer caves, especially those used by maternity colonies, are nearly always located within a kilometer (0.6 mile) of rivers or reservoirs over which the bats feed. The summer caves are warm with dome ceilings that trap body heat. Most gray bats migrate seasonally between hibernating and maternity caves, and both types of caves are located in Missouri. Gray bats are active at night, foraging for insects over water or along shorelines, and they need a corridor of forest riparian cover between roosting caves and foraging areas. They can travel as much as 20 kilometers (12 miles) from their roost caves to forage.

Gray bats are endangered largely because of their habitat of living in large numbers in only a few caves, thus making the species vulnerable to human disturbance and habitat loss or modification. Disturbance of gray bats in their caves during their hibernation can cause them to use their energy reserves and could lead to starvation. Disturbances to their caves during their nursing season (June and July) can frighten females causing them to drop non-volant pups to their death in panic to flee from the intruder.

Additionally, many important caves that have been historically used by gray bats have been inundated by reservoirs. The commercialization of caves, and alterations of the air flow, temperature, humidity, and amount of light can make the cave unsuitable habitat for gray bats and drive bats away.

The fatal bat disease, white-nose syndrome (WNS), has not yet been documented to adversely affect the gray bat. However, because gray bats are cave obligates, and considering how WNS has decimated other cave-dwelling bat species, WNS could be another significant threat to the gray bat.

No known suitable hibernacula or maternity caves have been documented within or adjacent to the project area, but suitable summer foraging habitat is present, and the species may occur in adjacent areas as well as the project area.

4.1.2. Effects Determination

Impact of No Action Alternative - No caves would be impacted under the No Action Alternative. No tree clearing would take place under the No Action Alternative. Suitable habitat for the bat population in the local area would see minimal change.

Impacts of Proposed Federal Action – No caves would be impacted under any of the considered alternatives. There would be no impact to foraging habitat within the proposed project area. No tree clearing is anticipated for the action alternatives. Noise impacts are anticipated, but the noise would be minimal and is not anticipated to individually or cumulatively have any adverse impact on the population as a whole. Therefore, we conclude that the Proposed Federal Project will have **No Effect for the Gray Bat.**

4.2 Indiana Bat (*Myotis Sodalis*)

4.2.1. Status

The Indiana bat is a federally listed, endangered mammal species (USFWS, 2007). The range of the Indiana bat includes much of the eastern half of the United States, including Missouri. Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods, as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forest, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds in pastures. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to single young in June or July. A maternity colony may vary widely in size due to time of year, roost switching behavior, and thermal conditions. Maternity roosts with a few to more than 350 individuals have been reported (USFWS, 2007) but typically contain fewer than 100 individuals. A single colony may utilize several roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females.

Disturbance and vandalism, improper cave gates and structures, natural hazards, such as flooding or freezing, changing environmental conditions, land use changes in maternity range, and chemical contamination are the leading causes of population decline in the Indiana Bat (USFWS, 2007). To avoid impacting this species, tree clearing activities should not occur during the period of April 1 to October 31.

Suitable summer foraging and roosting habitat exists within the project area. Potential roost trees in already forested areas such as Denmark and Drift Islands are continuously changing as potential roost trees are created and existing roost trees become unsuitable. Tree mortality is anticipated to continue accruing in mature Cottonwood and Green Ash over the near-term.

No known suitable hibernacula or maternity caves have been documented within or adjacent to the project area, but suitable summer foraging habitat is present, and the species may occur in adjacent areas as well as the project area.

4.2.2. Effects Determination

Impact of No Action Alternative - No caves would be impacted under the No Action Alternative. No tree clearing would take place under the No Action Alternative. Suitable habitat for the bat population in the local area would see minimal change.

Impacts of Proposed Federal Action – No caves would be impacted under any of the considered alternatives. There would be no impact to foraging habitat within the proposed project area. No tree clearing is anticipated for the action alternatives. Noise impacts are anticipated, but the noise would be minimal and is not anticipated to individually or cumulatively have any adverse impact on the population as a whole. Therefore, we conclude that the Proposed Federal Project will have **No Effect for the Indiana Bat**.

4.3 Tricolored Bat (*Perimyotis subflavus*)

4.4.1. Status

The Tricolored bat is proposed for federally listing as an endangered mammal species. Tricolored bats were formerly called eastern pipistrelle. Tricolored bats are usually found roosting singly. Maternity colonies averaged approximately 4 (range 1-8) females and pups in Indiana (USFWS, 2022). In winter, tricolored bats hibernate in caves with a preference for caves that are humid and warm. In summer, they generally leave their hibernation caves and roost in trees, clumps of leaves in the canopy, cliffside crevices, and human-made structures. They forage for insects high in the air along forest edge and the boundaries streams or open bodies of water. Tricolored bats mate during spring, fall, and sometimes in the winter. Maternity colonies begin forming in mid-April and females bear 1 to 2 pups by late May to mid-July.

No known suitable hibernacula or maternity caves have been documented within or adjacent to the project area, but suitable summer foraging habitat is present, and the species may occur in adjacent areas as well as the project area.

4.4.2. Effects Determination

Impact of No Action Alternative - No caves would be impacted under the No Action Alternative. No tree clearing would take place under the No Action Alternative. Suitable habitat for the bat population in the local area would see minimal change.

Impacts of Proposed Federal Action – No caves would be impacted under any of the considered alternatives. There would be no impact to foraging habitat within the proposed project area. No tree clearing is anticipated for the action alternatives. Noise impacts are anticipated, but the noise would be minimal and is not anticipated to individually or cumulatively have any adverse impact on the population as a whole. Therefore, we conclude that the Proposed Federal Project will have **No Effect for the Tricolored Bat.**

4.5 Spectaclecase mussel (*Cumberlandia monodonta*)

4.5.1. Status

Spectaclecase is a federally listed, endangered mussel species (USFWS, 2019). This mussel lives in large rivers in sheltered areas (e.g., beneath rock slabs). Historically, this large mussel was found in at least 44 streams of the Mississippi, Ohio, and Missouri river basins in 14 states; however, today it is found only in 20 streams, with the populations fragmented and restricted to short stream reaches. Pool 24 is considered to still harbor an extant, but sparse population. In 2012, there was one dead shell of Spectaclecase found along the chevron structures within the project area near RM 289-290 (Ecological Specialist Inc, 2014). However, no Spectaclecase live or dead, were observed in the most recent sampling in fall of 2023. Suitable habitat for this federally listed species is not currently present within the project area, as the substrate from the most recent survey was defined as primarily shifting sands.

4.5.2. Effects Determination

Impact of No Action Alternative – Under the no action alternative, natural river processes will continue within the side channels. The already rare occurrence of Spectaclecase is expected to continue with due to little structure to provide sheltered areas that are attractive to Spectaclecase colonization.

Impacts of Proposed Federal Action – The proposed side channel improvement measures such as sporadic placement of large sized boulders and cobble would provide flow refugia and sheltered areas that are preferred by Spectaclecase. There will be a short term decrease in habitat quality during and immediately following construction, but that is expected to be fully offset by the creation of additional side channel habitat diversity. Mussel surveys have been conducted to inform placement of mussel riffle habitat stone, so as to avoid any impacts to mussels that may already be occupying the areas. Post construction monitoring surveys would also follow to document effectiveness of the mussel substrate measure. Therefore, the Proposed Federal Action ***may affect but is not likely to adversely affect the Spectaclecase mussel.***

4.7 Monarch Butterfly (*Danaus plexippus)*

4.7.1. Status

The monarch butterfly is a large orange butterfly that is a candidate for listing on the Endangered Species List. Monarch populations of eastern North America have declined 90%. Much of the Monarch butterfly's life is spent migrating between Canada, Mexico, and the U.S. Monarchs do not overwinter in Missouri (USFWS, 2021). The monarch occurs in a variety of habitats where it searches for its host plant, milkweed. Of the over 100 species of milkweed that exist in North America, only about one fourth of them are known to be important host plants for monarch butterflies. The main monarch host plant is Common Milkweed (*Asclepias syriaca*) (Kaul & Wilsey, 2019). Other common hosts include Swamp Milkweed (*Asclepias incarnata*), Butterfly Milkweed (*Asclepias tuberosa*), Whorled Milkweed (*Asclepias verticillata*), and Poke Milkweed (*Asclepias exaltata*) (USFWS, 2021). Both Common and Swamp Milkweed are likely to occur in the wetland and forested areas within the project area. Three factors appear most important to explain the decline of Monarchs: loss of milkweed habitat, logging at overwintering sites, climate change, and extreme weather. In addition, natural enemies such as diseases, predators, and parasites, as well as chemicals used in agricultural activities may also contribute to the decline.

4.7.2. Effects Determination

Impact of No Action Alternative – Under the No Action Alternative, the side channel habitat would remain unchanged, and sediment would continue to accumulate. The emergent wetlands and side channel habitat do not support host plants in the study area. As a result, this alternative would have no effect on the Monarch Butterfly.

Impacts of Proposed Federal Action – The proposed alternatives would all be aquatic based features and would not affect any host plants or suitable habitat for the Western Regal Fritillary. Therefore, we conclude that the Proposed Federal Project will have **No Effect for the Monarch Butterfly.**

4.8 Western Regal Fritillary (*Argynnis idalia occidentalis*)

4.8.1. Status

The Western Regal Fritillary (Arynnis idalia occidentalis) is a subspecies of butterfly that was proposed as threatened in the Federal Register (vol. 89, No. 151/ August 6, 2024 /pgs 63888-63909). Adults lay eggs in grassland habitat during the late-summer/early fall on a range of senesced plants, the ground, or on rocks (USFWS, 2023). The eggs hatch after approximately 3-8 weeks to overwinter in vegetation for the winter. In early spring the larvae emerge to search for young prairie violets (Viola pedatifida., their primary source of food which support growth and molting of caterpillars. During this phase, caterpillars (larvae) seek shelter on violets or in nearby grass clumps. In late spring to early summer, the caterpillars pupate in nearby herbaceous vegetation for 2.5-4 weeks (Selby, 2007). The adult phase of butterfly emerges in early summer (June-July). Adult butterflies require a diversity of nectar-producing flowers (forbs) to support the reproductive phase at the end of summer to begin the lifecycle again. The species may be capable of moving 100 miles or more, but shorter movements within or between suitable habitat patches is typical (Selby, 2007). The amount of movement may be affected by available nectar sources, habitat isolation, and surrounding habitats. Female Regal Fritillaries tend to disperse greater distances than males which allows recolonization of extirpated areas.

The species depends on large blocks of native grasslands with warm-season bunchgrasses in the central and northern Great Plains, portions of the Midwest, and in eastern Pennsylvania (USFWS, 2023). The grassland habitat must be relatively non-degraded. The habitat needs of each phase (i.e. egg, larvae, pupae, adult) important in determining the ability of a site to support one or more stages of this species' lifecycle. Warm season bunchgrasses provide shelter for individuals in all life stages. Moisture levels at occupied sites are mesic (moderately moist) in the east (eastern subspecies) and more xeric (dry) in the Midwest and Great Plains (western subspecies). Milkweeds (Asclepias spp.), thistles (Cirsium spp.), and wild bergamot (Monarda fistulosa) are favored nectar sources (Ferster and Vulinec, 2010).

The habitat needs of each phase (i.e. egg, larvae, pupae, adult) is important in determining the ability of a site to support one or more stages of this species' lifecycle.

4.8.2. Effects Determination

Impact of No Action Alternative – Under the No Action Alternative, the side channel habitat would remain unchanged, and sediment would continue to accumulate. The emergent wetlands and side channel habitat do not support host plants in the study area. As a result, this alternative would have no effect on the Western Regal Fritillary

Impacts of Proposed Federal Action – The proposed alternatives would all be aquatic based features and would not affect any host plants or suitable habitat for the Western Regal Fritillary. Therefore, we conclude that the Proposed Federal Project will have **No Effect for the Western Regal Fritillary**

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6. LIST OF PREPARERS

Zachary Day

Biologist

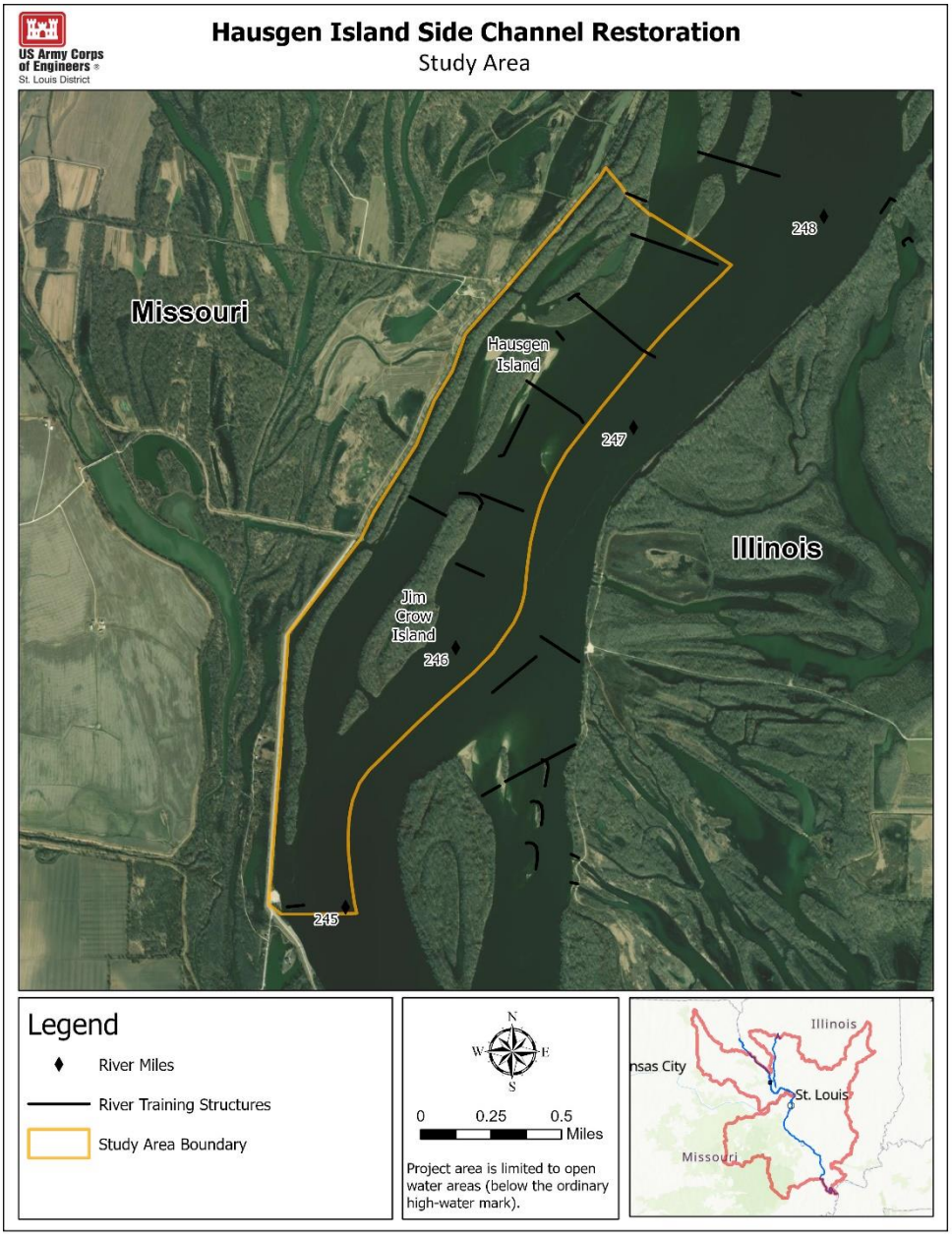
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NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION
ECOSYSTEM RESTORATION PROJECT

POOL 25, UPPER MISSISSIPPI RIVER MILES 248-245
LINCOLN COUNTY, MISOURI



July 2025
Appendix D
Hydraulics and Hydrology

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1 Introduction

1.1 Project Location

The project area lies within Pool 25 of the Upper Mississippi River between Lock and Dam (L&D) 24, river mile (RM) 274 at Clarksville, MO, and L&D 25 (RM 242) at Winfield, MO. The Hausgen Island Complex is approximately 200 acres of side channel and backwater habitats between Jim Crow and Little Stag Islands (RM 248 and 245) on the right descending bank of the Mississippi River in Lincoln County, MO.

The proposed work would consist completely of aquatic habitat restoration along the Missouri bank. The work would be below the Ordinary High Water Mark (OHWM); therefore, no landowners are identified, and operation and maintenance costs would be 100% federally funded. Potential measures that could be implemented with this work include dike alteration, river training structures, substrate enhancement, slope revetment, and other means of environmental restoration. The work would aim to restore side channel habitat and connectivity to benefit native species. The project boundary area is shaded in blue in Figure 1.

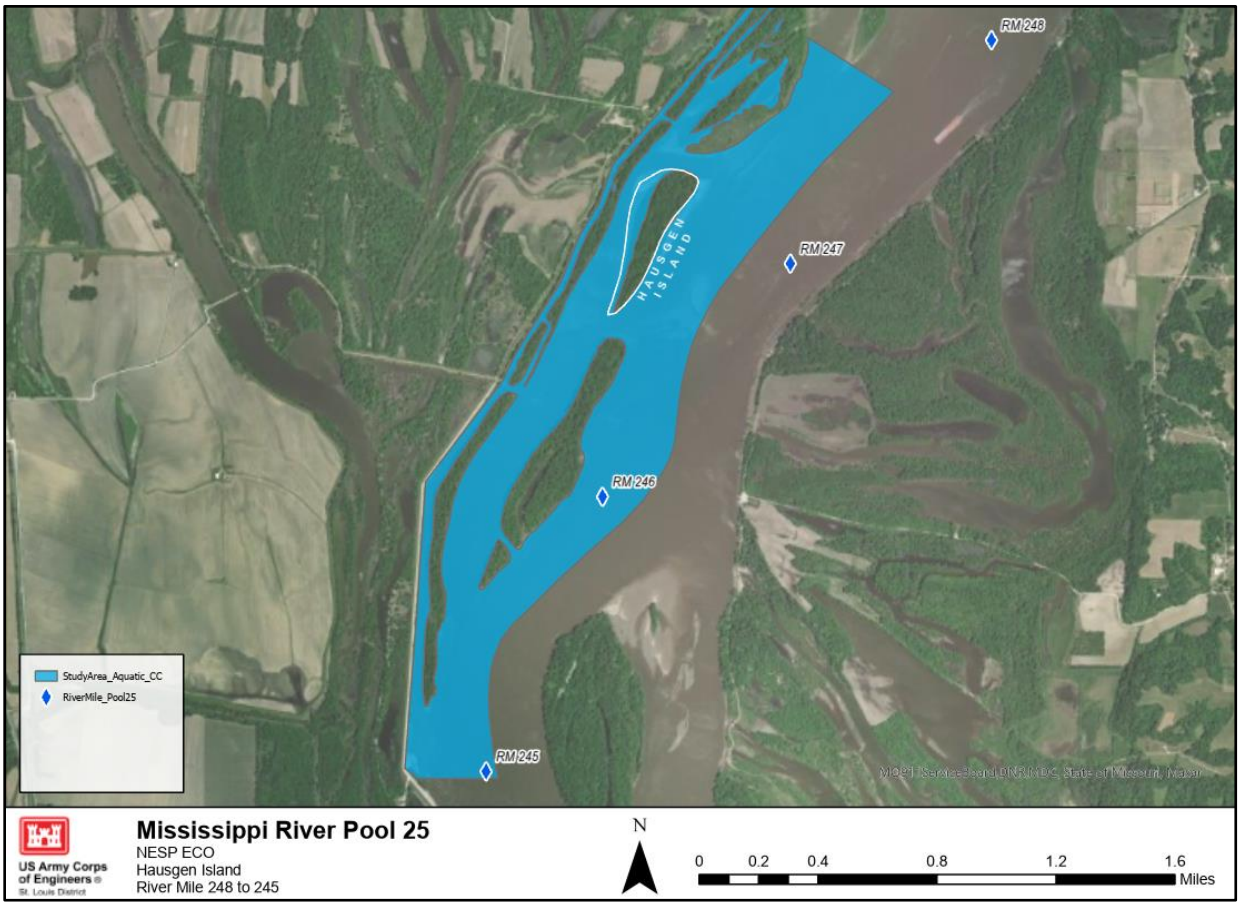


Figure 1. Hausgen Island

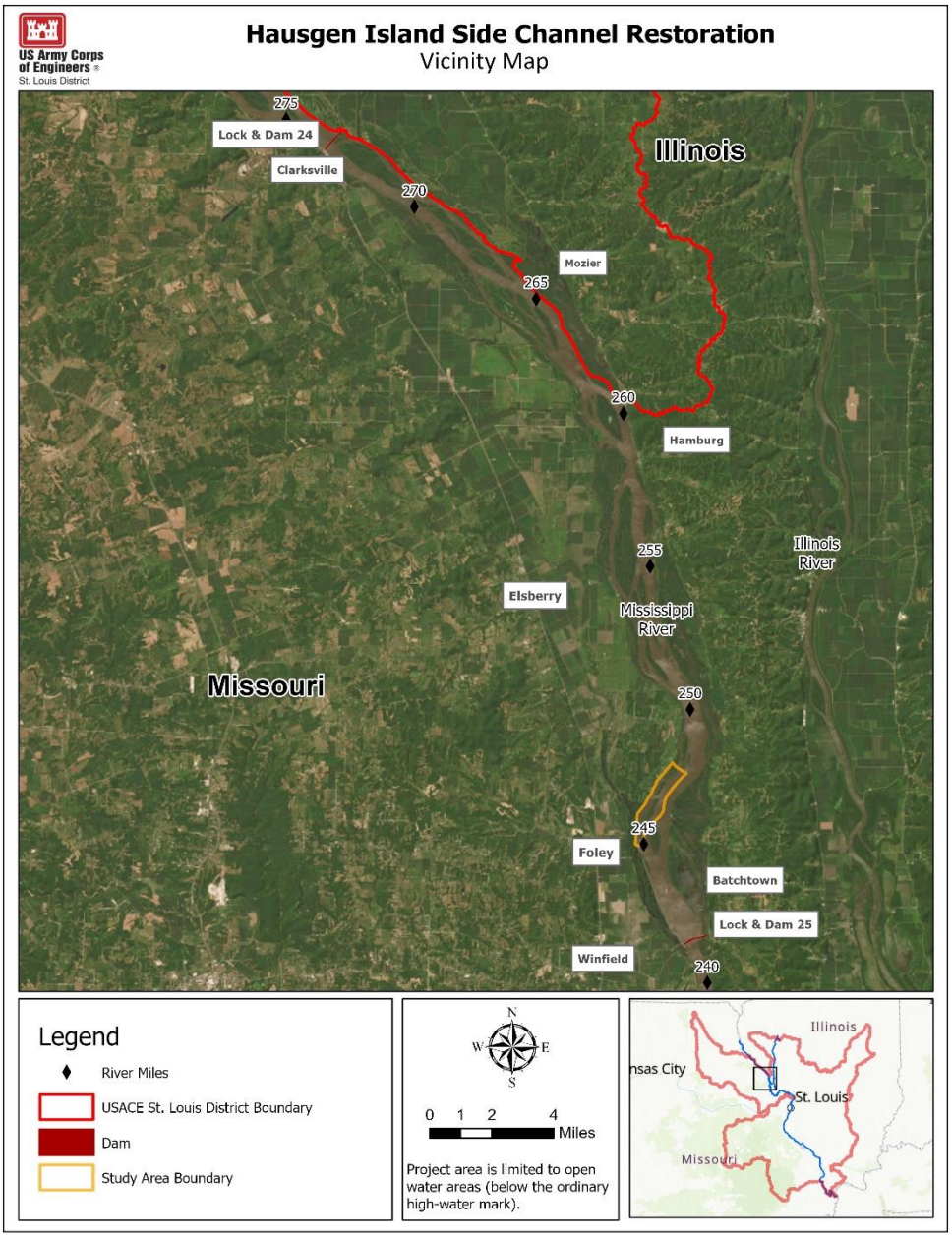


Figure 2. Vicinity Map

1.2 Historical Information

Since the mid-19th century, the U.S. Army Corps of Engineers (USACE) has been charged by Congress to improve the Mississippi River for navigation through dredging, snagging, clearing, and channel constriction. This was accomplished by the removal of shoals and sandbars, closing off meandering sloughs and backwaters to confine flow within the main channel, and excavating rock from a series of rapids to clear passage for navigational traffic. Starting in 1866, Congress began authorization to maintain a 4-foot channel, then increased channel depth to 4.5-foot

channel in 1878, and again increased depth to a 6-foot channel in 1907. In 1930, Congress, authorized the 9-Foot Channel Navigation Project. Thus between 1930 and 1940, the USACE constructed the Upper Mississippi River and Illinois Waterway to provide a 9-foot navigation channel depth to a minimum width of 400 feet. As part of the construction of L&D 25 and the creation of Pool 25 in 1935, most of the islands within the study area of Pool 25 were acquired by the federal government. Construction on L&D 25 began in early November 1935, was formally initiated on July 21, 1936, and was completed on March 12, 1940. Since the 1880s, levees were constructed and continue to be maintained on the Upper Mississippi River System (UMRS).

The navigation pools in the St. Louis District are maintained based upon hinge point limits. As the flows increase and the upper limits of the hinge point is approached, the pool level is lowered to compensate until the flows start decreasing or max drawdown is reached. As the flows decrease and the lower limit of the hinge point is approached, the pool level is raised to compensate until the flows start increasing. The lower limit at the hinge point is defined by the lowest river level allowable for a safe and dependable navigation channel and in coordination with dredging efforts. The upper limit is defined by the highest river level that can be maintained by the dam, because the land above this limit isn't owned by the U.S. government, thus not authorized to be inundated by the project. The project area entails side channels and backwaters of two primary islands (Hausgen and Jim Crow Islands) along with the southern portion of Little Stag Island within the lower pool of L&D 25 below the hinge point at Mosier Landing (RM 260.3).

1.3 Project Purpose and Need

The purpose of the feasibility study determines whether there may be interest in restoring side channel and backwater habitats. Side channels are important aquatic habitat for many native species including UMR riverine fishes and freshwater mussels. Historically, the study area had freshwater mussel beds, but these beds have been impacted through time due to degraded side channel conditions (e.g., increased siltation, sediment homogenization). Restoring side channels to promote freshwater mussel habitat has been identified by the River Resources Action Team (RRAT) as a resource need within the Lower Impounded Reach of the Mississippi River.

An initial site visit with USACE, Illinois Department of Natural Resources (IDNR), Fish and Wildlife Services (FWS), and Missouri Department of Conservation (MDC) team members was completed on November 3, 2023. Multiple recreational structures (hunting blinds and boat ramps) were identified. A large sandbar on the Missouri side of Hausgen Island was found with few mature plants starting to establish growth. It appears island building is occurring along the north end of Hausgen Island and the lower portion of Little Stag Island. During normal pool levels, the side channel along Hausgen appeared to be up to 5 feet deep in places and along Jim Crow the depths were up to 15 feet. The side channel exhibited decent flow conditions, with higher flow movement along Jim Crow Island than Hausgen Island. There was some noticeable bank erosion occurring along the interior banks of smaller barrier islands, especially along the Missouri bank line. Without intervention, the team members are concerned the side channel will eventually become cut off from the main channel and habitat connectivity will be lost.

Sediment routinely builds up within the backwater areas and side channels after large flood events or during low flow situations. The rate at which sediment deposition occurs depends heavily on the duration and velocity of flow at specific time periods. Since there are no sediment gauge

stations located within Pool 25 to provide accurate data, sediment rates within the project area had to be estimated using a comparison of bathymetric terrain data obtained through past hydrographic surveys. Bathymetric survey data within the side channels from 2023 and 2012 was used for this elevation comparison to approximate a deposition rate range from 1.8 inches to 2.9 inches per year. The value mentioned could be highly variable due to limited data over the past decades and characteristic changes of these side channels. It should also be noted that, bathymetric surveys are simply snapshots in time; hydrographic survey have limited coverage within side channels and backwater areas; comparison terrain data was limited to only two surveys; and comparing two converted surveys can introduce statistical errors. The average daily sediment load of the Mississippi River at Hannibal, Missouri, is about 70,000 tons (USACE, 2001).



Figure 3. Sandbar on Hausgen Island November 3, 2023



Figure 4. Boat Ramp on Hausgen Side Channel November 3, 2023

2 HEC-RAS 2D Modeling

The Hydraulic Engineering Center River Analysis System (HEC-RAS) version 6.3.1 was used to construct a 2D numerical model of the Hausgen Island complex study area. The geometry from HEC-RAS was created from imported ArcGIS shapefiles. These shapefiles were used to establish the location of bank lines, river centerline, islands, river miles, and several river training structures.

The HEC-RAS model starts near the Mosier Landing gauge (RM 260.3) and extends downstream to L&D Pool 25 (RM 242). Hausgen Island is situated approximately 4 miles upstream of L&D 25 (RM 246 to RM 248). The extent of model was limited by a series of levees along the Missouri right descending bank (Figure 5) and the Illinois river bluff along North Mississippi River Road.

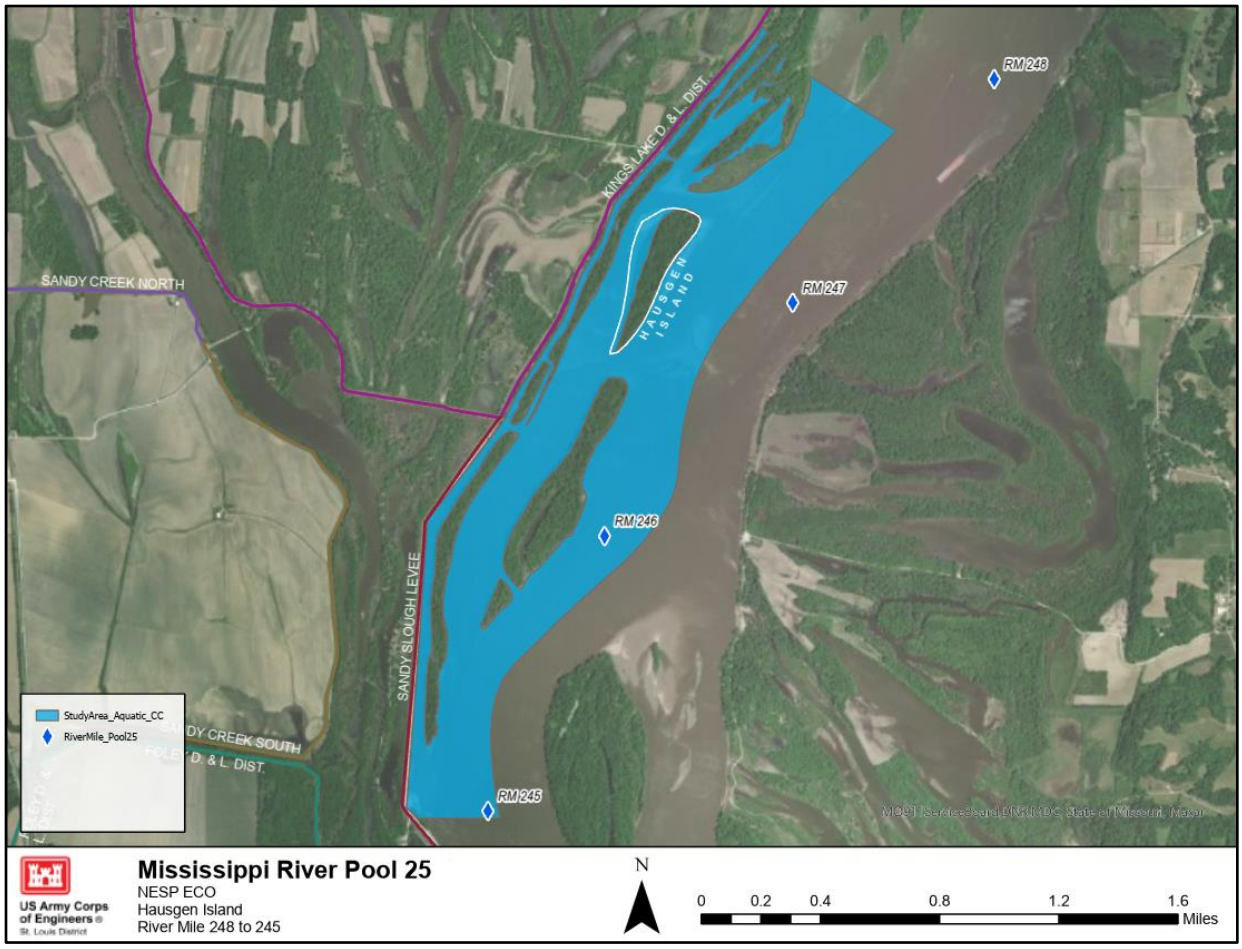


Figure 5. Surrounding Levee Districts

The limits of the HEC-RAS 2D model are shown in red on Figure 6. The following sub-sections detail how the model was made and how it was used to evaluate project alternatives.

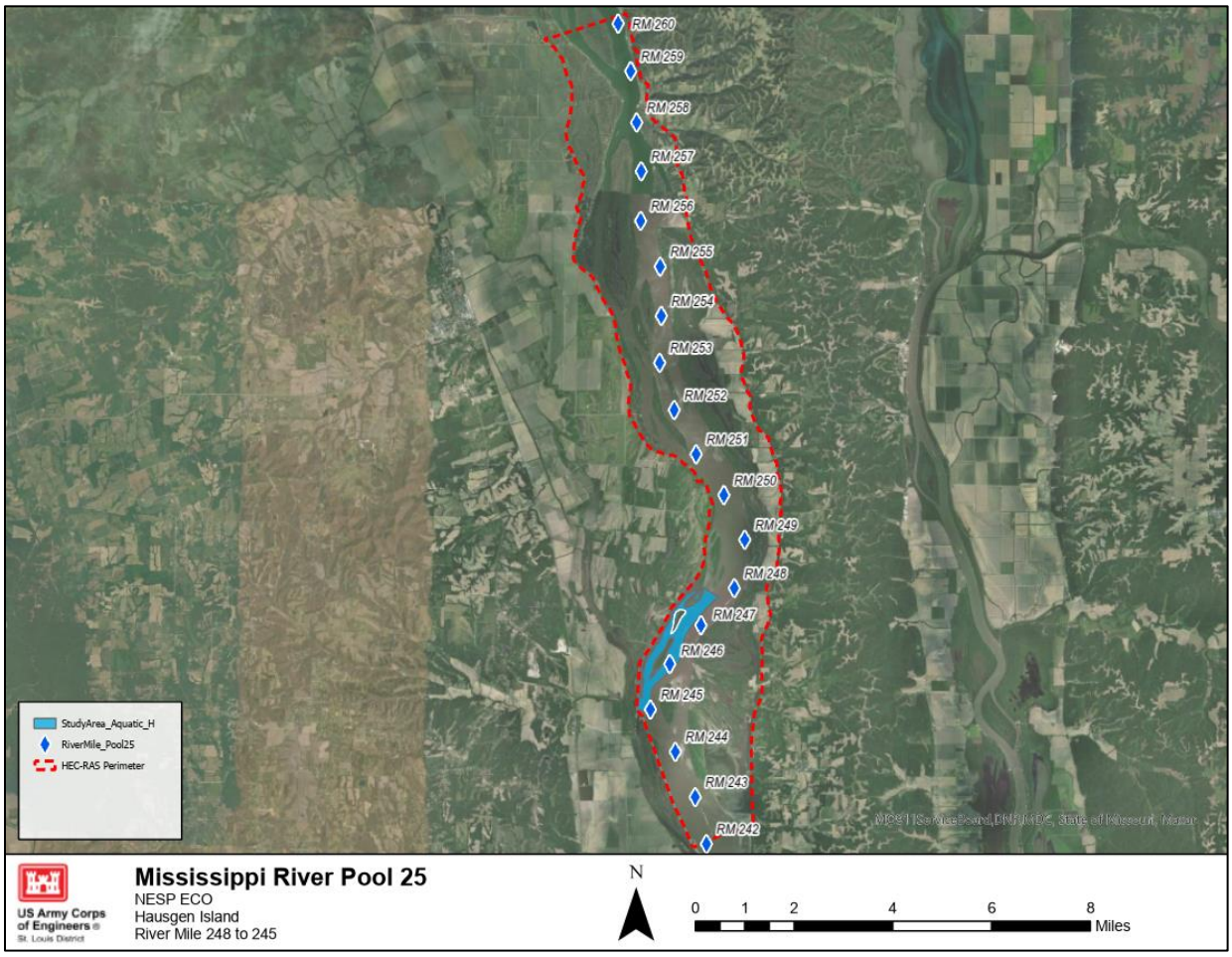


Figure 6. HEC-RAS 2D Model Limits

2.1 Geometry

2.1.1 Terrains

The existing conditions terrain compiles a combination of LiDAR ground elevation topography, and various bathymetric surveys collected by USGS and USACE (see Table 1 & Table 2). The USGS topographic and bathymetric elevation data from survey date 2016 were used as the base layer for the model terrain. All elevation data integrated into the terrain was converted to the North American Vertical Datum of 1988 (NAVD88) (feet) and reprojected into North American Datum (NAD) of 1983 State Plane MO East (US survey feet) coordinate system. These separate data sources were layered and merged using feathering and terrain painting functionality in ArcGIS Pro v3.1.0 and Global Mapper Pro v23.0. Project features represented in terrains include islands, side channels, dredged backwaters, levees, ridgelines, and river training structures (existing, altered, and new). These features were added to the existing terrain by further manipulation in Global Mapper Pro and/or by altering roughness values in the HEC-RAS model.

Table 1. Elevation Data Sources

Source	Survey Date	Coordinate System	Vertical Datum
USGS Aerial LiDAR (Pool 25)	2016	NAD 1983 UTM Zone 15N (m)	NAVD88 (ft)
USGS Bathymetry (Pool 25)	2016	NAD 1983 UTM Zone 15N (m)	NAVD88 (ft)
USACE Aerial LiDAR (Red's/Gilead)	2023	NAD 1983 UTM Zone 15N (m)	NAVD88 (ft)

Table 2. USACE Bathymetric Surveys

RM Coverage	Survey	Date	Type
RM 241-273	Pool 25 Comprehensive Main Channel	2016	Single Beam & Multi Beam Sonar
RM 258-262	Main Channel	7/31/2020	Multi Beam Sonar
RM 245-247	Hausgen Island	5/9/2023	Multi Beam Sonar
RM 269-273	Clarksville & Carroll Islands	5/17/2023	Single Beam & Multi Beam Sonar
RM 248-256	Red's Landing & Gilead Slough	8/15/2023	Single Beam & Multi Beam Sonar
RM 242-247	Hausgen Island	5/31/2024	Single Beam
RM 272-273	Clarksville Island	5/31/2024	Single Beam

Figure 7 below shows the extent of surveys for Pool 25 that comprise the terrain. Surveys are highlighted in blue with darker blue indicating the layering order.

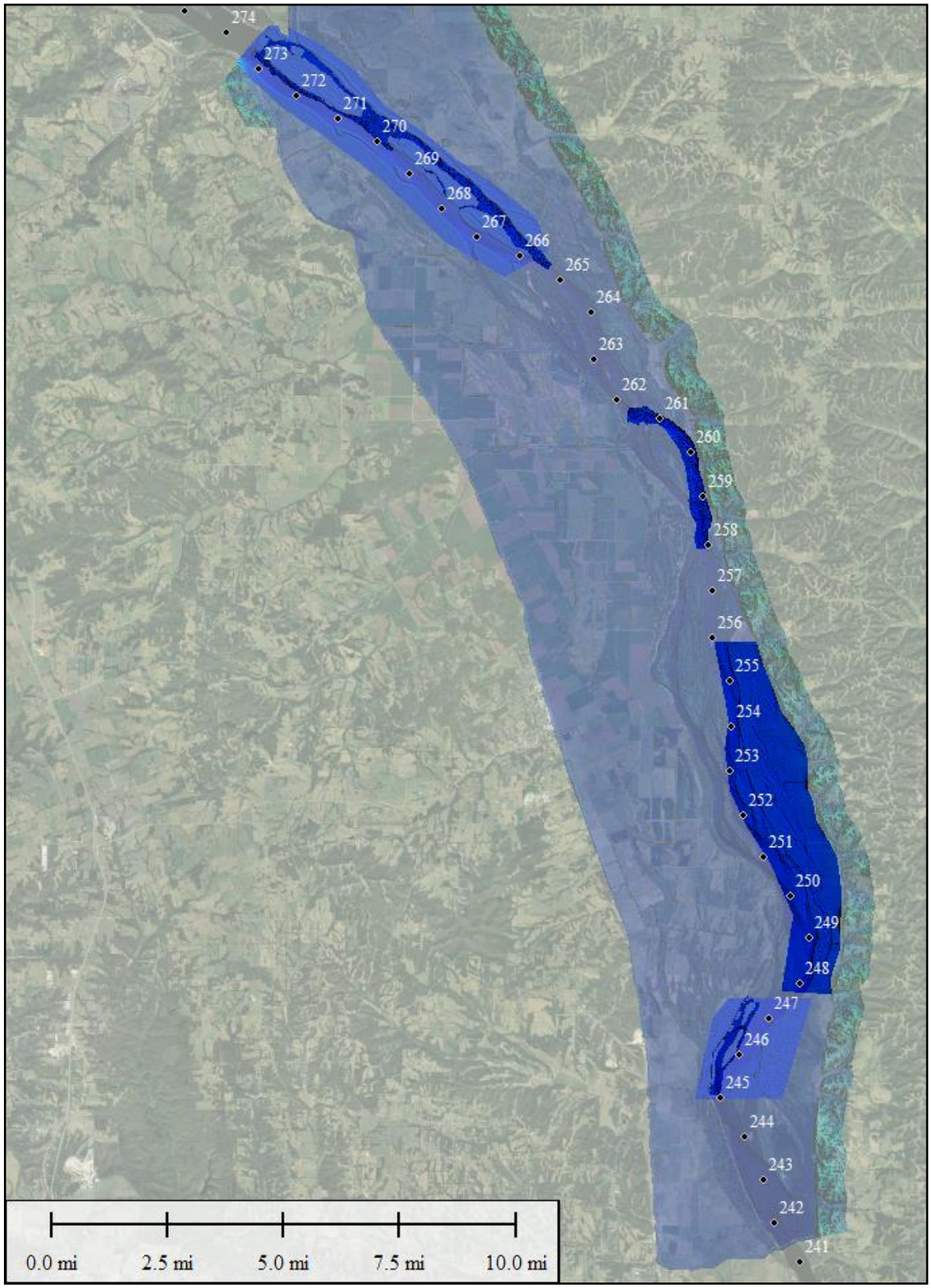


Figure 7 Pool 25 terrain extents

2.1.2 Mesh Development

The HEC-RAS 2D numerical modeling was setup with a 2D flow area covered with individual computation cells making up a model mesh network. Each individual cell element was spaced every 100 feet by 100 feet. These cells allow volumetric computations to be performed on an individual cell by cell basis. Breaklines were used to establish the river centerline so the mesh would align perpendicular to flow. Breaklines were added to topographic and bathymetric features along riverbanks, levees, island, and other river training structures throughout the 2D modeled area. These breaklines were enforced into the mesh area. The model mesh was then edited to ensure each computation cell element did not exceed 8 sides to allow for faster model analysis run times. After model simulations run through multiple iterations, the data output provides calculated water surface elevations (WSE), velocities, flow depths, etc. at each cell location for the entire modeled mesh 2D flow area. Figure 8 shows a typical 2D flow area mesh created from the topographic, bathymetric, cell elements, and breaklines for the existing and proposed conditions.

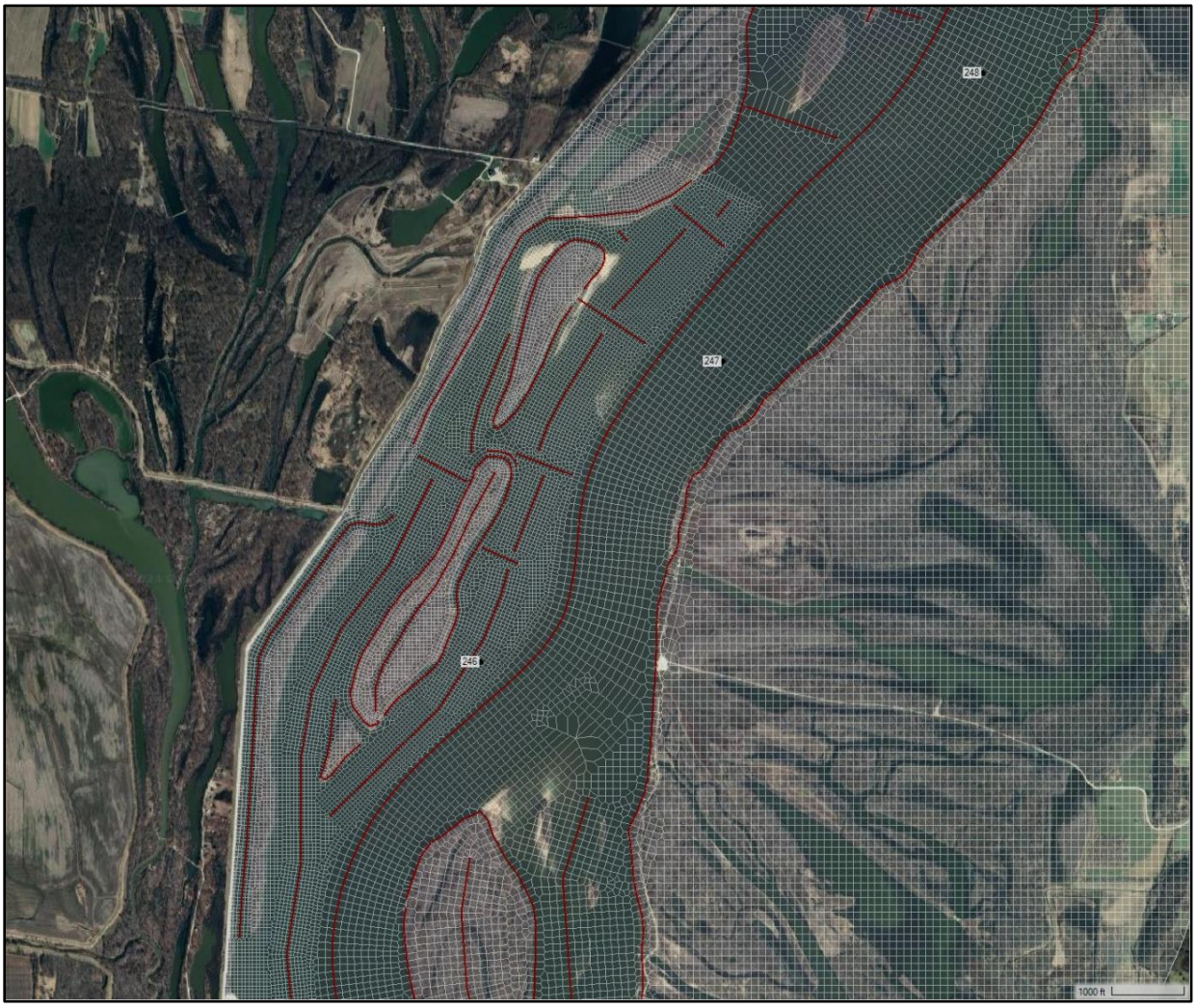


Figure 8. Existing Model Conditions

2.1.3 Model Features

Existing features were setup, adjusted, or assumed within the existing model to provide representative conditions that were not identified, surveyed, or provided during data collection. Features included backwaters, scour structures, dikes, and other river training structures. These features were modeled by modifying the raster terrain layer in Global Mapper Pro using terrain painting functionality. Structure river training features, such as dikes, were placed into the surface at their respective locations and adjusted accordingly to their terrain locations. The materials used to construct the dikes consisted of stone grade A. Table 3 shows a list of River Training Structure Inventory within the project region.

Table 3. River Training Structure Inventory Hausgen Island (RM 245 – RM 249)

Structure Name	Dike ID	River Mile	Descending Bank Side
Dike 245.0R	245.00R	245.0	Right
Batchtown Diversion Dike	245.2L	245.2	Left
Chevron 245.4L	245.40L	245.4	Left
Chevron 245.4L	245.40L	245.4	Left
Chevron 245.5L	245.50L	245.5	Left
Dike 245.7L	245.70L	245.7	Left
Chevron 245.7L	245.70L	245.7	Left
Dike 246.0L	246.00L	246.0	Left
Dike 246.2L	246.20L	246.2	Left
Dike 246.3R	246.30R	246.3	Right
Dike 246.4R	246.40R	246.4	Right
Bullnose Dike 246.5R	246.5	246.5	Right
Dike 246.5R	246.50R	246.5	Right
Dike 246.7R	246.70R	246.7	Right
Dike 246.9R	246.90R	246.9	Right
Dike 247.1R	247.10R	247.1	Right
Dike 247.2R	247.20R	247.2	Right
Dike 247.6R	247.60R	247.6	Right
Dike 247.7R	247.70R	247.7	Right
Dike 247.9R	247.90R	247.9	Right
Chevron 248.1L	248.1L	248.1	Left
Dike 248.15L	248.10L	248.1	Left
Dike 248.1L	248.10L	248.1	Left
Dike 248.4R	248.40R	248.4	Right
Dike 248.5R	248.50R	248.5	Right
Dike 248.6R	248.60R	248.6	Right
Dike 248.7R	248.70R	248.7	Right
Dike 248.8R	248.80R	248.8	Right

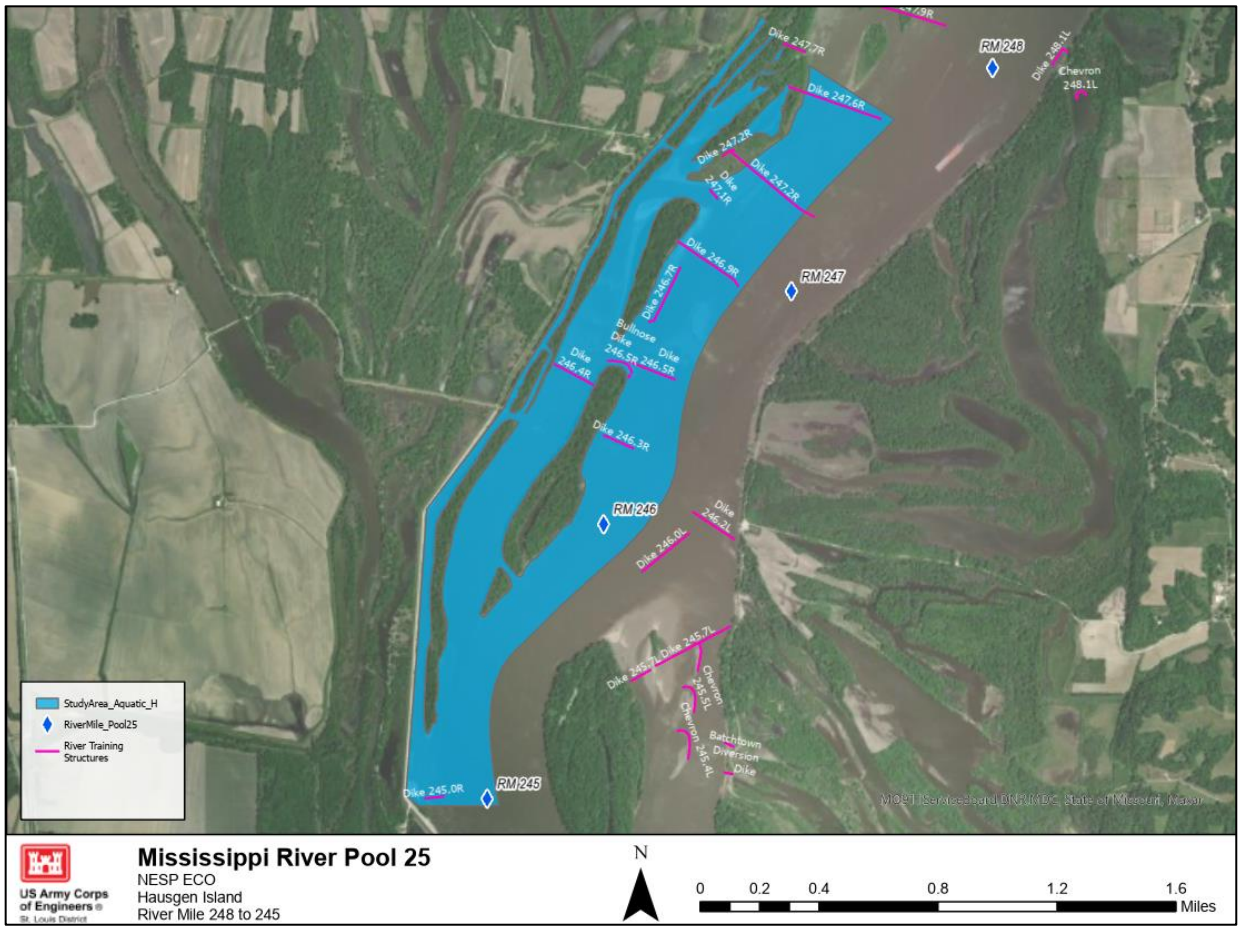


Figure 9. River Training Structures RM 248 - 246

2.1 Calibration

2.1.1 Boundary Conditions

The upstream boundary condition was set at Mosier Landing gauge (RM 260.3), and flow information was taken from the “Upper Mississippi River System Flow Frequency Study” (USACE, 2004) for larger flow models. The downstream boundary condition was set at L&D Pool 25 (RM 242) for corresponding stage elevation for each studied flow condition. An energy grade slope of 0.001178 ft/ft was measured along the thalweg of the channel at the downstream boundary condition as a basis to set the flow distribution for model simulations. The boundary conditions allow 2D HEC-RAS to calculate starting and ending flow distributions (elevations, velocities, depths, etc.) across these terrain sections through each simulation analysis. The next few tables show average monthly discharges and relevant design data.

An interpolated value for the datum conversion was used. The NGVD29 to NAVD88 conversion at Mosier Landing was noted as -0.46 and the NGVD29 to NAVD88 conversion at L&D 25 Pool was noted as -0.40. An assumed conversion factor of -0.4 was used to convert elevation data from

NGVD29 to NAVD88. For calculation purposes, this conversion factor remained constant throughout the model extents.

Table 4. Average Monthly Discharges (2009-2023)

Month	L&D 24 Tailwater 2009 - 2023 Avg Discharge (cfs)	Mosier Landing 2009 - 2023 Avg Discharge (cfs)
January	85,699	98,855
February	89,503	99,267
March	143,589	145,902
April	173,652	181,988
May	191,002	196,356
June	178,431	184,641
July	153,501	156,901
August	96,826	99,899
September	98,053	101,858
October	119,231	124,125
November	104,789	111,658
December	91,316	99,825

Table 5. Relevant Design Data (WSE NAVD 88)

	Current Discharge (cfs)	Discharge from FFS (cfs)	RM 260.30 Elevation (ft NAVD 88)	RM 241.49 Elevation (ft NAVD 88)	Daily Percent Exceedance
Existing Channel Bottom	-	-	408.10	412.7	-
L&D 25 Minimum Pool	10,000	-	433.80	429.3	99.99 %
L&D 25 Normal Pool	20,000	-	433.95	433.6	99.31 %
ADCP Survey 7/28/2023	206,491	-	433.91	431.5	99.75 %
50% AEP 2-year	-	210,000	441.2	434.0	10.19 %
L&D 25 Overflow Dike	211,800	-	-	434.1	9.91 %
20% AEP 5-year	-	269,000	444.4	437.2	3.59 %
10% AEP 10-year	-	310,000	446.1	439.4	1.72 %
1% AEP 100-year	-	443,000	450.3	445.2	0.28 %
Levee Crown	-	-	451.7	445.3	-

* Elevation conversion from NGVD29 to NAVD88 assumed to be -0.4 ft

Table 6. Water Surface Elevations based on the Flow Frequency Study

River Mile	50% AEP 2-year	20% AEP 5-year	10% AEP 10-year	1% AEP 100-year
260.30	441.3	444.5	446.2	450.4
260.17	441.2	444.4	446.2	450.4
259.18	440.8	444.0	445.8	450.0
258.00	440.3	443.5	445.3	449.6
257.57	440.1	443.3	445.2	449.4
256.40	439.6	442.8	444.7	449.0
255.26	439.1	442.3	444.3	448.6
254.18	438.6	441.8	443.9	448.3
253.21	438.1	441.4	443.5	447.9
252.19	437.7	441.0	443.1	447.6
251.22	437.3	440.6	442.7	447.2
250.00	436.8	440.0	442.3	446.9
249.50	436.7	439.8	442.1	446.8
248.22	436.2	439.3	441.6	446.4
247.09	435.9	438.8	441.2	446.1
246.00	435.5	438.4	440.8	445.8
245.39	435.3	438.1	440.6	445.7
244.03	434.9	437.7	440.1	445.4
243.22	434.6	437.5	439.9	445.4
242.02	434.2	437.3	439.6	445.3
241.49	434.0	437.2	439.4	445.2

* Elevation conversion from NGVD29 to NAVD88 assumed to be -0.4 ft

2.1.2 Initial Conditions

The model was set to run from 00:00 to 24:00 hour to calibrate the model within a 24-hour period to allow for model stabilization. The model was set with a ramp-up time of 12 hours and set at 1-minute computational time step intervals for stabilization and calibration. The model warm-up period consists of 1-hour intervals starting from zero flow to the first flow value in the hydrograph, then maintaining that flow constant during the simulation. Data output intervals were set to 15-minute intervals.

2.1.3 Roughness Values

Manning's "n" roughness values were established and assigned according to 2019 National Land Cover Database (NLCD) land cover designations for model analysis. Table 7 shows typical Manning's "n" values for various land cover types. Each Manning's "n" value was reviewed and adjusted accordingly during calibration. The adjusted calibrated Manning's "n" values can be found in the third column of the table.

Table 7. Manning's "n" Values by Land Cover (NLCD)

Land Cover Region Description	NLCD Range Manning's "n" Values	Calibrated Manning's "n" Values
Open Water	0.025 - 0.05	0.025
Developed, Open Space	0.03 - 0.05	0.03
Developed, Low Density	0.06 - 0.12	0.06
Developed, Medium Density	0.08 - 0.16	0.08
Developed, High Density	0.12 - 0.20	0.12
Barren Land	0.023 - 0.030	0.025
Grassland/Herbaceous	0.025 - 0.05	0.03
Shrub/Scrub	0.07 - 0.16	0.07
Mixed Forest	0.08 - 0.20	0.08
Undeveloped, Deciduous Forest	0.10 - 0.20	0.10
Undeveloped, Evergreen Forest	0.08 - 0.16	0.10
Agricultural, Cultivated Crops	0.020 - 0.05	0.03
Agricultural, Pasture/Hay	0.025 - 0.05	0.035
Wetlands, Forested (Woody)	0.045 - 0.15	0.04
Wetlands, Non-Forested (Emergent Herbaceous)	0.05 - 0.085	0.045

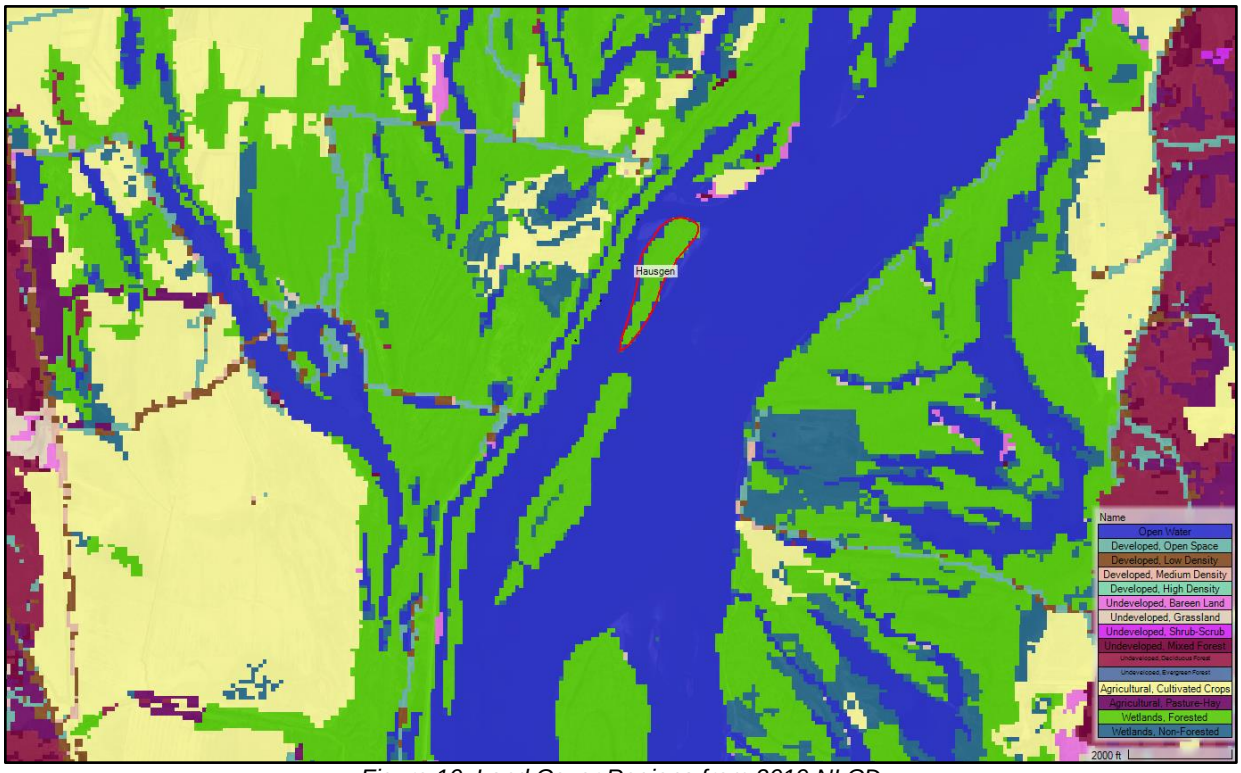


Figure 10. Land Cover Regions from 2019 NLCD

River training structures were not captured in the NLCD. Roughness values were manually applied on river training structures within the project boundary area and set to a Manning's "n" value of 0.04 for all river training structures (Arcement & Schneider, 1984).

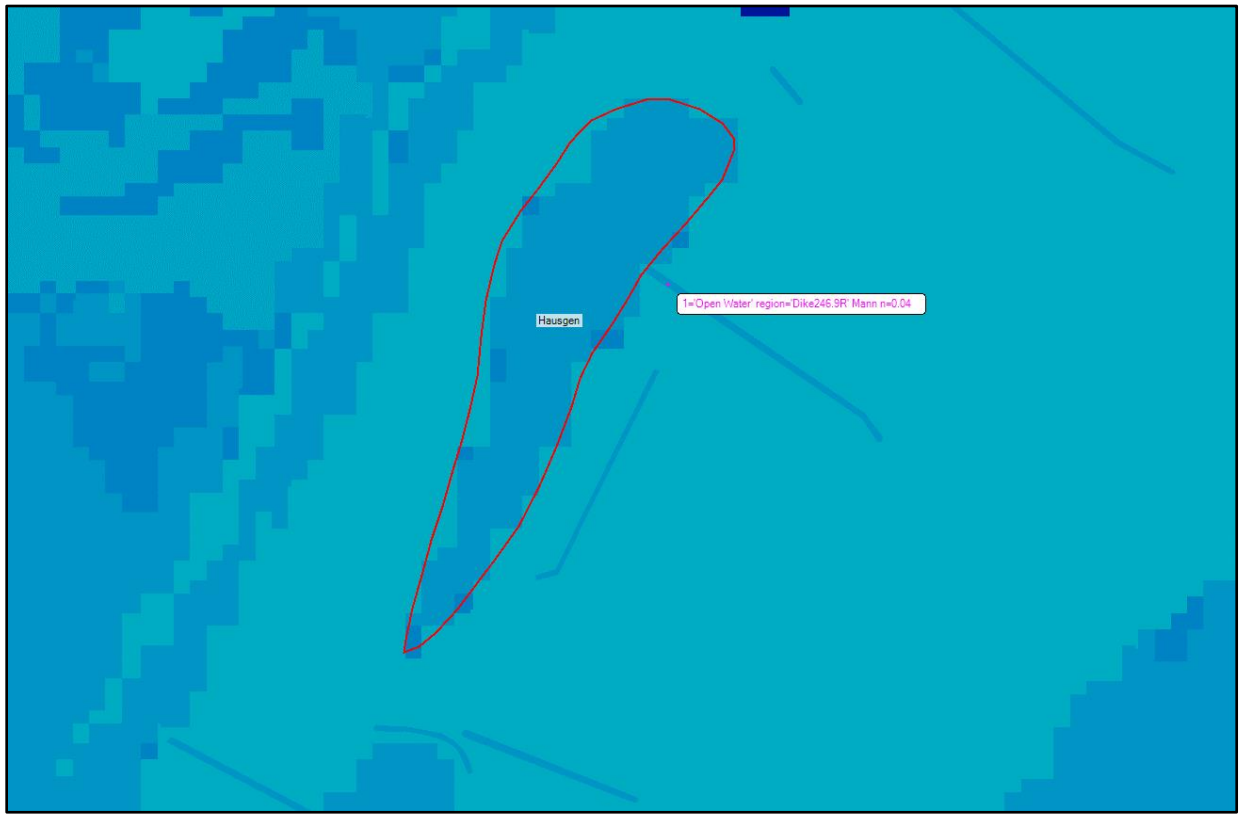


Figure 11. Modified Manning's "n" Values on river training structures

2.1.4 Calibration Results

The WSEs within the lower portion of Pool 25, from the hinge point near Mosier Landing to the upper pool at L&D 25, were calibrated to the 1% annual exceedance probability (AEP) or the 100-year flood event. Table 8 and Figure 12 show the WSE values from the Flow Frequency Study, FEMA FIRM Flood Data, and the HEC-RAS 2D model. Cross sections were determined using sections that overlapped on the FEMA database and the USACE database. The model was also calibrated to WSEs for flow frequency events of 2-year (50%), 5-year (20%), and 10-year (10%). (Table 9, Table 8, and Figure 13).

Table 8. HEC-RAS Calibration Results

	River Mile	100-Yr (1% AEP) WSE MVS Flow Frequency Study (ft)	100-Yr (1% AEP) WSE FEMA FIRM Flood Data (ft)	100-Yr (1% AEP) WSE HEC-RAS 2D Model (ft)
FEMA_CS18	RM 242.02	445.30	445.50	445.30
FEMA_CS17	RM 244.03	445.40	445.60	445.70
FEMA_CS16	RM 246.00	445.80	445.90	446.09
FEMA_CS15	RM 248.22	446.40	446.50	446.64
FEMA_CS14	RM 250.00	446.90	447.00	447.10
FEMA_CS13	RM 252.19	447.60	447.70	447.68
FEMA_CS12	RM 255.26	448.60	448.70	448.47
FEMA_CS11	RM 258.00	449.60	449.70	449.33
FEMA_CS10	RM 260.17	450.40	450.50	449.78

* Elevation conversion from NGVD29 to NAVD88 assumed to be -0.4 ft

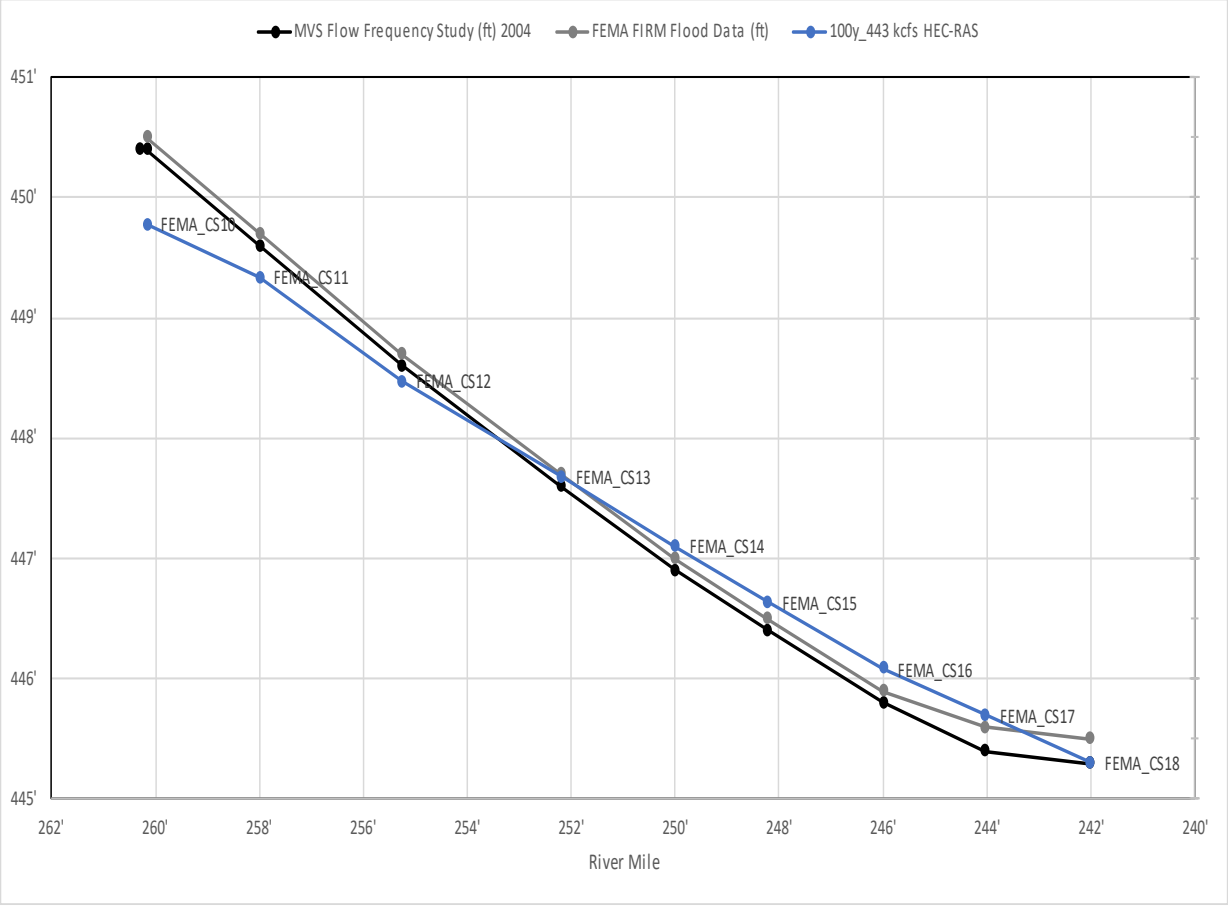


Figure 12. 100-year HEC-RAS Calibration

Table 9. MVS Flow Frequency Study – HEC-RAS Calibration

River Mile	**1% AEP** (100-year) 443,000 cfs		**10% AEP** (10-year) 310,000 cfs		**20% AEP** (5-year) 269,000 cfs		**50 % AEP** (2-year) 210,000 cfs	
	MVS Flow Frequency Study 2004 (ft)	HEC-RAS 2D Model (ft)	MVS Flow Frequency Study 2004 (ft)	HEC-RAS 2D Model (ft)	MVS Flow Frequency Study 2004 (ft)	HEC-RAS 2D Model (ft)	MVS Flow Frequency Study 2004 (ft)	HEC-RAS 2D Model (ft)
242.02	445.30	445.30	439.60	439.60	437.30	437.30	434.20	434.20
244.03	445.40	445.70	440.10	440.12	437.70	437.88	434.90	434.83
246.00	445.80	446.09	440.80	440.70	438.40	438.63	435.50	435.70
248.22	446.40	446.65	441.60	441.39	439.30	439.41	436.20	436.53
250.00	446.90	447.11	442.30	441.90	440.00	439.95	436.80	437.12
252.19	447.60	447.69	443.10	442.52	441.00	440.49	437.70	437.61
255.26	448.60	448.48	444.30	443.50	442.30	441.49	439.10	438.99
258.00	449.60	449.34	445.30	444.58	443.50	442.89	440.30	439.98
260.17	450.40	449.78	446.20	444.99	444.40	443.2	441.20	440.64
260.30	450.40	-	446.20	-	444.50	-	441.30	-

* Elevation conversion from NGVD29 to NAVD88 assumed to be -0.4 ft

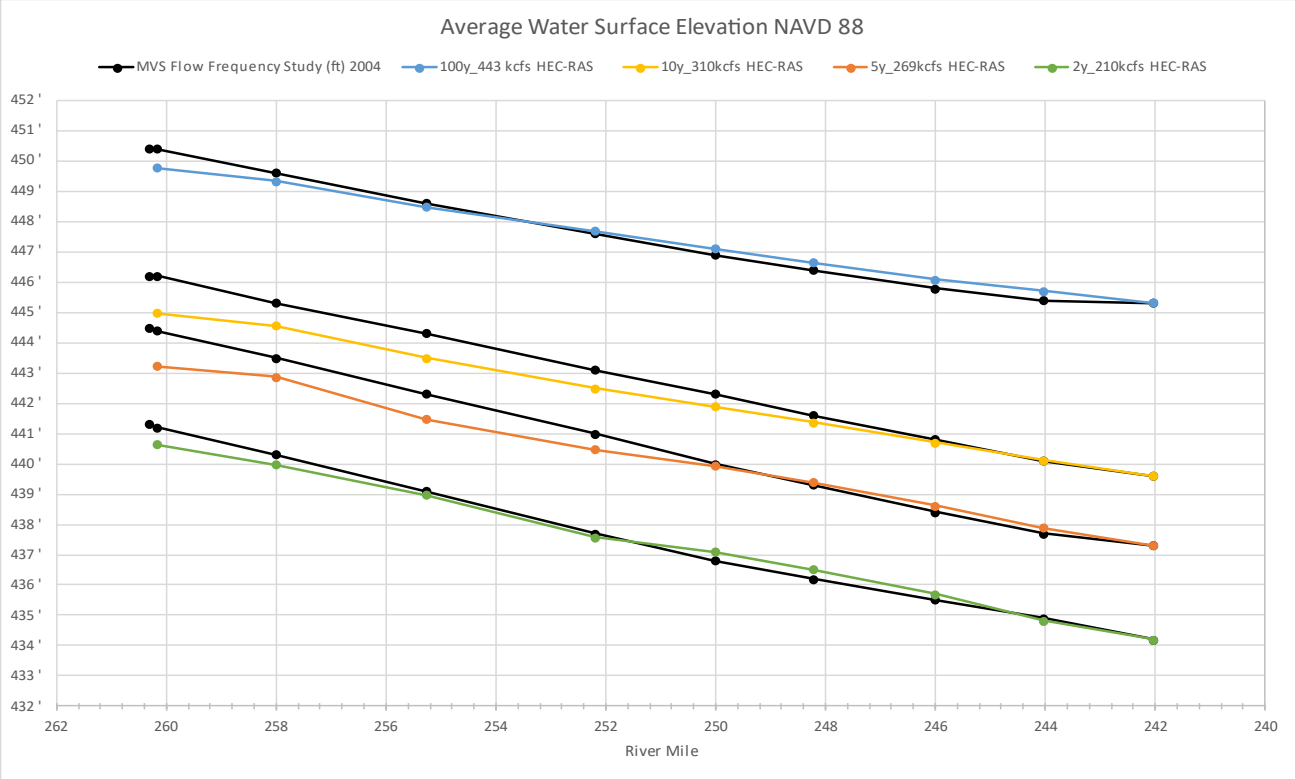


Figure 13. MVS Flow Frequency Study - HEC-RAS Calibration

Velocity within the HEC-RAS model was also calibrated to acoustic doppler current profiler (ADCP) measured flow events. The ADCP survey collection was taken by the Geospatial Branch on 5/25/2023 within the side channels of Jim Crow Island between RM 245-246 during a flow

condition of approximately 206,500 cfs over a 24-hour period on the survey date. The flow data for the hydraulic model was obtained from USACE's Mosier Landing gauge on the same day as the ADCP survey. The velocities from the ADCP survey were then compared to the hydraulic model. The ADCP collection is depicted with velocity arrows and the hydraulic model velocity shading results shown underneath. Figure 14 shows the velocity calibration results.

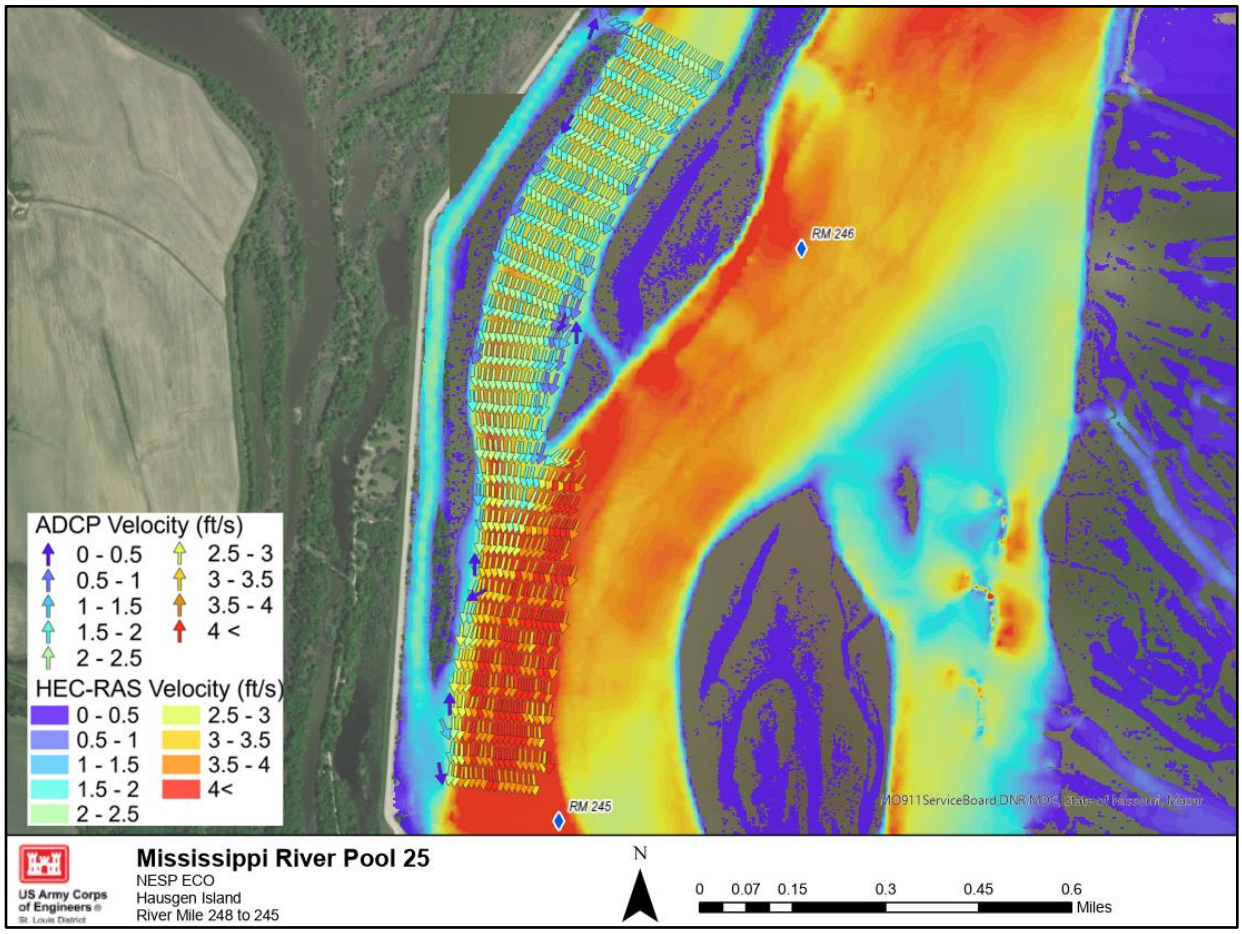


Figure 14. ADCP Model Calibration

After the model was calibrated, other low-flow scenarios were tested using L&D 24 Tailwater discharges and Mosier gauge readings provided from USACE St. Louis District Water Control. For these low-flow scenarios, the same terrain mesh, manning's "n" values, boundary locations, and cross sections were used for these model runs. Monthly average discharges along with select pool discharges were pulled from USACE records between the years 2009 to 2023. The normal pool, moderate pool, ADCP flow, average monthly minimum, average monthly median, and average monthly maximum were calculated; and these events were run within the HEC-RAS program. The WSEs for these conditions are shown in Table 10 and Figure 15 for each existing HEC-RAS flow condition. The results were deemed acceptable by hydraulic engineers given the different parameters.

Table 10. Low Flow Model Scenarios

River Mile	**Discharge*:** Normal Pool 20,000 cfs	**Discharge*:** Moderate Pool 55,000 cfs	**Discharge*:** ADCP 5/25/2023 206,491 cfs	**Discharge* 2009-2023 Monthly Avg:** Monthly Min Avg 95,000 cfs	**Discharge* 2009-2023 Monthly Avg:** Monthly Med. Avg. 120,000 cfs	**Discharge* 2009-2023 Monthly Avg:** Monthly Max. Avg. 175,000 cfs
RM 242.02	433.60	434.00	434.20	434.00	434.05	434.10
RM 244.03	433.61	434.04	434.80	434.13	434.26	434.55
RM 246.00	433.62	434.13	435.65	434.38	434.64	435.20
RM 248.22	433.63	434.21	436.47	434.61	434.98	435.87
RM 250.00	433.64	434.28	437.05	434.78	435.23	436.32
RM 252.19	433.65	434.35	437.52	434.98	435.49	436.73
RM 255.26	433.69	434.59	438.90	435.57	436.33	437.67
RM 258.00	433.73	434.83	439.87	435.71	436.72	438.80
RM 260.17	433.74	434.90	440.52	436.27	437.26	439.27

* Elevation conversion from NGVD29 to NAVD88 assumed to be -0.4 ft

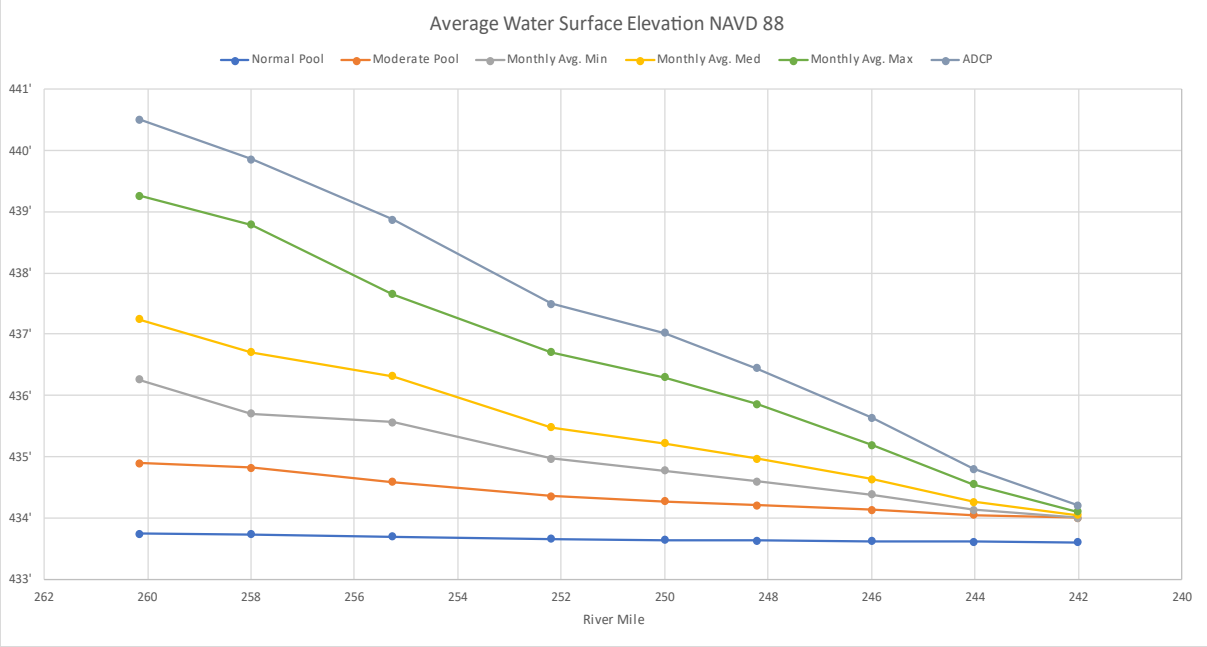


Figure 15. Low Flow Model Scenarios

This concludes the calibration phase of the 2D HEC-RAS model for the Hausgen Island complex study area.

3 Design Alternatives

Three design alternatives were developed by the PDT for the study area. The design alternatives (FWOP, Minimum Habitat Benefit, and Maximum Habitat Benefit) consist with or without the project features detailed within the following subsections. This section summarizes the corresponding project features contained within each design alternative of the study area. The design alternatives were then analyzed at the flow conditions shown in Table 11 for each habitat benefit alternative and corresponding selected project features contained within each alternative. The flow conditions selected represent significant targets for proposed features modeled within each habitat benefit alternative.

Table 11. Modeled Flow Conditions

Flow Condition	L&D 25 Pool Flow (CFS)
Moderate Pool	55,000
Avg. Median Pool	120,000
Avg. Maximum Pool	175,000
50% AEP (2-year)	210,000
20% AEP (5-year)	269,000
1% AEP (100-year)	443,000

The moderate pool was selected to represent a low flow condition. The average median pool will be used to help analyze habitat features such as mussel riffles and woody bundles. The average maximum pool represents a higher flow, but below significant flood events as a check on habitat features within the model. The 50% AEP was used to closely represent the OHWM, a benchmark set by the PDT for side channel restoration. The 20% AEP was utilized to analyze a low-level flood event with project features. Finally, the 1% AEP will be used to analyze the tentatively selected plan (TSP) for a No-Rise Analysis as required when constructing projects within FEMA designated waterways. A summary of the alternative analysis can be found at the end of this section. The TSP and No-Rise Analysis discussion can be found in Section 4.

3.1 Project Features

The features chosen for analysis include mussel habitat enhancement with rock-gravel substrate, bank stabilization with gradual slope revetment (GSR), and river training structure modifications, such as notching, hard points, or side channel enhancement dikes (SCEDs). Each of the project features were placed into two design alternatives: minimum habitat benefit and maximum habitat benefit. A No Action, Future Without Project (FWOP) was also analyzed with no project features nor improvements. Features contained within each alternative are shown in Table 12 below. Specifics of each feature will be discussed in the following sections.

Table 12. Project Alternatives

Feature(s)	**No Action** FWOP	**Alt 1** Minimum Habitat Benefit	**Alt 2** Maximum Habitat Benefit
Mussel Habitat Enhancement (Rock-Gravel Substrate)	-	X	X
Bank Stabilization(Gradual Slope Revetment)	-	X	X
River Training Structure(Notching, Hard Points, SCED)	-	-	X

3.1.1 Mussel Habitat Enhancement

Mussels are a freshwater species responsible for filtering water and play a crucial role in the overall health of the ecosystem. With increased sedimentation due to pooling of water since the construction of Locks and Dams, mussel habitats have become at risk. Biologists are interested in supporting these ecosystems by creating more desirable substrate for mussel beds to form. Ideal mussel habitat consists of even-sized stone gradations so that natural sediment deposition may occur within the voids.

To determine suitable mussel habitat, biologists specified the desired mussel substrate would fall within areas where depths were 3 feet or greater and velocity profiles were between 1 ft/s and 3 ft/s based on an upstream boundary flow regime of 120 kcfs.

Utilizing RAS calculators, areas where the depth and velocity criteria were highlighted. This was then sent to the biologists who determined ideal pockets where mussel substrate would be placed. In Figure 16 below, the purple denotes all areas where the criteria were met. The orange polygons show the regions where the mussel riffles will be tested.

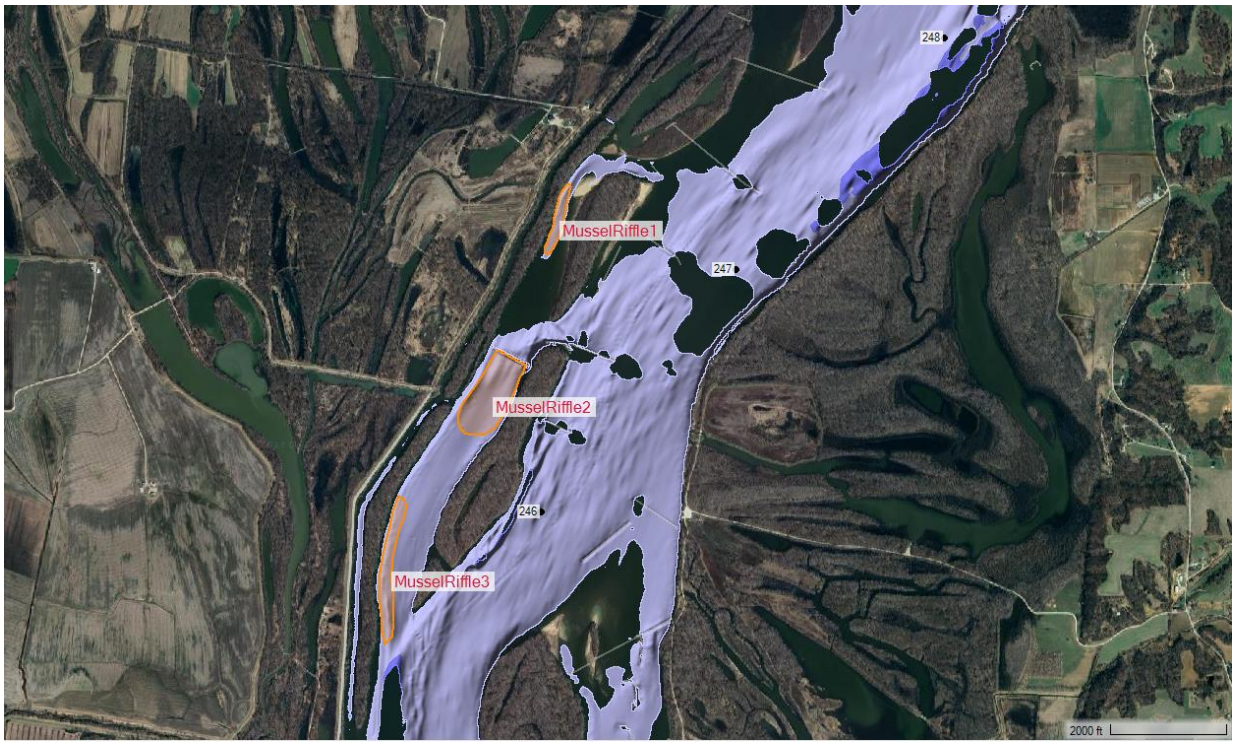


Figure 16. Mussel Riffle Locations

Since 2D HEC-RAS produces depth-averaged velocities, which averages the velocity of the whole water column, biologists were made aware of this limitation when modeling habitat locations. Manning's roughness n-values were increased to 0.026 within mussel habitats regions for the alternative models. More on the biological aspect of the mussel habitats can be found in the Environmental Appendix E.

3.1.2 Bank Stabilization

For proposed habitat, the utilization of bank stabilization with gradual slope revetment (GSR) will be placed to stabilize the right descending banklines of Jim Crow Island and the tertiary channel on the Missouri bank. Typical slope revetment involves placing rock along the shoreline to armor the slope. GSR takes that method further by extending the bankline into the channel at a shallow slope with revetment. This not only enhances the stability of the bankline slope, but also provides voids within the revetment for aquatic habitat. Manning's roughness n-values were increased to 0.04 within GSR regions for the alternative models.



Figure 17. GSR Placement

An example profile of the GSR modeled for this project is shown below in Figure 18. A bench width of 10 feet has been set at a constant elevation, unique to each GSR location based on surrounding terrain conditions.

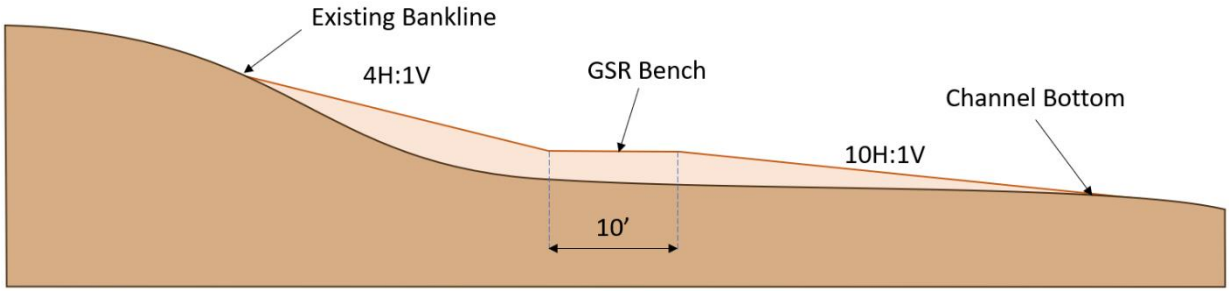


Figure 18. Gradual Slope Revetment Example Profile

3.1.3 River Training Structure Modification

River training structures (RTS) redistribute or redirect the river's energy to achieve various flow patterns and velocity results. Such results include scouring or deepening a channel for navigation, enhancing shoreline stabilization, managing sediment distribution, or increasing habitat by inducing bathymetric diversity. RTS should be keyed or tied into the existing bankline to avoid flanking or bypassing of the river, which may pose detrimental results. Current RTS modifications for this project include dike notching and the construction of hard points. Initially, side channel enhancement dikes (SCEDs) were proposed, modeled, and analyzed, but eventually screened

due to lack of any noticeable benefit. Further discussion of SCED deployment is provided in the following sub Section 3.1.3.3.

3.1.3.1 Notching

RTS are primarily utilized to provide scouring within the main channel for dependable navigation. However, side effects of RTS installation may adversely disturb a side channel's bathymetric and flow diversity. Notching existing structures is a method that has been proven to promote the enhancement of bathymetric and flow diversity thereby providing aquatic habitat in these areas. A notch was proposed for Dike 247.2R, upstream of Hausgen Island (Figure 19). The benefit of notching this dike was to introduce more flow into the side channel of Hausgen, improve bathymetric diversity and encourage habitat regeneration. The modeled notch measures 100 feet in width and the top elevation of the existing dike will be degraded by 10 feet. The existing crown elevation of Dike 247.2R is currently 436 feet. Once the dike is notched within the 100-foot width, it will be set to a notch elevation of 426 feet.



Figure 19. Notch of Dike 247.2R

3.1.3.2 Hard Points

Hard Points are smaller training structures that extend perpendicular to the bankline and protect the bankline from erosion. It has been observed that hard points create aggradation (accumulation of material) on the upstream portion and degradation (removal of material) on the downstream portion. Four hard points are proposed along the right descending bank of the Hausgen side channel (Figure 20). The hard points aim to steer flow away from the bankline and help induce scouring within the side channel to improve bathymetric diversity and flow conditions.



Figure 20. Hausgen Hard Point Placement

The hard points for this project feature will follow a geometry of a 10H:1V slope, 40 feet from the bankline to a hinge elevation of 430 feet, determined by the OHWM (50% AEP), and then follow a 5H:1V slope down to the existing channel elevation.

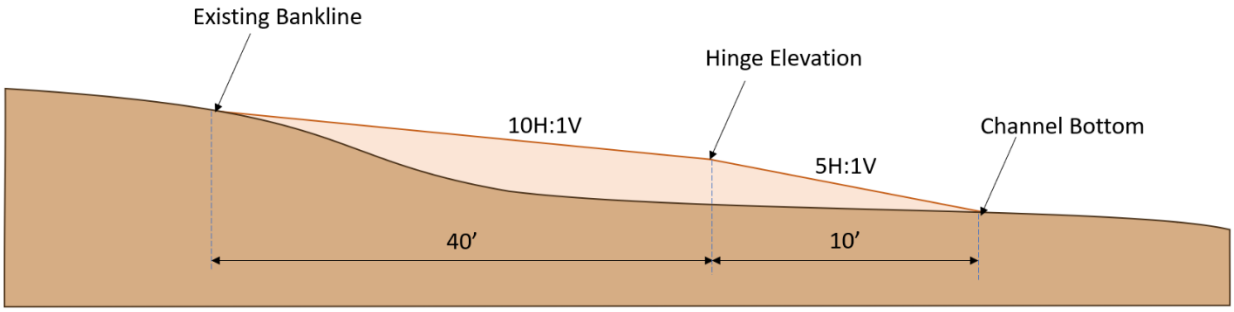


Figure 21. Example Hard Point Profile

3.1.3.3 Side Channel Enhancement Dikes

SCEDs are river training structures that extend into the river, comparable to a regular dike, but typically feature a curved upstream "hook" to capture and direct flow from the main channel into side channels. Two SCEDs were initially proposed for this project: SCED1 located at the entrance of Hausgen Island, and SCED2 located near the tertiary channel of Jim Crow Island (Figure *22*). Both SCEDs were eventually screened due to lack of substantial benefit to side channel enhancement.

The proposed SCEDs were modeled with a crest width of 10 feet extending to existing grade with side slopes of 2H:1V. The crest elevations of the SCEDs were modeled to similar elevations to neighboring structures and below the OHWM. SCED1 had a crest elevation of 436 feet and SCED2 had a crest elevation of 426 feet.



Figure 22. Screened SCED Locations

Six different variations for SCED1 alignments (Figure 23) and two variations for SCED2 alignments were tested to determine overall benefit (Figure 24). For Hausgen SCED1, these variations included a 'No SCED' option and was labeled as 'Existing' which served as a control during comparison. The 'Long SCED' extended from the opening of Hausgen to the left descending side of the notch of Dike247.2R. The 'Medium SCED' and 'Short SCED' extended partially towards Dike247.2R. The 'Reverse SCED' extended from Dike247.2R towards the opening of Hausgen. Finally, a scenario of just utilizing a '100-foot Notch Only' with no SCED was tested and ultimately used in alternative model development.

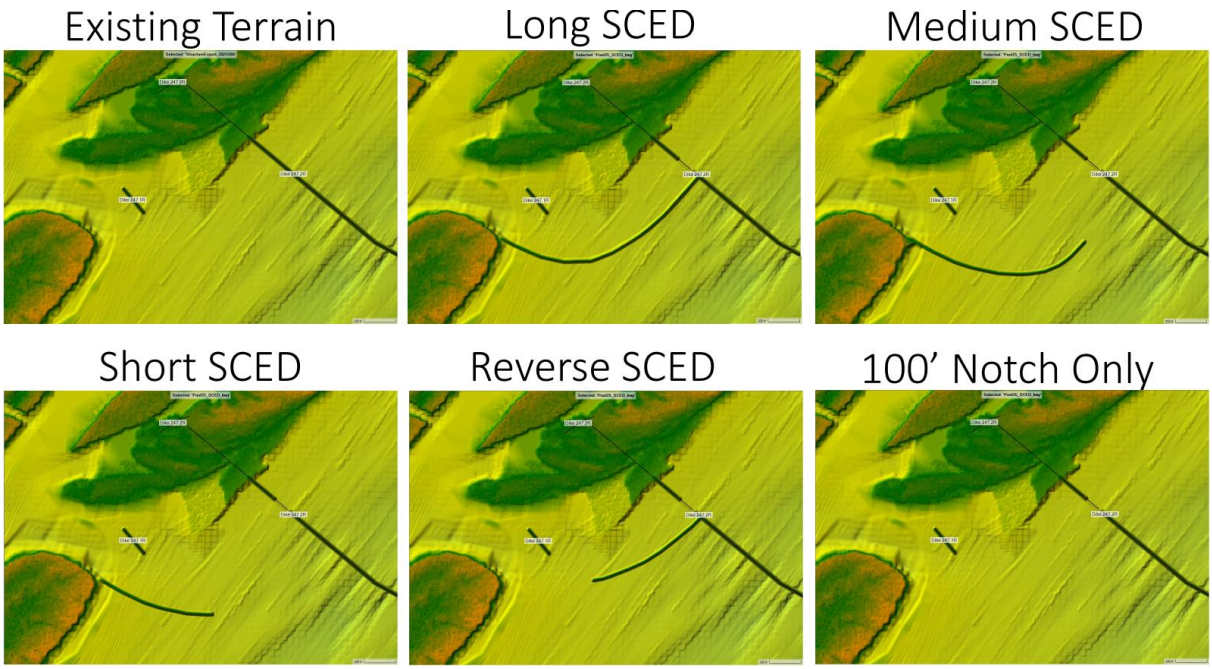


Figure 23. Hausgen SCED1 Alignments

The alternatives for Jim Crow included only two layouts: the ‘No SCED’/’Existing’ and one configuration for ‘SCED2’ to direct flow into the tertiary channel along the Missouri bank.

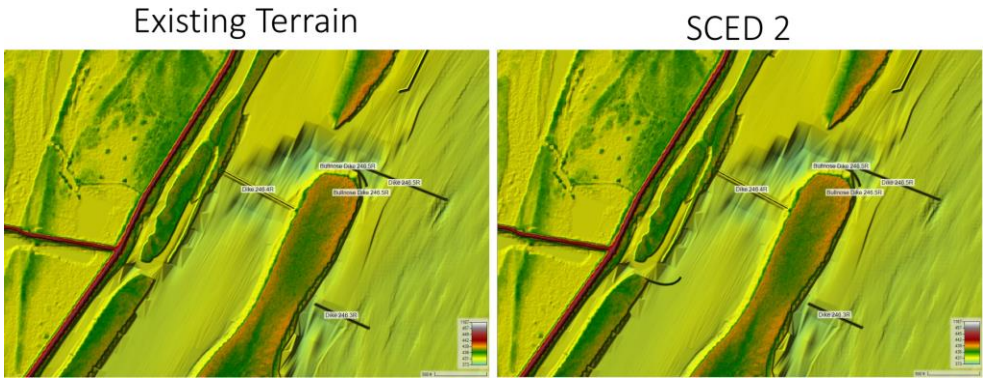


Figure 24. Jim Crow SCED2

The 50% AEP (210 kcfs) and Average Median (120 kcfs) flow regimes were used for modeling comparisons between each layout configuration. The 50% AEP represents the OHWM, and the Average Median flow was used to analyze habitat features. All other variables, such as terrain, bathymetry, Manning’s n-values, etc., remained the same. Cross sections were analyzed at the entrance of the Hausgen side channel and side channel of Jim Crow to compare each SCED configuration with effects on velocity and flow (Figure 25).

It should be acknowledged that the velocity values from the cross section are averaged along the whole line as well as depth averaged. The individual values at certain points may vary slightly. For feasibility modeling purposes, these averages are deemed acceptable by hydraulic engineers. Further refinement and detail will be analyzed during the tentatively selected plan (TSP) phase.



Figure 25. SCED Cross Sections

Based on the model runs at the cross section locations, it was determined the effects of flow velocity were minimal compared to existing flow velocity conditions. The cost for implementation of the SCEDs was not justifiable with such small benefits in return. In most cases velocity barely increased by 0.10 ft/s. In some cases, flow and velocity were decreased, thereby affecting the project negatively. As a result, the SCED feature was ultimately screened from each alternative during planning feasibility. Table 13 below shows the averaged results at the designated cross sections for the flow events.

Table 13. Hausgen SCED Cross Sections

Cross Section		Vel (ft/s)	+/- FT/S	% change	Flow (cfs)	+/- CFS	% change
HausgenXS1							
210 kcfs	Existing	2.94	-	-	6,422	-	-
	Long SCED	2.97	0.03	1.02%	6,504	82	1.28%
	Medium SCED	3.03	0.09	3.06%	6,638	216	3.36%
	Short SCED	2.95	0.01	0.34%	6,461	39	0.61%
	Reverse SCED	2.93	-0.01	-0.34%	6,402	-20	-0.31%
	100' Notch Only	**2.96**	**0.02**	**0.68%**	**6,458**	**36**	**0.56%**
120 kcfs	Existing	0.96	-	-	2,967	-	-
	Long SCED	1.01	0.05	5.21%	3,069	102	3.44%
	Medium SCED	1.00	0.04	4.17%	3,061	94	3.17%
	Short SCED	0.97	0.01	1.04%	2,979	12	0.40%
	Reverse SCED	0.96	0.00	0.00%	2,947	-20	-0.67%
	100' Notch Only	**0.97**	**0.01**	**1.04%**	**2,980**	**13**	**0.44%**
HausgenXS2							
210 kcfs	Existing	2.64	-	-	5,960	-	-
	Long SCED	2.68	0.04	1.52%	6,043	83	1.39%
	Medium SCED	2.74	0.10	3.79%	6,163	203	3.41%
	Short SCED	2.69	0.05	1.89%	6,005	45	0.76%
	Reverse SCED	2.66	0.02	0.76%	5,952	-8	-0.13%
	100' Notch Only	**2.65**	**0.01**	**0.38%**	**5,990**	**30**	**0.50%**
120 kcfs	Existing	1.11	-	-	2,689	-	-
	Long SCED	1.21	0.10	9.01%	2,785	96	3.57%
	Medium SCED	1.21	0.10	9.01%	2,778	89	3.31%
	Short SCED	1.18	0.07	6.31%	2,705	16	0.60%
	Reverse SCED	1.16	0.05	4.50%	2,676	-13	-0.48%
	100' Notch Only	**1.11**	**0.00**	**0.00%**	**2,700**	**11**	**0.41%**
JimCrowXS1							
210 kcfs	Existing	1.15	-	-	1,600	-	-
	Long SCED	1.23	0.08	6.96%	1,728	128	8.00%
	Medium SCED	1.22	0.07	6.09%	1,719	119	7.44%
	Short SCED	1.16	0.01	0.87%	1,730	130	8.13%
	Reverse SCED	1.15	0.00	0.00%	1,731	131	8.19%
	100' Notch Only	**1.15**	**0.00**	**0.00%**	**1,598**	**-2**	**-0.13%**
120 kcfs	Existing	0.53	-	-	883	-	-
	Long SCED	0.49	-0.04	-7.55%	939	56	6.34%
	Medium SCED	0.49	-0.04	-7.55%	940	57	6.46%
	Short SCED	0.52	-0.01	-1.89%	948	65	7.36%
	Reverse SCED	0.52	-0.01	-1.89%	949	66	7.47%
	100' Notch Only	**0.53**	**0.00**	**0.00%**	**882**	**-1**	**-0.11%**

3.1 No Action - Future Without Project (FWOP)

There are no features, so no additional modeling for the "No Action – Future without Project" model. The "existing conditions" model shown in Section 2 would be most representative for hydraulic analysis.

Table 14. FWOP

Feature(s)	**No Action** FWOP	**Alt 1** Minimum Habitat Benefit	**Alt 2** Maximum Habitat Benefit
Mussel Habitat Enhancement (Rock-Gravel Substrate)	-	X	X
Bank Stabilization (Gradual Slope Revetment)	-	X	X
River Training Structure (Notching, Hard Points, SCED)	-	-	X

Without action, it is anticipated that the upper side channel of the Hausgen Island complex would continue to degrade causing the side channel to eventually close off completely as high loads of sediments continue to build within the upper reach of Hausgen Island's side channel. The backwater (low flow area) aquatic habitat within the study area would continue to degrade due to loss of flow, depth diversity, and loss of side channel connection within the island complex. Island building would continue at the upper end of Hausgen Island and lower portion of Little Stag Island until eventually the two islands combine into one, cutting off connectivity of the side channel habitat. The aquatic habitat would turn into a low quality, terrestrial area comprised almost completely of sand that allows for only a few species such as willow and cottonwood to establish. Eventually over time, Jim Crow Island would experience the same degradation as sediments move further downstream.

L&D 25 operations are not expected to change from the existing condition and will continue to function according to congressional directives and environmental pool management criteria. Navigation along the main channel will continue to have adverse effects and impacts on important habitats within side channel and backwaters within Pool 25 of the Mississippi River. Navigation induced shoreline erosion would continue degrading both islands and aquatic habitats. If an alternative plan is not selected, habitats within the study area would be impacted even further with sediments and lose connectivity.

3.1 Minimum Habitat Benefit

The minimum habitat benefit alternative included mussel habitat enhancement and bank stabilization with GSR.

Table 15. Alternative 1 - Minimum Habitat Benefit

Feature(s)	**No Action** FWOP	**Alt 1** Minimum Habitat Benefit	**Alt 2** Maximum Habitat Benefit
Mussel Habitat Enhancement (Rock-Gravel Substrate)	-	X	X
Bank Stabilization (Gradual Slope Revetment)	-	X	X
River Training Structure (Notching, Hard Points, SCED)	-	-	X



Figure 26. Alternative 1 - Minimum Habitat Benefit

The primary objective for the minimum alternative was to create suitable habitat for mussels and other aquatic species. Both features will provide specific rock-gravel substrate gradations within the GSR and riffle substrate to accommodate appropriate habitat conditions for mussels along with larger voids, suitable for other aquatic species, such as fish. Within the model, the manning's roughness coefficients were increased to a n-value of 0.026 over areas with mussel riffles and n-value of 0.04 for GSR to mimic the placement of rock and gravel features.

3.2 Maximum Habitat Benefit

The maximum habitat benefit alternative includes mussel habitat enhancement, bank stabilization, and river training structure modification.

Table 16. Alternative 2- Maximum Habitat Benefit

Feature(s)	**No Action** FWOP	**Alt 1** Minimum Habitat Benefit	**Alt 2** Maximum Habitat Benefit
Mussel Habitat Enhancement (Rock-Gravel Substrate)	-	X	X
Bank Stabilization (Gradual Slope Revetment)	-	X	X
River Training Structure (Notching, Hard Points, SCED)	-	-	X

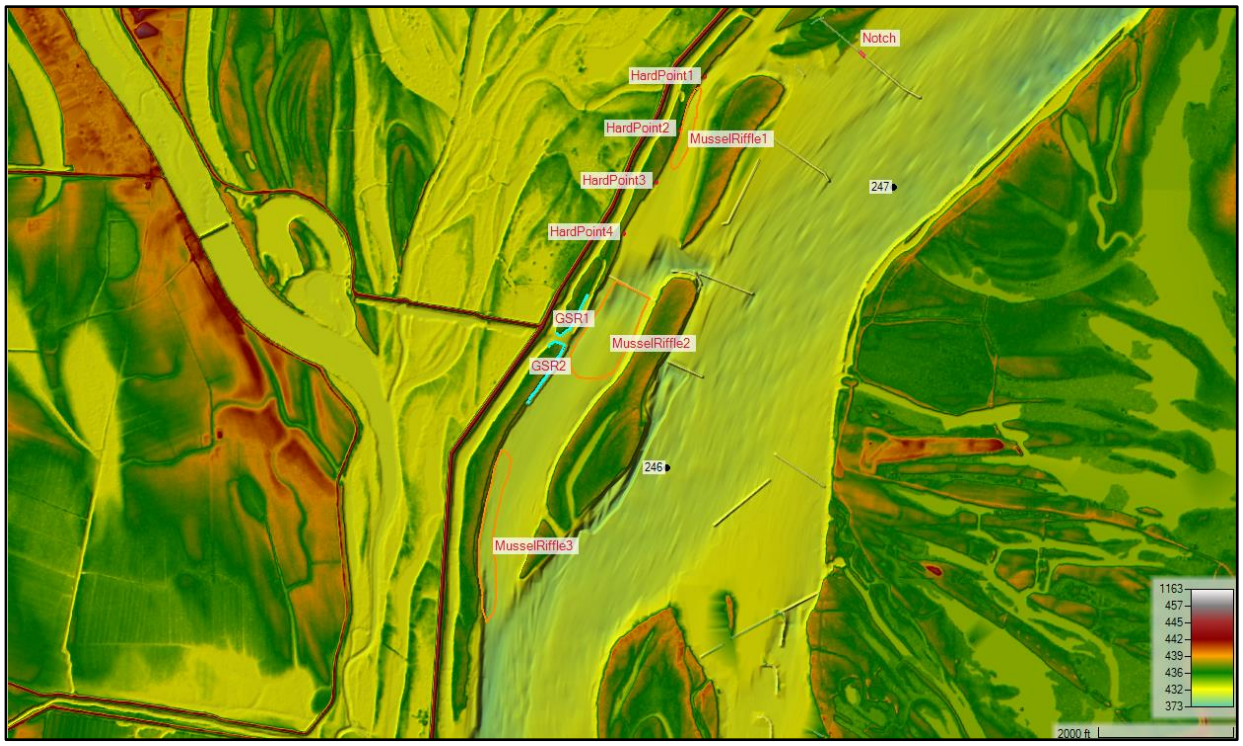


Figure 27. Alternative 2 - Maximum Habitat Benefit

In addition to the features and results described within the minimum habitat benefit alternative, this alternative included dike notching and creation of hard points. Alterations to the river training structures were designed to increase flows, provide bank protection, and redirect water during lower flow events. Within the model, the manning's roughness coefficients were increased to a n-value of 0.026 over areas with mussel riffles and n-value of 0.04 for GSR to mimic the placement of rock and gravel features.

3.3 Alternatives Analysis Summary

For each design alternative, project features were input into the terrain utilizing HEC-RAS terrain editing functions. The features were merged into the terrain following the specifications previously mentioned. The Manning's roughness values were edited on those features. For these analyses, the 50% AEP represents the OHWM, and the Average Median flow was used to analyze habitat features.

Cross sections were chosen throughout the Hausgen and Jim Crow backwaters to determine changes in velocity and flow between the design alternatives (Figure 28). Each cross section was determined to capture terrain changes between the different alternatives and were drawn from left descending bank to the right descending bank. Hausgen 1 was located to analyze the effects on including the notch at Dike 247.2R, Hausgen 2 captures most of the side channel inflow, and Hausgen 3 captures the side channel flow downstream of the sandbar. Jim Crow 1 shows the initial effects after the Cross Dike 246.2R, Jim Crow 2 represents the entrance to the tertiary channel, and Jim Crow 3 represents the most downstream portion of the project limits. The results for each design alternative were then compared to the existing conditions model.



Figure 28. Design Alternative Cross Sections

Table 17. Alternative Cross Section Results

Cross Section		Vel (ft/s)	+/- FT/S	% change	Flow (cfs)	+/- CFS	% change
Hausgen 1	**Ex - 210 kcfs**	**1.22**			**8,993**		
	Alt 1 - 210 kcfs	1.21	0.00	0%	8,996	3	0%
	Alt 2 - 210 kcfs	1.28	0.06	5%	14,392	5399	60%
	Ex - 120 kcfs	**0.68**			**5,134**		
	Alt 1 120 kcfs	0.68	0.00	0%	5,131	-3	0%
	Alt 2 120 kcfs	0.71	0.04	5%	7,755	2621	51%
Hausgen 2	**Ex - 210 kcfs**	**1.26**			**5,701**		
	Alt 1 - 210 kcfs	1.22	-0.04	-3%	5,544	-158	-3%
	Alt 2 - 210 kcfs	1.22	-0.04	-3%	5,547	-154	-3%
	Ex - 120 kcfs	**0.72**			**2,537**		
	Alt 1 120 kcfs	0.69	-0.02	-3%	2,463	-75	-3%
	Alt 2 120 kcfs	0.69	-0.02	-3%	2,460	-77	-3%
Hausgen 3	**Ex - 210 kcfs**	**1.17**			**5,702**		
	Alt 1 - 210 kcfs	1.15	-0.02	-1%	5,544	-158	-3%
	Alt 2 - 210 kcfs	1.16	-0.01	-1%	5,548	-154	-3%
	Ex - 120 kcfs	**0.59**			**2,537**		
	Alt 1 120 kcfs	0.58	-0.01	-2%	2,463	-75	-3%
	Alt 2 120 kcfs	0.58	-0.63	-1%	2,460	-77	-3%
Jim Crow 1	**Ex - 210 kcfs**	**1.62**			**42,398**		
	Alt 1 - 210 kcfs	1.57	-0.04	-3%	40,759	-1639	-4%
	Alt 2 - 210 kcfs	1.57	-0.05	-3%	40,526	-1872	-4%
	Ex - 120 kcfs	**0.93**			**23,659**		
	Alt 1 120 kcfs	0.91	-0.02	-3%	22,731	-927	-4%
	Alt 2 120 kcfs	0.90	-0.03	-3%	22,595	-1064	-4%
Jim Crow 2	**Ex - 210 kcfs**	**0.84**			**2,258**		
	Alt 1 - 210 kcfs	0.81	-0.03	-4%	2,141	-117	-5%
	Alt 2 - 210 kcfs	0.82	-0.02	-2%	1,865	-393	-17%
	Ex - 120 kcfs	**0.50**			**1,224**		
	Alt 1 120 kcfs	0.46	-0.03	-7%	1,112	-111	-9%
	Alt 2 120 kcfs	0.47	-0.03	-6%	948	-275	-22%
Jim Crow 3	**Ex - 210 kcfs**	**2.18**			**40,587**		
	Alt 1 - 210 kcfs	2.14	-0.04	-2%	39,024	-1564	-4%
	Alt 2 - 210 kcfs	2.14	-0.04	-2%	39,061	-1527	-4%
	Ex - 120 kcfs	**1.29**			**22,715**		
	Alt 1 120 kcfs	1.26	-0.02	-2%	21,877	-838	-4%
	Alt 2 120 kcfs	1.27	-0.35	-2%	21,901	-814	-4%

Alternative 1 flow and velocity were compared to existing conditions. At the Hausgen cross sections, minimal changes in velocity and flow were observed. This is to be expected as the features did not change as much over these cross sections. The Jim Crow cross sections saw the most change when compared to the existing conditions. A decrease in velocity was observed downstream of the mussel riffles and GSR. The decrease in velocity is not significant enough to cause concern for sedimentation.

Alternative 2 flow and velocity were compared to the existing condition. At the Hausgen cross sections, minimal changes in velocity were observed. Flow increased at the Hausgen 1 cross

section, directly below the notch. This demonstrates some additional benefit of including a notch in Dike 247.2R in this project. This increase in velocity is favorable as more sediment can be transported through this region, keeping the side channel open. The Jim Crow cross sections saw minimal changes in velocity and decreases in flow. This is to be expected as those cross sections were downstream of the mussel riffles and GSR.

4 Proposed Design

4.1 Tentatively Selected Plan (TSP)

The Tentatively Selected Plan was determined to be Alternative 2 – Maximum Habitat Benefit. The PDT saw this alternative as the most beneficial habitat enhancements for the aquatic species inhabiting these side channels. Figure 29 below shows the existing terrain in the project location.

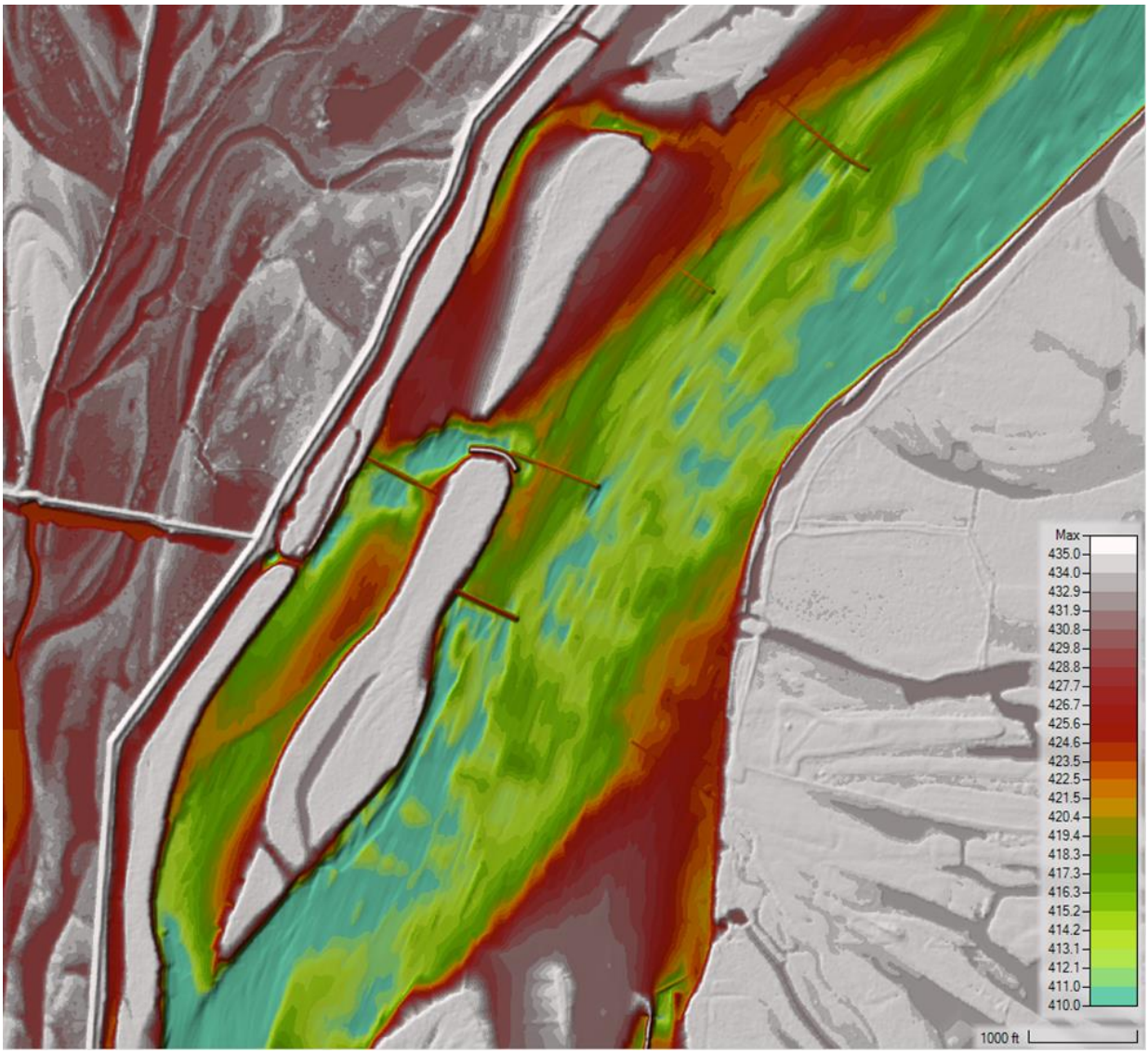


Figure 29. Existing Terrain

Most features were retained within this alternative and placed to produce the best hydraulic function. However, during TSP, adjustments were made within the model to remove some GSR from the project along the right descending banklines of Jim Crow Island (remove half of GSR2) and the tertiary channel on the Missouri bankline (remove all GSR3). The removal of the GSR in these areas were seen by the PDT as not substantially impacting the overall project nor calculated habitat benefits and will save on construction costs overall and conserve already established

aquatic habitats in these locations. The GSR shown in Figure 30 below represent the 'final' GSR locations for the TSP. The TSP will include the features of mussel riffles with rock-gravel substrate, bank stabilization with GSR, hard points, and notching Dike 247.2R. All these features provided the best habitat benefits for the Hausgen Island Complex Side Channel HREP.

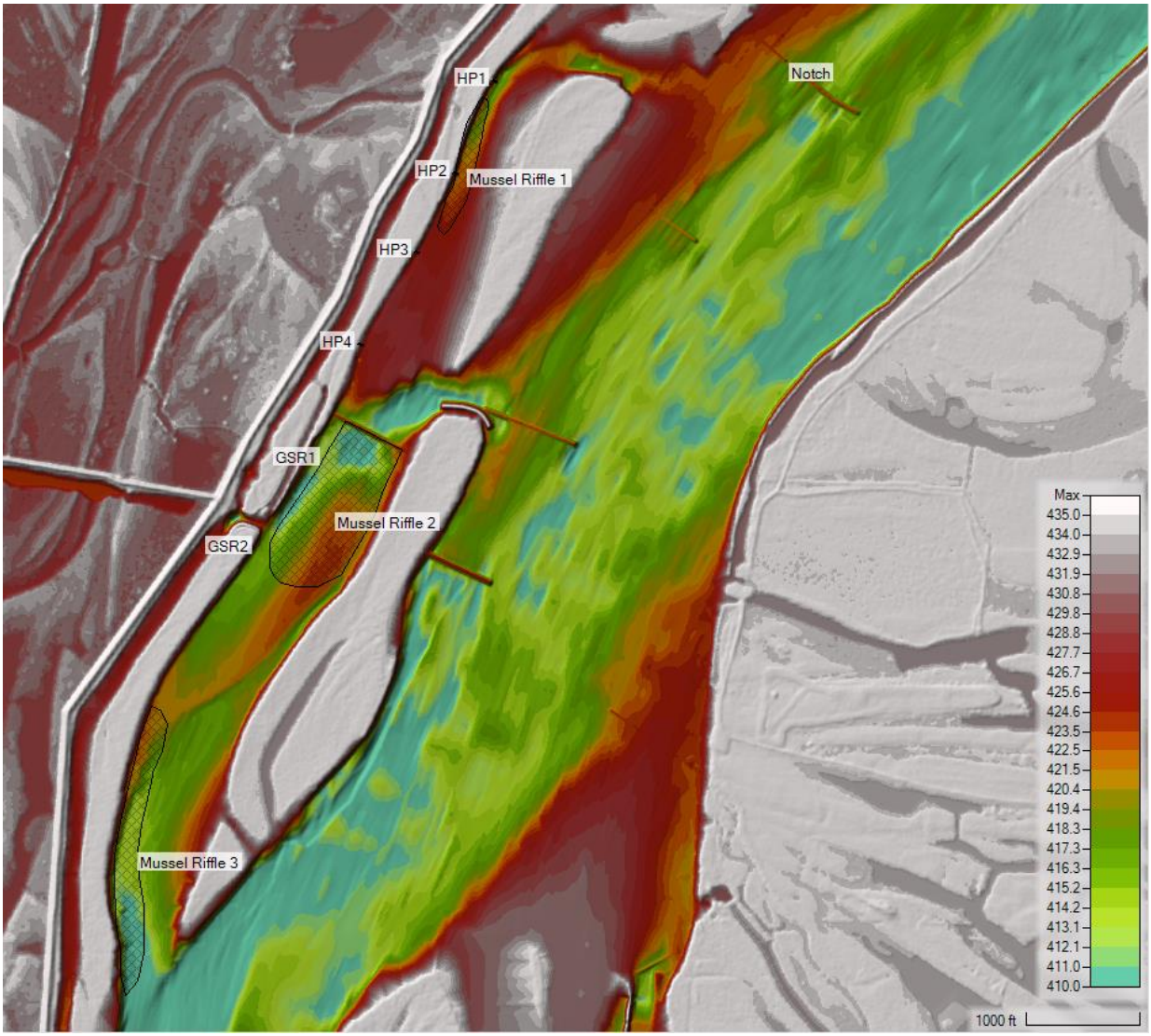


Figure 30 TSP Terrain

The final velocities were analyzed for various flows. The Average Median flow (120 kcfs) was used to analyze habitat features, the 50% AEP (210 kcfs) represents the OHWM, and the 5-year (269 kcfs) represents a higher flow, yet below the 1% AEP. Figure 31, Figure 32, and Figure 33 below show a comparison between the existing and the TSP project areas within the project bounds. Areas where mussel riffles were located produced a slightly lower velocity, which is deemed favorable by biologists. The introduction of the notch and hard points allowed for slight increases in the Hausgen side channel, which aids in the transport of sediment.

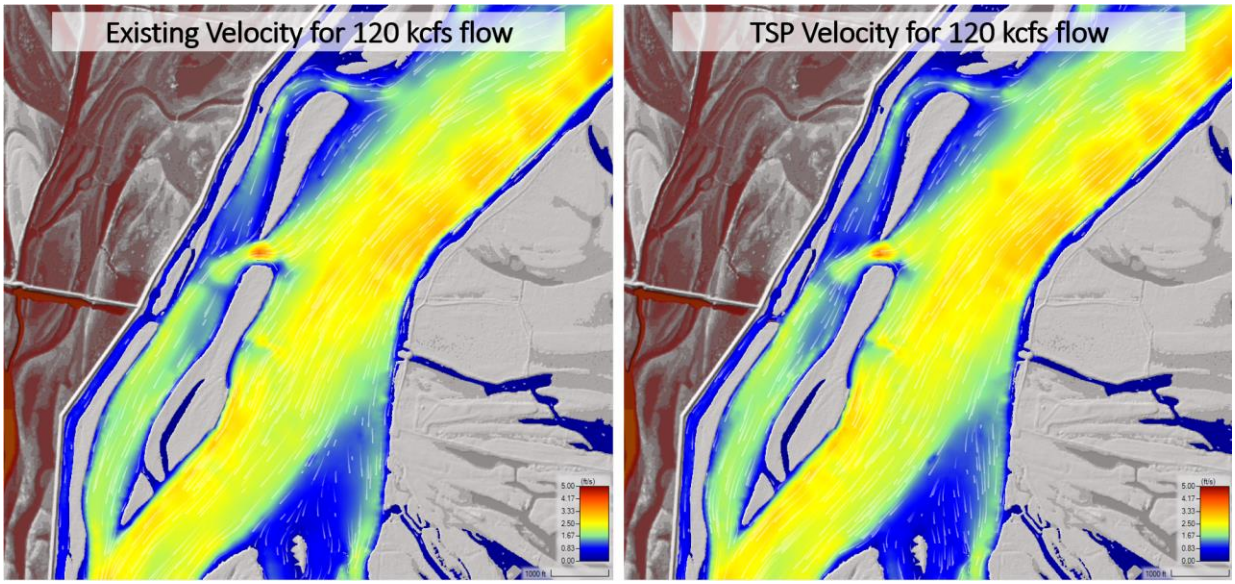


Figure 31. Velocity – Existing vs TSP 120 kcfs

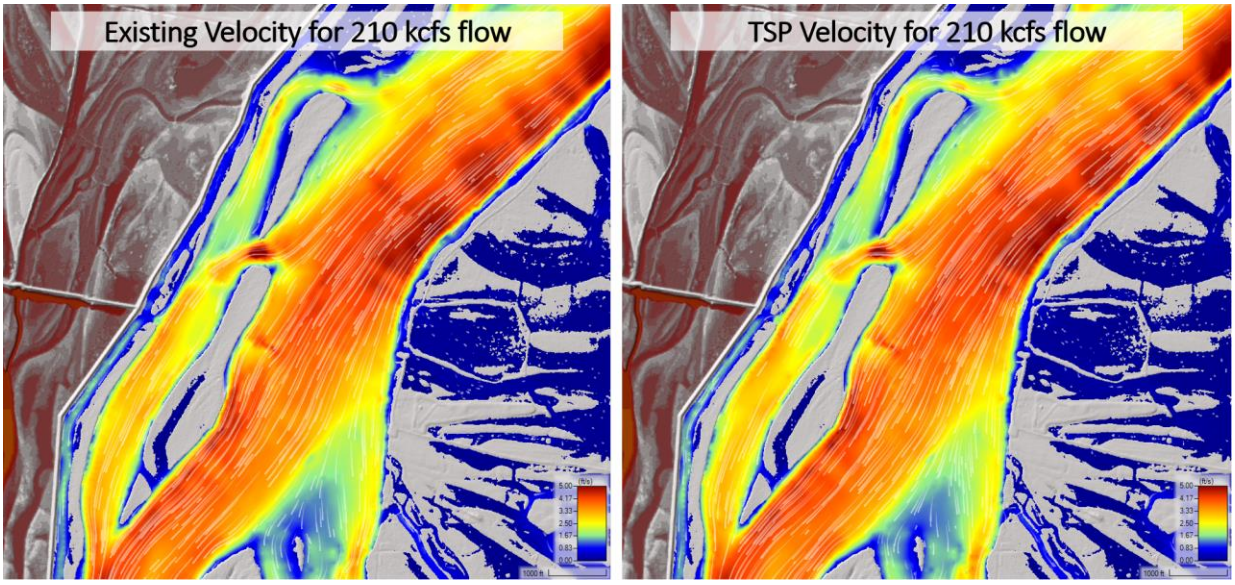


Figure 32. Velocity – Existing vs TSP 210 kcfs

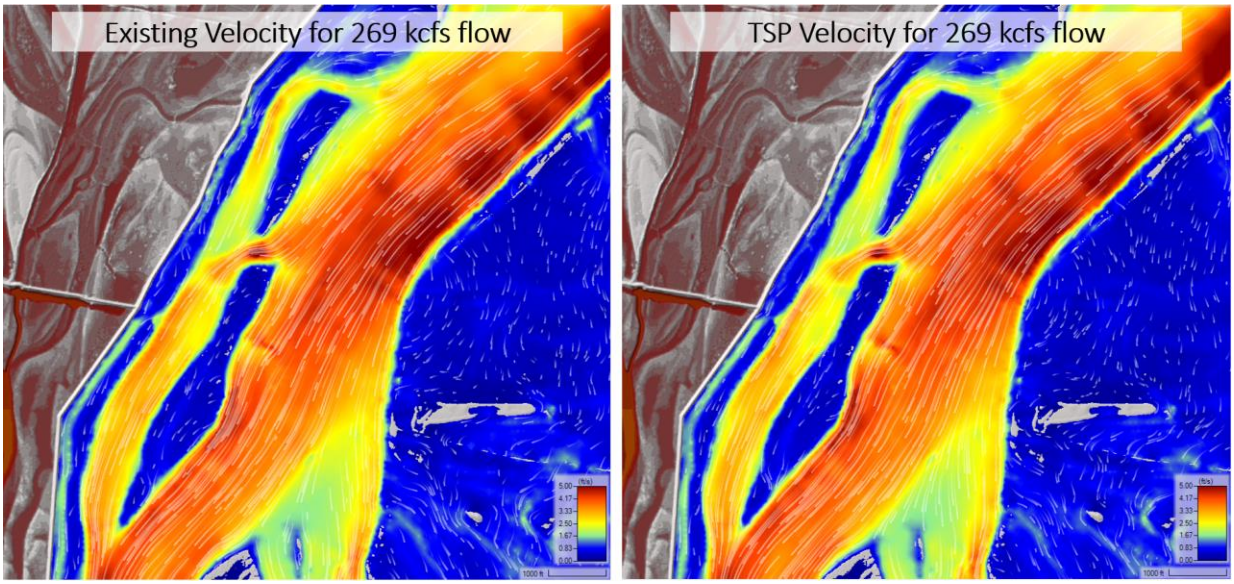


Figure 33. Velocity – Existing vs TSP 269 kcfs

Although this model is not a mobile bed model, depths were analyzed. Figure 34, Figure 35, and Figure 36 below show a comparison between the existing and the TSP project areas within the project bounds. The lower flows showed adequate depths for mussel habitat.

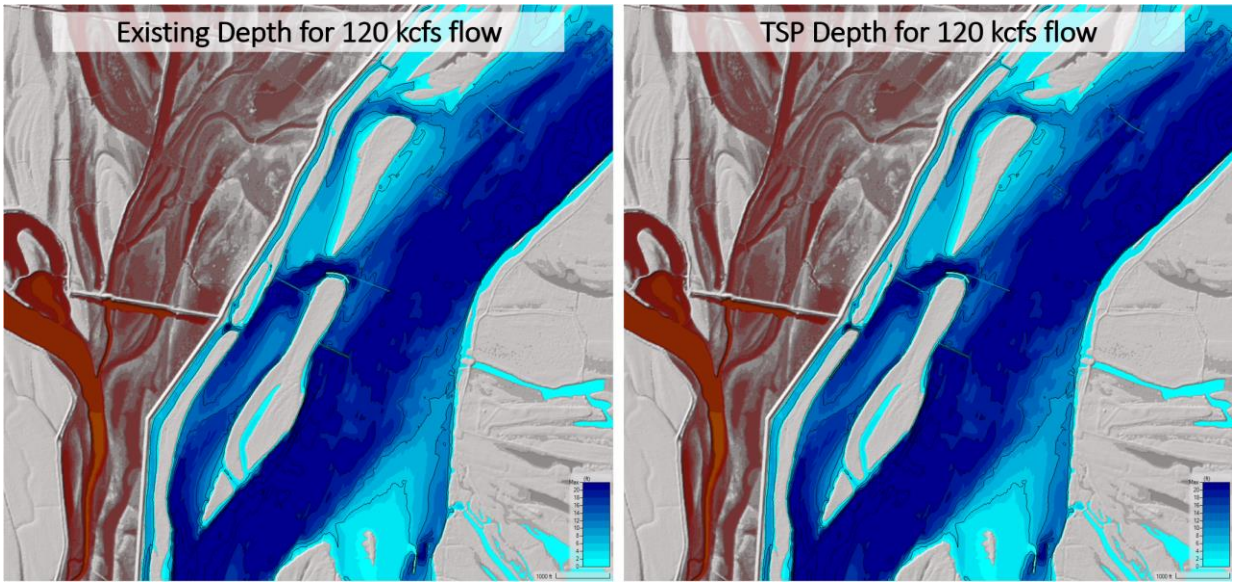


Figure 34. Depth – Existing vs TSP 120 kcfs

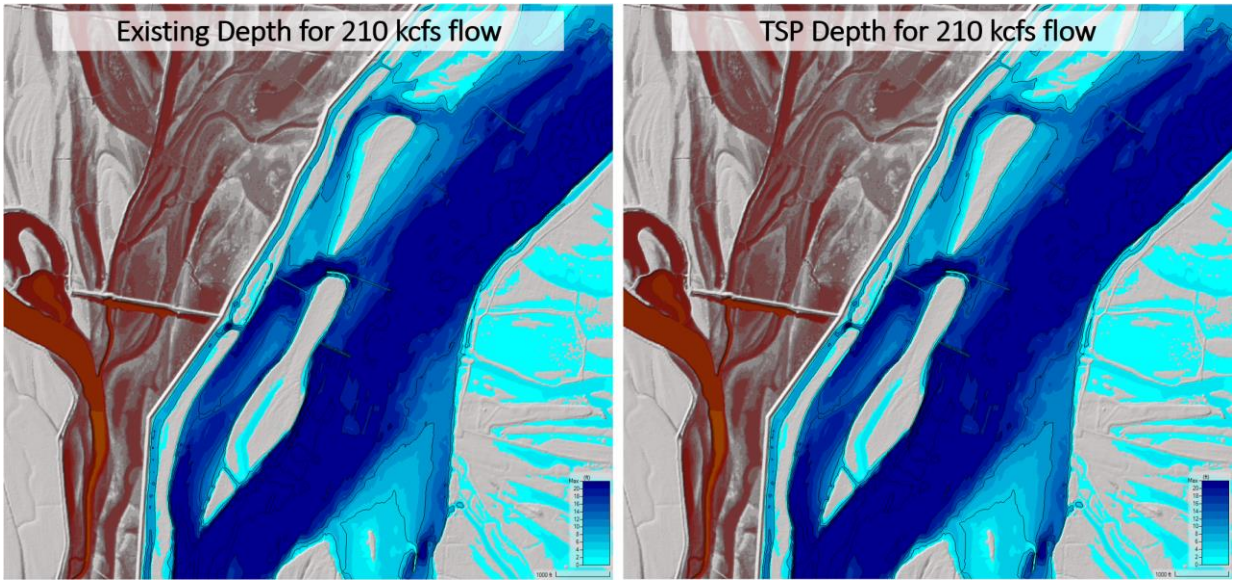


Figure 35. Depth – Existing vs TSP 210 kcfs

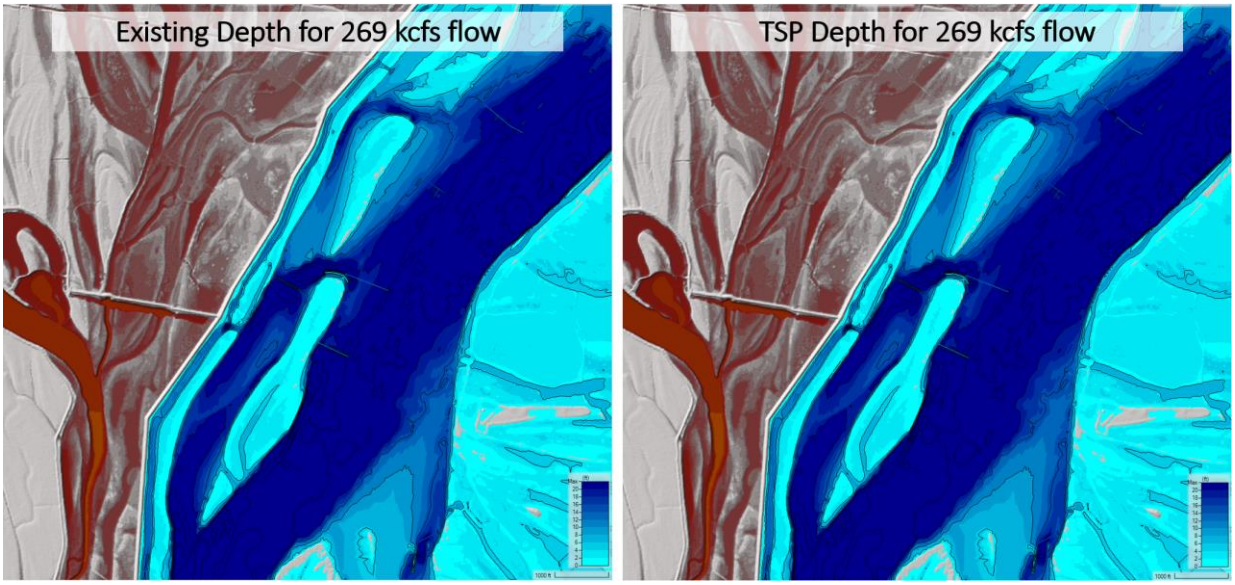


Figure 36. Depth – Existing vs TSP 269 kcfs

4.2 No-Rise Analysis

For any project in the FEMA regulatory floodway, a 'no-rise' determination must be made to ensure adverse flooding along neighboring structures will not be impacted.

The criteria for no rise specify that an increase in water surface of 0.0049 feet or more would not be allowed. All cross sections within the model showed less than a 0.0049 foot increase from the existing condition to the TSP. The cross sections used during calibration were used for the no rise comparison throughout the stretch. The 1% AEP event was used for this comparison. Further investigation of 'no rise' will be conducted in the design phase of this project.

Table 18. No Rise Analysis - 1% AEP

River Mile	**1% AEP WSE ft** Existing	**1% AEP WSE ft** TSP	**No Rise ft**
242.02	445.3024	445.3024	0.0000’
244.03	445.6983	445.6983	0.0000’
246.00	446.0861	446.0864	0.0003’
248.22	446.6406	446.6413	0.0007’
250.00	447.1003	447.1010	0.0007’
252.19	447.6793	447.6799	0.0006’
255.26	448.4730	448.4735	0.0006’
258.00	449.3331	449.3336	0.0004’
260.17	449.7784	449.7789	0.0004’
260.30	445.3024	445.3024	0.0000’

An additional comparison for the 2 year, 210 kcfs flow event was compared. The water surface elevation for all cross sections was less than the maximum allowable rise.

Table 19. No Rise Analysis - OHWM

River Mile	**210 kcfs OHWM WSE ft** Existing	**210 kcfs OHWM WSE ft** TSP	**No Rise ft**
242.02	434.2034	434.2034	0.0000’
244.03	434.8246	434.8249	0.0003’
246.00	435.6909	435.6919	0.0010’
248.22	436.5064	436.5079	0.0015’
250.00	437.0971	437.0985	0.0014’
252.19	437.5833	437.5844	0.0011’
255.26	438.9760	438.9769	0.0010’
258.00	439.9677	439.9684	0.0007’
260.17	440.6299	440.6305	0.0006’
260.30	434.2034	434.2034	0.0000’

Since all cross section’s water surface elevations were less than the maximum allowable rise, the criteria, from a preliminary standpoint, the ‘no-rise’ check was complete. Further investigation and refinement will be completed in the design portion of this project.

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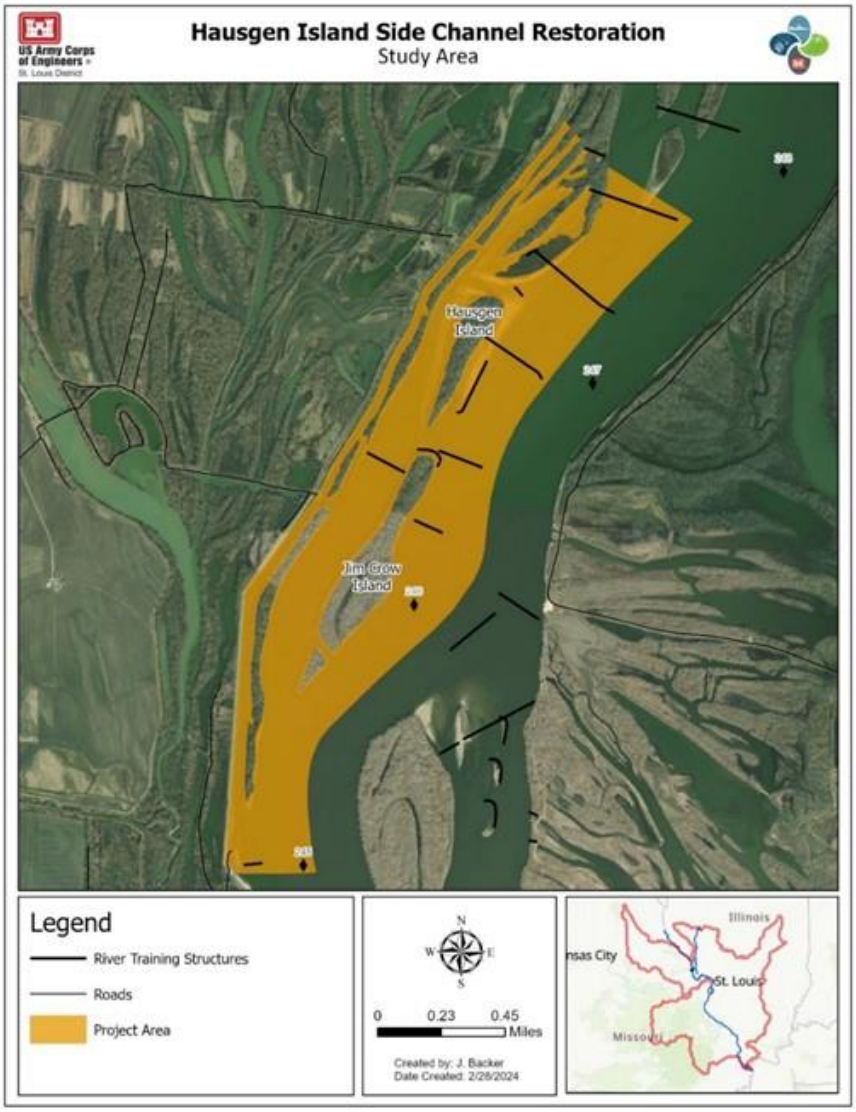
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NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION
ECOSYSTEM RESTORATION PROJECT

POOL 25, UPPER MISSISSIPPI RIVER MILES 248-245
LINCOLN COUNTY, MISOURI



US Army Corps of Engineers ®
St. Louis District

July 2025
Appendix E
Monitoring and Adaptive Management

1. Introduction

The 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662) authorized implementation of ecosystem restoration projects to ensure the coordinated development and improvement of the Upper Mississippi River System. Section 2039 of WRDA 2007 requires that when conducting a feasibility study for ecosystem restoration, the proposed project includes a plan for monitoring the success of the ecosystem restoration. The implementation guidance for Section 2039, in the form of a CECW-PB Memo dated 31 August 2009, also requires that an adaptive management plan be developed for all ecosystem restoration projects.

Adaptive management "prescribes a process wherein management actions can be changed in response to monitored system response, so as to maximize restoration efficacy or achieve a desired ecological state" (Fischenich et al. 2012).

At the programmatic level, knowledge gained from monitoring one project can be applied to other projects. Opportunities for this type of adaptive management are common within the UMRS. Using an adaptive management approach during project planning enabled better selection of appropriate design and operating scenarios to meet the NESP Hausgen Island Ecosystem Restoration project objectives. Lessons learned in designing, constructing, and operating similar restoration projects within the UMRS have been incorporated into the planning and design of this project to ensure that the proposed plan represents the most effective design and operation to achieve project goal and objectives.

The adaptive management for the Hausgen Island project describes and justifies whether adaptive management is needed in relation to the proposed project management alternatives identified in the project feasibility study. This appendix outlines how the results of the project-specific monitoring plan would be used to adaptively manage the project, including monitoring targets which demonstrate project success in meeting project objectives. The District's intent was to develop monitoring and adaptive management actions appropriate for the project's goals and objectives.

2. Goals and Objectives

The primary goal of the Hausgen Island project is to restore and improve the quality and diversity of aquatic ecosystem resources within the Project Area. Full realization of the potential habitat value in the project area has been hindered the loss of side channel depth and flow diversity, structural diversity, and aquatic connectivity has decreased habitat function, extent, and availability for native aquatic species. Restoring flow diversity, connectivity, and substrate heterogeneity throughout the project area would benefit a multitude of aquatic species and several habitat types (side channel, main channel border, tertiary channels, etc.).

The following restoration measures, also described in detail in Section 4.1 of the main report, were considered to achieve the Project goal and objectives:

- Hard Points
- Partial Degradation/Notching of Closure Structures (Flow)
- Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement)
- Bank Stabilization Utilizing GSR for Mussel Habitat

3. Sources of Uncertainty

Adaptive management provides a process for making decisions in the face of uncertainty. The primary incentive for implementing an adaptive management plan is an increased likelihood of achieving desired project outcomes given the identified uncertainties, which can include incomplete description and understanding of relevant ecosystem structure and function; imprecise relationships among project management actions and corresponding outcomes; engineering challenges in implementing project alternatives; and ambiguous management and decision-making processes. Below is a list of uncertainties associated with the aquatic habitat in the Hausgen Island Project.

3.1 Side Channel Habitat

Substrate enhancements to provide substrate heterogeneity and stable microhabitats will be utilized in the side channels. There is a risk that these project features may result in unintended and potentially unwanted changes to flow patterns and hydraulic effects. A modification to project features in the side channel may be required if this risk is realized, which could impact project costs and schedule.

The District evaluated the level of uncertainty and risk in the use of improperly-sized material for in-stream structures. Mussel riffles will essentially consist of scattered boulder fields constructed of large quarry stone in the side channels to provide substrate heterogeneity, flow diversity, flow refugia that provides microhabitats of stabile substrate for the colonization of native freshwater mussels. Due to the dynamic nature of the flows in the Mississippi River, there is a risk that the stone may shift and change sedimentation and/or erosion patterns over time, potentially to an extent that the measures are no longer performing as intended. A modification to the stone mussel riffle placement in the side channels may be required if this risk is realized, which could impact project costs and schedule.

Hard points and partial notching of river training structures are measures intended to improve flow patterns within the side channel. Should the flows and velocities not actualize the intended ranges, some modification to hard points, or existing river training structures within the project area may be required, based on observed flows post-construction.

4. Monitoring of Objectives to Determine Project Success and Adaptive Management Measures

The power of a monitoring program developed to support determinations of project success and inform adaptive management lies in the establishment of feedback between continued project monitoring and corresponding project management. Performance indicators to the above objectives were developed with the best available knowledge. They were developed to be specific, measurable, attainable, realistic, and timely. Performance indicators, monitoring targets, and Adaptive Management measures are summarized in Section 4.1 below. The conceptual monitoring schedule and estimated costs are provided in Table 1.

4.1 Aquatic Habitats

- **Flow Diversity:** ADCP surveys will be conducted upon completion of the project to determine baseline conditions and construction compliance. Comparison surveys will be conducted at years 3, 6, and 9 to evaluate performance and changes within the project area over time. Monitoring is intended to measure an increase in flow diversity, as evidenced by flow profiles across side channel habitat.

Success Criteria:

Monitoring Target	Management Measure Objective
Increase over baseline flow profiles throughout side channel.	Provide variation in flows found throughout side channel to increase overall range of available habitat types (i.e., riffle, run, pool).

Adaptive Management Measure: Should surveys show lack of flow enhancements, several options would be available, up to, but limited to: Reconfiguring Hard Points, and Reconfiguring the Training Structure Notch.

- **Mussel Habitat Quality:** Targeted mussel surveys across the constructed measures at years 3, 6, and 9 post-construction will be conducted to evaluate probability of mussel colonization. Presence/absence of mussels is not particularly evaluated for success, however, the primary metric for success would be the presence/absence of stable substrates conducive to mussel colony establishment within the flow refugia provided by the placed substrate. Surveys conducted during planning will be used as baseline for comparison.

  In addition, targeted multi-beam surveys of the placed mussel substrate will be used immediately following construction completion to determine location and placement. Comparison surveys will be conducted at years 3, 6, and 9 to determine if the placed materials have been mobilized and moved out of the project area from high flows, or have become covered by unstable sediments and sands, which would make them no longer accessible for mussels to use as habitat.

Success Criteria:

Monitoring Target	Management Measure Objective
Increase in quantity and quality of stable mussel habitat over baseline throughout side channel.	Boulder habitat that can provide flow refugia and substrate stability for mussels to colonize.
Placed material still located within project area, providing flow refugia and substrate stability for mussels to colonize below them.	In place, free from sediment burial, and stable to provide area available for mussel colonization.

Adaptive Management Measure: Should surveys show lack of substrate stability and mussel colonization is not taking place on the created mussel habitat, the AM measure of supplemental stone placement and or stone gradation modification may be implemented for the mussel riffle feature and the GSR.

5. Documentation, Implementation Costs, Responsibilities, and Project Close-Out

5.1 Documentation, Reporting, and Coordination. The Project Delivery Team will document each of the performed assessments and communicate the results to the NESP program manager. Performance Evaluation Reports will be produced at years 5 and 10 to measure progress towards the Project goal and objectives as characterized by the selected performance measures.

5.2 Cost. The costs associated with implementing monitoring and adaptive management measures were estimated based on currently available data and information developed during plan formulation as part of the feasibility study. Because uncertainties remain as to the exact Project measures, monitoring elements, and adaptive management opportunities, the estimated costs in Table 2 will need refinement in PED during the development of the Detailed Monitoring and Adaptive Management Plans.

5.3 Responsibilities. The Corps will be responsible for collecting surveys, data analysis, site inspections, and visual observations to assist in overall project success evaluation.

5.4 Project Close-Out. Close-out of the Project would occur when it is determined that the Project has successfully met the Project success criteria described above. Success would be considered to have been achieved when the Project objectives have been met, or when it is clear that they will be met based upon the trends for the site conditions and processes. Project success would be based on the following:

- Success criteria met,
- Continued site inspections to determine continued Project performance,
- and Continued OMRR&R into the future.

Table 2. NESP Hausgen Island project conceptual monitoring schedule and estimated monitoring costs. Construction completion is set to year 0.

		Target Year	1	2	3	4	5	6	7	8	9	10	
Side Channel Restoration	Monitoring, Analysis, & Reporting	Site Inspections			x			x			x		$2,025
		Bathymetry Survey (Multi-beam) and ADCP Flow Surveys			x			x			x		$45,000
		Mussel Survey			x			x			x		$137,760
Subtotal													$184,785

		Target Year	1	2	3	4	5	6	7	8	9	10	
Side Channel Restoration	AM Feature	Reconfigure Hardpoints				x				x			$134,420
		Reconfiguring the Training Structure Notch				x				x			$115,851
		Modifying or Reconfiguring the Mussel Substrate Feature and GSR					x					x	$273,040
Subtotal													$523,311
Overall MAM Total													$708,096

6. References

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US Army Corps of Engineers
St. Louis District®

Environmental Quality Section
1222 Spruce Street
St Louis Missouri 63103

ENVIRONMENTAL SITE ASSESSMENT REPORT: HAUSGEN ISLAND NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM PROJECT IMPLEMENTATION

PREPARED FOR:

The U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Steet
St. Louis, Missouri 63103

December 10, 2024

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1.0 ABBREVIATIONS

ABV	Description
AST	Above Ground Storage Tank
ATSM	American Society for Testing and Materials
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
DOD	Department of Defense
EDR	Environmental Data Resources
EMF	Electromotive force
ES	Enforcement Standard
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FRDS	Federal Reporting Data System
HTRW	Hazardous Toxic Radioactive Waste
IEMA	Illinois Emergency Management Agency
LLC	Limited Liability Company
MDL	Method Detection Limit
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NWI	National Wetlands Inventory
PAL	Preventative Action Limit
PCB	Polychlorinated Biphenyl
PQL	Practical Quantitation Limit
RCL	Residual Contaminant Levels
REC	Recognized Environmental Condition
SEMS	Superfund Enterprise Management System
SSURGO	Soil Survey Geographic Database
UIC	Underground Injection Control
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank

2.0 ACKNOWLEDGEMENTS AND QUALIFICATIONS

Project Name:	Hausgen Island Navigation and Ecosystem Sustainability Program Project Implementation
Site Information:	Mississippi River Miles 245 - 248
County:	Lincoln County, Missouri
Latitude, Longitude:	39.068074°, -90.710905°

Site Assessor: _____

Kaleb Rakers
Environmental Specialist

Environmental Professional Qualification:

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in 40 CFR 312.10.

I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

_____

Kevin P Slattery
Senior Reviewer
Supervisory Environmental Specialist

3.0 EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers regulations (ER-1165-2-132, ER 200-2-3) and Division policy requires procedures be established to facilitate early identification and appropriate consideration of potential HTRW in reconnaissance, feasibility, preconstruction engineering and design, land acquisition, construction, operations and maintenance, repairs, replacement, and rehabilitation phases of water resources studies or projects by conducting a Phase I Environmental Site Assessment (ESA). USACE specifies that these assessments follow the process/standard practices for conducting Phase I ESA's published by the American Society for Testing and Materials (ASTM).

The purpose of a Phase I ESA is to identify, to the extent feasible in the absence of sampling and analysis, the range of contaminants (i.e. Recognized Environmental Conditions, RECs) within the scope of the U.S. Environmental Protection Agency's (EPA) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. Current policy is to avoid known HTRW to the extent practicable or until hazard risks and potential liability are mitigated.

A Phase I ESA has been conducted for the Hausgen Island Navigation and Ecosystem Sustainability Program (NESP) project using methods outlined by ASTM 1527-13. This included a records review, physical site visit, and communications with persons knowledgeable of the project footprint and adjoining properties. Generally, the project area contains no major sites of interest, which pose significant HTRW concerns. The environmental impact for the migration of off-site contaminants onto the project property is negligible. Therefore, no special considerations are being recommended for the project to proceed to construction. It is however recommended that a Site Health and Safety Plan, and a Quality Control Plan are submitted by the awarded contractor, discussed internally by USACE personnel, and implemented to prevent environmental hazards from being developed during construction. CEMVS EC-EQ should be contacted immediately if future development of the property discovers hazardous or toxic materials.

4.0 INTRODUCTION

4.1 **Background**

The purpose of this Environmental Site Assessment (ESA) was to evaluate the current and historical conditions of the subject property in an effort to identify Recognized Environmental Conditions (RECs) in connection with the subject property and surrounding operations. Recognized Environmental Conditions are defined as the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. *De minimis* conditions are not recognized environmental conditions.

4.2 **Scope of Work**

A Phase I ESA was conducted at the subject property in accordance with ASTM Standards Practice E 1527-13, 1903-44, and further defined below:

- USACE has engaged with individuals having institutional knowledge of the subject properties to discuss environmental conditions. Documented conversations and questionnaires are available in Supplementary Materials A.

- USACE has physically inspected the subject property via walking survey, looking for signs of recognized environmental conditions such as stressed vegetation, soil staining, dumping, and evidence of aboveground and underground storage tanks. Photo documentation for the site visit is available in Supplementary Materials B.

- USACE has gathered and reviewed available Federal, State, and tribal environmental records. Standard environmental records reviewed included Federal NPL; Federal and State CERCLIS; Federal and State institutional controls/engineering controls registries; Federal ERNS list; State and tribal landfill and/or disposal site lists; State and tribal leaking storage tank lists; State and tribal registered storage tank lists; State and tribal voluntary cleanup sites; and State Brownfield sites. Details from the standard environmental records review are available in Supplementary Materials C.

- USACE has physically observed adjoining properties, paying particular attention to evidence of aboveground and underground storage tanks, questionable housekeeping practices, or unusual business practices.

4.3 **Limitations**

The observations, measurements, and research reported herein are considered sufficient in detail and scope to form a reasonable basis for a limited Phase I ESA of the subject property (ASTM 1527-13). The assessment, conclusions, and recommendations presented herein are based upon the subjective evaluation of limited data. The data may not represent all conditions at the subject site, as they reflect the information gathered from specific locations. The limitations of this assessment should be recognized as the client formulates conclusions on the environmental risks associated with these properties.

5.0 GENERAL PROJECT AND SITE INFORMATION

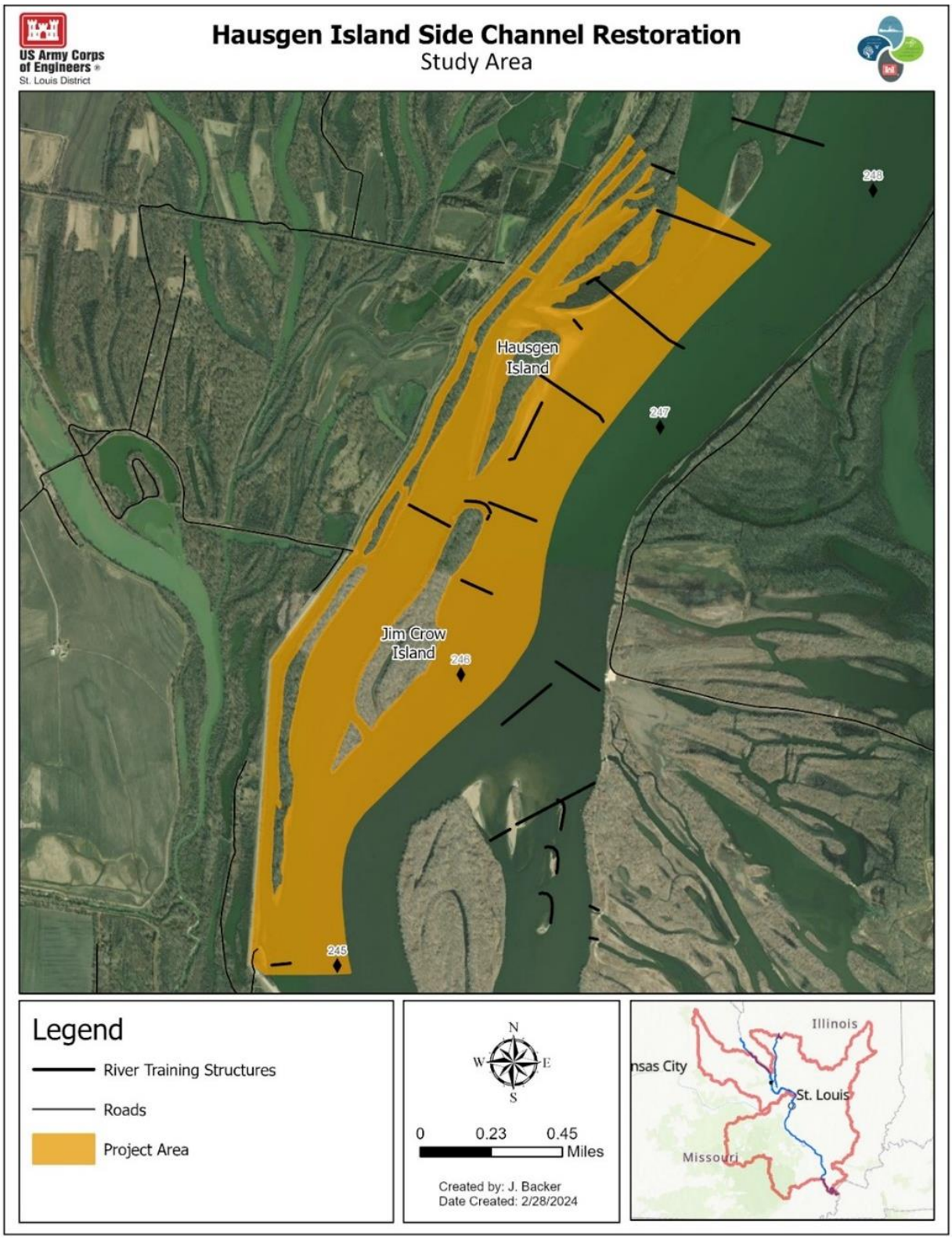


Figure 1: Project Map.

5.1 **Project Description**

The project is located on the right descending bank of the Mississippi River, near Foley, Missouri. The project lies in the lower portion of Pool 25 between river miles 248 and 245. The proposed project focuses on an approximate 250-acre side channel complex in the vicinity of Hausgen and Jim Crow Islands, all proposed project features will be located below the ordinary high-water mark. The project objective is to increase depth and flow diversity of aquatic side channels throughout the project area.

5.2 **Physical Site Description**

The proposed project features will largely be focused in a large side channel between Hausgen and Jim Crow Islands and a few smaller islands located near the Missouri bank. There is also a secondary side channel formed between these smaller islands and the Missouri bank where a few proposed project features are located. All of these islands are heavily forested with a few inlets that are connected to the main river depending on river levels.

5.3 **Historical and Current Land Use**

The islands are owned by the U.S. Army Corps of Engineers and has been managed by the Missouri Department of Conservation (MDC) since 1986. The area is largely used for duck hunting with multiple blinds leased to hunter by MDC located throughout the entirety of the project. The Foley Public Access boat ramp is located at the bottom of the project area and is used by numerous recreational boaters throughout the year. Historic aerial photos dating back to 1950 show the islands being heavily forested.

5.4 **Adjoining Property Use**

The main channel of the Mississippi river is located to the East and South of the project area. The BK Leach Memorial Conservation Area is located to the North of the project areas. The west side of the project is boarder by the levee along the Missouri bank and a few private docks are located on the Missouri bank with limited access. There are numerous residences located directly behind the levee.

6.0 PHASE I ENVIRONMENTAL SITE ASSESSMENT DUE DILIGENCE

6.1 **Interview(s) with Past and Present Owners, Operators, and Occupants**

The content of the questions asked followed the format of ASTM 2247-16. Relevant information discovered during the interview is summarized in Supplementary Materials A. A questionnaire was sent to the Missouri Department of Conservation since they manage the site area. The questionnaire was completed by Clinton Owenby who has served as the District Supervisor and Area Manager of the Upper Mississippi Conservation Area for 1 year.

6.2 **Interview(s) with State and/or Local Emergency Response Officials**

The United States Coast Guard was contacted for an interview with emergency response officials, but no response was received. The National Response Center database was reviewed for any emergency responses that would have occurred by the Coast Guard in the site area.

6.3 **Site Reconnaissance**

On November 3, 2023, Environmental Specialist Kaleb Rakers of CEMVS-EC-EQ and other members of the study team performed a site visit for the Hausgen Island NESP project. Members of USFWS and Missouri Department of Conservation who are knowledgeable about the site area were also present for this site visit. On February 8, 2024, Environmental Specialists Kaleb Rakers and Travis Schepker of CEMVS-EC-EQ performed a more extensive site visit for the Hausgen Island NESP project. All accessible areas of the project were covered during this site visit. Photo documentation for the site visit can be reviewed in the table of referenced figures (pg. 14).

6.4 **Records Review**

Table 1 provides a full list of records reviewed by the Environmental Professional for this assessment. These records assist in meeting the requirements of EPA's Standards and Practices for All Appropriate Inquiry (AAI; 40 CFR Part 312), and the ASTM Standard Practice for Environmental Site Assessments (ASTM E1527-13). In addition, the physical setting was assessed for the project area by reviewing topographic maps to identify conditions in which hazardous substances or petroleum products could migrate. Additional details can be reviewed in Supplemental Materials B.

Table 1: Government Records Reviewed

Standard Environmental Record Resources Provided by EDR Lightbox	**Search Distance miles (kilometers)**
Federal NPL (Superfund) sites	1.0 (1.6)
Federal Delisted NPL sites	0.5 (0.8)
Federal sites subject to CERCLA removals and CERCLA orders	0.5 (0.8)
Federal CERCLA sites with NFRAP	0.5 (0.8)
Federal RCRA facilities undergoing Corrective Action	1.0 (1.6)
Federal RCRA TSD facilities	0.5 (0.8)
Federal RCRA generators	Target property and adjoining properties
Federal institutional control/engineering control registries	Target Property Only
Federal ERNS list	Target Property Only
State and tribal "Superfund" equivalent sites	1.0 (1.6)
State and tribal hazardous waste facilities	0.5 (0.8)
State and tribal landfills and solid waste disposal facilities	0.5 (0.8)
State and tribal leaking storage tanks	0.5 (0.8)
State and tribal registered storage tanks	Target property and adjoining properties
State and tribal institutional control/engineering control registries	Target Property Only
State and tribal voluntary cleanup sites	0.5 (0.8)
State and tribal brownfield sites	0.5 (0.8)

7.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

A Records review, site reconnaissance, and interviews with knowledgeable persons identified no RECs near or within the Hausgen Island NESP project footprint. Findings of this effort are summarized below:

Generally, the project area contains no major sites of interest, which pose significant environmental concerns. The environmental impact for the migration of off-site contaminants onto the project property is negligible. Therefore, a Phase II Environmental Site Assessment is not being recommended currently. A Site Health and Safety Plan, and a Quality Control Plan should be required, discussed, and implemented to prevent environmental hazards from being developed during construction. CEMVS-EC-EQ should be contacted immediately if future development of the property indicates the presence of hazardous or toxic materials.

8.0 OPINION OF THE ENVIRONMENTAL PROFESIONAL

Based on the data and resources available for this assessment, it is the Environmental Professional's opinion that the Project Area contains no major sites of interest that would impact the project's design, cost, or schedule. The environmental impact for the migration of off-site contaminants onto the Project Area is negligible, a Phase II ESA is not recommended at this time.

The CEMVS-EC-EQ should be contacted with any known or suspected variations from the conditions described herein. If future development of the properties indicates the presence of hazardous or toxic materials, CEMVS-EC-EQ should be notified.

9.0 DEVIATIONS

There were no interviews conducted with emergency response officials for this site area, this is considered a deviation from the ASTM method used for this Phase I.

10.0 LIMITATIONS AND EXCEPTIONS

U.S. Army Corps of Engineers, Environmental Quality and HTRW Section, Environmental and Munitions Branch (CEMVS-EC-EQ) should be contacted with any known or suspected variations from the conditions described herein. If future development of the property indicates the presence of hazardous or toxic materials, USACE should be notified to perform a re-evaluation of the environmental conditions.

The scope of this assessment did not include any additional environmental investigation, not outlined herein, or analyses for the presence or absence of hazardous or toxic materials in the soil, ground water, surface water, or air, in, on, under, or above the subject tract.

This site assessment was performed in accordance with generally accepted practices of consultants undertaking similar studies at the same time and in the same geographical area, and USACE observed that degree of care and skill generally exercised by consultants under similar circumstances and conditions. The findings and conclusions stated herein must be considered not as scientific certainties, but rather as professional opinions concerning the significance of the limited data gathered during the course of the environmental site assessment. No other warranty, expressed or implied, is made.

Specifically, USACE does not and cannot represent that the site contains no hazardous waste or material, oil (including petroleum products), or other latent condition beyond that observed by USACE during its site assessment.

The observations described in this report were made under the conditions stated herein. The conclusions presented in the report were based solely upon the services described therein, and not on scientific tasks or procedure beyond the scope of described services or the time and budgetary constraints imposed by the client. Furthermore, such conclusions are based solely on site conditions and rules and regulations, which were in effect at the time of the study.

In preparing this report, USACE relied on certain information provided by State and local officials and other parties referenced herein, and on information contained in the files of State and/or local agencies available to USACE at the time of the site assessment. Although there may have been some degree of overlap in the information provided by these various sources, an attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this site assessment was not made.

Observations were made of the site and of structures on the site as indicated within the report. Where access to portions of the site or to structures on the site was unavailable or limited, USACE renders no opinion as to the presence of indirect evidence relating to hazardous waste, material, oil, or other petroleum products in that portion of the site or structure. In addition, USACE renders no opinion as to the presence of hazardous waste or material, oil, or other petroleum products or to the presence of indirect evidence relating to hazardous material, oil, or petroleum products where direct observation of the interior walls, floor, roof, or ceiling of a structure on a site was obstructed by objects or coverings on or over these surfaces.

Unless otherwise specified in the report, USACE did not perform testing or analyses to determine the presence or concentration of asbestos, radon, formaldehyde, lead-based paint, lead in drinking water, electromagnetic fields (EMFs), or polychlorinated biphenyls (PCBs) at the site or in the environment at the site.

The purpose of this report is to assess the physical characteristics of the subject site with respect to the presence of hazardous waste, material, oil, or petroleum products in the environment. Except as otherwise described in this report, no specific attempt was made to check on the compliance of present or past owners or operators of the site with Federal, State, or local laws and regulations, environmental or otherwise.

Personnel from CEMVS-EC-EQ have specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property and declare that, to the best of their professional knowledge and belief, meet the definitions of Environmental Professionals as defined under 40 CFR 312.

11.0 REFERENCES

ASTM, 2021. 1527-21 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

ASTM, 2021. E2247-16 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process for Forestland or Rural Property.

USACE, 1992. ER 1165-2-132 Hazardous Toxic and Radioactive Waste Guidance for Civil Works Projects, Washington DC: Department of the Army.

USACE, 2010. ER 200-2-3 *Environmental Compliance Policies,* Washington D. C.: Department of the Army.

USEPA, 2005. 40 CFR 312: Innocent Landowners, Standards for Conducting All Appropriate Inquiries. *Code of Federal Regulations.*

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Figure 2: Southern tip of Jim Crow Island.



Figure 3: Middle of Jim Crow Island.



Figure 4: Southern section of Jim Crow Island.



Figure 5: Middle section of Jim Crow Island.



Figure 6: Inlet on Jim Crow Island.



Figure 7: Area surrounding the inlet on Jim Crow Island.



Figure 8: Northern section of the inlet on Jim Crow Island.



Figure 9: Debris on the northern part of Jim Crow Island.



Figure 10: Debris on the northern tip of Jim Crow Island.



Figure 11: Southern portion of Hausgen Island.



Figure 12: Middle section of Hausgen Island.



Figure 13: Northern section of Hausgen Island.

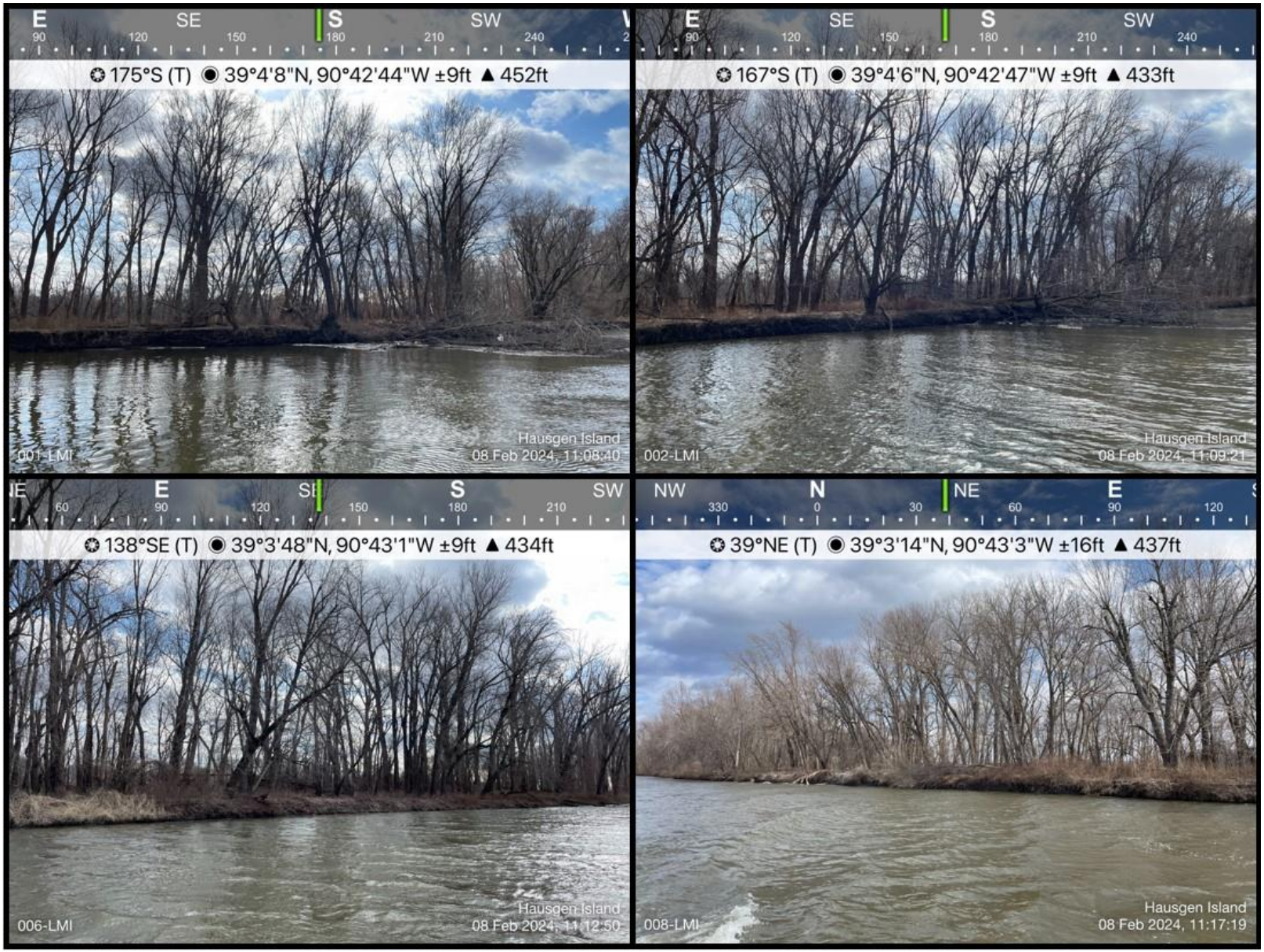


Figure 14: Inlet in Little Stag Island at the top of the project area.

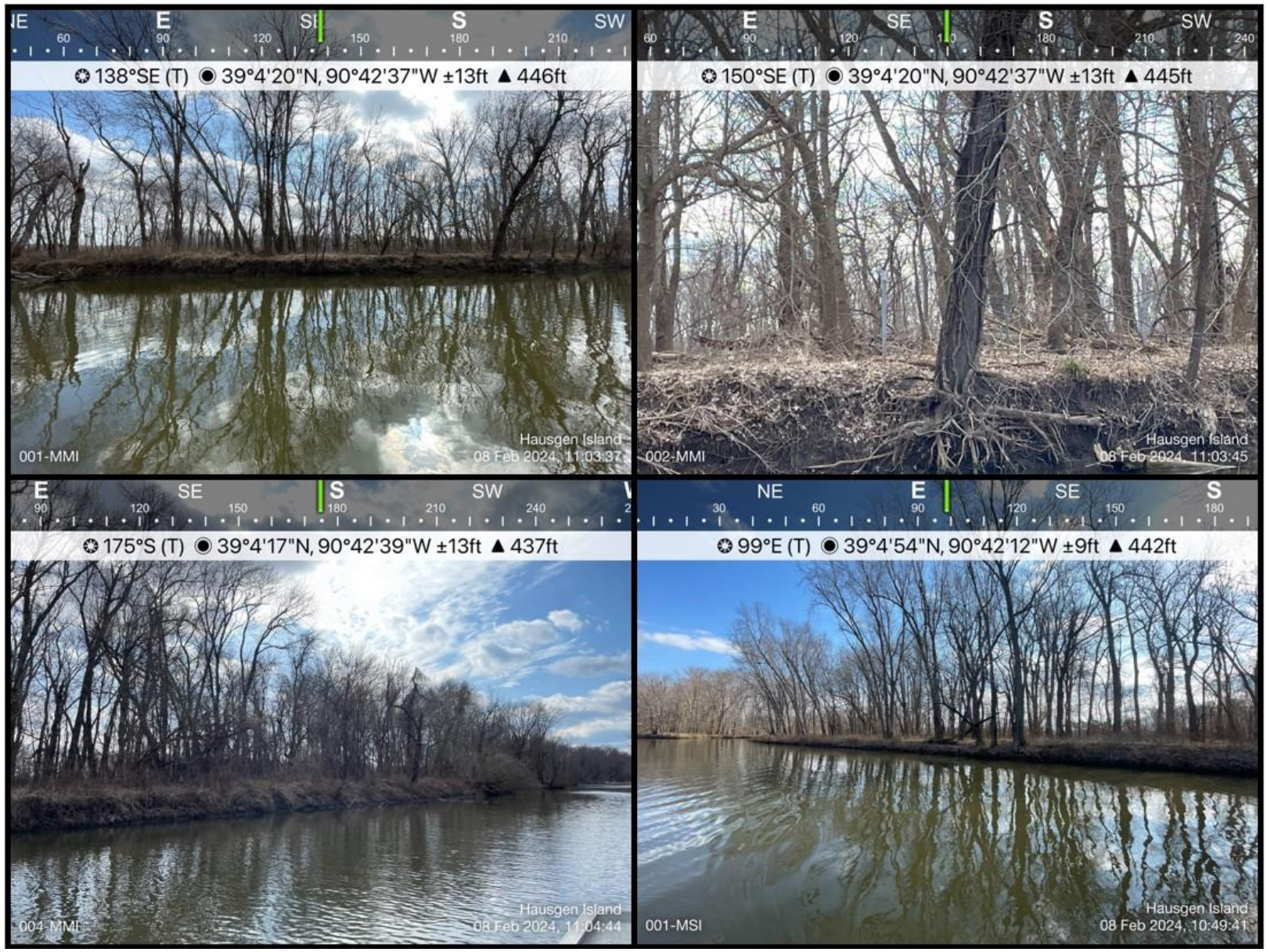


Figure 15: Northern section of the secondary side channel.

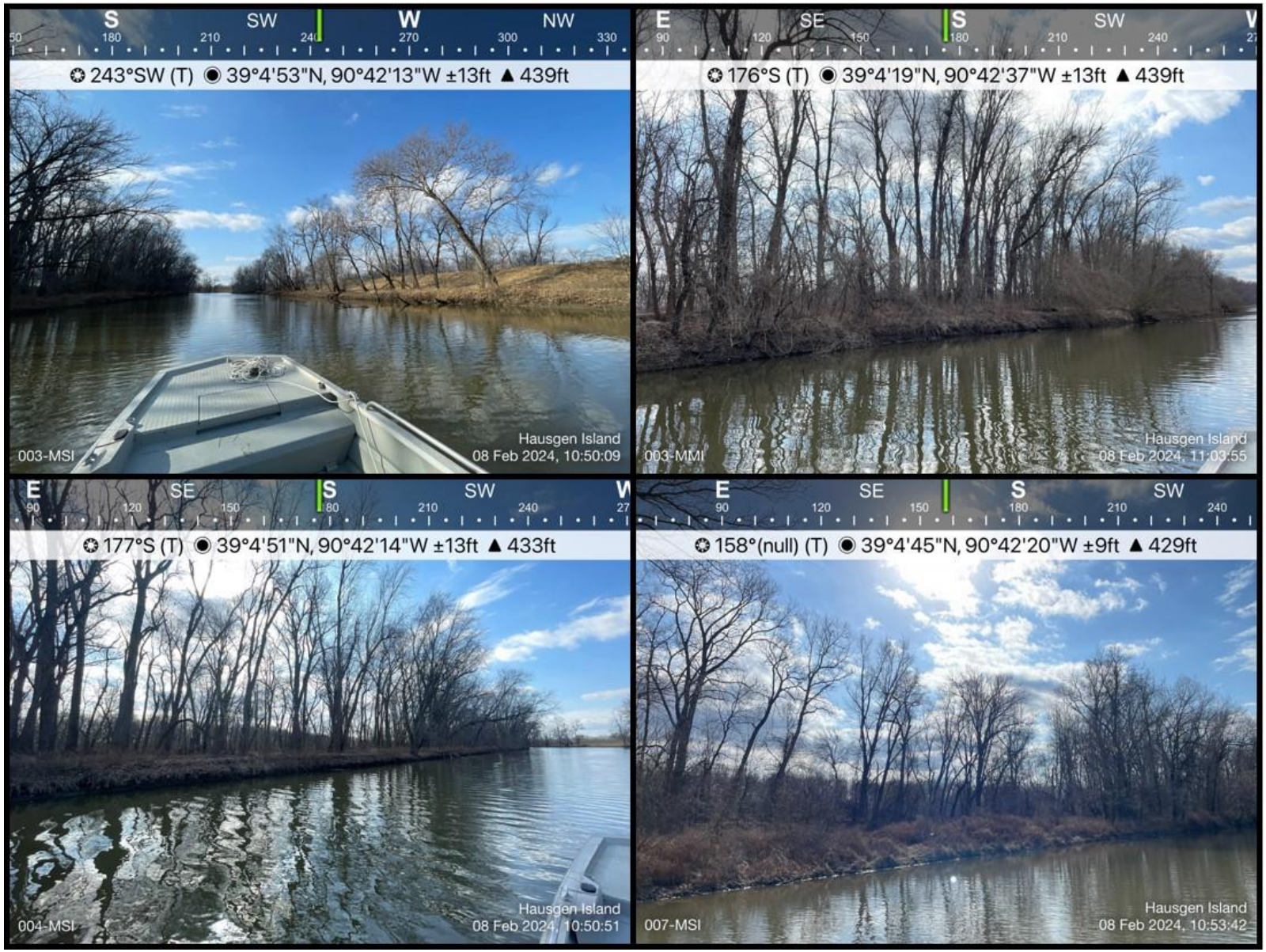


Figure 16: Middle area of the secondary side channel.



Figure 17: Southern area of the secondary side channel.

SUPPLEMENTARY MATERIALS A: INTERVIEW QUESTIONNAIRE

Name: Clinton Owenby
Agency: Missouri Department of Conservation
Position/Role on Property: District Supervisor, Area Manager of Upper Mississippi CA
Time in Position: 1 year

1. How long has the current owner owned this property?
   Owned by U.S. Army Corps of Engineers, under Missouri Department of Conservation management since 1986.

2. Has there ever been any herbicide or pesticide application to the property? NO

   If so, what chemicals were applied? N/A

   How many years were they applied? N/A

3. Has there ever been any type of spill (oil products, chemicals, etc.) on the property? NO

   If so, what was spilled an approximately how many gallons? N/A

   Did spill reach surface waters? N/A

4. Was the property ever used for an industrial use? If so, what type? NO

5. Were the properties ever used as a dump site (metal, tires, glass, chemical containers, old drums, etc.), either household or industrial? NO

6. Were there or are there any storage tanks either underground or aboveground?
   If so, how many gallons, what did they store, gasoline, fuel oil, etc.? NO

   Did they leak and were they removed? N/A

7. Are there any wells (drinking or other) on this property? NO

8. Were there or are there any wastewater treatment or sewage disposal facilities (septic systems, lagoons, etc.) on this property? NO

9. Were there or are there any transformers, capacitors or hydraulic equipment which could have contained PCB's? NO

10 Any storage of hazardous materials? If so, how much, when, for how many years?
   Where on property? NO

11. Any burn pits on this property? NO

12. Any buildings on this property? NO

Were they built before 1980? N/A

13. Has an asbestos and lead based paint survey been completed for the buildings? N/A

    If so, was any asbestos and/or lead based paint found? N/A

    Was it removed? N/A

14. Is the property served by a public or private drinking water supply? NO

    Is this supply conveyed through asbestos cement mains, lead containing lines or piping that uses copper and/or lead solder? N/A

15. Are there pipelines on or near this property? If so, where are they located? What are they transporting? NO

16. Does the property require a National Pollutant Discharge Elimination System? If so, what is the NPDES number? Have there been any violations? NO

SUPPLEMENTARY MATERIALS B: RECORDS REVIEW

Hausgen Island
Hausgen Island
Foley, MO 63347

Inquiry Number: 7517395.9s
December 12, 2023

EDR Area / Corridor Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E1527 - 21), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E2247 - 16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E1528 - 22) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

SUBJECT PROPERTY INFORMATION

ADDRESS

HAUSGEN ISLAND
FOLEY, MO 63347

TARGET PROPERTY SEARCH RESULTS

The Target Property was identified in the following databases.

Page Numbers and Map Identifcations refer to the EDR Area/Corridor Report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were not identified.

Unmappable (orphan) sites are not considered in the foregoing analysis.

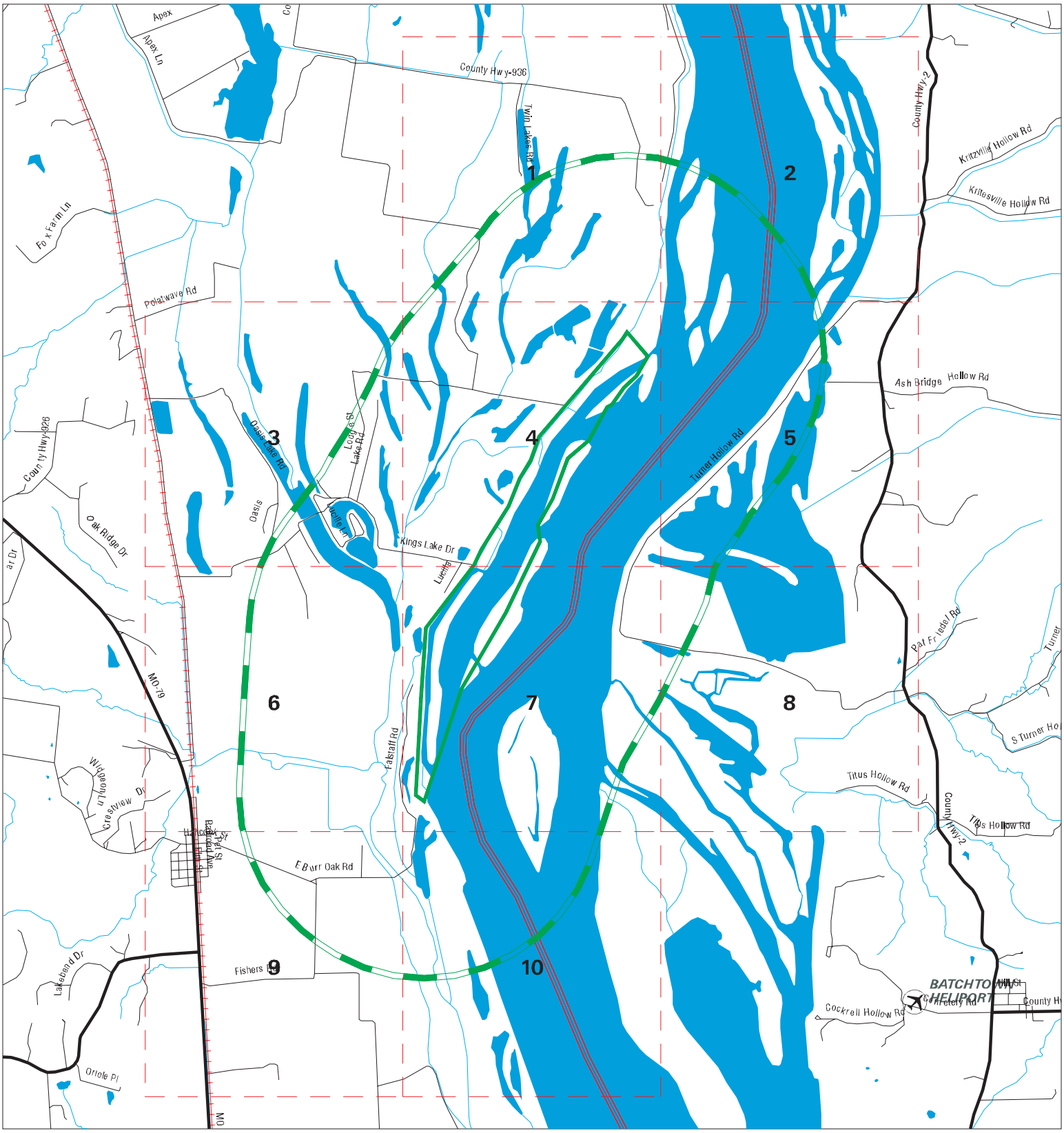
MAPPED SITES SUMMARY

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Key Map - 7517395.9s



- Sites
- Target Property
- Search Buffer
- Focus Map - No Sites
- Focus Map - Sites
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA

0 1/2 1 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23 7:51 AM

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Lists of Federal NPL (Superfund) sites								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Lists of Federal Delisted NPL sites								
Delisted NPL	1.000		0	0	0	0	NR	0
Lists of Federal sites subject to CERCLA removals and CERCLA orders								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Lists of Federal CERCLA sites with NFRAP								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Lists of Federal RCRA facilities undergoing Corrective Action								
CORRACTS	1.000		0	0	0	0	NR	0
Lists of Federal RCRA TSD facilities								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Lists of Federal RCRA generators								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-VSQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROLS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
Lists of state- and tribal hazardous waste facilities								
SHWS	1.000		0	0	0	0	NR	0
Lists of state and tribal landfills and solid waste disposal facilities								
SWF/LF	0.500		0	0	0	NR	NR	0
Lists of state and tribal leaking storage tanks								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
Lists of state and tribal registered storage tanks								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
TANKS	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
AUL	0.500		0	0	0	NR	NR	0
Lists of state and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
Lists of state and tribal brownfield sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
HIST LF	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
DEL SHWS	1.000		0	0	0	0	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
MINES MRDS	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
PFAS NPL	0.250		0	0	NR	NR	NR	0
PFAS FEDERAL SITES	0.250		0	0	NR	NR	NR	0
PFAS TSCA	0.250		0	0	NR	NR	NR	0
PFAS TRIS	0.250		0	0	NR	NR	NR	0
PFAS RCRA MANIFEST	0.250		0	0	NR	NR	NR	0
PFAS ATSDR	0.250		0	0	NR	NR	NR	0
PFAS WQP	0.250		0	0	NR	NR	NR	0
PFAS NPDES	0.250		0	0	NR	NR	NR	0
PFAS ECHO	0.250		0	0	NR	NR	NR	0
PFAS ECHO FIRE TRAINING	0.250		0	0	NR	NR	NR	0
PFAS PART 139 AIRPORT	0.250		0	0	NR	NR	NR	0
AQUEOUS FOAM NRC	0.250		0	0	NR	NR	NR	0
BIOSOLIDS	TP		NR	NR	NR	NR	NR	0
PFAS	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
AIRS	TP		NR	NR	NR	NR	NR	0
ASBESTOS	TP		NR	NR	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
MINES	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
MO RRC	TP		NR	NR	NR	NR	NR	0
SMARS	0.500		0	0	0	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA HWS	TP		NR	NR	NR	NR	NR	0
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	0	0	0	0	0	0

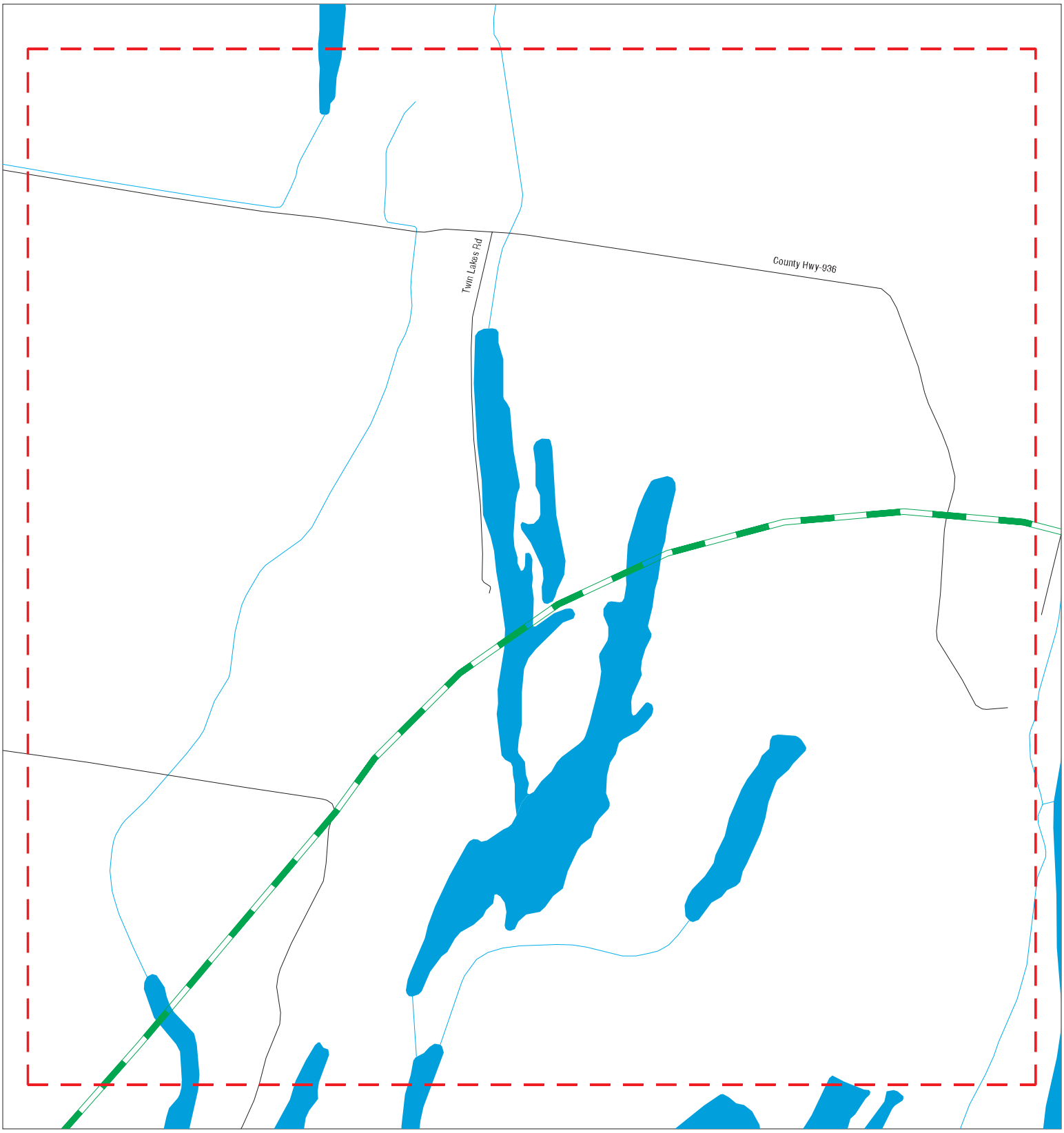
NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Focus Map - 1 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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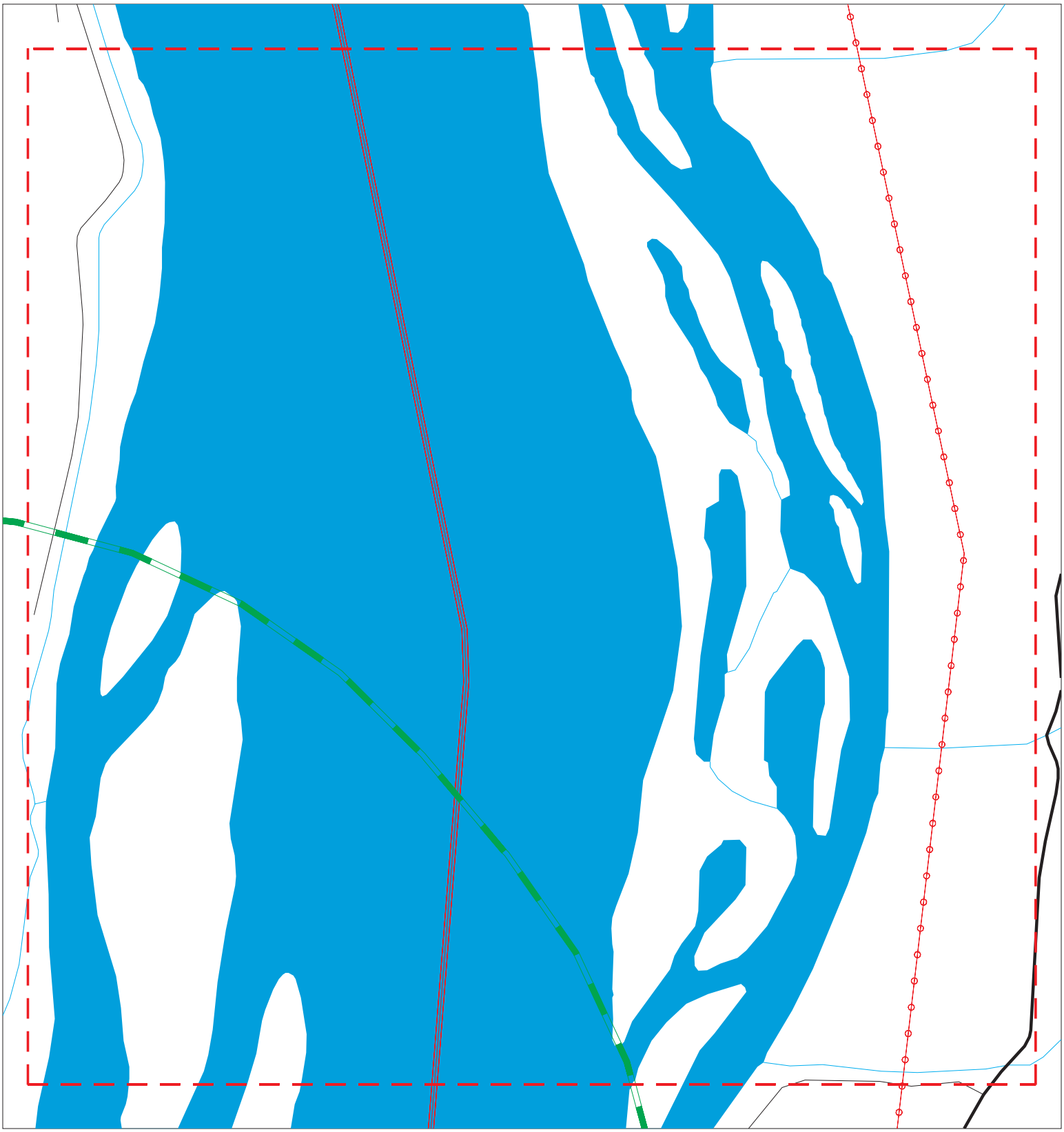
MAPPED SITES SUMMARY - FOCUS MAP 1

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 2 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island ADDRESS: Hausgen Island CITY/STATE: Foley MO ZIP: 63347	CLIENT: U.S. Army Corps of Engineers CONTACT: Kaleb Rakers INQUIRY #: 7517395.9s DATE: 12/12/23

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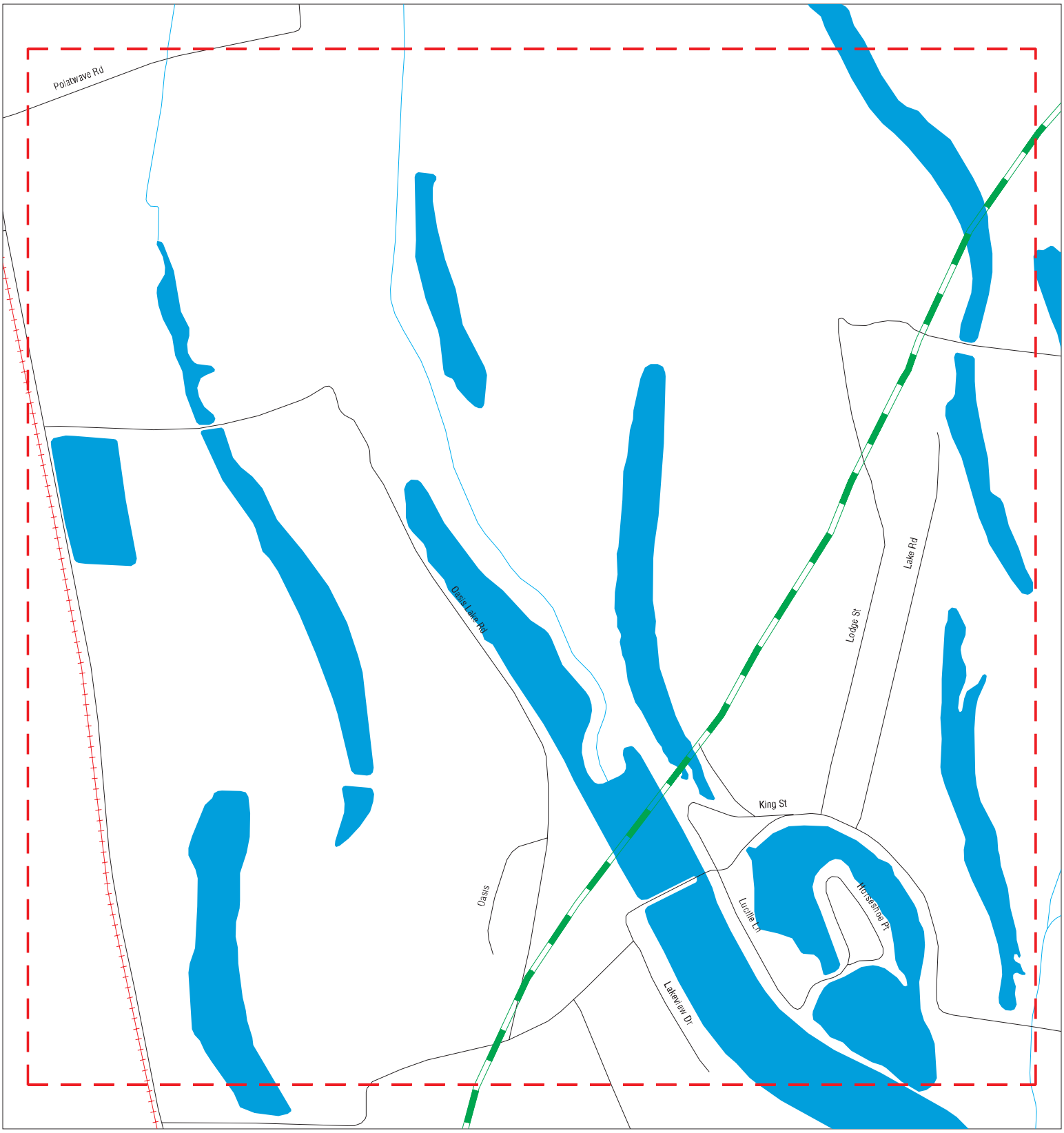
MAPPED SITES SUMMARY - FOCUS MAP 2

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 3 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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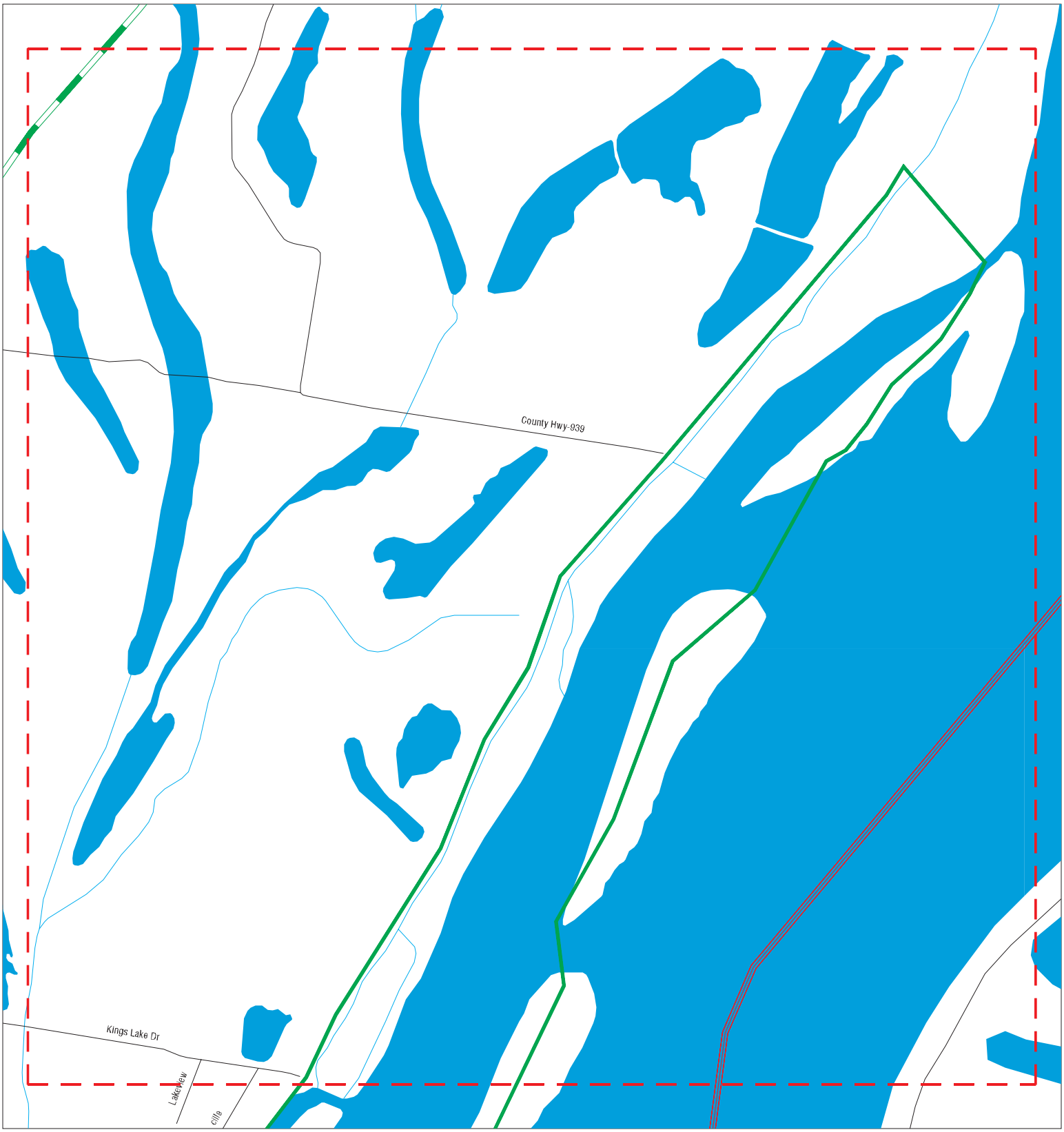
MAPPED SITES SUMMARY - FOCUS MAP 3

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 4 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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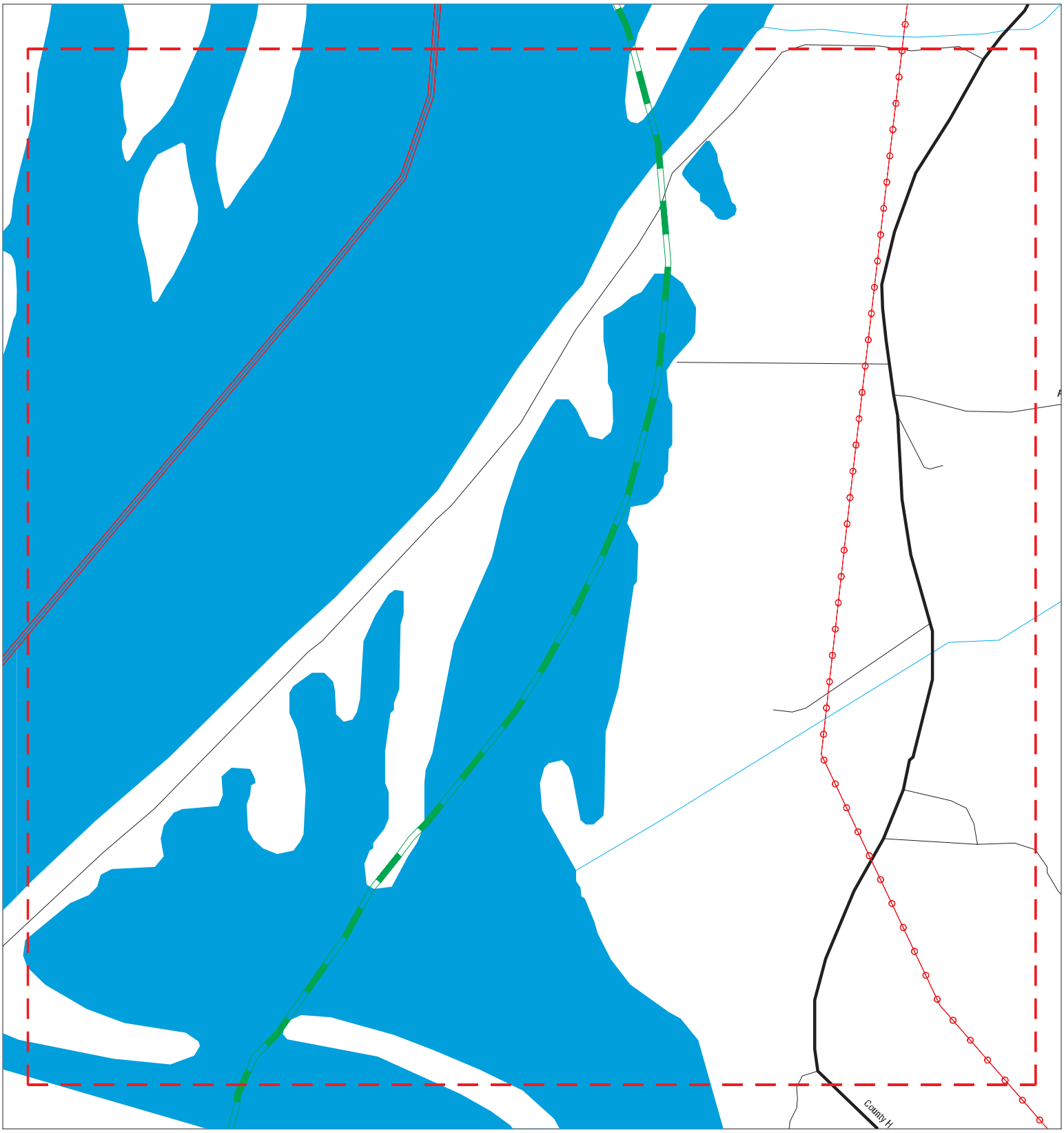
MAPPED SITES SUMMARY - FOCUS MAP 4

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 5 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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MAPPED SITES SUMMARY - FOCUS MAP 5

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 6 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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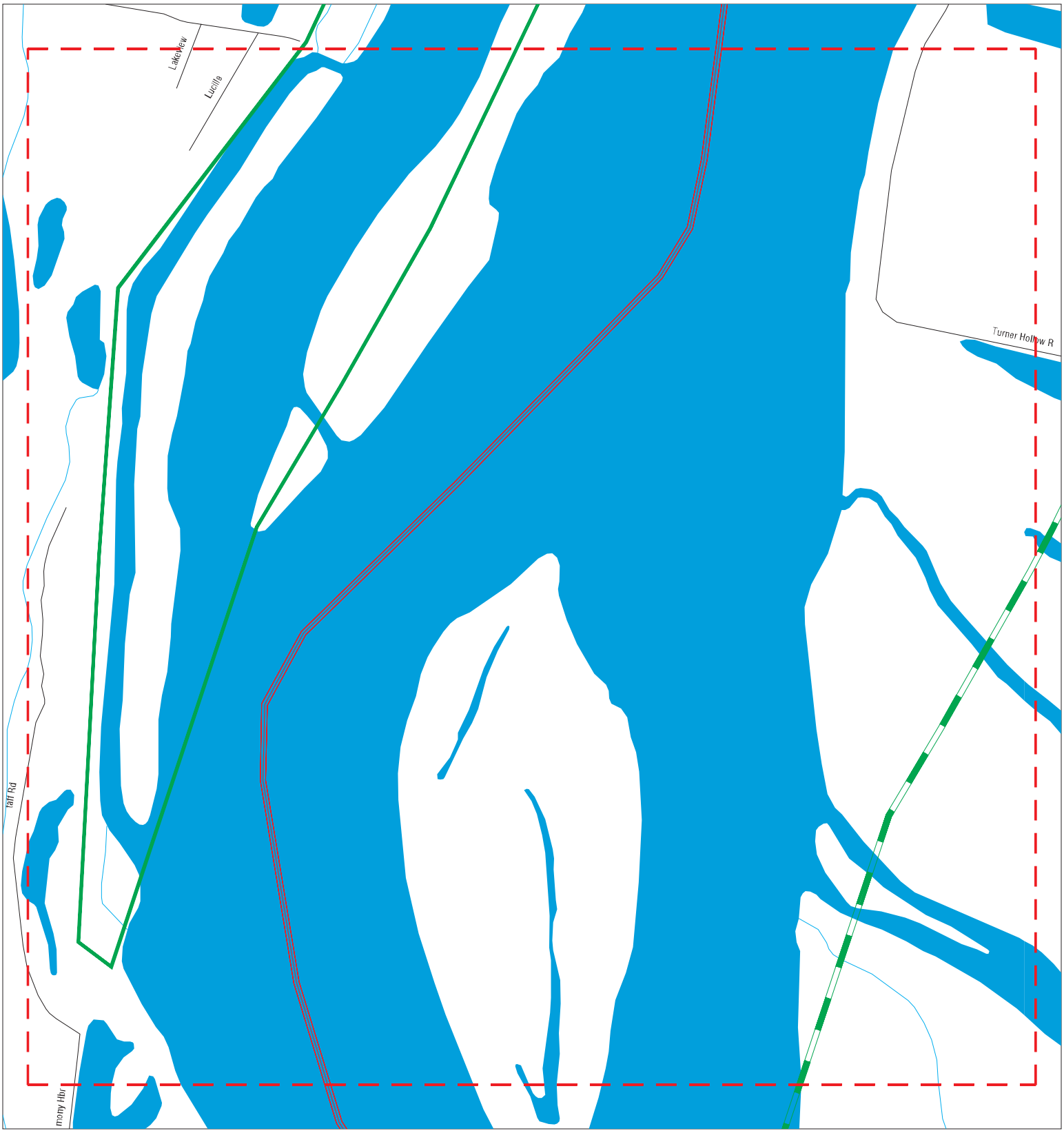
MAPPED SITES SUMMARY - FOCUS MAP 6

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 7 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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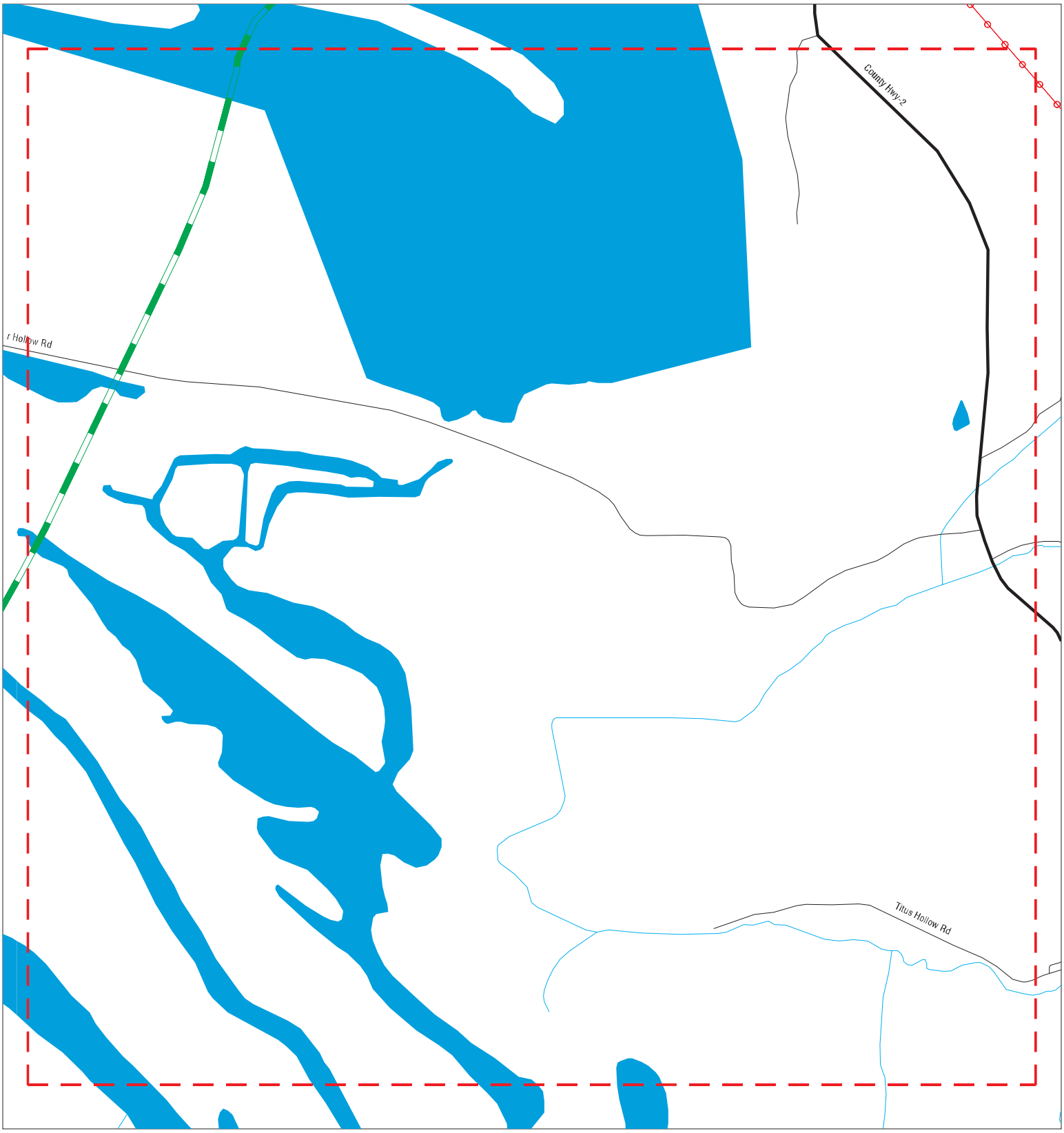
MAPPED SITES SUMMARY - FOCUS MAP 7

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 8 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island ADDRESS: Hausgen Island CITY/STATE: Foley MO ZIP: 63347	CLIENT: U.S. Army Corps of Engineers CONTACT: Kaleb Rakers INQUIRY #: 7517395.9s DATE: 12/12/23

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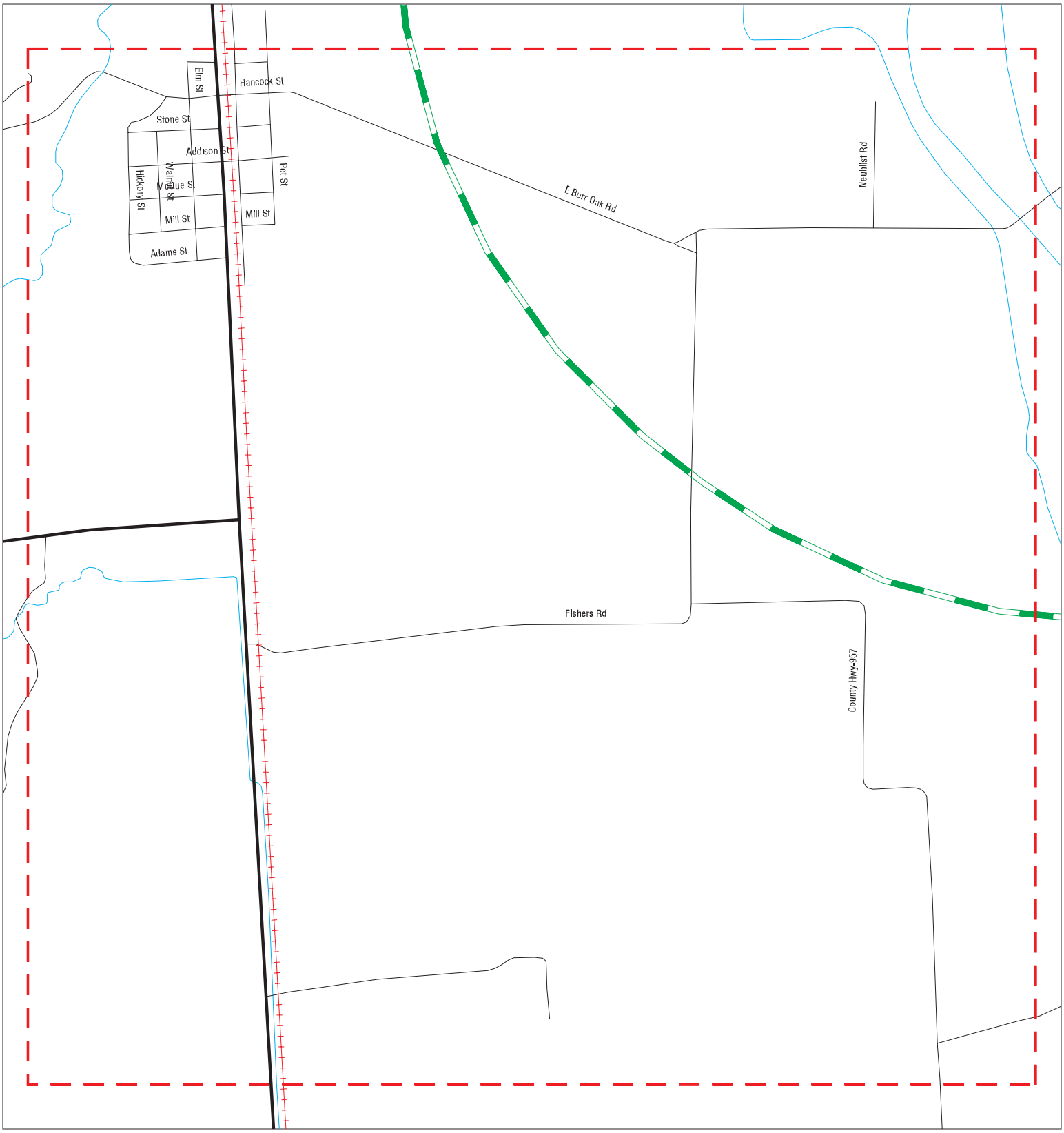
MAPPED SITES SUMMARY - FOCUS MAP 8

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 9 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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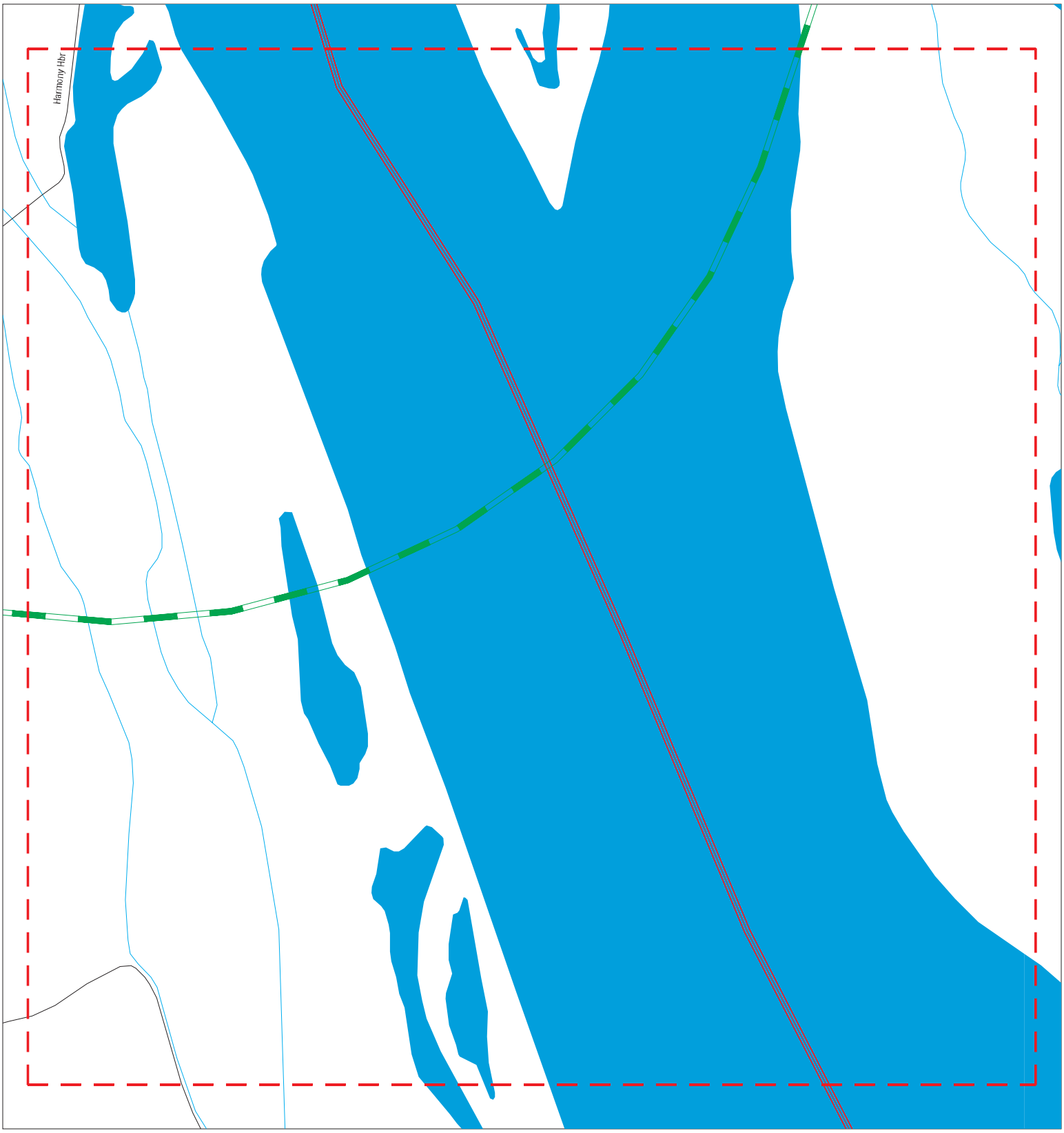
MAPPED SITES SUMMARY - FOCUS MAP 9

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 10 - 7517395.9s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Dept. Defense Sites
Indian Reservations BIA

0 1/8 1/4 Miles

SITE NAME: Hausgen Island	CLIENT: U.S. Army Corps of Engineers
ADDRESS: Hausgen Island	CONTACT: Kaleb Rakers
CITY/STATE: Foley MO	INQUIRY #: 7517395.9s
ZIP: 63347	DATE: 12/12/23

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MAPPED SITES SUMMARY - FOCUS MAP 10

Target Property:
HAUSGEN ISLAND
FOLEY, MO 63347

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

MAP FINDINGS

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number

NO SITES FOUND

Count: 0 records

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
		NO SITES FOUND			

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Lists of Federal NPL (Superfund) sites

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: N/A
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: N/A
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

Lists of Federal Delisted NPL sites

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: N/A
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Quarterly

Lists of Federal sites subject to CERCLA removals and CERCLA orders

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 06/23/2023
Date Data Arrived at EDR: 06/23/2023
Date Made Active in Reports: 09/20/2023
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 09/26/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System

SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 01/22/2024
Data Release Frequency: Quarterly

Lists of Federal CERCLA sites with NFRAP

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 01/22/2024
Data Release Frequency: Quarterly

Lists of Federal RCRA facilities undergoing Corrective Action

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 07/24/2023
Date Data Arrived at EDR: 07/31/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 14

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

Lists of Federal RCRA TSD facilities

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 07/24/2023
Date Data Arrived at EDR: 07/31/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 913-551-7003
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

Lists of Federal RCRA generators

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 07/24/2023
Date Data Arrived at EDR: 07/31/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 913-551-7003
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 07/24/2023
Date Data Arrived at EDR: 07/31/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 913-551-7003
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

RCRA-VSQG: RCRA - Very Small Quantity Generators (Formerly Conditionally Exempt Small Quantity Generators)

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Very small quantity generators (VSQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 07/24/2023
Date Data Arrived at EDR: 07/31/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 913-551-7003
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

Federal institutional controls / engineering controls registries

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 08/03/2023
Date Data Arrived at EDR: 08/07/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 64

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 11/02/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 08/21/2023
Date Data Arrived at EDR: 08/21/2023
Date Made Active in Reports: 11/07/2023
Number of Days to Update: 78

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 11/17/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

US INST CONTROLS: Institutional Controls Sites List

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 08/21/2023
Date Data Arrived at EDR: 08/21/2023
Date Made Active in Reports: 11/07/2023
Number of Days to Update: 78

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 11/17/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/18/2023
Date Data Arrived at EDR: 09/20/2023
Date Made Active in Reports: 12/11/2023
Number of Days to Update: 82

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 09/20/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

Lists of state- and tribal hazardous waste facilities

HWS DETAIL: Registry Annual Report

Each site is described in detail in this annual report and includeds the following information: a general description of the site; a summary of any significant environmental problems at and near the site; a summary of any serious health problems in the immediate vicinity of the site; the status of any testing, monitoring or remedial actions in progress or recommended by the department.

Date of Government Version: 06/30/2022
Date Data Arrived at EDR: 03/01/2023
Date Made Active in Reports: 05/19/2023
Number of Days to Update: 79

Source: Department of Natural Resources
Telephone: 573-751-3176
Last EDR Contact: 11/22/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Annually

SHWS: Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 09/12/2022
Date Data Arrived at EDR: 09/21/2022
Date Made Active in Reports: 12/08/2022
Number of Days to Update: 78

Source: Department of Natural Resources
Telephone: 573-751-1990
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Annually

Lists of state and tribal landfills and solid waste disposal facilities

SWF/LF: Solid Waste Facility List

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 08/21/2023
Date Data Arrived at EDR: 08/22/2023
Date Made Active in Reports: 11/06/2023
Number of Days to Update: 76

Source: Department of Natural Resources
Telephone: 573-751-5401
Last EDR Contact: 11/17/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

Lists of state and tribal leaking storage tanks

LUST: Leaking Underground Storage Tanks

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 08/28/2023
Date Data Arrived at EDR: 09/06/2023
Date Made Active in Reports: 11/22/2023
Number of Days to Update: 77

Source: Department of Natural Resources
Telephone: 573-751-0135
Last EDR Contact: 11/30/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

LAST: Leaking Aboveground Storage Tanks
A listing of leaking aboveground storage tanks.

Date of Government Version: 08/28/2023
Date Data Arrived at EDR: 09/06/2023
Date Made Active in Reports: 11/22/2023
Number of Days to Update: 77
Source: Department of Natural Resources
Telephone: 573-751-6822
Last EDR Contact: 11/30/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 04/19/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 04/19/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 04/14/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 04/26/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 04/25/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

Lists of state and tribal registered storage tanks

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 03/08/2023
Date Data Arrived at EDR: 03/09/2023
Date Made Active in Reports: 05/30/2023
Number of Days to Update: 82

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 10/10/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

UST: Petroleum Storage Tanks
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 08/28/2023
Date Data Arrived at EDR: 09/06/2023
Date Made Active in Reports: 11/22/2023
Number of Days to Update: 77

Source: Department of Natural Resources
Telephone: 573-751-0135
Last EDR Contact: 11/30/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

AST: Aboveground Petroleum Storage Tanks
Registered Aboveground Storage Tanks.

Date of Government Version: 12/05/2023
Date Data Arrived at EDR: 12/06/2023
Date Made Active in Reports: 12/11/2023
Number of Days to Update: 5

Source: Department of Agriculture
Telephone: 573-751-7062
Last EDR Contact: 11/21/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Semi-Annually

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 04/19/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 04/25/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 04/14/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 04/26/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 04/20/2023
Date Data Arrived at EDR: 05/09/2023
Date Made Active in Reports: 07/14/2023
Number of Days to Update: 66
Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

TANKS: Underground Storage Tank Database
Storage tank sites

Date of Government Version: 08/28/2023
Date Data Arrived at EDR: 09/06/2023
Date Made Active in Reports: 11/22/2023
Number of Days to Update: 77
Source: Department of Natural Resources
Telephone: 573-526-2058
Last EDR Contact: 11/30/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

AUL: Sites with Controls
Activity and use limitations include both engineering controls and institutional controls.

Date of Government Version: 08/07/2023
Date Data Arrived at EDR: 08/08/2023
Date Made Active in Reports: 10/24/2023
Number of Days to Update: 77
Source: Department of Natural Resources
Telephone: 573-751-3176
Last EDR Contact: 11/07/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: Quarterly

Lists of state and tribal voluntary cleanup sites

VCP: Sites Participating in the Voluntary Cleanup Program
Sites participating in the Voluntary Cleanup Program.

Date of Government Version: 08/07/2023
Date Data Arrived at EDR: 08/08/2023
Date Made Active in Reports: 10/24/2023
Number of Days to Update: 77
Source: Department of Natural Resources
Telephone: 573-526-8913
Last EDR Contact: 11/07/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: Quarterly

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 07/27/2015
Date Data Arrived at EDR: 09/29/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 142
Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 09/12/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27
Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 07/08/2021
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

Lists of state and tribal brownfield sites

BROWNFIELDS: Brownfields Site List

Brownfields are sites where redevelopment and reuse is hampered by known or suspected contamination with hazardous substances. While many brownfield sites are minimally contaminated, potential environmental liability can be a problem for owners, operators, prospective buyers and financial institutions. Because of the large number of these sites, their economic impact especially in heavily industrial areas is substantial.

Date of Government Version: 08/07/2023
Date Data Arrived at EDR: 08/08/2023
Date Made Active in Reports: 10/24/2023
Number of Days to Update: 77

Source: Department of Natural Resources
Telephone: 573-526-8913
Last EDR Contact: 11/07/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: Quarterly

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 08/15/2023
Date Data Arrived at EDR: 08/30/2023
Date Made Active in Reports: 12/01/2023
Number of Days to Update: 93

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 08/30/2023
Next Scheduled EDR Contact: 12/25/2023
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

HIST LF: Solid Waste Facility Database List

This database contains detailed information per site. It is no longer maintained by the Department of Natural Resources. For current information on solid waste facilities/landfills see the SWF/LF database.

Date of Government Version: 04/12/2005
Date Data Arrived at EDR: 07/19/2006
Date Made Active in Reports: 08/18/2006
Number of Days to Update: 30

Source: Department of Natural Resources
Telephone: 573-751-5401
Last EDR Contact: 01/12/2009
Next Scheduled EDR Contact: 04/13/2009
Data Release Frequency: No Update Planned

SWRCY: Solid Waste Recycling Facilities

A listing of recycling center locations.

Date of Government Version: 06/07/2023
Date Data Arrived at EDR: 06/08/2023
Date Made Active in Reports: 08/30/2023
Number of Days to Update: 83

Source: Department of Natural Resources
Telephone: 573-526-3944
Last EDR Contact: 11/16/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 10/23/2023
Next Scheduled EDR Contact: 02/05/2024
Data Release Frequency: Varies

ODI: Open Dump Inventory
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39
Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations
A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137
Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 10/10/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: No Update Planned

IHS OPEN DUMPS: Open Dumps on Indian Land
A listing of all open dumps located on Indian Land in the United States.

Date of Government Version: 04/01/2014
Date Data Arrived at EDR: 08/06/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 176
Source: Department of Health & Human Serivces, Indian Health Service
Telephone: 301-443-1452
Last EDR Contact: 10/28/2023
Next Scheduled EDR Contact: 02/05/2024
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 08/21/2023
Date Data Arrived at EDR: 08/21/2023
Date Made Active in Reports: 11/07/2023
Number of Days to Update: 78
Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 11/17/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: No Update Planned

CDL: Environmental Emergency Response System
Incidents reported to the Department of Natural Resources where drug lab materials were involved.

Date of Government Version: 12/05/2022
Date Data Arrived at EDR: 12/05/2022
Date Made Active in Reports: 02/24/2023
Number of Days to Update: 81
Source: Department of Natural Resources
Telephone: 573-751-3443
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

DEL SHWS: Registry Sites Withdrawn or Deleted
A list of sites that were removed from the Registry or for which Registry action was suspended due to cleanup.

Date of Government Version: 09/12/2022
Date Data Arrived at EDR: 09/21/2022
Date Made Active in Reports: 12/08/2022
Number of Days to Update: 78
Source: Department of Natural Resources
Telephone: 573-522-3710
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Annually

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 08/21/2023
Date Data Arrived at EDR: 08/21/2023
Date Made Active in Reports: 11/07/2023
Number of Days to Update: 78

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 11/17/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Quarterly

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 11/01/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Semi-Annually

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 09/18/2023
Date Data Arrived at EDR: 09/20/2023
Date Made Active in Reports: 11/14/2023
Number of Days to Update: 55

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 09/20/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

SPILLS: Environmental Response Tracking Database

Releases of hazardous substances reported to the department's Environmental Emergency Response (EER) section.

Date of Government Version: 12/05/2022
Date Data Arrived at EDR: 12/05/2022
Date Made Active in Reports: 02/24/2023
Number of Days to Update: 81

Source: Department of Natural Resources
Telephone: 573-526-3349
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 06/27/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/22/2013
Number of Days to Update: 50

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 07/24/2023
Date Data Arrived at EDR: 07/31/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 913-551-7003
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 08/07/2023
Date Data Arrived at EDR: 08/15/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 56

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 11/10/2023
Next Scheduled EDR Contact: 02/26/2024
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 06/07/2021
Date Data Arrived at EDR: 07/13/2021
Date Made Active in Reports: 03/09/2022
Number of Days to Update: 239

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 10/09/2023
Next Scheduled EDR Contact: 01/22/2024
Data Release Frequency: Varies

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 04/02/2018
Date Data Arrived at EDR: 04/11/2018
Date Made Active in Reports: 11/06/2019
Number of Days to Update: 574

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 10/04/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 07/30/2021
Date Data Arrived at EDR: 02/03/2023
Date Made Active in Reports: 02/10/2023
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 11/08/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 06/19/2023
Date Data Arrived at EDR: 06/20/2023
Date Made Active in Reports: 08/14/2023
Number of Days to Update: 55

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 09/20/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 10/31/2023
Next Scheduled EDR Contact: 02/12/2024
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 09/30/2017
Date Data Arrived at EDR: 05/08/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 73

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 11/03/2023
Next Scheduled EDR Contact: 02/12/2024
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2020
Date Data Arrived at EDR: 06/14/2022
Date Made Active in Reports: 03/24/2023
Number of Days to Update: 283

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 09/15/2023
Next Scheduled EDR Contact: 12/25/2023
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2021
Date Data Arrived at EDR: 08/18/2023
Date Made Active in Reports: 11/07/2023
Number of Days to Update: 81

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 11/13/2023
Next Scheduled EDR Contact: 02/26/2024
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 07/17/2023
Date Data Arrived at EDR: 07/18/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 84

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 10/20/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Annually

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Annually

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 05/09/2023
Date Data Arrived at EDR: 06/29/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 09/26/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 02/12/2024
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 03/20/2023
Date Data Arrived at EDR: 04/04/2023
Date Made Active in Reports: 06/09/2023
Number of Days to Update: 66

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 10/06/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 11/18/2016
Date Data Arrived at EDR: 11/23/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 79

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 09/27/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: No Update Planned

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: No Update Planned

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 07/20/2023
Date Data Arrived at EDR: 09/01/2023
Date Made Active in Reports: 09/20/2023
Number of Days to Update: 19

Source: Nuclear Regulatory Commission
Telephone: 301-415-0717
Last EDR Contact: 10/10/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2021
Date Data Arrived at EDR: 04/14/2023
Date Made Active in Reports: 07/10/2023
Number of Days to Update: 87

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 11/27/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 01/12/2017
Date Data Arrived at EDR: 03/05/2019
Date Made Active in Reports: 11/11/2019
Number of Days to Update: 251
Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 11/27/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 09/13/2019
Date Data Arrived at EDR: 11/06/2019
Date Made Active in Reports: 02/10/2020
Number of Days to Update: 96
Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 11/03/2023
Next Scheduled EDR Contact: 02/12/2024
Data Release Frequency: Varies

RADINFO: Radiation Information Database
The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 07/01/2019
Date Data Arrived at EDR: 07/01/2019
Date Made Active in Reports: 09/23/2019
Number of Days to Update: 84
Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 09/22/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 01/02/2020
Date Data Arrived at EDR: 01/28/2020
Date Made Active in Reports: 04/17/2020
Number of Days to Update: 80
Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 10/04/2023
Next Scheduled EDR Contact: 02/05/2024
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 06/30/2023
Date Data Arrived at EDR: 07/19/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 83

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2021
Date Data Arrived at EDR: 03/09/2023
Date Made Active in Reports: 03/20/2023
Number of Days to Update: 11

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 12/06/2023
Next Scheduled EDR Contact: 01/01/2024
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/14/2015
Date Made Active in Reports: 01/10/2017
Number of Days to Update: 546

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 10/02/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program

DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 03/03/2023
Date Data Arrived at EDR: 03/03/2023
Date Made Active in Reports: 06/09/2023
Number of Days to Update: 98

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 10/25/2023
Next Scheduled EDR Contact: 02/12/2024
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 08/30/2019
Date Data Arrived at EDR: 11/15/2019
Date Made Active in Reports: 01/28/2020
Number of Days to Update: 74

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 11/09/2023
Next Scheduled EDR Contact: 02/26/2024
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 09/19/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 16

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 12/04/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/01/2023
Date Data Arrived at EDR: 08/22/2023
Date Made Active in Reports: 11/07/2023
Number of Days to Update: 77

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 11/17/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Semi-Annually

MINES VIOLATIONS: MSHA Violation Assessment Data

Mines violation and assessment information. Department of Labor, Mine Safety & Health Administration.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 82

Source: DOL, Mine Safety & Health Admi
Telephone: 202-693-9424
Last EDR Contact: 10/04/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: Quarterly

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing

This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 01/07/2022
Date Data Arrived at EDR: 02/24/2023
Date Made Active in Reports: 05/17/2023
Number of Days to Update: 82

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 11/20/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 11/20/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

ABANDONED MINES: Abandoned Mines

An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The inventory contains information on the location, type, and extent of AML impacts, as well as, information on the cost associated with the reclamation of those problems. The inventory is based upon field surveys by State, Tribal, and OSMRE program officials. It is dynamic to the extent that it is modified as new problems are identified and existing problems are reclaimed.

Date of Government Version: 11/28/2023
Date Data Arrived at EDR: 11/29/2023
Date Made Active in Reports: 12/11/2023
Number of Days to Update: 12

Source: Department of Interior
Telephone: 202-208-2609
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

MINES MRDS: Mineral Resources Data System

Mineral Resources Data System

Date of Government Version: 08/23/2022
Date Data Arrived at EDR: 11/22/2022
Date Made Active in Reports: 02/28/2023
Number of Days to Update: 98

Source: USGS
Telephone: 703-648-6533
Last EDR Contact: 11/20/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 11/03/2023
Date Data Arrived at EDR: 11/08/2023
Date Made Active in Reports: 11/20/2023
Number of Days to Update: 12

Source: EPA
Telephone: (913) 551-7003
Last EDR Contact: 11/08/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Quarterly

ECHO: Enforcement & Compliance History Information

ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 06/24/2023
Date Data Arrived at EDR: 06/29/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 202-564-2280
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Quarterly

DOCKET HWC: Hazardous Waste Compliance Docket Listing

A complete list of the Federal Agency Hazardous Waste Compliance Docket Facilities.

Date of Government Version: 05/06/2021
Date Data Arrived at EDR: 05/21/2021
Date Made Active in Reports: 08/11/2021
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: 202-564-0527
Last EDR Contact: 11/15/2023
Next Scheduled EDR Contact: 03/04/2024
Data Release Frequency: Varies

UXO: Unexploded Ordnance Sites

A listing of unexploded ordnance site locations

Date of Government Version: 09/06/2023
Date Data Arrived at EDR: 09/13/2023
Date Made Active in Reports: 12/11/2023
Number of Days to Update: 89

Source: Department of Defense
Telephone: 703-704-1564
Last EDR Contact: 09/13/2023
Next Scheduled EDR Contact: 01/22/2024
Data Release Frequency: Varies

FUELS PROGRAM: EPA Fuels Program Registered Listing

This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 08/14/2023
Date Data Arrived at EDR: 08/15/2023
Date Made Active in Reports: 10/19/2023
Number of Days to Update: 65

Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 11/10/2023
Next Scheduled EDR Contact: 02/26/2024
Data Release Frequency: Quarterly

PFAS NPL: Superfund Sites with PFAS Detections Information

EPA's Office of Land and Emergency Management and EPA Regional Offices maintain data describing what is known about site investigations, contamination, and remedial actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) where PFAS is present in the environment.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 10/02/2023
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 703-603-8895
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS FEDERAL SITES: Federal Sites PFAS Information

Several federal entities, such as the federal Superfund program, Department of Defense, National Aeronautics and Space Administration, Department of Transportation, and Department of Energy provided information for sites with known or suspected detections at federal facilities.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 10/02/2023
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS TSCA: PFAS Manufacture and Imports Information

EPA issued the Chemical Data Reporting (CDR) Rule under the Toxic Substances Control Act (TSCA) and requires chemical manufacturers and facilities that manufacture or import chemical substances to report data to EPA. EPA publishes non-confidential business information (non-CBI) and includes descriptive information about each site, corporate parent, production volume, other manufacturing information, and processing and use information.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 10/02/2023
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS TRIS: List of PFAS Added to the TRI

Section 7321 of the National Defense Authorization Act for Fiscal Year 2020 (NDAA) immediately added certain per- and polyfluoroalkyl substances (PFAS) to the list of chemicals covered by the Toxics Release Inventory (TRI) under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) and provided a framework for additional PFAS to be added to TRI on an annual basis.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 10/02/2023
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 202-566-0250
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS RCRA MANIFEST: PFAS Transfers Identified In the RCRA Database Listing

To work around the lack of PFAS waste codes in the RCRA database, EPA developed the PFAS Transfers dataset by mining e-Manifest records containing at least one of these common PFAS keywords: PFAS, PFOA, PFOS, PERFL, AFFF, GENX, GEN-X (plus the VT waste codes). These keywords were searched for in the following text fields: Manifest handling instructions (MANIFEST_HANDLING_INSTR), Non-hazardous waste description (NON_HAZ_WASTE_DESCRIPTION), DOT printed information (DOT_PRINTED_INFORMATION), Waste line handling instructions (WASTE_LINE_HANDLING_INSTR), Waste residue comments (WASTE_RESIDUE_COMMENTS).

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 10/02/2023
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS ATSDR: PFAS Contamination Site Location Listing

PFAS contamination site locations from the Department of Health & Human Services, Center for Disease Control & Prevention. ATSDR is involved at a number of PFAS-related sites, either directly or through assisting state and federal partners. As of now, most sites are related to drinking water contamination connected with PFAS production facilities or fire training areas where aqueous film-forming firefighting foam (AFFF) was regularly used.

Date of Government Version: 06/24/2020
Date Data Arrived at EDR: 03/17/2021
Date Made Active in Reports: 11/08/2022
Number of Days to Update: 601

Source: Department of Health & Human Services
Telephone: 202-741-5770
Last EDR Contact: 10/23/2023
Next Scheduled EDR Contact: 02/05/2024
Data Release Frequency: Varies

PFAS WQP: Ambient Environmental Sampling for PFAS

The Water Quality Portal (WQP) is a part of a modernized repository storing ambient sampling data for all environmental media and tissue samples. A wide range of federal, state, tribal and local governments, academic and non-governmental organizations and individuals submit project details and sampling results to this public repository. The information is commonly used for research and assessments of environmental quality.

Date of Government Version: 09/23/2023
Date Data Arrived at EDR: 10/03/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS NPDES: Clean Water Act Discharge Monitoring Information

Any discharger of pollutants to waters of the United States from a point source must have a National Pollutant Discharge Elimination System (NPDES) permit. The process for obtaining limits involves the regulated entity (permittee) disclosing releases in a NPDES permit application and the permitting authority (typically the state but sometimes EPA) deciding whether to require monitoring or monitoring with limits. Caveats and Limitations: Less than half of states have required PFAS monitoring for at least one of their permittees and fewer states have established PFAS effluent limits for permittees. New rulemakings have been initiated that may increase the number of facilities monitoring for PFAS in the future.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 10/02/2023
Number of Days to Update: 89
Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS ECHO: Facilities in Industries that May Be Handling PFAS Listing

Regulators and the public have expressed interest in knowing which regulated entities may be using PFAS. EPA has developed a dataset from various sources that show which industries may be handling PFAS. Approximately 120,000 facilities subject to federal environmental programs have operated or currently operate in industry sectors with processes that may involve handling and/or release of PFAS.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 82
Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS ECHO FIRE TRAINING: Facilities in Industries that May Be Handling PFAS Listing

A list of fire training sites was added to the Industry Sectors dataset using a keyword search on the permitted facilitys name to identify sites where fire-fighting foam may have been used in training exercises. Additionally, you may view an example spreadsheet of the subset of fire training facility data, as well as the keywords used in selecting or deselecting a facility for the subset. as well as the keywords used in selecting or deselecting a facility for the subset. These keywords were tested to maximize accuracy in selecting facilities that may use fire-fighting foam in training exercises, however, due to the lack of a required reporting field in the data systems for designating fire training sites, this methodology may not identify all fire training sites or may potentially misidentify them.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 82
Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PFAS PART 139 AIRPORT: All Certified Part 139 Airports PFAS Information Listing

Since July 1, 2006, all certified part 139 airports are required to have fire-fighting foam onsite that meet military specifications (MIL-F-24385) (14 CFR 139.317). To date, these military specification fire-fighting foams are fluorinated and have been historically used for training and extinguishing. The 2018 FAA Reauthorization Act has a provision stating that no later than October 2021, FAA shall not require the use of fluorinated AFFF. This provision does not prohibit the use of fluorinated AFFF at Part 139 civilian airports; it only prohibits FAA from mandating its use. The Federal Aviation Administration?s document AC 150/5210-6D - Aircraft Fire Extinguishing Agents provides guidance on Aircraft Fire Extinguishing Agents, which includes Aqueous Film Forming Foam (AFFF).

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/05/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 82
Source: Environmental Protection Agency
Telephone: 202-272-0167
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

AQUEOUS FOAM NRC: Aqueous Foam Related Incidents Listing

The National Response Center (NRC) serves as an emergency call center that fields initial reports for pollution and railroad incidents and forwards that information to appropriate federal/state agencies for response. The spreadsheets posted to the NRC website contain initial incident data that has not been validated or investigated by a federal/state response agency. Response center calls from 1990 to the most recent complete calendar year where there was indication of Aqueous Film Forming Foam (AFFF) usage are included in this dataset. NRC calls may reference AFFF usage in the ?Material Involved? or ?Incident Description? fields.

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/06/2023
Date Made Active in Reports: 09/25/2023
Number of Days to Update: 81
Source: Environmental Protection Agency
Telephone: 202-267-2675
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

PCS: Permit Compliance System

PCS is a computerized management information system that contains data on National Pollutant Discharge Elimination System (NPDES) permit holding facilities. PCS tracks the permit, compliance, and enforcement status of NPDES facilities.

Date of Government Version: 07/14/2011
Date Data Arrived at EDR: 08/05/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 55

Source: EPA, Office of Water
Telephone: 202-564-2496
Last EDR Contact: 09/28/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: No Update Planned

PCS ENF: Enforcement data

No description is available for this data

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 02/05/2015
Date Made Active in Reports: 03/06/2015
Number of Days to Update: 29

Source: EPA
Telephone: 202-564-2497
Last EDR Contact: 09/28/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

BIOSOLIDS: ICIS-NPDES Biosolids Facility Data

The data reflects compliance information about facilities in the biosolids program.

Date of Government Version: 07/16/2023
Date Data Arrived at EDR: 07/18/2023
Date Made Active in Reports: 08/28/2023
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 202-564-4700
Last EDR Contact: 10/03/2023
Next Scheduled EDR Contact: 01/29/2024
Data Release Frequency: Varies

PFAS: PFAS Detections

PFAS detection list

Date of Government Version: 07/05/2023
Date Data Arrived at EDR: 07/13/2023
Date Made Active in Reports: 08/09/2023
Number of Days to Update: 27

Source: Department of Natural Resources
Telephone: 517-751-9857
Last EDR Contact: 09/27/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

AIRS: Permit Facility Listing

A listing of Air Pollution Control Program permits.

Date of Government Version: 03/22/2023
Date Data Arrived at EDR: 03/22/2023
Date Made Active in Reports: 06/06/2023
Number of Days to Update: 76

Source: Department of Natural Resources
Telephone: 573-751-4817
Last EDR Contact: 10/26/2023
Next Scheduled EDR Contact: 02/12/2024
Data Release Frequency: Varies

ASBESTOS: Asbestos Notification Listing

The department requires notification of demolitions and abatement projects involving regulated structures at least 10 working days before crews begin a project.

Date of Government Version: 06/29/2023
Date Data Arrived at EDR: 06/30/2023
Date Made Active in Reports: 09/19/2023
Number of Days to Update: 81

Source: Department of Natural Resources
Telephone: 573-751-4817
Last EDR Contact: 10/05/2023
Next Scheduled EDR Contact: 01/15/2024
Data Release Frequency: Varies

COAL ASH: Coal Ash Disposal Sites

A listing of power plants with coal ash ponds.

Date of Government Version: 01/03/2018
Date Data Arrived at EDR: 02/01/2018
Date Made Active in Reports: 03/22/2018
Number of Days to Update: 49

Source: Department of Natural Resources
Telephone: 573-526-1825
Last EDR Contact: 09/21/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: No Update Planned

DRYCLEANERS: Drycleaners in Missouri Listing

A listing of drycleaner facilities that are potentially eligible for reimbursement of department approved cleanup costs under the Drycleaning Environmental Response Trust Fund.

Date of Government Version: 11/30/2017
Date Data Arrived at EDR: 12/13/2017
Date Made Active in Reports: 01/18/2018
Number of Days to Update: 36

Source: Department of Natural Resources
Telephone: 573-526-8913
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Quarterly

Financial Assurance 1: Financial Assurance Information Listing

Financial Assurance information.

Date of Government Version: 06/09/2023
Date Data Arrived at EDR: 06/29/2023
Date Made Active in Reports: 09/22/2023
Number of Days to Update: 85

Source: Department of Natural Resources
Telephone: 573-751-3553
Last EDR Contact: 11/21/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Annually

Financial Assurance 2: Financial Assurance Information Listing

Financial assurance information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay

Date of Government Version: 12/19/2022
Date Data Arrived at EDR: 02/28/2023
Date Made Active in Reports: 05/17/2023
Number of Days to Update: 78

Source: Department of Natural Resources
Telephone: 573-751-5401
Last EDR Contact: 11/30/2023
Next Scheduled EDR Contact: 03/11/2024
Data Release Frequency: Quarterly

MINES: Industrial Mineral Mines Database

This data set contains names, locations and additional data for active Industrial Mineral Mines permitted with the Missouri Department of Natural Resources, Division of Environmental Quality, Land Reclamation Program. Industrial Mineral Mines permitted are rock quarries, clay pits, sand and gravel pits, or in-stream sand and gravel operations.

Date of Government Version: 04/30/2021
Date Data Arrived at EDR: 07/14/2021
Date Made Active in Reports: 10/07/2021
Number of Days to Update: 85

Source: Department of Natural Resources
Telephone: 573-751-4041
Last EDR Contact: 10/11/2023
Next Scheduled EDR Contact: 01/22/2024
Data Release Frequency: Varies

NPDES: Permitted Facility Listing

A listing of permitted facilities from the Water Pollution Branch.

Date of Government Version: 06/26/2023
Date Data Arrived at EDR: 07/19/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 83

Source: Department of Natural Resources
Telephone: 573-751-7023
Last EDR Contact: 09/21/2023
Next Scheduled EDR Contact: 01/08/2024
Data Release Frequency: Quarterly

RRC: Certified Hazardous Waste Resource Recovery Facilities

Facilities that take hazardous waste material, either from on-site or off-site, and make it re-usable.

Date of Government Version: 09/30/2020
Date Data Arrived at EDR: 10/06/2020
Date Made Active in Reports: 12/28/2020
Number of Days to Update: 83

Source: Department of Natural Resources
Telephone: 573-751-3176
Last EDR Contact: 11/28/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Annually

SMARS: Site Management and Reporting System

SMARS currently houses information for Superfund, Federal Facility, Brownfields Voluntary Cleanup Program and Missouri's other state response programs.

Date of Government Version: 07/03/2023
Date Data Arrived at EDR: 07/25/2023
Date Made Active in Reports: 10/10/2023
Number of Days to Update: 77

Source: Department of Natural Resources
Telephone: 573-751-3043
Last EDR Contact: 10/25/2023
Next Scheduled EDR Contact: 02/05/2024
Data Release Frequency: Quarterly

UIC: Underground Injection Wells Database

A listing of underground injection well locations. The UIC Program is responsible for regulating the construction, operation, permitting, and closure of injection wells that place fluids underground for storage or disposal.

Date of Government Version: 09/01/2022
Date Data Arrived at EDR: 02/14/2023
Date Made Active in Reports: 04/28/2023
Number of Days to Update: 73

Source: Department of Natural Resources
Telephone: 573-368-2183
Last EDR Contact: 11/16/2023
Next Scheduled EDR Contact: 02/26/2024
Data Release Frequency: Semi-Annually

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historical Auto Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historical Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List

The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Natural Resources in Missouri.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Natural Resources in Missouri.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/15/2014
Number of Days to Update: 198

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Natural Resources in Missouri.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 08/07/2023
Date Data Arrived at EDR: 08/08/2023
Date Made Active in Reports: 10/24/2023
Number of Days to Update: 77

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/07/2023
Next Scheduled EDR Contact: 02/19/2024
Data Release Frequency: No Update Planned

NY MANIFEST: Facility and Manifest Data

Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 12/31/2019
Date Data Arrived at EDR: 11/30/2023
Date Made Active in Reports: 12/01/2023
Number of Days to Update: 1

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 11/30/2023
Next Scheduled EDR Contact: 02/05/2024
Data Release Frequency: Quarterly

PA MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 06/30/2018
Date Data Arrived at EDR: 07/19/2019
Date Made Active in Reports: 09/10/2019
Number of Days to Update: 53

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 10/05/2023
Next Scheduled EDR Contact: 01/22/2024
Data Release Frequency: Annually

RI MANIFEST: Manifest information

Hazardous waste manifest information

Date of Government Version: 12/31/2020
Date Data Arrived at EDR: 11/30/2021
Date Made Active in Reports: 02/18/2022
Number of Days to Update: 80

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 11/09/2022
Next Scheduled EDR Contact: 02/26/2024
Data Release Frequency: Annually

WI MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 05/31/2018
Date Data Arrived at EDR: 06/19/2019
Date Made Active in Reports: 09/03/2019
Number of Days to Update: 76

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 11/29/2023
Next Scheduled EDR Contact: 03/18/2024
Data Release Frequency: Annually

Oil/Gas Pipelines

Source: Endeavor Business Media

Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by Endeavor Business Media. This information is provided on a best effort basis and Endeavor Business Media does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of Endeavor Business Media.

Electric Power Transmission Line Data

Source: Endeavor Business Media

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Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Child Care Facilities
Source: Department of Health & Senior Services
Telephone: 573-751-2450

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005, 2010 and 2015 from the U.S. Fish and Wildlife Service.

State Wetlands Data: National Wetland Inventory of Missouri
Source: Department of Natural Resources
Telephone: 573-751-5110

STREET AND ADDRESS INFORMATION

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Hausgen Island

Hausgen Island

Foley, MO 63347

Inquiry Number: 7517395.8

December 13, 2023

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Date EDR Searched Historical Sources:

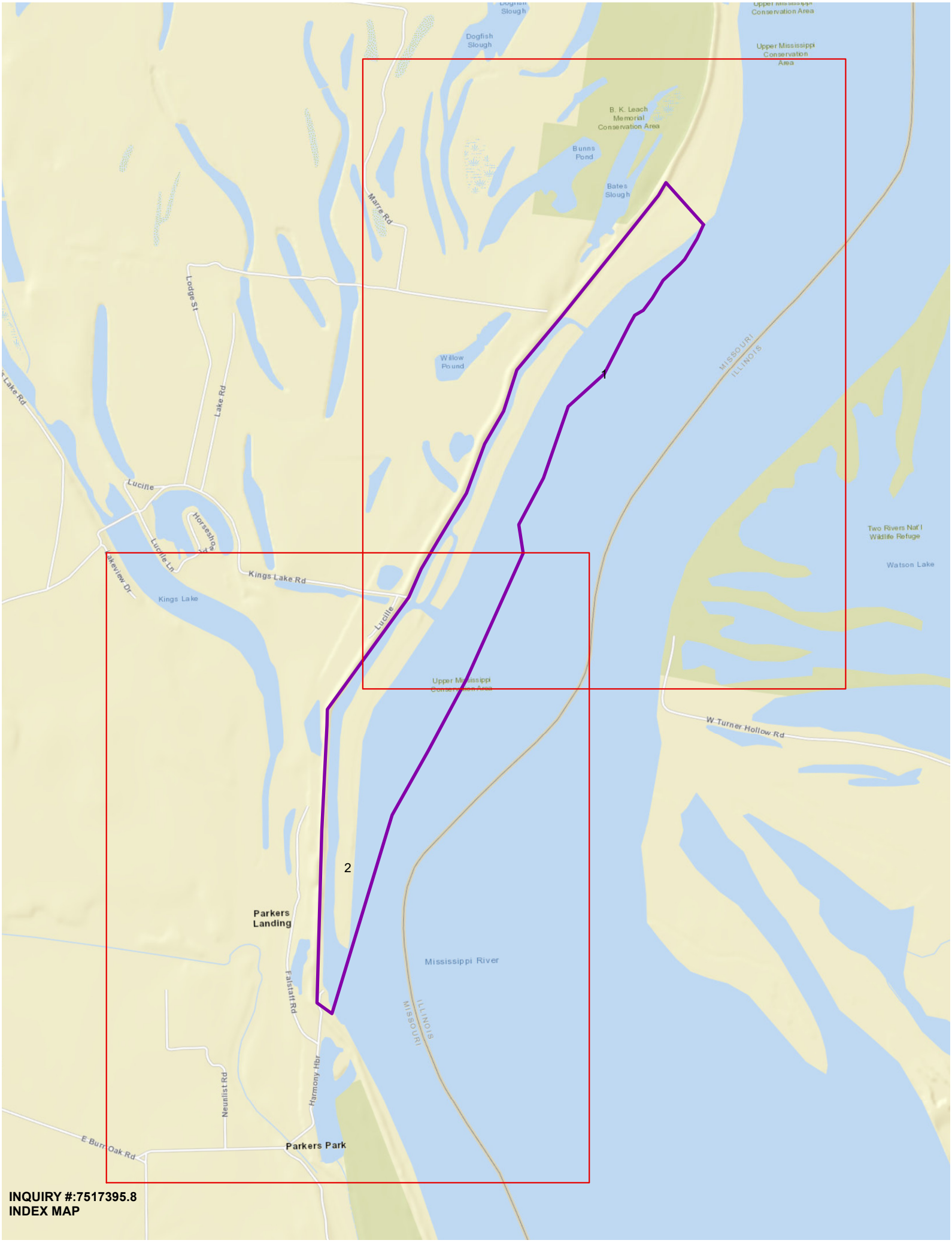
Aerial Photography December 13, 2023

Target Property:

Hausgen Island

Foley, MO 63347

Year	***Scale***	***Details***	***Source***
1956	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1956	USGS
1974	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1974	USGS
1979	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1979	USGS
1980	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1980	USGS
1985	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1985	USDA
1996	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1996	USGS/DOQQ
1999	Aerial Photograph. Scale: 1"=1000'	Flight Year: 1999	USGS/DOQQ
2005	Aerial Photograph. Scale: 1"=1000'	Flight Year: 2005	USGS/DOQQ
2007	Aerial Photograph. Scale: 1"=1000'	Flight Year: 2007	USDA/NAIP
2011	Aerial Photograph. Scale: 1"=1000'	Flight Year: 2011	USDA/NAIP
2016	Aerial Photograph. Scale: 1"=1000'	Flight Year: 2016	USDA/NAIP
2020	Aerial Photograph. Scale: 1"=1000'	Flight Year: 2020	USDA/NAIP



INQUIRY #:7517395.8
INDEX MAP



INQUIRY #: 7517395.8
YEAR: 1956
SCALE: 1"=1000'



INQUIRY #: 7517395.8
YEAR: 1956
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 1974
SCALE: 1"=1000'


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YEAR: 1974
SCALE: 1"=1000'


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YEAR: 1979
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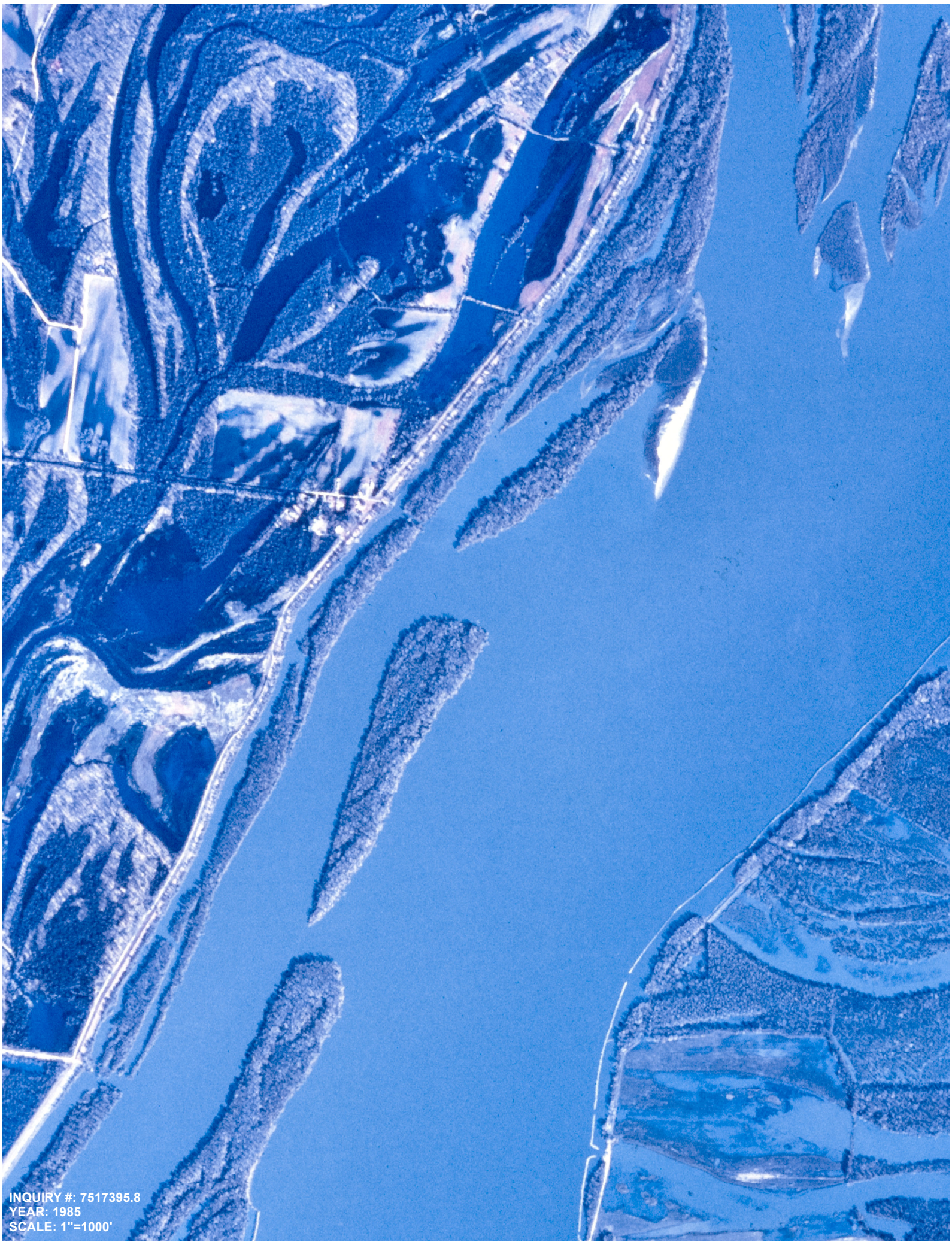

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YEAR: 1979
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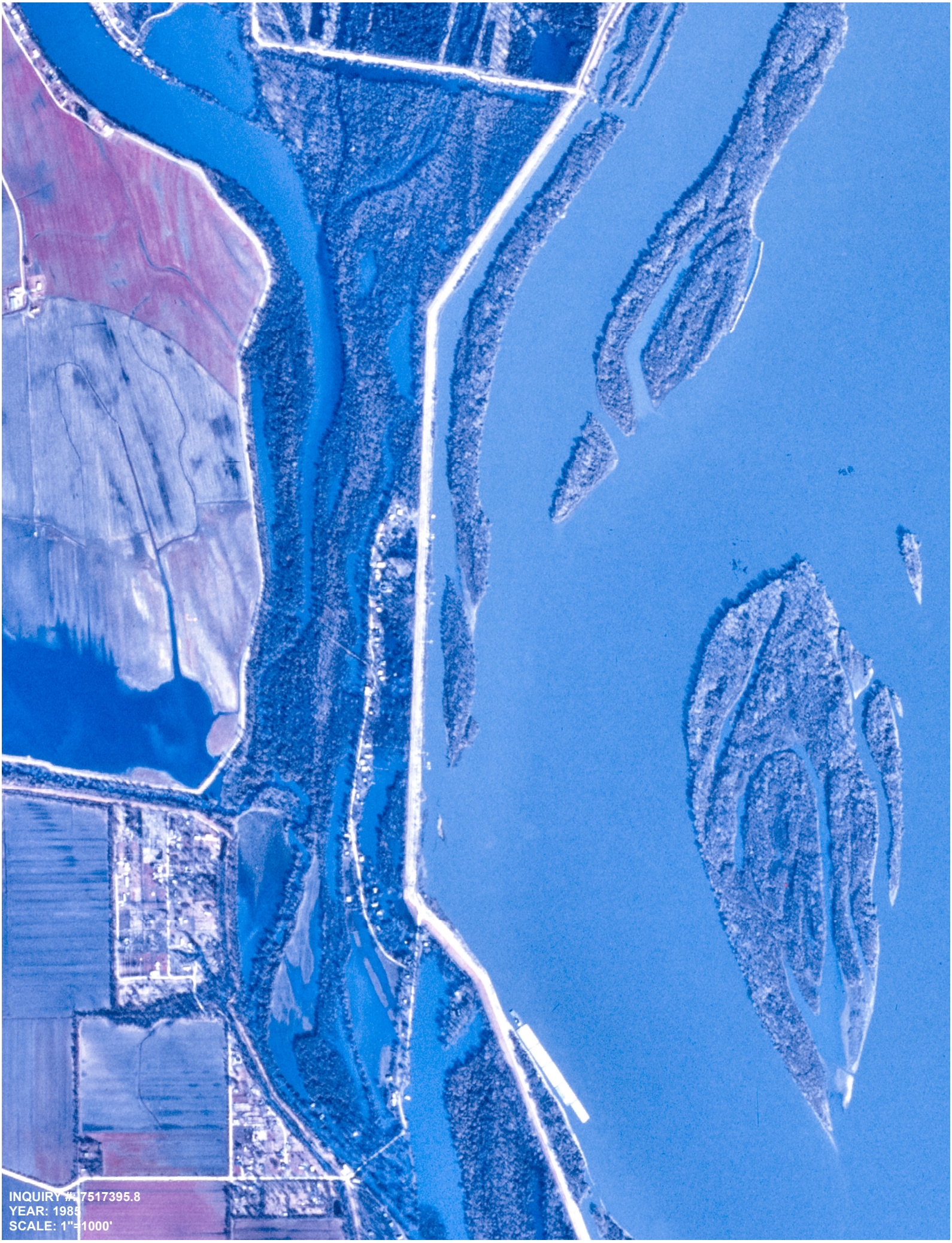
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YEAR: 1980
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INQUIRY #: 7517395.8
YEAR: 1980
SCALE: 1"=1000'



INQUIRY #: 7517395.8
YEAR: 1985
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 1985
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 1996
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 1996
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 1999
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 1999
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2005
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2005
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2007
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2007
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2011
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2011
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2014
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2014
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2016
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2016
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2020
SCALE: 1"=1000'


INQUIRY #: 7517395.8
YEAR: 2020
SCALE: 1"=1000'

Hausgen Island

Hausgen Island

Foley, MO 63347

Inquiry Number: 7517395.5

December 11, 2023

EDR Historical Topo Map Report

with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

12/11/23

Site Name:	Client Name:
Hausgen Island	U.S. Army Corps of Engineers
Hausgen Island	U.S. Army Corps of Engineers
Foley, MO 63347	Saint Louis, MO 63103
EDR Inquiry # 7517395.5	Contact: Kaleb Rakers

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Search Results:

P.O.# NA

Project: NA

Coordinates:

Latitude:	39.0667 39° 4' 0" North
Longitude:	-90.712004 -90° 42' 43" West
UTM Zone:	Zone 15 North
UTM X Meters:	697946.38
UTM Y Meters:	4326669.97
Elevation:	434.00' above sea level

Maps Provided:

2021
2017
2015
1996
1975
1938
1934
1930

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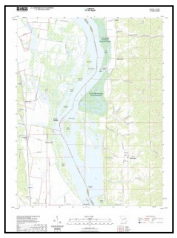
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Topo Sheet Key

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2021 Source Sheets



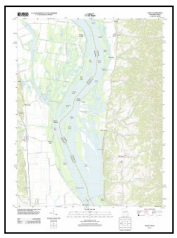
Foley
2021
7.5-minute, 24000

2017 Source Sheets



Foley
2017
7.5-minute, 24000

2015 Source Sheets



Foley
2015
7.5-minute, 24000

1996 Source Sheets



Foley
1996
7.5-minute, 24000
Aerial Photo Revised 1993

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1975 Source Sheets



Foley
1975
7.5-minute, 24000
Aerial Photo Revised 1974

1938 Source Sheets



Hardin
1938
15-minute, 62500

1934 Source Sheets



Hardin
1934
15-minute, 62500

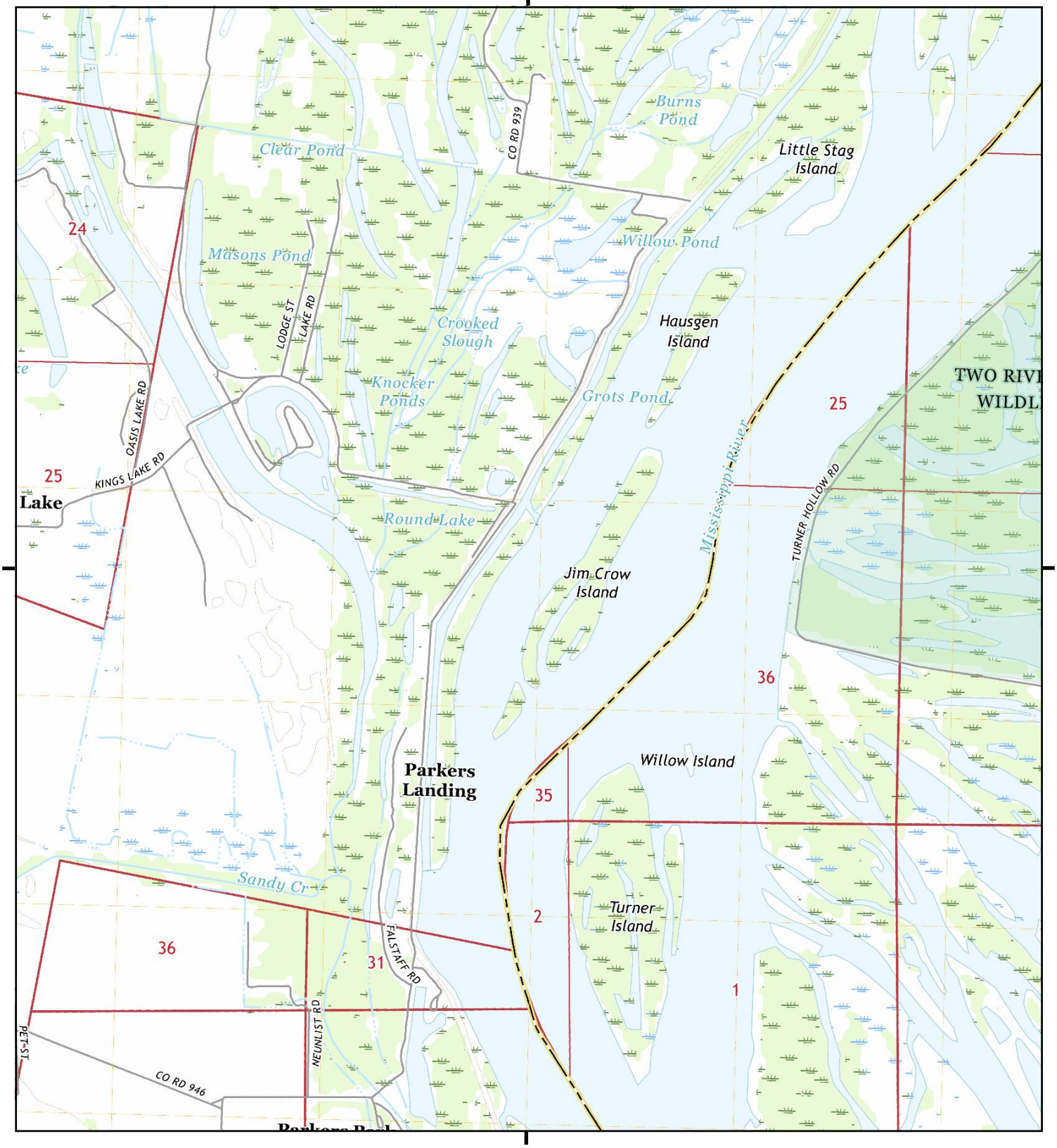
1930 Source Sheets



Hardin
1930
15-minute, 62500

Historical Topo Map

2021



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

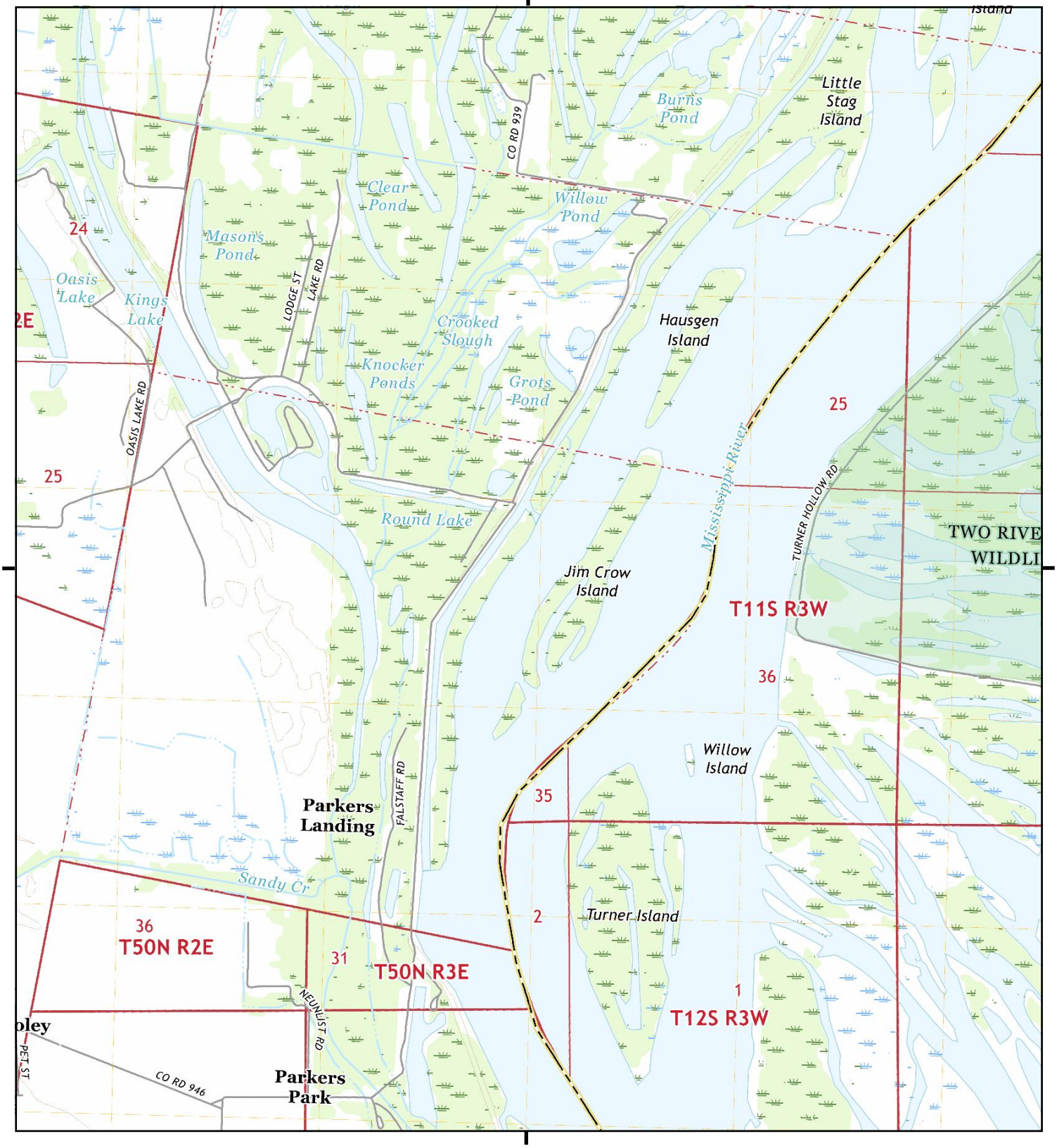
TP, Foley, 2021, 7.5-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N

Historical Topo Map

2017



This report includes information from the following map sheet(s).

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W E
SW S SE

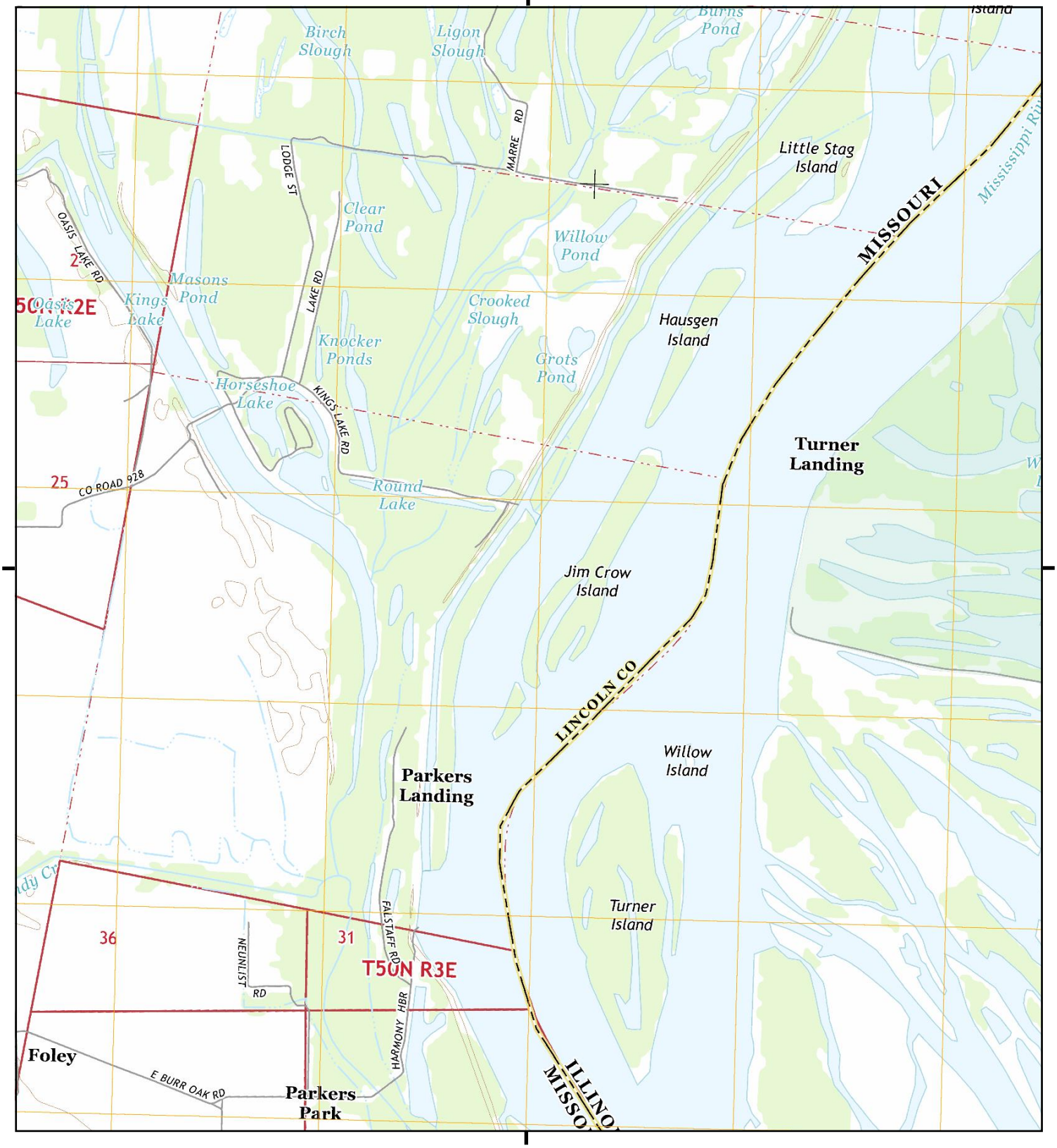
TP, Foley, 2017, 7.5-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N

Historical Topo Map

2015



This report includes information from the following map sheet(s).

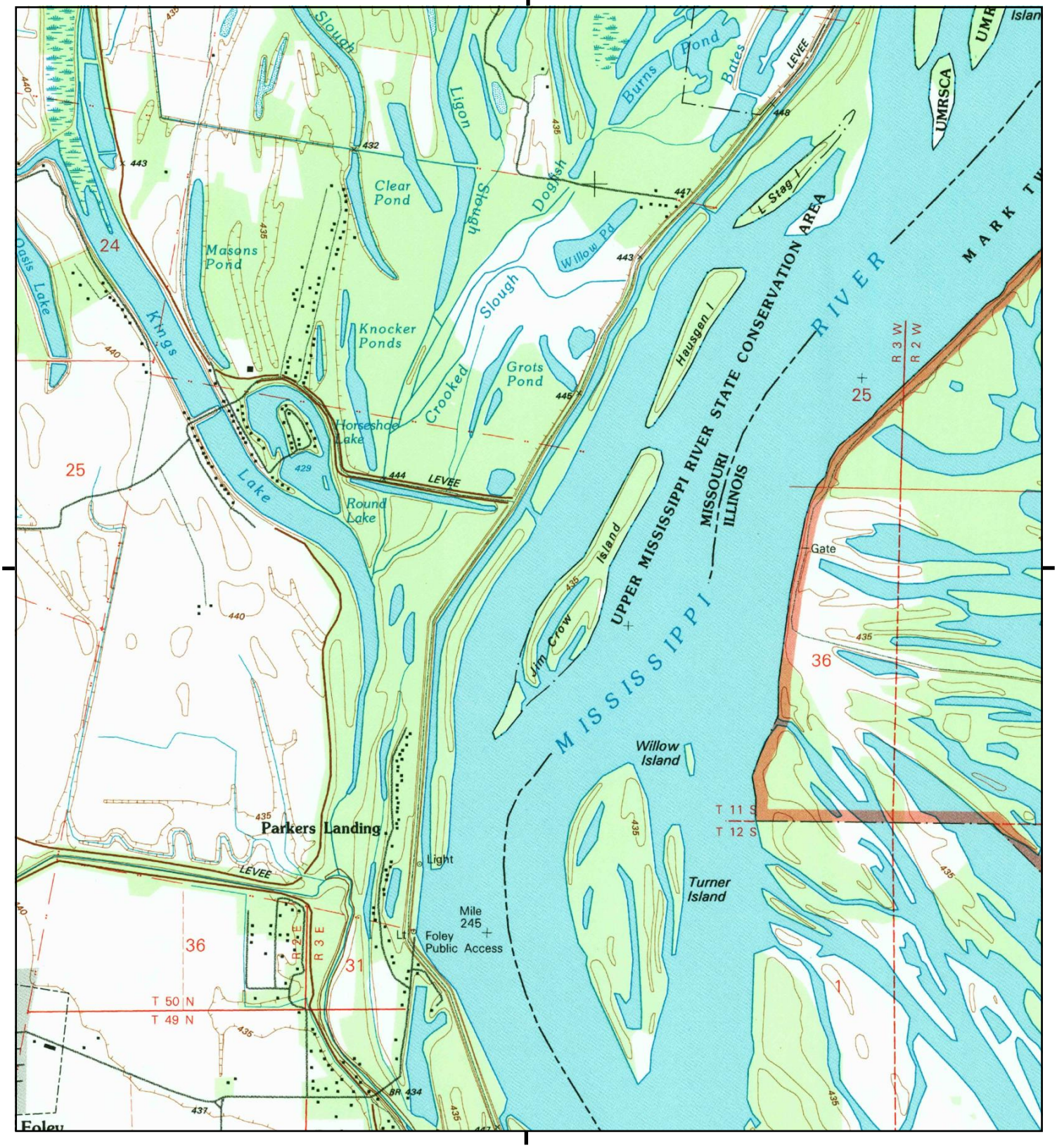
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Foley, 2015, 7.5-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N



This report includes information from the following map sheet(s).

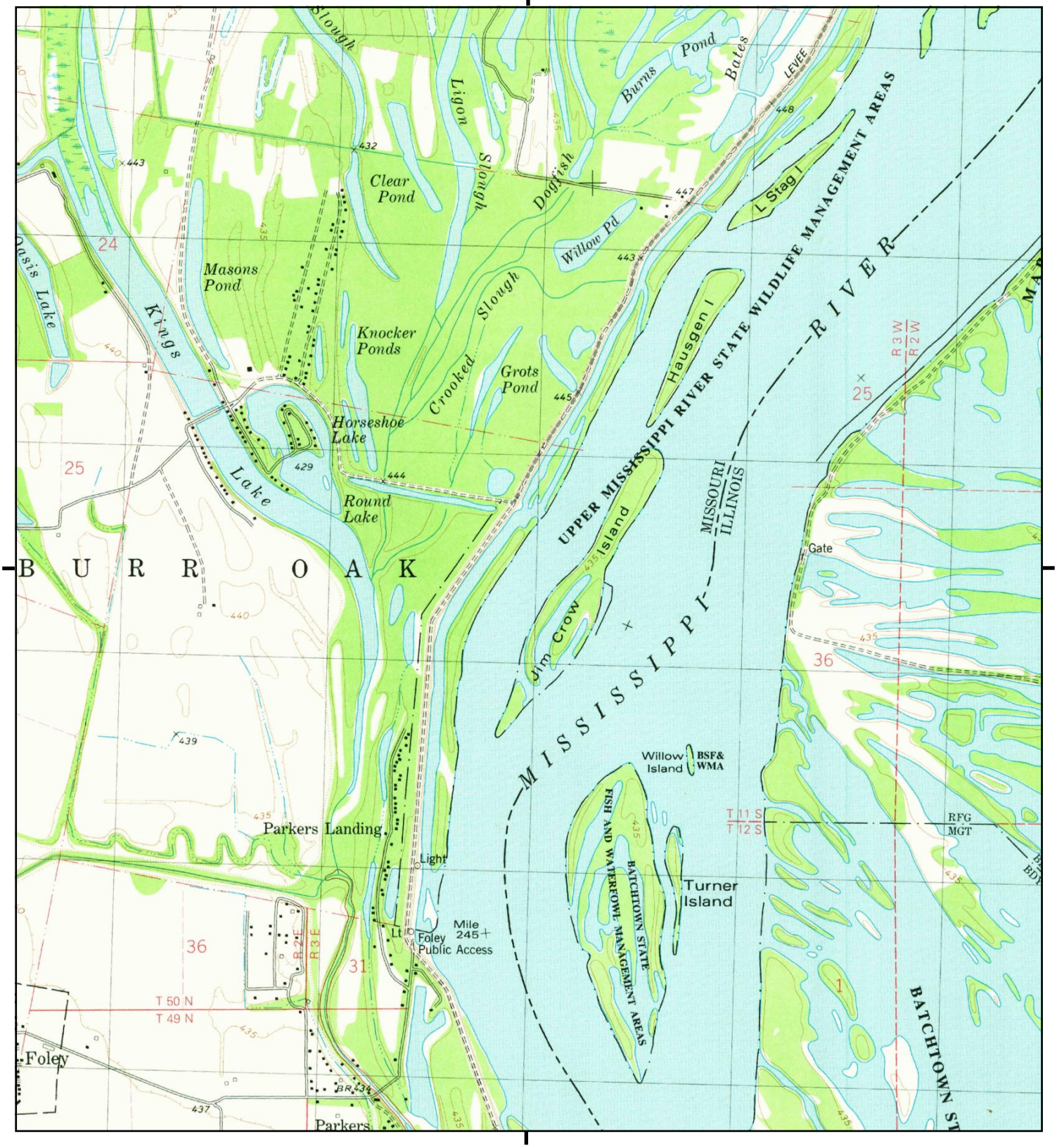
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Foley, 1996, 7.5-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N



This report includes information from the following map sheet(s).

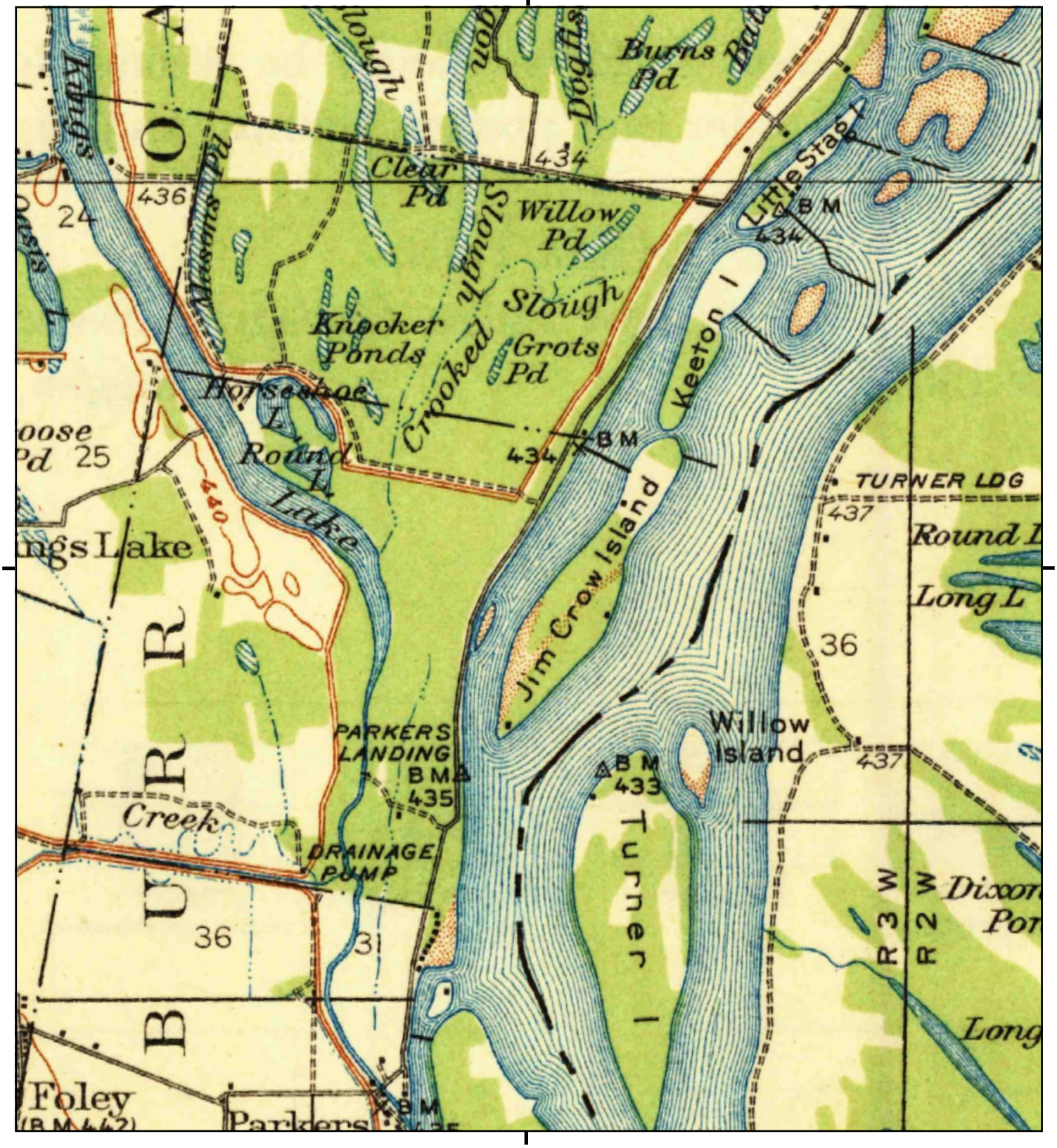
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Foley, 1975, 7.5-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N



This report includes information from the following map sheet(s).

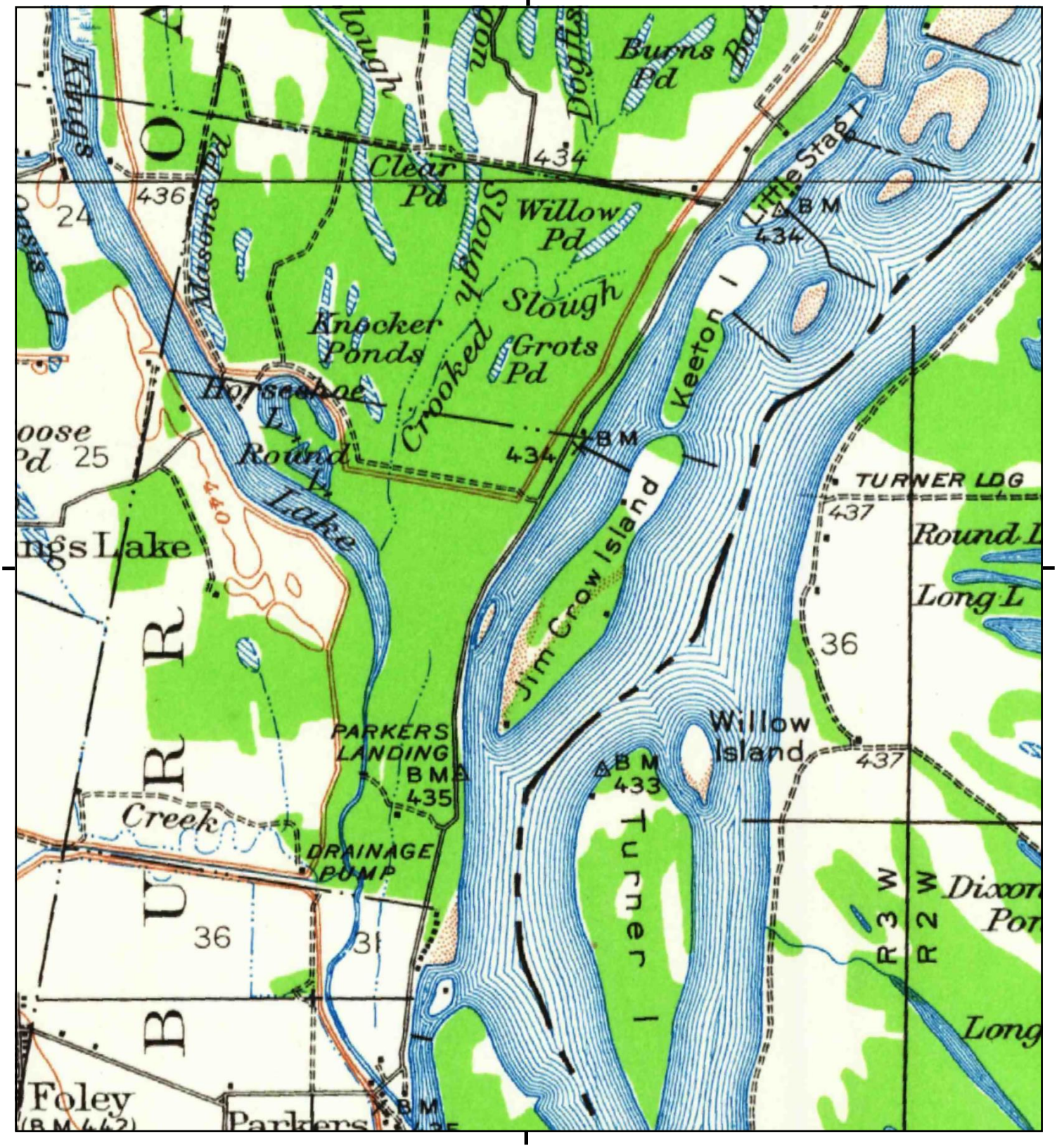
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Hardin, 1938, 15-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N



This report includes information from the following map sheet(s).

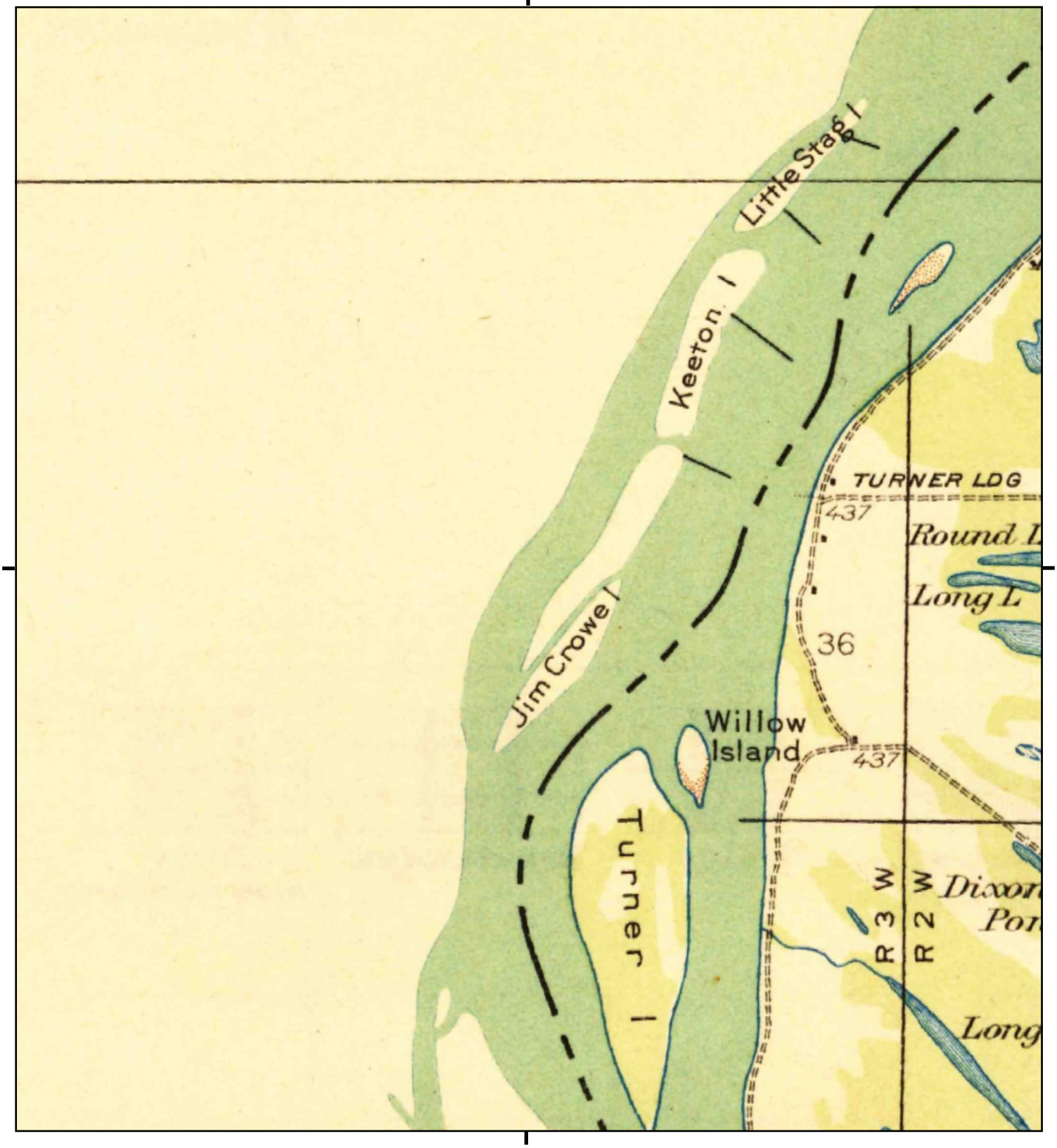
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Hardin, 1934, 15-minute

SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N



This report includes information from the following map sheet(s).

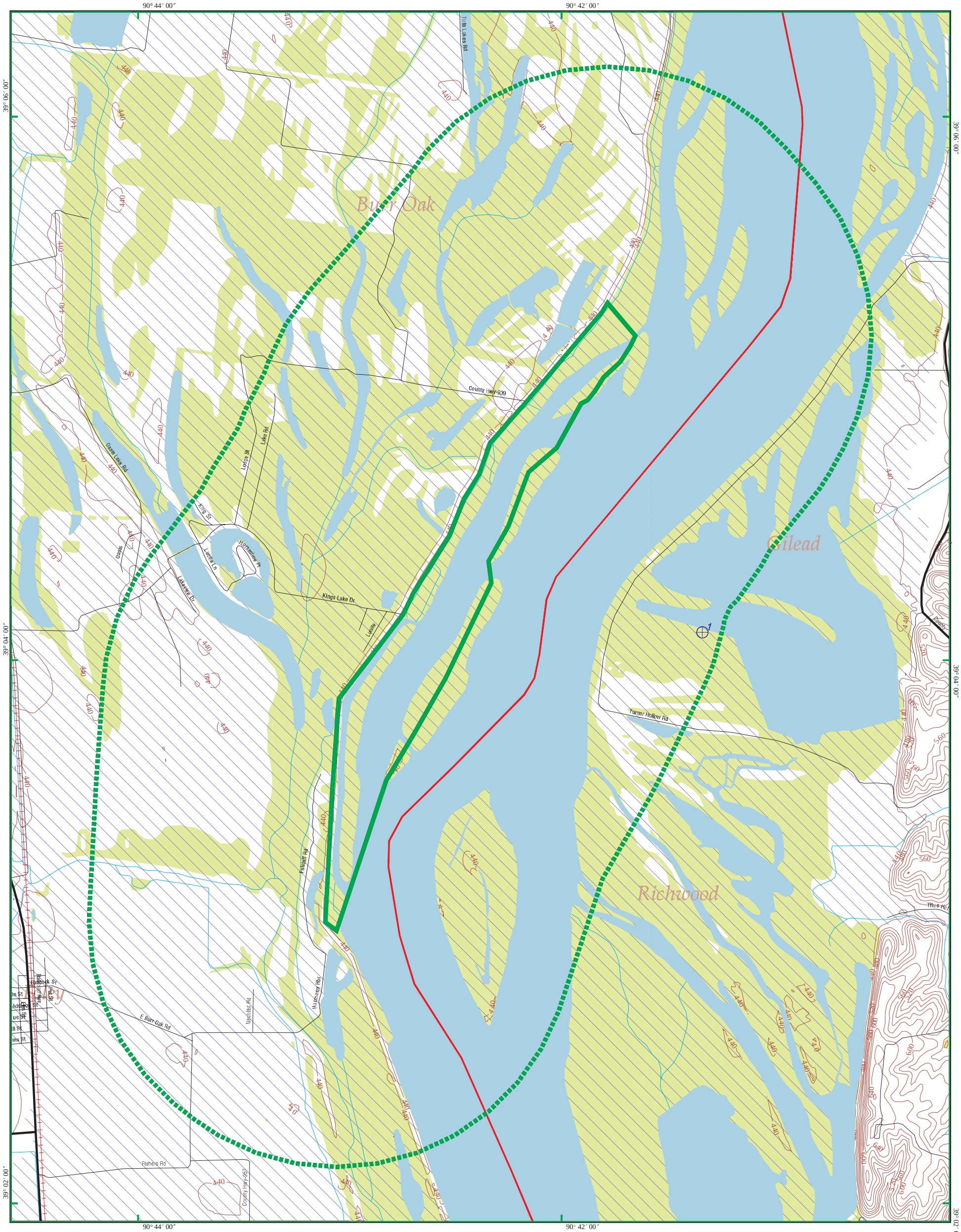
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NW N NE
W E
SW S SE

TP, Hardin, 1930, 15-minute

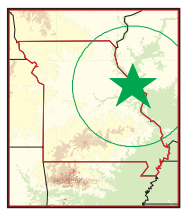
SITE NAME: Hausgen Island
ADDRESS: Hausgen Island
Foley, MO 63347
CLIENT: U.S. Army Corps of Engineers

N



EDR DataMap® - Well Search

Hausgen Island



Foley, MO

- Listed Water Wells
- Study Boundary
- Roads
- Major Roads
- Waterways
- Railroads
- Contour Lines
- Fault Lines
- Water
- Superfund Sites
- 100-Yr Flood Zones
- Wetlands

N

0 1/4 1/2

Scale in Miles

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7517395.9w - 11 Dec 23

Hausgen Island
Foley, MO 63347

Inquiry Number: 7517395.9w
December 11, 2023

EDR DataMap™ Well Search Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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Please contact EDR at 1-800-352-0050
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GEOCHECK VERSION 2.1
SUMMARY

FEDERAL DATABASE WELL INFORMATION

MAP ID	WELL ID

NO WELLS FOUND

STATE WATER WELL INFORMATION

MAP ID	WELL ID
1	ILSG40000013622

PUBLIC WATER SUPPLY SYSTEM INFORMATION

NO WELLS FOUND

USGS TOPOGRAPHIC MAP(S)

39090-A6 FOLEY, MO IL

AREA RADON INFORMATION

Federal EPA Radon Zone for CALHOUN County: 1

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for CALHOUN COUNTY, IL

Number of sites tested: 2

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	1.200 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	2.600 pCi/L	50%	50%	0%

Federal EPA Radon Zone for LINCOLN County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for LINCOLN COUNTY, MO

Number of sites tested: 5

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	1.360 pCi/L	80%	20%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	1.200 pCi/L	100%	0%	0%

GEOCHECK VERSION 2.1
STATE DATABASE WELL INFORMATION

State Well Information:

Map ID: 1

WELLS SGS:

Database:	Water Well Records	API #:	120132031100
IL SWSP #:	221888	Status:	Water Well
Date Drilled:	19901019050000	Farm Name:	Not Reported
Well Name:	Not Reported	Driller:	Sisk, Gary Drill Co.
Elevation:	0	Elevation Reference:	Not Reported
Total Depth:	62	Lithologic Formation:	sand
Top of Formation (ft):	42	Bottom of Formation (ft):	62
Pump Flow (gpm):	0		
URL:	https://isgs-oas.isgs.illinois.edu/reports/rwservlet?watersummary&120132031100		

MISSOURI GOVERNMENT WELL RECORDS SEARCHED

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

State Wetlands Data: National Wetland Inventory of Missouri
Source: Department of Natural Resources
Telephone: 573-751-5110

Missouri Public Drinking Water Wells
Source: Department of Natural Resources
Telephone: 573-526-5448

Missouri Geologic Well Log Database
Source: Department of Natural Resources
Telephone: 573-526-5448

Oil and Gas Well Database
Source: Department of Natural Resources
Telephone: 573-368-2143

STREET AND ADDRESS INFORMATION

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Hausgen Island

Hausgen Island

Foley, MO 63347

Inquiry Number: 7517395.6

December 12, 2023

Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

12/12/23

Site Name:	Client Name:
Hausgen Island	U.S. Army Corps of Engineers
Hausgen Island	U.S. Army Corps of Engineers
Foley, MO 63347	Saint Louis, MO 63103
EDR Inquiry # 7517395.6	Contact: Kaleb Rakers

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Certified Sanborn Results:

Certification # DF73-4C1C-B536

PO # NA

Project NA

UNMAPPED PROPERTY

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Sanborn® Library search results

Certification #: DF73-4C1C-B536

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- ☑ Library of Congress
- ☑ University Publications of America
- ☑ EDR Private Collection

The Sanborn Library LLC Since 1866™

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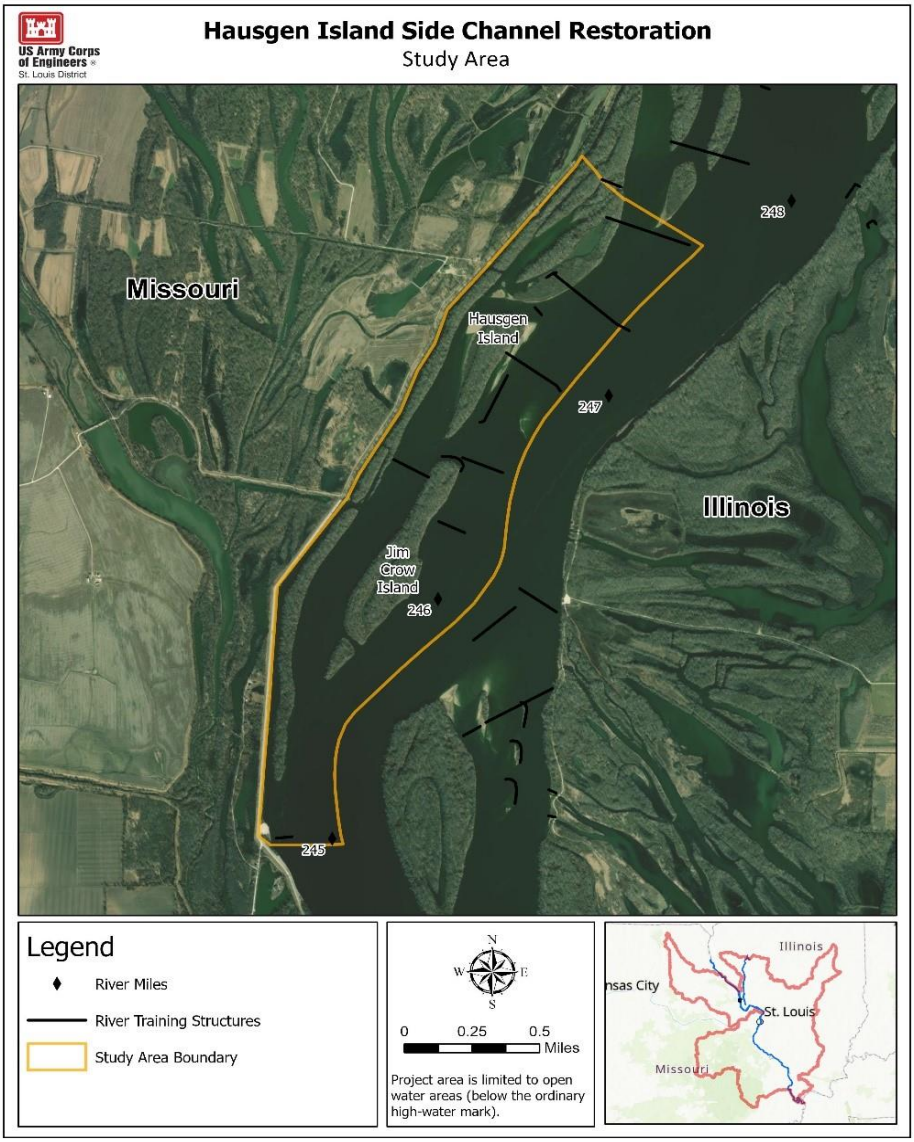
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NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

POOL 25 ISLAND - HAUSGEN ISLAND

POOL 25, Mississippi River, Miles 248 – 245
Lincoln County, Missouri



Appendix I: Real Estate

Navigation Ecosystem Sustainability Program
US Army Corps of Engineers - St. Louis District

US Army Corps of Engineers ®
St. Louis District

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1. Purpose

This Real Estate Plan (REP) has been prepared to present the real estate requirements required to support the Project Implementation Report (PIR) environmental assessment (EA). Project purpose is to restore and maintain sustainability of side channel habitat within the Upper Mississippi River (UMR), Pool 25, in the vicinity of Hausgen Island complex (RM 248-245). The proposed project would restore the functionality of the project area through construction of measures that would support quality side channel habitat for desirable native plant and animal species and emulate more natural river processes, structures, and functions for a resilient and sustainable ecosystem. By restoring the side channels will promote freshwater mussel habitat, specifically in the Lower Impounded Reach of the Mississippi River.

1.1 Project Area

The Project is located on the right descending bank of the Mississippi River, near Foley, Missouri, in Lincoln County, Missouri. The proposed project lies in the lower portion of Pool 25 between River Miles (RM) 248 and 245. Project features will be located 100% below the Ordinary High-Water Mark (OHWM); therefore, the construction of this project would be 100% federal and does not require a Sponsor. The approximate 250-acre area consists of side channels and connected backwaters in the vicinity of Hausgen and Jim Crow Islands.

The Lead sponsor for this project is the USACE, serving as lead federal agency in collaboration with the River Resources Action Team (RRAT).

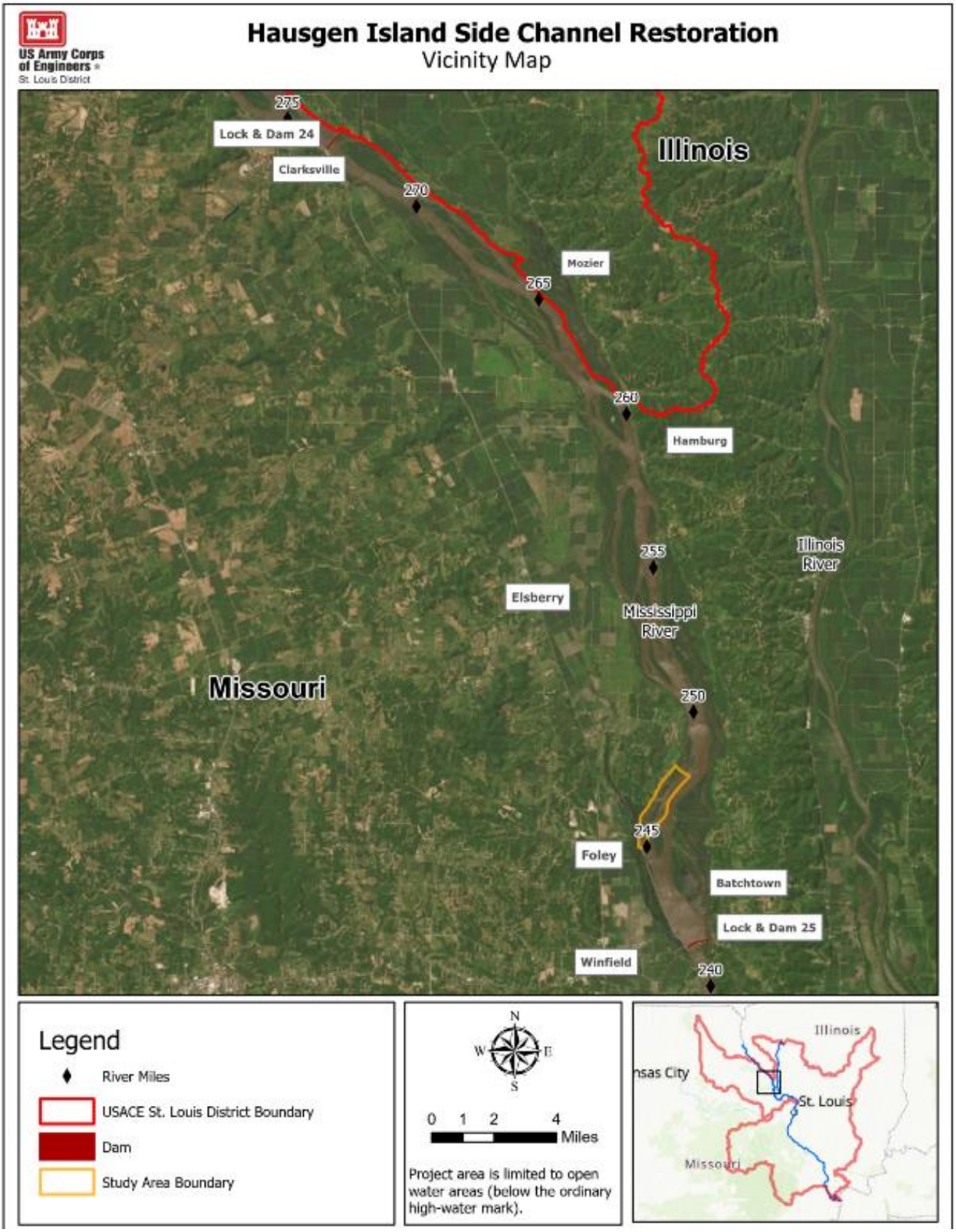


Figure 1: Project Vicinity Map

1.2 Authority

NESP is a dual-purpose navigation and ecosystem restoration program for the Upper Mississippi River (UMR) and Illinois Waterway (IWW) System authorized by Title VIII (Sections 8001-8005) of the Water Resources Development Act (WRDA) of 2007 (Public Law (PL) 110-114, 33 USC 652 statutory note), substantially in accordance with the Report of the Chief of Engineers dated 15 December 2004 (Chief's Report). NESP is a regional program that includes geographic areas within the boundaries of the USACE St. Paul, Rock Island, and St. Louis Districts. The navigation portion of the NESP includes both small- and large-scale navigation improvements and mitigation. The ecosystem restoration portion of the NESP includes large projects at specific locations and a programmatic authorization for projects with a total single project cost not to exceed $25 million. Under the ecosystem restoration portion of NESP, a project will be implemented at 100 percent Federal expense if it (i) is located below the ordinary high-water mark (OHWM) or in a connected backwater; (ii) modifies the operation of structures for navigation; or (iii) is located on federally owned land. All other ecosystem restoration projects under the NESP are implemented with cost sharing of 65 percent Federal, 35 percent non-federal. (PL 110-114, Section 8004(b)(3)).

2. Lands, Easements and Rights-of-way (LER)

The TSP for the Hausgen Island Complex side channel restoration NESP Project (Alternative 2 – Maximum - mussel enhancement, flow / depth diversity, connectivity) is shown in Figure ES-1. It consists of multiple measures to improve the side channel ecosystem structure and function by implementation of the following:

- Partial degradation / notching of river training structures
- Creation of hard points within side channel
- Rock – gravel substrate enhancement for mussel habitat
- Bank stabilization utilizing gradual slope revetment (GSR) for mussel habitat

The TSP was identified as the National Ecosystem Restoration (NER) Plan. For ecosystem restoration projects, the plan that maximizes ecosystem benefits compared to costs is selected as the NER Plan. The TSP is a best buy alternative that yields 92 net average annual habitat units (AAHUs) at an average annual cost of $1,786 per AAHU (FY2025 price level; FY2025 federal discount rate of 3.0%). The TSP best meets the identified planning objectives and has support from partners and consulting agencies. Implementation of the Plan would increase the quality and quantity of ecosystem resources and meet the needs of a large variety of native aquatic and terrestrial species. Maintaining side channel depth diversity would improve aquatic habitat for native fishes such as the state listed Lake Sturgeon. Maintaining the current shoreline biota would continue to provide habitat for the state listed American Bittern. Improved mussel habitat would enhance vital habitat for mussel species, including the state listed Ebonyshell within the proposed project area and the upper Mississippi River. The improved habitat is anticipated to provide enhanced opportunities for the recruitment of federally protected mussel species as well. The project outputs are also consistent with the goals and objectives of the NESP.

All proposed project measures would be located below the ordinary high-water mark (OHWM); therefore, project first cost funding for restoration measures would be 100 percent federal; and responsibility for the operation, maintenance, rehabilitation, replacement, and repair (OMRR&R) of the project would also be the responsibility of the USACE.

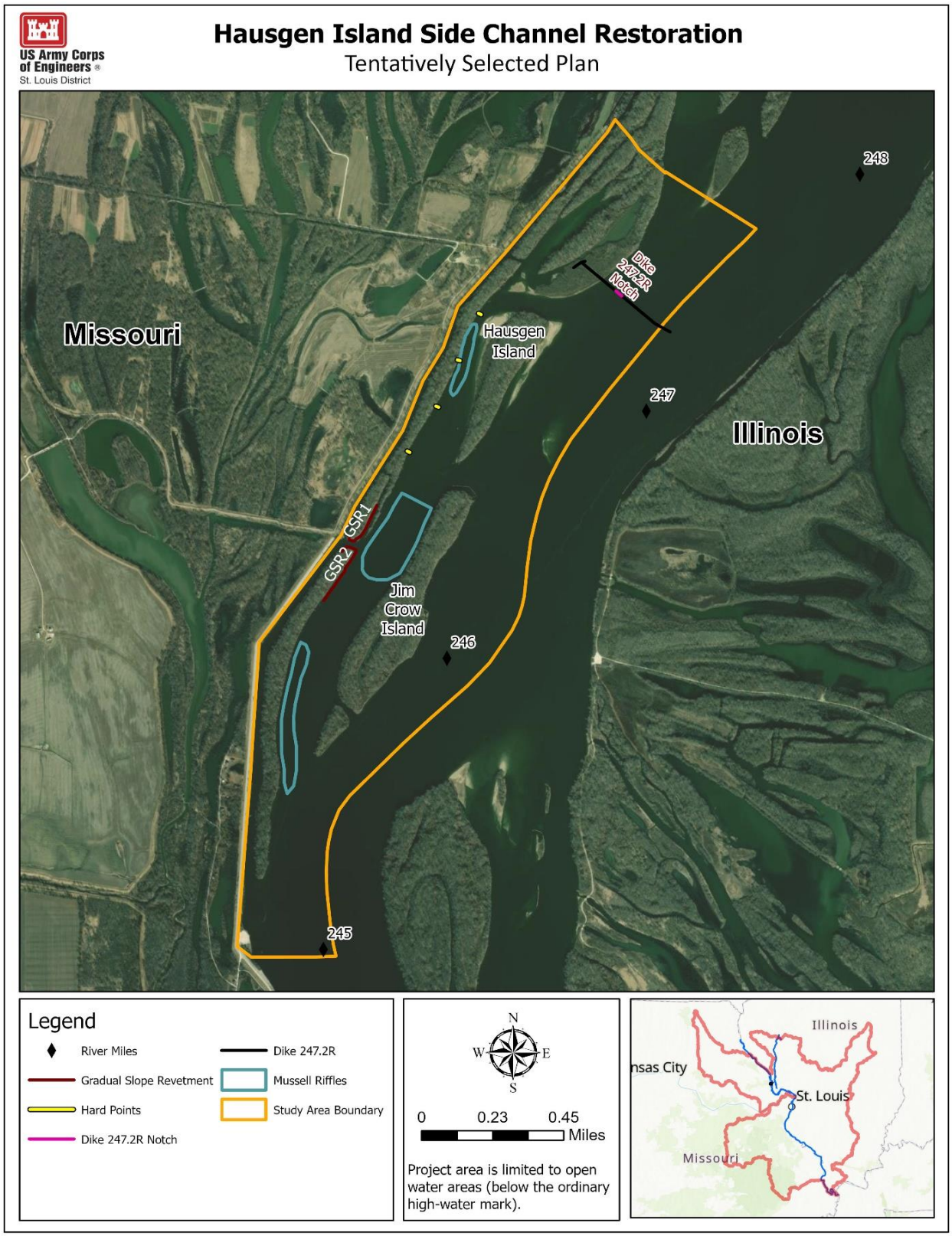


Figure 2: Tentatively Selected Plan

PROPERTY ID CODE	USACE TRACT NO.	RPUID	ORG_CODE	ESTATE
CAC25-LP-5688	L-10	840560	MVS	FEE SIMPLE
CAC25-LP-5707	L-11	840561	MVS	FEE SIMPLE
CAC25-LP-5708	L-12	840562	MVS	FEE SIMPLE
CAC25-LP-5709	L-13	840563	MVS	FEE SIMPLE
CAC25-LP-5710	L-14	840564	MVS	FEE SIMPLE
CAC25-LP-5711	L-15	840565	MVS	FEE SIMPLE
CAC25-LP-5683	L-6	824133	MVS	FEE SIMPLE
CAC25-LP-5684	L-7	824134	MVS	FEE SIMPLE
CAC25-LP-5686	L-8	824135	MVS	FEE SIMPLE
CAC25-LP-5687	L-9	824136	MVS	FEE SIMPLE

Table 1: Tracts managed by the US Army Corps of Engineers

3. Sponsor-Owned LER

The Federal Sponsor for this project is the USACE Saint Louis District on lands owned by the United States of America.

4. Non-Standard Estates

No non-standard estates are required for implementation of this Project.

5. Existing Federal Projects

Navigation and Ecosystem Sustainability Program (NESP) Upper Mississippi River Lock 25 New 1200-ft Lock Chamber is located at Lock and Dam 25, in Calhoun County, Illinois and Lincoln County, Missouri at river mile (RM) 241.1 on the Upper Mississippi River near Winfield, Missouri. The project is on Federally owned lands and is authorized by the Water Resources Development Act of 2007, Title VIII Upper Mississippi River and Illinois Waterway System.

6. Federally Owned Lands

The Project features proposed are located on lands owned by the Unites States of America and managed by the U.S. Fish and Wildlife Service.

7. Navigation Servitude

This project does serve a purpose which is in the aid of navigation. The dual-purpose navigation and ecosystem sustainability program (NESP) was authorized under Section 8004(b)(2) of the Water Resources Development Act (WRDA) of 2007, by Congress, utilizing powers granted by the United State Constitution, Article 1, Section 8, for the restoration and sustainability of the river's multiple uses.

8. Mapping

A map of the site location is shown in figure 2.

9. Induced Flooding

Appendix D, section 4.2 of the Hydrologic and Hydraulic Engineering section conducted a no-rise analysis proposed project features would not impact flood stages. For any project along the waterways, a 'no-rise' determination must be made to ensure adverse flooding along neighboring structures will not be impacted.

The criteria for no rise for this analysis was to highlight any location where a rise of 0.0049 feet or more would be investigated. Using the criteria of 0.0049 feet, all cross sections within the model fell below that. The cross sections used during calibration were used for the no rise comparison throughout the stretch. The 1% AEP event was used for this comparison (shown on Table 18). Further investigation of 'no rise' will be conducted in the design phase of this project.

Since all cross sections fell below the criteria, from a preliminary standpoint, the 'no-rise' check was complete (shown on Table 19). Further investigation and refinement will be completed in the design portion of this project.

10. Baseline Cost Estimate

The total estimated cost during PED and Construction is $25,000. USACE Saint Louis District Real Estate involvement during the planning and design phase and construction phase.

Accounts	
01: Lands and Damages	$0
Total L&D (FY25$)	$0
02: Relocations	$0
Total Relocations (FY25$)	$0
30/31: PED/Construction	FY25$
Federal Real Estate Oversight	$20,000
Estimated TC (FY25$)	
Contingency @25%	$5,000
Total (FY25$)	$25,000

11. Relocation Assistance Benefits

The recommended plan does not require the project to provide temporary or permanent relocation benefits to residential, farm or business entities.

12. Mineral Activity

There are no known mineral rights or activities affecting the study area.

13. Sponsor Assessment

This Project is 100% a Federal Project. No Sponsor is required.

14. Zoning

No known zoning ordinances are proposed.

15. Schedule of Land Acquisition Milestones

The lands, easements, or rights-of-way required for this project are already owned by the United States of America and managed by the United States Corps of Engineers Saint Louis District.

16. Facility or Utility Relocations

There are no requirements for facility or utility relocations.

17. HTRW

A Phase I Environmental Site Assessment was conducted on the project area.

SUMMARY OF FINDINGS - The records review, site reconnaissance, and interviews with knowledgeable persons identified no RECs near or within the Hausgen Island NESP project footprint. Findings of this effort are summarized below:

Generally, the project area contains no major sites of interest, which pose significant environmental concerns. The environmental impact for the migration of off-site contaminants onto the project property is negligible. Therefore, a Phase II Environmental Site Assessment is not being recommended currently. A Site Health and Safety Plan, and a Quality Control Plan should be required, discussed, and implemented to prevent environmental hazards from being developed during construction. CEMVS-EC-EQ should be contacted immediately if future development of the property indicates the presence of hazardous or toxic materials.

OPINION OF THE ENVIRONMENTAL PROFESIONAL - Based on the data and resources available for this assessment, it is the Environmental Professional's opinion that the Project Area contains no major sites of interest that would impact the project's design, cost, or schedule. The environmental impact for the migration of off-site contaminants onto the Project Area is negligible, a Phase II ESA is not recommended at this time. The CEMVS-EC-EQ should be contacted with any known or suspected variations from the conditions described herein. If future development of the properties indicates the presence of hazardous or toxic materials, CEMVS-EC-EQ should be notified.

18. Landowner Attitude

There is no known landowner opposition to this Project.

19. Notification to the Sponsor Regarding the Risks Associated with Land Acquisition Before Execution of the Project Partnership Agreement (PPA)

This section is not applicable. The sponsor of this project is a federal entity that doesn't require the execution of a PPA. This project will be funded, 100% from congressional appropriated dollars on lands owned by the United States of America.

20. Other Relevant Real Estate Issues

No other known relevant real estate issues exist.

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Hausgen Island Complex

Appendix H - Economics

July 2025

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Section 1
Cost Effective and Incremental Cost Analyses

1.1 INTRODUCTION

For environmental planning, where traditional benefit-cost analysis is not possible because costs and benefits are expressed in different units, two analytical methods are used to assist Corps planners in the decision process. First, cost effectiveness (CE) analysis is conducted to ensure that the least cost solution is identified for each possible level of environmental output. Subsequent incremental cost analysis (ICA) of the cost-effective solutions is conducted to reveal changes in costs for increasing levels of environmental outputs. In the absence of a common measurement unit for comparing the non-monetary benefits with the monetary costs of environmental plans, cost effectiveness and incremental cost analysis are valuable tools to assist in decision making.

It is important to keep in mind that the most useful information developed by these two methods is what it tells decision makers about the relative relationships among solutions – that one will likely produce greater output than another, or one is likely to be more costly than another – rather than the specific numbers that are calculated. Furthermore, these analyses will usually not lead, and are not intended to lead, to a single best solution (as in economic cost-benefit analysis); however, they will improve the quality of decision making by ensuring that a rational, supportable approach is used in considering and selecting alternative methods to produce environmental outputs.

To perform the CE/ICA, use was made of the IWR Planning Suite Decision Support Software developed by the US Army Corps of Engineers Institute for Water Resources (IWR). IWR Planning Suite has been developed to assist with plan comparison by conducting cost effectiveness and incremental cost analyses, identifying the plans which are the best financial investments (“Best Buys”), and displaying the effects of each on a range of decision variables. The software is available via the IWR Planning Suite Internet. The latest version (2.0.9.35) has been certified for use by USACE Headquarters, meaning that it has been reviewed and certified by the appropriate Planning Center of Expertise (PCX) and represents a corporate approval that the model is sound and functional.

1.2 COST EFFECTIVE SOLUTIONS (CE)

In cost effectiveness analysis, it is necessary to filter out plans that produce the same output level as another plan, but cost more; or cost the same amount or more than another plan, but produce less output. This CE analysis was performed by the IWR planning model.

Table 1 displays the expected environmental outputs in terms of average annual habitat units along with the total first cost, interest during construction, and total average annual cost for each of the restoration alternatives and No Action plans. In this instance both alternatives are cost effective.

1.3 COST EFFECTIVE AND INCREMENTALLY JUSTIFIED (BEST BUY PLANS)

The final step in the analysis is to determine which subset of the cost-effective solutions is also incrementally justified. These solutions, also known as Best Buy Plans or Best Buy Alternatives, are those plans that provide increases in benefits at the lowest average cost (per habitat unit). The IWR Planning model was run to make the necessary calculations producing the results shown in Table 2. In this case, both alternatives are Best Buy Plans. The No Action alternative is always, by default, a Best Buy Plan as well.

Included in Table 2 are the incremental costs per habitat unit for the Best Buy Plans. Incremental cost is calculated by dividing the difference between the solution's costs by the difference between the solution's outputs. Reviewing this table with the incremental cost information now allows the decision maker to make the following comparisons of alternative restoration plans and to progressively ask "Is it worth it?"

As noted previously, neither cost effectiveness analysis nor incremental cost analysis will tell the decision maker what choice to make. However, the information developed by both analyses will help the decision maker make a more-informed decision and, once a decision is made, better understand its consequences in relation to other choices. Figure 1 shows the full range of solutions and highlights the cost-effective solutions and the incrementally justified (Best Buy) solutions. Figure 2 shows the incremental cost and output for the Best Buy Plans.

Table 1. Summary of Outputs (AAHUs) and Costs

Name of Alternative	First Cost	Interest During Construction	Average Annual Construction	Average Annual O&M and MAM	Average Annual Cost	AAHUs	Cost Effective or Best Buy
No Action	$ -	$ -	$ -	$ -	$ -	-	
Min Alt 1	$2,455,000	$36,553	$96,835	$18,125	$114,961	74.00	**Best Buy**
Max Alt 2	$3,284,000	$48,896	$129,535	$26,863	$156,398	92.00	**Best Buy**

Note: Costs are shown at the 2025 price level and were annualized using the current FY25 Federal discount rate of 3.0 percent over a 50-year period of analysis.

Table 2. Best Buy Plans and Incremental Costs (AAHUs)

Name of Alternative	AAHUs	First Cost	Interest During Construction	Average Annual Cost	Average Annual Cost per AAHU	Additional Average Annual Cost	Additional Output (AAHUs)	Incremental Cost (per AAHU)
No Action	-	$ -	$ -	$ -	$ -	$ -	-	$ -
Min Alt 1	74.00	$2,455,000	$36,553	$114,961	$1,554	$114,961	74.00	$1,554
Max Alt 2	92.00	$3,284,000	$48,896	$156,398	$1,700	$41,437	18.00	$2,302

Note: Costs are shown at the 2025 price level and were annualized using the current FY25 Federal discount rate of 3.0 percent over a 50-year period of analysis.

Figure 1. Full Range of Solutions

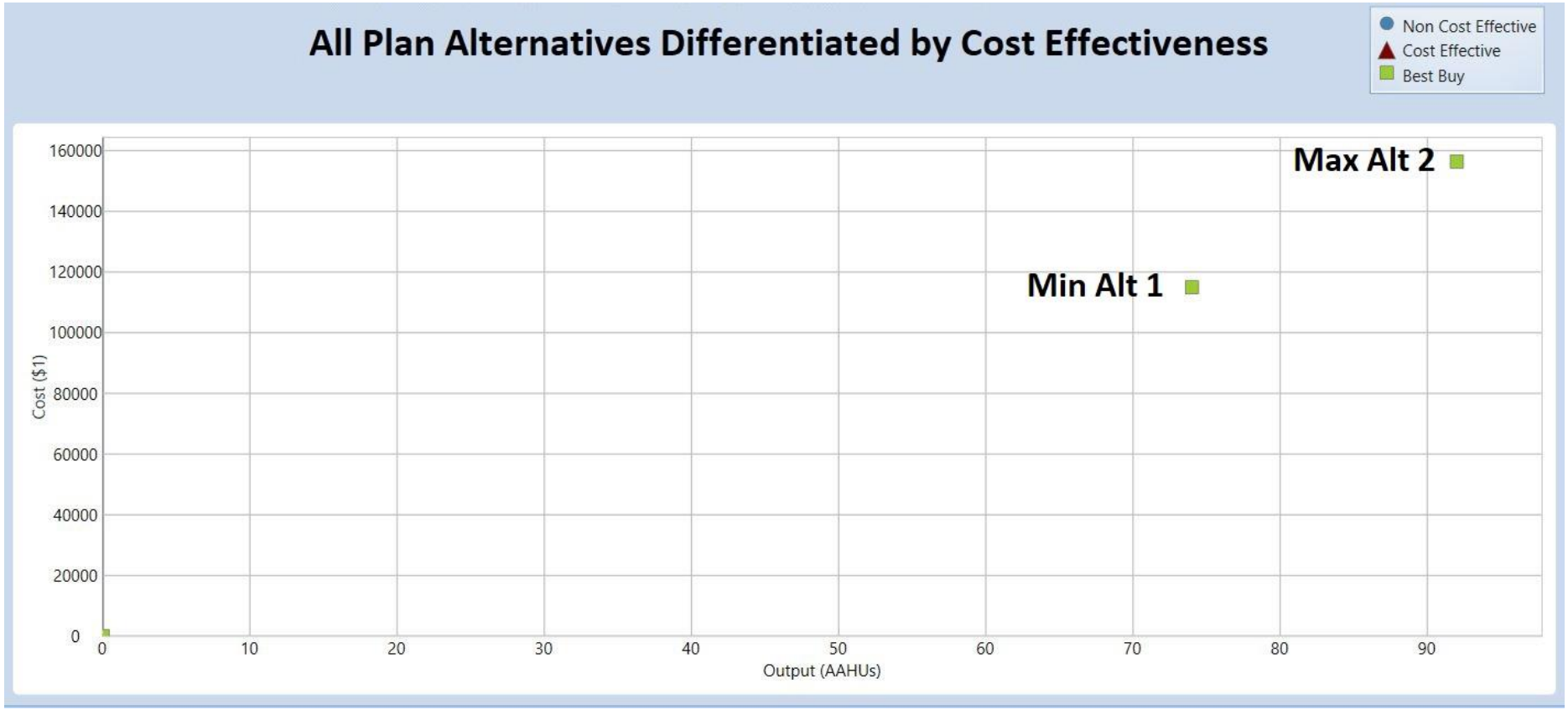


Figure 2. Incremental Cost of Best Buy Plans



Section 2
Regional Economic Development

2.1 RECONS MODEL

The U.S. Army Corps of Engineers (USACE) Institute for Water Resources, Louis Berger, and Michigan State University have developed a regional economic impact modeling tool, RECONS (Regional ECONomic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities. This modeling tool automates calculations and generates estimates of jobs, labor income, value added, and sales through the use of IMPLAN®'s multipliers and ratios, customized impact areas for USACE project locations, and customized spending profiles for USACE projects, business lines, and work activities. RECONS allows the USACE to evaluate the regional economic impact and contribution associated with USACE expenditures, activities, and infrastructure.

2.2 RESULTS

Table 3. Local, State, and National Impacts: Minimum Alt 1

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$1,714,208	21.9	$1,193,975	$800,107
Secondary Impact		$924,920	6.1	$232,676	$443,181
Total Impact	$1,714,208	$2,639,129	27.9	$1,426,651	$1,243,289
State					
Direct Impact		$2,060,418	27.8	$1,682,896	$1,101,417
Secondary Impact		$2,610,314	14.5	$839,631	$1,419,654
Total Impact	$2,060,418	$4,670,732	42.3	$2,522,528	$2,521,070
US					
Direct Impact		$2,438,076	37.1	$2,035,109	$1,519,610
Secondary Impact		$5,023,311	22.7	$1,579,442	$2,726,218
Total Impact	$2,438,076	$7,461,387	59.8	$3,614,551	$4,245,828

* Jobs are presented in full-time equivalence (FTE)

Table 4. Local, State, and National Impacts: Maximum Alt 2

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$2,293,059	29.3	$1,597,154	$1,070,286
Secondary Impact		$1,237,246	8.1	$311,246	$592,834
Total Impact	$2,293,059	$3,530,305	37.4	$1,908,400	$1,663,120
State					

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Direct Impact		$2,756,177	37.2	$2,251,174	$1,473,341
Secondary Impact		$3,491,760	19.4	$1,123,156	$1,899,040
Total Impact	$2,756,177	$6,247,937	56.6	$3,374,330	$3,372,381
US					
Direct Impact		$3,261,361	49.6	$2,722,321	$2,032,750
Secondary Impact		$6,719,574	30.3	$2,112,785	$3,646,802
Total Impact	$3,261,361	$9,980,935	79.9	$4,835,106	$5,679,552

* Jobs are presented in full-time equivalence (FTE)

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS,
THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

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THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

WHEREAS, the U.S. Army Corps of Engineers (USACE) is authorized to carry out the Upper Mississippi River – Illinois Waterway System (UMR-IWW) Navigation and Ecosystem Sustainability Program (NESP) pursuant to Title VIII of the Water Resources Development Act (WRDA) of 2007 (P.L. 110-114); and,

WHEREAS, the USACE implements projects under the NESP to attain and maintain the sustainability of the UMR-IWW ecosystem, addressing the cumulative impacts and ongoing effects of the navigation system and improving ecological integrity of the UMR-IWW, including projects with measures for island building, restoration of floodplain, backwater, side channels, and tributary confluences, fish passage, water level management, wing dam and dike restoration and modification, island and shoreline protection; topographical diversity, dam point control, use of dredged material for environmental purposes, spillway, dam, and levee modification to benefit the environment, and land and easement acquisition, as well as cultural resource management and mitigation and forest management; and,

WHEREAS, the USACE is also authorized to carry out the Upper Mississippi River Restoration (UMRR) Program for Habitat Rehabilitation and Enhancement Projects (HREP) pursuant to Section 1103 of the WRDA of 1986 (P.L. 99-662), as amended, codified in 33 U.S.C. 652; and,

WHEREAS, the USACE implements projects under the UMRR Program to rehabilitate and enhance habitat of the Upper Mississippi River System (UMRS); and,

WHEREAS, the USACE, as a Federal agency, is required to comply with Section 106 of the National Historic Preservation Act (NHPA), as amended (54 U.S.C. § 306108) and its implementing regulations, "Protection of Historic Properties," codified in 36 CFR § 800; and,

WHEREAS, the USACE has determined that projects under the NESP and UMRR Programs (hereinafter the "Programs") entail undertakings which may have the potential to affect historic properties included in or eligible for inclusion in the National Register of Historic Places (NRHP) as defined under 36 CFR § 800.16(y); and,

WHEREAS, the USACE has determined due to the nature of the Programs, their generally shared multi-state geographic region and similar authorized purposes, that a combined Programmatic Agreement (PA) to address both Programs is needed to clarify review procedures, improve consistency, consultation, and accountability in fulfilling its responsibilities to comply with Section 106 of the NHPA pursuant to 36 CFR § 800.14(b)(2) for the Program undertakings, as defined in Stipulation I.A.; and,

WHEREAS, the Program undertakings are subject to development and analysis which is detailed in Project Implementation Reports (PIRs), Feasibility Reports, or other decision or implementation documents which discuss program undertaking alternatives and typically identify a Tentatively Selected Plan in the draft decision document, followed by a Recommended Plan in the final decision document, that becomes the proposed project after decision document approval; and,

WHEREAS, the Program undertakings are subject to environmental review under the National Environmental Policy Act (NEPA) and other environmental laws; and,

WHEREAS, the USACE may defer the identification of the Area of Potential Effect (APE), as defined in Attachment B, and completion of the Section 106 process to include final identification and evaluation of historic properties, assessment of project effects to historic properties, and resolution of adverse effects, if any, until after completing the final USACE decision document and requirements of NEPA for a Program undertaking but before the implementation of the Program undertaking begins; and,

WHEREAS, this PA does not invalidate or supersede existing program alternatives or any other applicable Section 106 agreements including project level agreements for Steamboat HREP (Rock Island District), Quincy Bay HREP (Rock Island District), and Green Island HREP (Rock Island District), executed for undertakings already being implemented under either of the Programs; and,

WHEREAS, the USACE shall seek ways to avoid, minimize, and mitigate any adverse effects to historic properties, listed on or eligible for inclusion in the NRHP; and,

WHEREAS, the USACE has consulted with the State Historic Preservation Offices of Illinois (IlSHPO), Iowa (IaSHPO), Minnesota (MnSHPO), Missouri (MoSHPO), and Wisconsin (WiSHPO) (collectively, the "SHPOs") on the development of this PA, and the SHPOs are Signatories to this PA; and,

WHEREAS, the U.S. Fish and Wildlife Service (USFWS) has designated the USACE as the lead federal agency for Section 106 compliance for the Programs but will participate as a Signatory to this PA because it will be responsible for the operation and maintenance of Program

undertakings on lands and waters it administers or manages and would need to issue an Archaeological Resources Protection Act (ARPA, 16 U.S.C. 470 et seq) permit for work on Federal lands under the agency's jurisdiction; and,

WHEREAS, the National Park Service (NPS) has designated the USACE as the lead federal agency for Section 106 compliance for the Programs but will participate as an Invited Signatory to this PA because it will be responsible for the operation and maintenance of Program undertakings on lands and waters it administers or manages and would need to issue an ARPA permit for work on Federal lands under the agency's jurisdiction; and,

WHEREAS, the USACE recognizes the Federal government's special relationship with Federally recognized Indian Tribes and is responsible for government-to-government consultation pursuant to the NHPA, 36 CFR § 800.2(c)(2)(ii), the American Indian Religious Freedom Act (AIRFA, 42 U.S.C. 1996), Executive Orders 13007 and 13175, and Sections 3(c) and 12 of the Native American Graves Protection and Repatriation Act (NAGPRA, 25 U.S.C. 3001 et seq.); and,

WHEREAS, in accordance with 36 CFR § 800.2(c)(2)(ii), 800.3(f)(2), and 800.14(b)(2), the USACE, in a letter dated 14 October 2022, initiated consultation with 55 Federally recognized Indian Tribes (collectively, the "Consulting Tribes"), that may ascribe religious or cultural significance to historic properties that have the potential to be affected by Program undertakings and are entitled to be consulted about the identification and assessment of effects on historic properties, to consult on the development of this PA and these Tribes include the Absentee-Shawnee of Oklahoma, Bad River Band of Lake Superior Chippewa, Bois Fort Band of Chippewa, Caddo Nation of Oklahoma, Citizen Potawatomi Nation in Oklahoma, Delaware Nation, Delaware Tribe of Indians, Eastern Shawnee of Oklahoma, Flandreau-Santee Sioux, Fond du Lac Band of Lake Superior Chippewa, Fort Belknap Community, Forest County Potawatomi Community, Grand Portage Band of Lake Superior Chippewa, Hannahville Indian Community, Ho-Chunk Nation of Wisconsin, Iowa Tribe of Kansas and Nebraska, Iowa Tribe of Oklahoma, Keweenaw Bay Community, Kickapoo Traditional Tribe of Texas, Kickapoo Tribe in Kansas, Kickapoo Tribe of Oklahoma, Lac Courte Oreilles Band of Lake Superior Chippewa, Lac du Flambeau Band of Lake Superior Chippewa, Lac Vieux Desert Band of Lake Superior Chippewa, Little Traverse Bay of Odawa, Leech Lake Band of Ojibwe, Lower Sioux Community, The Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians, Menominee Tribe of Wisconsin, Mille Lacs Band of Ojibwe, Miami Tribe of Oklahoma, Nottawaseppi Huron Band of Potawatomi, Omaha Tribe of Nebraska, Otoe-Missouria Tribe, Peoria Tribe of Oklahoma, Pokagon Band of Potawatomi, Prairie Band of Potawatomi Nation, Prairie Island Community, Quapaw Nation, Red Cliff Band of Lake Superior Chippewa, Sac and Fox Nation of Missouri in Kansas and Nebraska, Sac and Fox Nation of Oklahoma, Sac and Fox Tribe of the Mississippi in Iowa (Meskwaki Nation), Santee Sioux Nation, Shakopee Mdewakanton Sioux, Shawnee Tribe, Sisseton-Wahpeton Oyate, Sokaogon Chippewa Community (Mole Lake Band of Lake Superior Chippewa), Spirit Lake Nation, St. Croix Band of Chippewa, The Osage Nation, United Keetoowah Band of Cherokee, Upper Sioux Community, White Earth Band of Ojibwe, and Winnebago Tribe of Nebraska; and,

WHEREAS, in accordance with 36 CFR § 800.6(c)(2), and based on each Consulting Tribe's response, the USACE has invited The Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians, the Miami Tribe of Oklahoma, the Peoria Tribe of Indians of Oklahoma, the Quapaw Nation, and The Osage Nation to be Invited Signatories, as defined in Attachment B, in this PA and each has elected to sign the PA, each as a Invited Signatory and collectively included in "Consulting Tribes"; and,

WHEREAS, each Invited Signatory Tribe has identified the area within which it may attach religious or cultural significance to historic properties that have the potential to be affected by Program undertakings, the Invited Signatory Tribe's "consultation area", as defined in Stipulation I.E, and each consultation area is included in Attachment C; and,

WHEREAS, in accordance with 36 CFR § 800.6 (c)(3), the Iowa Tribe of Kansas and Nebraska and the Winnebago Tribe of Nebraska have been invited to participate in the development of this PA and have elected to sign the PA, as a Concurring Party, as defined in Attachment B, and collectively included in "Consulting Tribes"; and,

WHEREAS, nothing in this PA diminishes or affects any treaty right of a Federally recognized Indian Tribe or any other right of a Federally recognized Indian Tribe or external boundary of an Indian reservation of a tribe. No provision of the PA shall alter existing law regarding the sovereign immunity of tribes or shall be construed to alter existing law regarding the trust duty of the United States to tribes (either to limit or expand that trust duty); and,

WHEREAS, the USACE acknowledges that Consulting Tribes possess special knowledge regarding any religious and cultural significance they may ascribe to historic properties, including Traditional Cultural Properties/Places, that may be physically or visually affected by a Program undertaking, and possess special expertise in assessing the eligibility of such properties; and,

WHEREAS, the USACE Programs benefit from consultation with Consulting Tribes in the identification and management of properties of religious and cultural significance, and the USACE shall ensure that its NHPA Section 106 procedures recognize the interests of Consulting Tribes in historic properties potentially affected by USACE decisions and afford Consulting Tribes participation in the process leading up to a USACE decision, in accordance with 36 CFR § 800; and,

WHEREAS, the USACE, USFWS, NPS, each SHPO, and each Consulting Tribe is each a Consulting Party as defined in Stipulation I.D; and,

WHEREAS, a Consulting Party will be recognized by the USACE as a Signatory, Invited Signatory, or Concurring Party, as applicable, under this PA starting on the date the Consulting Party signs the PA and provide the USACE with a record of its signature; and,

WHEREAS, the definitions set forth in 36 CFR § 800.16 are incorporated herein by reference and apply throughout this PA; and,

WHEREAS, in accordance with 36 CFR § 800.6(a)(1), the USACE, in a letter dated 19 October 2022, notified the Advisory Council on Historic Preservation (ACHP) of its decision to enter into this PA and has invited the ACHP to enter into consultation, and the ACHP has chosen to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii); and,

WHEREAS, the USACE provided opportunities for public review and comment on this PA by publishing online information, including a Public Notice posted on 15 November 2023 – 1 January 2024 for this PA, and receiving comments through online platforms, and will continue to engage the public, as appropriate, during Section 106 review of Program undertakings under the terms of this PA; and,

WHEREAS, for individual Program undertakings subject to this PA, the USACE may invite other agencies, organizations, and individuals to participate as Consulting Parties; and,

WHEREAS, each USACE District (St. Paul, Rock Island, or St. Louis, depending on individual Program undertakings), uses its own staff and authority and will consult with the SHPO of jurisdiction and the applicable Federally recognized Tribe(s) regarding the specific Program undertakings within its respective districts.

NOW, THEREFORE, the St. Paul, Rock Island, and St. Louis Districts of USACE, the IlSHPO, the IaSHPO, the MnSHPO, the MoSHPO, the WiSHPO, the USFWS, the ACHP (Signatories), the NPS, The Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians, the Miami Tribe of Oklahoma, the Peoria Tribe of Indians of Oklahoma, the Quapaw Nation, and The Osage Nation (Invited Signatories) agree that implementation of this PA in accordance with the following stipulations will allow the USACE to meet its responsibilities under Section 106 of the NHPA for the Program undertakings subject to this PA.

I. SCOPE AND APPLICABILITY

A. This PA shall apply to all undertakings under the NESP and UMRR Programs in the St. Paul, Rock Island, and St. Louis Districts of USACE that have the potential to cause effects to historic properties, if any, and require Section 106 review after the execution of this PA; are not otherwise covered by a separate memorandum of agreement (MOA) or programmatic agreement, and for which the USACE has not recognized another federal agency as lead federal agency (hereinafter the "Program undertakings").

B. The USACE will utilize this PA to fulfill its Section 106 responsibilities and those of the USFWS and NPS, who have designated the USACE as the lead federal agency pursuant to 36 CFR § 800.2(a)(2) for Program undertakings. The USFWS and/or NPS, as applicable may decide, and notify the USACE, for a specific Program undertaking that they will perform their own Section 106 compliance and the USACE will not be the lead federal agency for the Program undertaking. When the USACE is not designated as the lead federal agency and no other agency is designated lead federal agency, all federal agencies, including the USACE, remain individually responsible for their compliance with Section 106, but this PA will apply to Program undertakings. This provision does not prevent the USACE from recognizing another federal agency as lead federal agency for specific Program undertakings, as appropriate. If USACE recognizes another federal agency as lead federal agency for a specific Program undertaking that would otherwise be subject to this PA, this PA shall not apply.

C. All Program undertakings to which this PA is applicable shall be reviewed in accordance with the stipulations in this PA. The USACE may combine some or all of the steps during consultation in accordance with 36 CFR § 800.3(g).

D. Consultation among the SHPOs, Consulting Tribes, the USFWS, and the NPS (collectively, "Consulting Parties") when appropriate to this PA shall continue throughout the implementation of individual Program undertakings subject to this PA. The USACE shall identify and consult with the applicable Consulting Parties for each Program undertaking (the "Applicable Consulting Parties") consisting of:

1. The SHPO or SHPOs who reflect(s) the interests of the State(s) that overlaps with the Area of Potential Effects, as defined under Stipulation III.B and Attachment B, for the individual Program undertaking ("Applicable SHPO"); and,

2. The Consulting Tribes that are known to attach religious or cultural significance to historic properties within the Area of Potential Effects, as defined under Stipulation III.B, that may be affected by the individual Program undertaking ("Applicable Consulting Tribes"); and,

3. The USFWS and/or NPS when that agency would have operation and maintenance responsibility for the individual Program undertaking on lands or waters it administers or manages within the undertaking's Area of Potential Effects ("Applicable Federal Agency/ies").

E. The USACE acknowledges that contacts and consultation areas may change over time. Addressing this is primarily a USACE responsibility with assistance from the Consulting Parties. The relevant contact list for Consulting Parties at the time of execution of this PA is provided in Attachment D.

The USACE has requested and shall continue to request that each Consulting Tribe provide the area in which they may attach religious or cultural significance to historic properties (its "consultation area"), in the form of a map or other listing that USACE can use to identify Applicable Consulting Tribes for individual Program undertakings. All Invited Signatory Tribes have provided their consultation areas, included as Attachment C. For any Consulting Tribe who has not provided their consultation area, the USACE will use best available information to determine Applicable Consulting Tribes for Section 106 review of an individual Program undertaking.

F. The USACE shall seek ways to identify and preserve historic properties, and to avoid, minimize, or mitigate any adverse effects on historic properties. The USACE shall also endeavor to protect burials, cemeteries, or sites likely to contain human remains/artifacts and objects associated with interments or religious activities, and provide this information, studies, and/or reports to the Applicable Consulting Parties through the implementation of historic property surveys and testing, and the treatment of historic properties.

G. For each Program undertaking, the USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Program undertaking.

II. PERFORMANCE STANDARDS AND PROFESSIONAL QUALIFICATIONS STANDARDS

A. Pursuant to 36 CFR § 800.2(a), the Agency Official is the District Commander of the applicable USACE district with approval authority for a specific Program undertaking, who can commit the agency to take appropriate action for the Program undertaking to comply with Section 106 under this PA. The Agency Official may delegate authority to other USACE personnel who shall act on their behalf.

B. The USACE shall ensure all technical work, as defined in Attachment B, required under this PA is carried out in accordance with the professional standards and guidelines outlined in the Secretary of the Interior's (SOI) *Standards for Archaeology and Historic Preservation* (48 CFR 44716) and the SOI's *Standards for the Treatment of Historic Properties* (36 CFR Part 68), as applicable (individually or collectively, SOI Standards). The USACE will also consider other appropriate and applicable state laws, guidelines, or best practices for historic preservation activities within which state work is required.

1. Documentation in support of the USACE historic property eligibility determinations and findings of effect shall meet the documentation requirements specified in 36 CFR § 800.11 and the SOI Standards. Current state survey requirements/guidance for

documentation and reporting shall also be followed for work occurring in the respective state.

C. The USACE shall ensure that technical work conducted pursuant to this PA is carried out by or under the supervision of persons meeting qualifications set forth in the SOI's *Professional Qualification Standards*, as amended, for the pertinent discipline (see 48 F.R. 44738-44739) or the United States Office of Personnel Management (OPM) qualifications for cultural resources professionals such as Archaeologist GS-0193 series, Anthropologist GS-0190 series, or Historian GS-0170 series.

D. The USACE shall maintain professional qualified staff meeting SOI *Professional Qualification Standards,* OPM qualifications for cultural resources professionals, and/or Section 112 of the NHPA (hereafter referred to as "qualified staff".

1. The USACE qualified staff assigned to review USACE Program undertakings pursuant to this PA shall be a GS-9 or higher and meet the SOI *Professional Qualification Standards* or the OPM qualifications for cultural resources professionals such as Archaeologist GS-0193 series, Anthropologist GS-0190 series, or Historian GS-0170 series.

2. Qualified staff at or below the GS-7 level are considered to be performing duties in a developmental or technician capacity.

3. USACE qualified staff at GS-9 or higher shall oversee and review any work conducted by GS-7 or lower graded staff when the USACE implements any portion of the PA.

III. PROGRAM UNDERTAKING REVIEW PROCESS

A. USACE INTERNAL REVIEW PROCESS

1. At the earliest stages of developing a Program undertaking, the USACE shall assign a qualified staff member to ensure cultural resources and historic properties are identified and considered in the USACE planning process.

2. In general, the area of interest for the UMRR and NESP Programs includes the UMRS as defined in Public Law 99-662, which includes both the Mississippi River from its confluence with the Ohio River near Cairo, Illinois to Upper St. Anthony Falls Lock in Minneapolis-St. Paul and the Illinois River from its confluence with the Mississippi River at Grafton, Illinois to the Brandon Road Lock and Dam, Joliet, Illinois and river reaches having commercial navigation channels on the Minnesota River, Minnesota; Black River, Wisconsin; Saint Croix River, Minnesota and Wisconsin; Illinois River and Waterway, Illinois; and Kaskaskia River, Illinois and associated floodplains (Attachment A). The area of interest includes a 5-mile buffer on either side of the navigation centerline, to accommodate potential undertakings covered by the Programs, auditory and visual effects, and any other potential effects.

3. The USACE shall further refine the general area of interest for a specific project under the Programs in the development of the Recommended Plan, as defined in Attachment B, defining the Program undertaking subject to Section 106 review under this PA, defining and documenting an Area of Potential Effect, carrying out initial efforts to identify historic properties as stated under Stipulation III.A.4 and initiating an assessment of the Program undertaking's potential effects to historic properties.

4. Before the selection of the Recommended Plan for a specific Program undertaking, the USACE shall complete initial background research of the study area to include reviewing available investigations and consulting with the applicable state historic preservation databases and/or inventories to determine and direct adequate survey coverage for historic, architectural, and archaeological properties, terrestrial and aquatic.

5. At any given time during the development of the Recommended Plan for a specific Program undertaking, the USACE may seek input from the Applicable Consulting Parties as appropriate.

B. DEFINE AND DOCUMENT THE AREA OF POTENTIAL EFFECTS

1. In consultation with Applicable Consulting Parties, the USACE shall identify and document the Area of Potential Effects (APE) appropriate to the scope and scale of the Recommended Plan for a specific Program undertaking as identified through Stipulation III.A and include the following:

    i. The vertical and horizontal extents (i.e., height and depth), if available, of all construction activities required to complete the Program undertaking, including staging areas, access routes, and a reasonable buffer informed by consultation.

    ii. Areas outside of the construction areas of the Program undertaking where the Program undertaking's potential direct, indirect, or cumulative effects to historic properties may be reasonably anticipated.

2. The USACE is responsible for defining and documenting a final APE, including any modification to the APE as a result of change in scope and scale of the Recommended Plan, for each Program undertaking subject to review under this PA.

C. HISTORIC PROPERTY IDENTIFICATION

1. The USACE shall complete and document historic property identification efforts and issue formal NRHP-eligibility determinations for all properties within the APE for the proposed Program undertaking as follows.

2. The USACE shall complete a literature search of the APE.

i. The literature search shall include consulting the appropriate state historic inventory and archaeological site files, previous survey reports, historic contexts, and other pertinent documents of the appropriate state for information on previously developed historic contexts, recorded historic properties, and previously surveyed areas.

ii. The USACE shall use the literature search to determine adequacy of existing documentation and to inform the scope of any additional research or surveys, including the need for additional historic context development and/or re-evaluation of any previously identified historic properties or properties previously determined to be eligible for listing on the NRHP.

3. In accordance with appropriate state survey guidelines, implementation of historic property surveys and testing, the USACE shall record all properties meeting minimum criteria for recordation, such as buildings, structures, shipwrecks, objects, linear resources, landscapes, districts, Traditional Cultural Properties/Places, and archaeological/historical and burial sites. Recordation of structures, buildings, aquatic resources such as shipwrecks, objects, districts, and sites shall be prepared using the respective state recordation forms, as appropriate.

4. Pursuant to 36 CFR § 800.4(a)(4), historic property identification efforts shall include contacting the Tribal Historic Preservation Offices (THPOs), or other Tribal representative of Applicable Consulting Tribes for the Program undertaking, to assist in identifying properties within the APE, that may be of religious and cultural significance to them and may be eligible for listing on the NRHP.

5. The results of identification efforts, including any supporting documentation, shall be prepared in accordance with Stipulation II (Performance Standards and Qualifications).

6. The USACE shall make one of the following findings as a result of its historic property identification efforts:

i. "No Historic Properties Affected." If the USACE finds that either there are no historic properties identified within the APE or there are historic properties within the APE and the Program undertaking will have no effect upon them as defined in 36 CFR § 800.16(i) then the USACE shall make a "No Historic Properties Affected" finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(d), to the Applicable Consulting Parties for review and comment.

(1) For Program undertakings with a finding of "No Historic Properties Affected" the USACE shall provide the Applicable Consulting Parties information including the following:

(a) A full description of the Program undertaking, to include depth and amount of ground disturbance, as well as above-ground effects, anticipated;

(b) An APE map and narrative description of the APE for the Program undertaking;

(c) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE;

(d) Results of historic property identification efforts completed by the USACE, including an appropriate level of documentation, to include reports, forms, evaluations, eligibility determinations, or other documents supporting NRHP eligibility determinations;

(e) Any photos, additional maps, images, or plans, as appropriate; and

(f) A stated finding of "No Historic Properties Affected" for the Program undertaking and request for comment on said finding from the applicable SHPO(s).

(2) The Applicable Federal Agencies and Consulting Tribes are under no obligation to provide comments on the finding. However, if they wish the USACE to consider their comments regarding the "No Historic Properties Affected" finding, they shall submit comments in writing within thirty (30) calendar days of receipt of the fully documented finding, unless a request for extension was submitted. The USACE shall take any comments received from Applicable Federal Agencies and Consulting Tribes into consideration before concluding the consultation and will notify the Applicable SHPO of these concerns and the USACE response to them. Any objection to the finding received will be addressed in accordance with Stipulation III.C.6.4 below.

(3) The Applicable SHPO shall provide a response to a USACE finding within thirty (30) calendar days of receipt of a fully documented "No Historic Properties Affected" finding. If no comments or requests for an extension are received from the Applicable SHPO within the 30-day review period, the USACE will assume the SHPO has waived their opportunity to comment and has concurred with the finding.

(4) If an Applicable Consulting Party objects to the finding of "No Historic Properties Affected" within the 30-day review period, the USACE shall consult with the objecting party, and include other parties as appropriate, for no more than a total of thirty (30) calendar days, or other time period as agreed to among Applicable Consulting Parties, upon receipt of the notification of objection to attempt to resolve concerns as identified by the objecting party.

(a) The USACE may revise its finding of "No Historic Properties Affected." If the USACE revises its finding to "No Adverse Effect" for the specific Program undertaking, then the USACE shall continue consultation pursuant to Stipulation III.D.

(b) If at the end of the thirty (30) calendar days, the objecting party(ies) concurs with the finding of "No Historic Properties Affected", the USACE shall document this concurrence, and USACE has no further obligations for the specific Program undertaking under this Stipulation.

(c) If at the end of the thirty (30) calendar days, or agreed to specified time, the party(ies) objects to the finding of "No Historic Properties Affected" and the USACE has not altered its effects determination, the USACE shall notify the ACHP in accordance with Stipulation X.

(5) If an Applicable Consulting Party(ies) disagrees regarding NRHP eligibility of a property identified within the APE for a Program undertaking, the USACE shall notify all Applicable Consulting Parties. The USACE shall consult with the Applicable Consulting Party(ies) for no more than thirty (30) days upon receipt of the notification to resolve the disagreement. The USACE shall provide copies of the notification to other Applicable Consulting Parties within five (5) days of receipt. Upon request and at its discretion, the USACE may extend the consultation period to resolve the disagreement.

(i) If the dispute cannot be resolved, or if the ACHP or Secretary of the Interior so requests, the USACE shall obtain a determination of eligibility from the Keeper of the NRHP. The Keeper's determination will be final in accordance with 36 CFR Part 63.4.

(6) If the USACE does not carry out the Program undertaking as documented in the "No Historic Properties Affected" finding, then the USACE shall continue consultation in accordance with Stipulation III.C.

ii. If the USACE finds that there are historic properties identified within the APE which may be affected by the Program undertaking, then the USACE shall proceed to Stipulation III.D.

D. ASSESSMENT OF POTENTIAL ADVERSE EFFECTS TO HISTORIC PROPERTIES

1. Avoidance of adverse effects to historic properties is the preferred treatment approach. The USACE shall consider redesign of components of the Program undertakings to avoid potential adverse effects to historic properties. However, there may be instances where it is not feasible for the USACE to redesign Program undertakings to avoid adverse effects to historic properties.

2. The USACE shall assess potential adverse effects caused by the proposed Program undertaking on all identified historic properties within the APE. This assessment shall include consideration of all direct, indirect, and cumulative effects caused by the Program undertaking, and shall use the criteria of adverse effects (36 CFR § 800.5(a)(1)). The USACE shall make one of the following determinations:

    i. "No Adverse Effect to Historic Properties." If the USACE determines that historic properties present in the APE will be affected by the Program undertaking but the characteristics of the historic properties that qualify the properties for inclusion are not diminished or altered, then the USACE shall make a "No Adverse Effect to Historic Properties" finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(e), to the Applicable Consulting Parties for review and comment in accordance with Stipulation III.D.3.

    ii. "Adverse Effect to Historic Properties." If the USACE determines that historic properties present in the APE will be affected by the Program undertaking and the characteristics of the historic properties that qualify them for inclusion will be diminished or altered, then the USACE shall make an "Adverse Effect to Historic Properties" finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(e), to the Applicable Consulting Parties for review and comment in accordance with Stipulation III.D.4.

3. No Adverse Effect to Historic Properties

    i. For Program undertakings with a finding of "No Adverse Effect to Historic Properties" the USACE shall provide the Applicable Consulting Parties with the following:

        (1) A full description of the Program undertaking, to include depth and amount of ground disturbance, as well as above-ground effects, anticipated;

        (2) An APE map and narrative description of the APE for the Program undertaking;

        (3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE;

        (4) Results of historic property identification efforts completed by the USACE, including an appropriate level of documentation to include reports, forms, evaluations, eligibility determinations, or other documents supporting NRHP eligibility determinations;

(5) A description of the affected historic properties including information on the characteristics that qualify them for the NRHP;

(6) A description of the Program undertaking's potential effects on the identified historic properties and explanation of why the criteria of adverse effect were found applicable or inapplicable;

(7) Any photos, additional maps, images, or plans, as appropriate; and

(8) A stated finding of "No Adverse Effect to Historic Properties" for the Program undertaking and request for comment for said finding from the Applicable SHPO.

ii. The Applicable Federal Agencies and Consulting Tribes are under no obligation to provide comments on the finding of "No Adverse Effect to Historic Properties". However, if they wish the USACE to consider their comments regarding the finding of effect, Applicable Federal Agencies or Consulting Tribes shall submit comments in writing within thirty (30) calendar days of receipt. The USACE shall take any comments received into consideration before concluding the consultation and will notify the applicable SHPO of these concerns and the USACE response to them. Objections shall be addressed in accordance with Stipulation III.D.3.v. below.

iii. The Applicable SHPO shall provide a response to a USACE finding within thirty (30) calendar days of fully documented "No Adverse Effect to Historic Properties" finding. If no comments or a request for an extension are received within the 30-day review period, the USACE will assume SHPO has waived their ability to comment and has concurred.

iv. If the Applicable SHPO concurs with the "No Adverse Effect to Historic Properties" finding for a specific Program undertaking, the USACE shall first determine if any other party has objected to the finding, and if there are no objections, the USACE has no further obligations under this Stipulation.

v. If an Applicable Consulting Party(ies) objects to the finding of "No Adverse Effect to Historic Properties," the USACE shall consult with the objecting party (ies), and include other parties as appropriate, for no more than a total of thirty (30) calendar days, upon receipt of the notification of non-concurrence to attempt to resolve concerns as identified by the objecting party.

(1) The USACE may revise its finding of "No Adverse Effect to Historic Properties." If the USACE revises its finding to "No Historic Properties Affected," then the USACE shall continue consultation pursuant to Stipulation III.C.5.i. If the USACE revises its finding to "Adverse Effect," then the USACE shall continue consultation pursuant to Stipulation III.D.4.

(2) If at the end of the thirty (30) calendar days, the objecting party concurs with the finding of "No Adverse Effect to Historic Properties," the USACE shall document this concurrence, and the USACE has no further obligations under this Stipulation for the specific Program undertaking.

(3) If at the end of the thirty (30) calendar days, the objecting party(ies) still objects to the finding of "No Adverse Effect to Historic Properties", and the USACE has not altered its effects determination, the USACE shall notify the ACHP in accordance with Stipulation X.

vi. If the USACE does not carry out the Program undertaking as documented in the "No Adverse Effect" finding, then the USACE shall continue consultation in accordance with Stipulation III.C.

4. Adverse Effect to Historic Properties

i. For a specific Program undertaking with a finding of "Adverse Effect to Historic Properties," the USACE shall provide the Applicable Consulting Parties with the following:

(1) A full description of the Program undertaking, to include depth and amount of ground disturbance, as well as above-ground effects, anticipated;

(2) An APE map and narrative description of the Program undertaking;

(3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE;

(4) Results of historic property identification efforts completed by the USACE, including an appropriate level to include reports, forms, evaluations, eligibility determinations, or other documents of documentation supporting NRHP eligibility determinations;

(5) A description of the affected historic properties including information on the characteristics that qualify them for the NRHP;

(6) A description of the Program undertaking's potential effects on the historic properties and an explanation of why the criteria of adverse effect were found applicable or inapplicable;

(7) Any photos, additional maps, images, or plans, as appropriate;

(8) A stated finding of "Adverse Effect to Historic Properties" and request for comment for said finding from the Applicable SHPO.

ii. The USACE shall consult with the Applicable Consulting Parties to resolve the "Adverse Effect to Historic Properties" pursuant to Stipulation III.E.

E. RESOLUTION OF ADVERSE EFFECTS

1. The USACE shall notify Applicable Consulting Parties, and the public, upon receiving Applicable SHPO concurrence on a finding of "Adverse Effect to Historic Properties" for a Program undertaking using the following process:

   i. For public awareness, the USACE shall post a notice of the "Adverse Effect to Historic Properties" finding on the official USACE website for the involved District to include a description of the Program undertaking, a list of identified historic properties, the explanation for the finding of adverse effects, steps taken or considered by the USACE to avoid or minimize the adverse effects, any Applicable Consulting Party comments received by the USACE regarding the undertaking, and an invitation to provide written comment within thirty (30) calendar days of posting to the website.

   ii. Consulting Parties are under no obligation to provide comments on the finding of adverse effect. However, if they wish the USACE to consider their comments regarding the finding of adverse effect, Consulting Parties shall submit comments in writing within thirty (30) calendar days of receipt. The USACE shall take any comments received into consideration before concluding the consultation and will notify the Applicable Consulting Parties of any concerns and the USACE response to those concerns.

2. The USACE shall consult with the Applicable Consulting Parties to determine appropriate avoidance, minimization and/or mitigation measures to resolve the adverse effect. The USACE shall offer to facilitate a consultation meeting, to include Applicable Consulting Parties, within thirty (30) calendar days after notification of an adverse effect finding, to discuss Program undertaking alternatives to avoid, minimize, or mitigate the adverse effects, and may schedule additional meetings at its discretion.

3. If through consultation with Applicable Consulting Parties, the USACE modifies the Program undertaking to avoid adverse effects to historic properties within the APE, the USACE shall document the alternatives utilized to eliminate the potential adverse effects of the proposed Program undertaking resulting in a revised finding of "No Adverse Effect to Historic Properties," which must receive concurrence from the Applicable Consulting Parties pursuant to Stipulation III.D.3. Once concurrence is achieved, the USACE has no further obligations under this Stipulation for the specific Program undertaking.

4. If through consultation with the Applicable Consulting Parties, the USACE reaches agreement to appropriately resolve the adverse effects through minimization and/or mitigation measures then the measures agreed to by the USACE and the Applicable

Consulting Parties shall be specified in a Memorandum of Agreement (MOA) developed and executed for the Program undertaking in accordance with 36 CFR § 800.6(b)(1) and 800.6(c) and filed with the ACHP upon execution.

i. If any agreed-upon minimization and/or mitigation measure included in the final MOA involves archaeological data recovery or historic property documentation, then ground-disturbing activities or activities resulting in adverse effects to historic properties associated with the Program undertaking may not begin until after the adequate completion of the fieldwork for the data recovery or historic property documentation and the USACE has provided written notification in this regard.

ii. It is understood the USACE shall not complete archaeological data recovery while lands are under private ownership and mitigation of the adverse effect is not complete until the final draft of the data recovery report has been filed with and recommended for acceptance by the Applicable SHPO and other Applicable Consulting Parties as agreed-upon in the final MOA.

5. If through consultation with the Applicable Consulting Parties, the USACE cannot reach agreement to appropriately resolve adverse effects through minimization and/or mitigation measures, the USACE will notify the ACHP and seek a formal resolution in accordance with 36 CFR § 800.6(b)(2). The ACHP will only participate in the resolution of adverse effects for individual Program undertakings if a written request is received from the USACE or Applicable Consulting Party.

IV. SUBSEQUENT AGREEMENTS

A. Memoranda of Agreements developed to resolve adverse effects for specific Program undertakings under the Programs shall be negotiated between the respective USACE District (St. Paul, Rock Island, St. Louis), Applicable Consulting Parties, and ACHP, pursuant to 36 CFR § 800.6(c), and shall be independent of this PA.

V. REVIEW AND MONITORING OF PA IMPLEMENTATION

A. The purpose of the PA review and monitoring is to ensure the USACE identification and protection of historic properties in carrying out Program undertakings. This is accomplished through the review of Program undertakings that were completed during a reporting period and review of implementation of the PA. Electronic mail (email) will serve as the official correspondence method for all communications regarding this PA and its provisions. See Attachment D for a list of contacts and email addresses. Attachment D may be updated as needed without an amendment to this PA. It is the responsibility of each Consulting Party to inform a respective USACE District of any change in name, email address, or phone number of any point-of-contact listed in this PA. Following any updates to Attachment D, the USACE shall provide this information to all Consulting Parties. In order to foster cooperative relations as the terms of this PA are carried out, the USACE shall:

1. Beginning on the one-year anniversary of the execution of this PA, and on an annual basis thereafter, compile and distribute a report to Consulting Parties on the implementation of the terms of this PA.

2. Invite Consulting Parties to a review meeting every two (2) years. If it is agreed that such a meeting is not necessary at that time, the meeting may be waived. Meetings may be conducted in any mutually agreeable location and/or format, including in-person, video conferencing, or teleconferencing. The USACE shall remain responsible for initiating the biennial meetings in subsequent years. More frequent meetings may be appropriate based on specific circumstances and therefore an alternative meeting schedule may be established.

VI. CURATION

A. All records and materials resulting from the actions required by this PA shall be curated to the extent provided by law in accordance with 36 CFR Part 79, Curation of Federally Owned or Administered Archeological Collections, except those materials identified as Native American human remains and items associated with Native American burials which would be subject to Stipulation IX.

B. Subject to Stipulation VI and consistent with the USACE's property interest, the USACE or its contractors, in accordance with 36 CFR Part 79, will maintain all archaeological items and materials collected until any specified analyses and reviews are complete.

C. It is USACE policy that archaeological items and materials, not associated with human remains or burials, recovered from lands other than USACE fee-title, are the property of the respective landowner including private, state, federal, and other locally owned lands.

VII. CONFIDENTIALITY

A. The USACE shall seek and consider the views of the public in a manner that reflects the nature of the Program undertakings and their effects on historic properties following procedures pursuant to 36 CFR § 800.2(d) and in a manner that observes confidentiality requirements pursuant to Section 304 of the NHPA (54 U.S.C. 307103); Section 9 of the Archaeological Resources Protection Act (16 U.S.C. 470hh); and Section 552(b) of the Freedom of Information Act (5 U.S.C. 552) and applicable state laws.

B. The nature and location of archaeological sites and any other cultural resources discussed in this PA shall be considered confidential as provided for in 36 CFR § 800.11(c). The USACE shall use best efforts to protect sensitive information from disclosure as requested by Applicable Consulting Parties to the extent permitted by federal and applicable state laws identified in VII.A above.

VIII. POST-REVIEW DISCOVERIES

A. The USACE shall ensure that previously unidentified historic properties, or unanticipated effects to previously identified historic properties, discovered during the construction activities for Program undertakings are subject to the requirements of 36 CFR § 800.13(b-d). Discoveries of previously unidentified historic properties or unanticipated adverse effects to known historic properties is not anticipated. However, if this were to occur, the USACE shall ensure the following measures are met. USACE shall implement the provisions outlined below that are intended to ensure that Program undertakings are in compliance with applicable federal and state laws and regulations. These provisions will be included in all construction, operations, and maintenance plans.

1. The contractor will be instructed to cease all ground-disturbing activities in the area of the historic property, as well as within a 100-foot radius around but within the project footprint, to avoid and/or minimize harm to the property.

2. The contractor will be instructed to immediately notify the USACE of the discovery and implement interim measures, as appropriate, to protect the discovery from damage, looting, and vandalism, such as protective fencing and covering of the discovery with appropriate materials.

3. The USACE will inspect the work site to determine the extent of the discovery and ensure work activities have halted within the 100-foot radius.

4. The USACE will clearly mark the area of discovery and implement additional measures such as security, as appropriate, to protect the discovery from theft and vandalism.

5. The USACE shall provide an initial assessment of the resource's condition and eligibility to Applicable Consulting Parties and notify other Consulting Parties, if applicable, of the discovery within seven (7) calendar days.

B. If USACE, after consultation with Applicable Consulting Parties, determines the discovery is not a historic property as it is either isolated, does not retain integrity sufficient for listing on the NRHP, or if the historic property will not be further disturbed by construction activities, construction may resume within the 100-foot radius.

C. If USACE determines that the discovery is a historic property that is, or may be, eligible for listing on the NRHP, the USACE shall consult with Applicable Consulting Parties, regarding appropriate measures for site treatment pursuant to 36 CFR 800.6(a). Consulting Parties have ten (10) days to provide their comments on the proposed measures which may include:

1. Formal evaluation of the historic property;
2. Exploration of potential alternatives to avoid the historic property;

3. If the historic property will be adversely affected by project activities, preparation and implementation of a mitigation plan by USACE to resolve adverse effects in consultation with Applicable Consulting Parties.

D. The notified Applicable Consulting Parties have ten (10) days following notification to provide comment regarding NRHP eligibility determination of the discovery.

E. USACE shall prepare a report of findings describing the background history leading to and immediately following the reporting and resolution of an inadvertent discovery within thirty (30) days of the resolution for each inadvertent discovery.

F. USACE shall communicate the procedures to be observed to its contractors and personnel.

G. USACE shall provide a Notice to Proceed to the contractor to work in the area. Notices to Proceed may be issued by USACE for individual construction segments, defined by USACE in its construction specifications, after the identification and evaluation of historic properties and resolution of adverse effects has been completed.

IX. TREATMENT OF HUMAN REMAINS AND ITEMS OF RELIGIOUS AND CULTURAL IMPORTANCE

A. Under this PA, no investigative surveys or construction activities will be planned to knowingly disturb human remains, funerary objects, sacred objects, or objects of cultural patrimony. If any potential unmarked human burials or skeletal remains are encountered during construction activities, all ground disturbing activities will cease. Should any potential findings be made, field personnel will follow instructions provided by USACE for each project to initiate identification, evaluation, and consultation efforts as outlined below.

B. If human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered during field investigations or laboratory work or during construction activities, the USACE will comply with the provisions based on the nature of the land ownership at the time remains or objects are encountered.

1. The USACE will immediately notify appropriate law enforcement, appropriate medical examiner or coroner, the state archaeologist, Applicable SHPO, Applicable Consulting Tribes, and landowner within twenty-four (24) hours, or as soon as otherwise practicable, via email or telephone.

    i. The notification process will follow the state law appropriate for the location of the discovery:

        (1) Iowa per Code of Iowa 263B, Office of the State Archaeologist
        (2) Illinois per The Human Skeletal Remains Protection Act (20 ILCS 3440)

(3) Minnesota per Statutes Section 307.08, Office of the State Archaeologist and the Minnesota Indian Affairs Council
(4) Missouri Unmarked Human Burials Law (RSMo Chapter 194) and Missouri Cemeteries Law (RSMo Chapter 214); and/or
(5) Wisconsin per Statutes Section 157.70 and Wisconsin Administrative Code HS2, Wisconsin Burial Site Preservation Office

2. The USACE will require that all work will immediately cease within a 165-foot radius from the point of discovery and require that the contractor secure the area by placing pin flags within the work area radius around the discovery, and following other appropriate measures directed by USACE to protect the discovery from further disturbance. The USACE shall consult with the Applicable Consulting Parties regarding additional steps to be followed. All human remains, regardless of ancestry, will be treated with dignity and respect.

3. If the human remains, funerary objects, sacred objects, or objects of cultural patrimony appear to be Native American, the USACE, or the landowner, if located on private land, may be required to meet applicable federal, tribal, and state burial laws and ordinances. When on federal or tribal lands, the USACE will meet applicable requirements of the Native American Graves Protection and Repatriation Act for all Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony on a case-by-case basis, in accordance with 43 CFR Part 10.

4. If not on federal or tribal lands, the USACE shall notify appropriate authorities and work with the landowner and state to comply, as appropriate, with
   i. Code of Iowa 263B,
   ii. 20 Illinois Compiled Statue 3440
   iii. Minnesota Statutes Section 307.08,
   iv. Revised Statues of Missouri Chapters 194 and 214
   v. Wisconsin Statutes Section 157.70 and Wisconsin Administrative Code HS2.

5. Measures to protect the human remains and any associated artifact(s) will remain in effect until an appropriate treatment plan for the discovery (if applicable) has been completed for the remains and associated artifacts. The USACE will consider redesign of undertakings to avoid effects to human remains and any associated artifacts(s). The contractor will not resume work in the vicinity of the find until the USACE has granted clearance to do so.

6. Where suspected burial sites in the absence of human remains are encountered, the USACE or its contractor will comply, as applicable, with
   i. Code of Iowa 263B,
   ii. 20 Illinois Compiled Statue 3440
   iii. Minnesota Statutes Section 307.08,
   iv. Revised Statues of Missouri Chapters 194 and 214, and/or
   v. Wisconsin Statutes Section 157.70 and Wisconsin Administrative Code HS2

X. DISPUTE RESOLUTION

A. Should a Consulting Party to this PA object in writing regarding implementation of this PA, the USACE shall consult with the objecting party for no more than thirty (30) calendar days. The USACE shall provide copies of the written objection to other Consulting Parties within five (5) calendar days of receipt of the written objection. Upon request, the USACE shall make every effort to extend the consultation period, subject to mission requirements.

   1. The USACE shall take into account the reasons for the objection and evaluate the solutions suggested by the objecting party.

   2. If, after the thirty (30)-calendar-day review period, the USACE determines that the objection cannot be resolved, the USACE shall forward all documentation relevant to the dispute, including the USACE proposed resolution, to the ACHP.

      i. The ACHP shall provide the USACE with its advice on the resolution of the objection within thirty (30) calendar days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the USACE shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP and other Consulting Parties. The USACE shall provide Consulting Parties with a copy of this written response. The USACE will then proceed according to its final decision.

      ii. If the ACHP does not provide its advice regarding the dispute within the thirty (30) calendar-day time period, the USACE may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the USACE shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the signatories to the PA. The USACE shall provide Consulting Parties with a copy of this written response. The USACE will then proceed according to its final decision and notify Consulting Parties.

B. The USACE responsibilities to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

C. Should any member of the public raise a timely and substantive objection pertaining to the manner in which the terms of this PA are carried out, at any time during its implementation, the USACE shall take the objection into account by consulting with the objector. When the USACE responds to an objection, it shall notify the Consulting Parties of the objection and the manner in which it was resolved. The USACE may request the assistance of a Consulting Party to resolve an objection.

XI. SEVERABILITY

A. If any section, subsection, paragraph, sentence, clause, or phrase in this PA, for any reason, is held to be unconstitutional or invalid or ineffective, such decision shall not affect the validity or effectiveness of the remaining portions of this PA.

B. If any section, subsection, paragraph, sentence, clause, or phrase in this PA, for any reason, is held to be unconstitutional or invalid or ineffective, the signatories shall consult to determine whether an amendment to this PA is needed.

XII. ANTI-DEFICIENCY PROVISION

A. All parties to this agreement acknowledge the USACE fiduciary responsibilities pursuant to the Anti-Deficiency Act (31 USC 1341). All obligations on the part of the USACE under this PA shall be subject to the appropriations, allocation, and availability of sufficient funds available to the USACE for such purposes.

B. The legal responsibility of the USACE to comply with Section 106 of the NHPA is not affected by the availability of federal funding provided through appropriation.

XIII. AMENDMENTS

A. Any signatory to this PA may at any time propose amendments, whereupon all signatories shall consult to consider such amendment for no more than ninety (90) days. An amendment will be effective on the date a copy signed by all signatories is filed with the ACHP.

B. Any Consulting Tribe may update its consultation area in Attachment C without an amendment to this PA through notice to the respective USACE district. USACE will distribute the updated consultation area to all Consulting Parties.

XIV. TERMINATION OR WITHDRAWAL

A. If the USACE or the ACHP determines that the terms of this PA will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation XIII, above. If within ninety (90) calendar days (or another time period agreed to by all signatories) an amendment cannot be reached, the USACE or the ACHP may terminate the PA upon written notification to the other signatories.

    1. Once the PA is terminated, the USACE must review all undertakings identified post termination in accordance with 36 CFR § 800.3 through 800.7 or an applicable alternative under 36 CFR § 800.14. The USACE will include this in a final annual report per Stipulation V.

B. Any SHPO may terminate this PA as to its jurisdiction after providing the USACE written notice ninety (90) calendar days prior to termination.

1. The USACE shall consult with the terminating SHPO to identify any mutually acceptable measures that would avoid the party's termination.

2. If mutually acceptable measures are identified that would require amendment to the PA, the USACE shall follow the amendment process outlined in Stipulation XIII.

3. If within ninety (90) calendar days (or another time period agreed to by all signatories) mutually acceptable measures are not identified or an amendment cannot be reached, and the SHPO terminates, the PA will no longer apply within that SHPO's state, and the USACE will review all Program undertakings previously subject to this PA in that jurisdiction in accordance with 36 CFR § 800.3 through 800.7 or an applicable alternative under 36 CFR § 800.14, which may include entry into subsequent MOAs and/or PAs.

4. This PA will remain in effect in all other jurisdictions and for all other parties.

C. The USFWS and/or NPS may terminate the PA or withdraw as a Signatory/Invited Signatory after providing the USACE written notice ninety (90) calendar days prior to termination or withdrawal.

1. The USACE shall consult with the USFWS or NPS, as applicable, to identify any mutually acceptable measures that would avoid the termination or the party's withdrawal, as applicable.

2. If mutually acceptable measures are identified that would require an amendment to the PA, the USACE will follow the amendment process outlined in Stipulation XIII.

3. If within ninety (90) calendar days (or another time period agreed to by all signatories) mutually acceptable measures are not identified or an amendment cannot be reached, the USFWS or NPS, as applicable, may terminate the PA upon written notification to the other signatories, or withdraw from the PA. If the USFWS or NPS, as applicable, terminates the PA, USACE will follow Stipulation XIV.A.1. If the USFWS or NPS, as applicable, withdraws, the PA will remain in full force and effect.

D. Any Invited Signatory Tribe may withdraw as an Invited Signatory or terminate the PA as to its consultation area after providing the USACE written notice ninety (90) calendar days prior to withdrawal or termination.

1. The USACE shall consult with the withdrawing or terminating Invited Signatory Tribe to identify any mutually acceptable measures that would avoid the party's withdrawal or termination.

2. If mutually acceptable measures are identified that would require amendment to the PA, the USACE shall follow the amendment process outlined in Stipulation XIII.

3. If within ninety (90) calendar days (or another time period agreed to by all signatories) mutually acceptable measures are not identified or an amendment cannot be reached and an Invited Signatory Tribe withdraws, the USACE will continue to consult with the former Invited Signatory Tribe as a Consulting Tribe under the terms of this PA, and the PA will continue in full force and effect, including within the former Invited Signatory Tribe's consultation area. If within ninety (90) calendar days (or another time period agreed to by all signatories) mutually acceptable measures are not identified or an amendment cannot be reached and an Invited Signatory Tribe terminates as to its consultation area, the PA will no longer apply within that consultation area, and the USACE will review all Program undertakings previously subject to this PA in that consultation area in accordance with 36 CFR § 800.3 through 800.7 or an applicable alternative under 36 CFR § 800.14, which may include entry into subsequent MOAs and/or PAs. This PA will remain in effect in all other jurisdictions and for all other parties. The remaining Signatories may confer on whether additional amendment to the PA is warranted to address the termination by the Invited Signatory Tribe.

XV. DURATION

This PA shall remain in effect for ten (10) years, until March 18, 2034, and can be extended through amendment in accordance with Stipulation XIII. Prior to March 18, 2028 the USACE shall host a workshop for a four (4)-year review and assessment of the effectiveness of this PA.

XVI. IMPLEMENTATION

A. This PA may be executed in counterparts, with a separate page for each signature.

B. This PA shall become effective within the applicable state on the date of signature, whichever is latest, by the USACE, applicable SHPO or the ACHP.

C. The USACE shall ensure each consulting party is provided with a complete copy of the final PA and that the final PA and any amendments are filed with the ACHP.

XVII. EXECUTION

Execution of this PA by the St. Paul, Rock Island, and St. Louis Districts of the USACE, the IaSHPO, the IlSHPO, the MnSHPO, the MoSHPO, the WiSHPO, the USFWS, the NPS, the ACHP, The Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians, the Miami Tribe of Oklahoma, the Peoria Tribe of Indians of Oklahoma, the Quapaw Nation, and The Osage Nation and implementation of its terms is evidence that the USACE has taken into account the effects of its undertaking on historic properties and has afforded the ACHP opportunity to comment pursuant to Section 106 of the NHPA.

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS,
THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY
UNITED STATES ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT

E R Swenson Digitally signed by SWENSON.ERIC.RAYMOND.1032271894 Date: 2024.03.28 14:26:54 -10'00' **. Date:** 28 March 2024 **.**

Colonel Eric R. Swenson, St. Paul District Commander

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS,
THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY
UNITED STATES ARMY CORPS OF ENGINEERS, ROCK ISLAND DISTRICT

Digitally signed by CURRY.JESSE.THOMAS.1086509969
Date: 2024.04.02 12:46:17 -05'00'

. Date: 02 April 2024 **.**

Colonel Jesse T. Curry, Rock Island District Commander

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS,
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THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY
UNITED STATES ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT

PANNIER.ANDY.JOSEPH.1090474134 Digitally signed by PANNIER.ANDY.JOSEPH.1090474134 Date: 2024.03.22 13:20:53 -05'00'

_____. **Date:** _____.

Colonel Andy J. Pannier, St. Louis District Commander

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
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THE NATIONAL PARK SERVICE,
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THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
IOWA STATE HISTORIC PRESERVATION OFFICE

Heather Gibb . **Date:** 04/16/2024 .

Heather Gibb, State Historic Preservation Officer

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
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THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
ILLINOIS STATE HISTORIC PRESERVATION OFFICE

Carey L. Mayer **. Date:** 4/3/2024 **.**

Carey Mayer, Deputy State Historic Preservation Officer

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS
THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
MINNESOTA STATE HISTORIC PRESERVATION OFFICE

_____. **Date:** 4/9/2024.

Amy H. Spong, Deputy State Historic Preservation Officer

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
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THE MIAMI TRIBE OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
MISSOURI STATE HISTORIC PRESERVATION OFFICE

_____. Date: 06/17/2024

Brian Stith, Deputy Director Division of State Parks and
Deputy Missouri State Historic Preservation Officer

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
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THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
WISCONSIN STATE HISTORIC PRESERVATION OFFICE

Daina Penkiunas . **Date:** 4/11/2024 .

Daina Penkiunas, State Historic Preservation Officer

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
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THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
UNITED STATES FISH AND WILDLIFE SERVICE

WILLIAM MEEKS Digitally signed by WILLIAM MEEKS Date: 2024.04.16 20:48:24 -05'00' **. Date:** _____.

Will Meeks, Midwest Regional Director

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
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THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

SIGNATORY:
ADVISORY COUNCIL ON HISTORIC PRESERVATION



. Date: June 25, 2024 .

Reid Nelson, Executive Director

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
IOWA, ILLINOIS, MINNESOTA, MISSOURI, AND WISCONSIN,
THE U.S. FISH AND WILDLIFE SERVICE,
THE NATIONAL PARK SERVICE,
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS
THE MIAMI TRIBE OF OKLAHOMA,
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA,
THE QUAPAW NATION,
THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

INVITED SIGNATORY:
NATIONAL PARK SERVICE

Digitally signed by HERBERT FROST
Date: 2024.08.02 16:44:13 -05'00'

_____. **Date:** _____.

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
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REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

INVITED SIGNATORY:
THE MATCH-E-BE-NASH-SHE-WISH BAND OF POTTAWATOMI INDIANS

Melissa Brown **. Date:** 5-2-24 .

Melissa Brown, Senior Director of Operations

PROGRAMMATIC AGREEMENT
AMONG
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REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

INVITED SIGNATORY:
MIAMI TRIBE OF OKLAHOMA

Douglas Lankford Digitally signed by Douglas Lankford Date: 2024.05.03 11:50:27 -05'00' **. Date:** _____.

Chief Douglas Lankford

PROGRAMMATIC AGREEMENT
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THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
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REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

INVITED SIGNATORY:
QUAPAW NATION

Wena Supernaw . **Date:** 4/20/2024 .

Wena Supernaw, Chair

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
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REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

INVITED SIGNATORY:
THE OSAGE NATION

_____. **Date:** 4-23-24.

Geoffrey M. Standing Bear, Principle Chief

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
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THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

INVITED SIGNATORY:
THE PEORIA TRIBE OF INDIANS OF OKLAHOMA

_____. **Date:** 5/21/24 .

Chief Craig Harper

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, ST. PAUL,
ROCK ISLAND, AND ST. LOUIS DISTRICTS,
THE STATE HISTORIC PRESERVATION OFFICERS OF
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THE OSAGE NATION, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

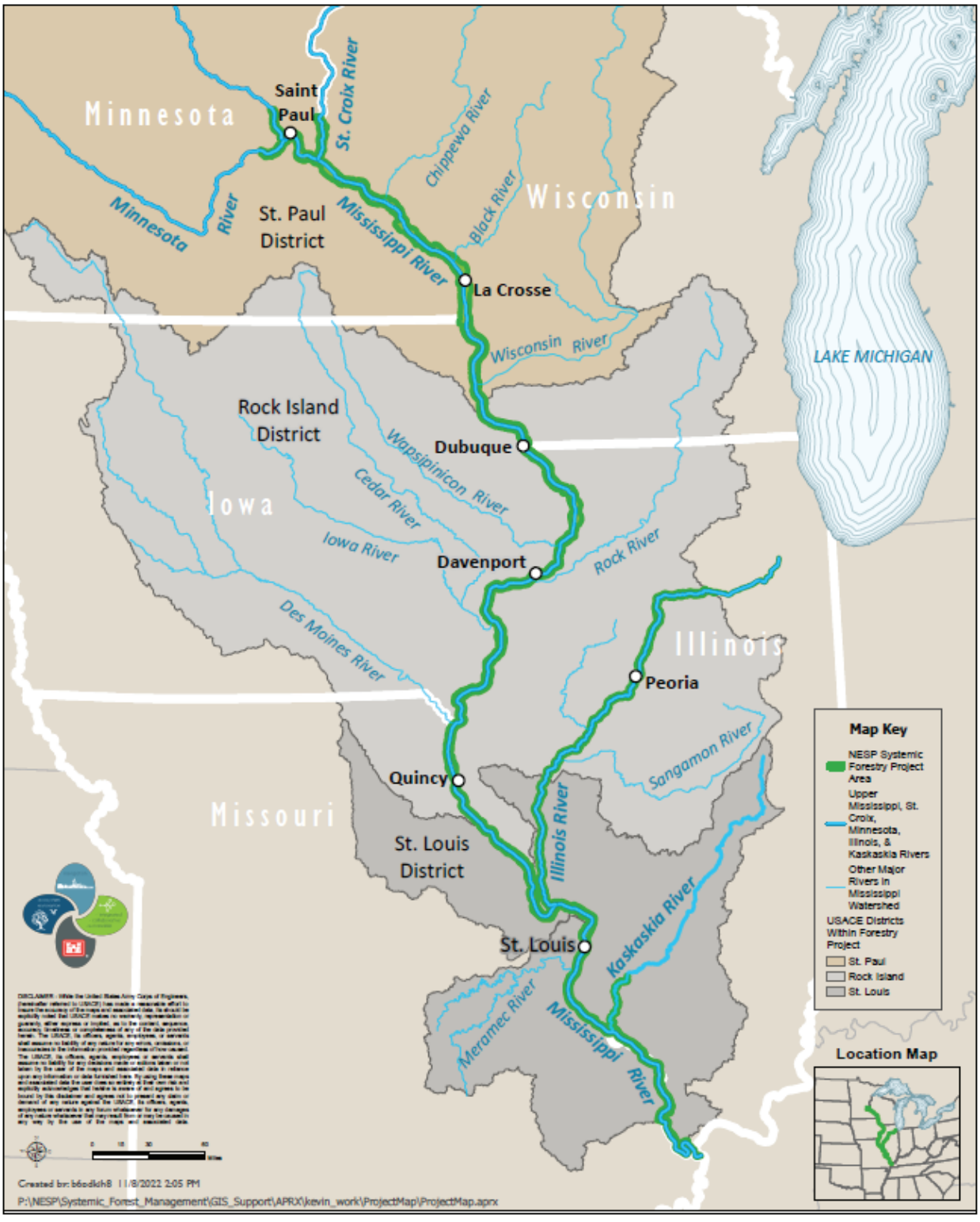
The Upper Mississippi River Restoration Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program

CONCURRING:
IOWA TRIBE OF KANSAS AND NEBRASKA

Alan Kelley . Date: 04.03.2024

Alan Kelley, Deputy Tribal Historic Preservation Officer

Attachment A – NESP and UMRR General Area of Interest



Attachment B: Definitions

Tentatively Selected Plan	Under Engineer Regulation ER_1105-2-61, the tentatively selected plan is the single alternative chosen from all those considered during the feasibility study and identified in the draft feasibility report/NEPA report released to the public for review. The tentatively selected plan usually becomes the recommended plan after agency endorsement.
Recommended Plan	Under Engineer Regulation ER_1105-2-100, the recommended plan is the plan proposed in the final decision document for implementation.
Area of Potential Effect (APE)	Under 36 CFR § 800.16(d) the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.
Signatory	In accordance with 36 CFR § 800.6(c)(1), a Signatory has the authority to execute, amend, or terminate the Programmatic Agreement.
Invited Signatory	In accordance with 36 CFR § 800.6(c)(2), Invited Signatories who sign the Programmatic Agreement are signatories with the authority to amend and terminate the Programmatic Agreement.
Concurring Party	In accordance with 36 CFR § 800.6(c)(3), a Concurring Party is a Consulting Party invited to concur in the Programmatic Agreement but does not have the authority to amend or terminate the Programmatic Agreement.
Technical work	In this PA means all efforts to identify and delineate, evaluate historic, architectural, and archaeological properties, and to assess potential adverse effects, and perform subsequent treatment of historic properties, such as avoidance, minimization, data recovery excavation, monitoring, or recordation of potential historic properties that is required under this PA.

Attachment C. Provided Tribal Consultation Areas

Tribe	Consultation Area by County				
	Illinois	**Iowa**	**Minnesota**	**Missouri**	**Wisconsin**
The Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians	Adams, Brown, Calhoun, Champaign, Madison, Monroe, Pike, and Saint Clair in MVS*	Clinton, Des Moines, Lee, Louisa, Muscatine, Scott	N/A	St. Charles, St. Louis, and St. Louis City in MVS*	Grant
The Miami Tribe of Oklahoma	All MVS*	N/A	N/A	Boone, Callaway, Cape Girardeau, Franklin, Gasconade, Jefferson, Lincoln, Marion, Mississippi, Montgomery, Osage, Perry, Pike, Ralls, St. Charles, St. Louis City, St. Louis Co., Ste. Genevieve, Scott, and Warren in MVS*	N/A
The Osage Nation	All MVS* and Adams, Boone, Brown, Bureau, Calhoun, Carroll, Cass, Champaign, Christian, De Witt, Fulton, Hancock, Henderson, Henry, Jo Daviess, Knox, Lee, Logan, Macon, Macoupin, Marshall, Mason, Menard, Mercer, Montgomery, Morgan, Moultrie, Ogle, Peoria, Piatt, Pike, Putnam, Rock Island, Sangamon, Schuyler, Shelby, Stark, Stephenson, Tazewell, Warren, Whiteside, Winnebago, and Woodford Counties in MVR*	Clinton, Des Moines, Henry, Jackson, Lee, Louisa, Muscatine, Scott, and Van Buren Counties	N/A	All MVS* and Adair, Clark, Knox, Lewis, Marion, Monroe, Ralls, Schuyler, Scotland, and Shelby Counties in MVR*	N/A

The Peoria Tribe of Indians in Oklahoma	Adams, Alexander, Calhoun, Carroll, Hancock, Henderson, Jackson, Jersey, Jo Daviess, Madison, Mercer, Monroe, Pike, Randolph, Rock Island, St. Clair, Union, and Whiteside Counties	All MVR*	All MVP*	All MVR*and MVS*	All MVP* and MVR*
Quapaw Nation	Alexander, Jackson, Johnson, Madison, Monroe, Pulaski, Randolph, St. Clair, and Union Counties	N/A	N/A	Bollinger, Butler, Cape Girardeau, Iron, Jefferson, Madison, Mississippi, Perry, Reynolds, St. Charles, Ste. Genevieve, St. Francois, St. Louis, St. Louis City, Scott, and Wayne Counties	N/A

*MVP is the St. Paul District, MVR is the Rock Island District, and MVS is the St. Louis District.

Attachment D: Consulting Party Distribution List (January 2024)

Agency and/or Tribe	Name	Title	Email
Iowa State Historic Preservation Office	Dr. Heather Gibb	State Historic Preservation Officer	heather.gibb@iowa.gov
Illinois State Historic Preservation Office	Mr. Jeffrey Kruchten	State Historic Preservation Officer	jeff.kruchten@illinois.gov
Minnesota State Historic Preservation Office	Amy Spong	Deputy State Historic Preservation Officer	amy.spong@state.mn.us
Missouri State Historic Preservation Office	Ms. Amy Rubingh	Review, Compliance, Records Coordinator	amy.rubingh@dnr.mo.gov
Wisconsin State Historic Preservation Office	Mr. Tyler Howe	State Historic Preservation Officer	tyler.howe@wisconsinhistory.org
National Park Service	Ms. Susan Snow	Superintendent – Effigy Mounds National Monument	Susan_Snow@nps.gov
U.S. Fish and Wildlife Service	Ms. Sabrina Chandler	Refuge Manager/Area Supervisor – UMR national Wildlife and Fish Refuge	sabrina_chandler@fws.gov
U.S. Fish and Wildlife Service	Mr. James Myster	Archaeologist	James_Myster@fws.gov
Advisory Council on Historic Preservation	Mr. Chris Daniel	Program Analyst	cdaniel@achp.gov
Absentee-Shawnee Tribe of Indians in Oklahoma	Ms. Devon Frazier Smith	Tribal Historic Preservation Officer	dfrazier@astribe.com
Absentee-Shawnee Tribe of Indians in Oklahoma	Ms. Carol Butler	Cultural Preservation Director	cbutler@astribe.com
Bad River Band of Lake Superior Chippewa	Mr. Larry Plucinski	Tribal Historic Preservation Officer	thpo@badriver-nsn.gov
Bois Forte Band of Chippewa	Mr. Jaylen Strong	Tribal Historic Preservation Officer	jaylen.strong@boisforte-nsn.gov
Caddo Nation of Oklahoma	Mr. Jonathan M. Rohrer	Tribal Historic Preservation Officer	jrohrer@mycaddonation.com
Citizen Potawatomi Nation, Oklahoma	Ms. Kelli Mosteller	Assistant Tribal Historic Preservation Officer	cpnthpo@potawatomi.org
Delaware Nation, Oklahoma	Ms. Carissa Speck	Historic Preservation Director	cspeck@delawarenation-nsn.gov
Delaware Tribe of Indians	Ms. Susan Bachor	Tribal Historic Preservation Officer	lheady@delawaretribe.org
Eastern Shawnee Tribe of Oklahoma	Mr. Paul Barton	Tribal Historic Preservation Officer	pbarton@estoo.net
Flandreau-Santee Sioux Tribe	Mr. Garrie Kills-A-Hundred	Tribal Historic Preservation Officer	garrie.killsahundred@fsst.org
Fond du Lac Band of Lake Superior Chippewa	Mr. Evan Schroeder	Tribal Historic Preservation Officer	EvanSchroeder@FDLREZ.com
Fort Belknap Indian Community	Emma "Emmy" Filesteel	Tribal Historic Preservation Officer	emma.filesteel@ftbelknap.org

Attachment D: Continued			
Tribe	**Name**	**Title**	**Email**
Forest County Potawatomi Community	Mr. Ben Rhodd	Tribal Historic Preservation Officer	Benjamin.Rhodd@fcp-nsn.gov
Forest County Potawatomi Community	Ms. Nicole Reske	Assistant Tribal Historic Preservation Officer	Nicole.Reske@fcpotawatomi-nsn.gov
Grand Portage Band of Lake Superior Chippewa	Mr. Rob Hull	Tribal Historic Preservation Officer	thpo@grandportage.com
Hannahville Indian Community	Mr. Earl Meshigaud	Tribal Historic Preservation Officer	EarlMeshigaud@hannahville.org
Ho-Chunk Nation of Wisconsin	Mr. William Quackenbush	Tribal Historic Preservation Officer	bill.quackenbush@ho-chunk.com
Iowa Tribe of Kansas and Nebraska	Mr. Lance Foster	Tribal Historic Preservation Officer	lfoster@iowas.org
Iowa Tribe of Kansas and Nebraska	Mr. Alan Kelley	Deputy Tribal Historic Preservation Officer	akelly@iowas.org
Iowa Tribe of Oklahoma	Ms. Candace Pershall	Cultural Preservation	cpershall@iowanation.org
Keweenaw Bay Indian Community	Mr. Gary Loonsfoot, Jr.	Tribal Historic Preservation Officer	gloonsfoot@kbic-nsn.gov
Kickapoo Traditional Tribe of Texas	Mr. Hector Gonzalez	Historic Preservation	hector.gonzalez@kttttribe.org
Kickapoo Tribe of Oklahoma	Mr. Darwin Kaskaske	Chairman	darwin.kaskaske@okkt.net
Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas	Mr. Lester Randall	Chairman	
Lac Courte Oreilles Band of Lake Superior Chippewa	Mr. Brian Bisonette	Tribal Historic Preservation Officer	brian.bisonette@lco-nsn.gov
Lac du Flambeau Band of Lake Superior Chippewa	Ms. Sarah Thompson	Tribal Historic Preservation Officer	Sarah.Thompson@ldftribe.com
Lac Vieux Desert Band of Lake Superior Chippewa	Ms. Alina Shively	Tribal Historic Preservation Officer	alina.shively@lvd-nsn.gov
Little Traverse Bay Bands of Odawa Indians	Ms. Melissa Wiatrolik	Tribal Historic Preservation Officer	MWiatrolik@LTBBODAWA-NSN.GOV
Leech Lake Band of Ojibwe	Ms. Gina Lemon	Tribal Historic Preservation Officer	ginalemon@llojibwe.net
Lower Sioux Indian Community	Ms. Cheyanne St. John	Tribal Historic Preservation Officer	lowersiouxthpo@lowersioux.com
Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians	Ms. Lakota Hobia	Tribal Historic Preservation Officer	lakota.hobia@glt-nsn.gov
Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians	Ms. Kaila Akina	THPO Assistant Director	kaila.akina@glt-nsn.gov
Menominee Indian Tribe of Wisconsin	Mr. David Grignon	Tribal Historic Preservation Officer	dgrignon@mitw.org
Mille Lacs Band of Ojibwe	Mr. Mike Wilson	Tribal Historic Preservation Officer	Mike.Wilson@millelacsband.com
Miami Tribe of Oklahoma	Mr. Logan York	Tribal Historic Preservation Officer	lyork@miamination.com

Attachment D: Continued			
Tribe	**Name**	**Title**	**Email**
Nottawaseppi Huron Band of Potawatomi, Michigan	Mr. Douglas R. Taylor	Tribal Historic Preservation Officer	douglas.taylor@nhbp-nsn.gov
Omaha Tribe of Nebraska	Mr. Dwight Howe	Tribal Historic Preservation Officer	dwight.howe@theomahatribe.com
Otoe-Missouria Tribe of Indians, Oklahoma	Ms. Elsie Whitehorn	Tribal Historic Preservation Officer	ewhitehorn@omtribe.org
Peoria Tribe of Indians of Oklahoma	Ms. Burgundy Fletcher	Tribal Historic Preservation Specialist	bfletcher@peoriatribe.com
Pokagon Band of Potawatomi Indians, Michigan and Indiana	Mr. Matthew Bussler	Tribal Historic Preservation Officer	matthew.bussler@pokagonband-nsn.gov
Prairie Band of Potawatomi Nation	Ms. Tara Mitchell	Deputy Tribal Historic Preservation Officer	taramitchell@pbpnation.org
Prairie Island Indian Community	Mr. Noah White	Tribal Historic Preservation Officer	Noah.White@piic.org
Quapaw Nation	Mr. Billie Burtrum	Tribal Historic Preservation Office	Billie.Burtrum@quapawnation.com
Red Cliff Band of Lake Superior Chippewa	Mr. Marvin Defoe	Tribal Historic Preservation Officer	marvin.defoe@redcliff-nsn.gov
Sac and Fox Nation of Missouri in Kansas and Nebraska	Ms. Lisa Montgomery	Director Environmental Protection Agency	lisa.montgomery@sacfoxenviro.org
Sac and Fox Nation, Oklahoma	Mr. Chris Boyd	NAGPRA/Historic Preservation	chris.boyd@sacandfox-nsn.gov
Sac and Fox Tribe of the Mississippi in Iowa (Meskwaki Nation)	Mr. Johnathan Buffalo	Historic Preservation Director	director.historic@meskwaki-nsn.gov
Santee Sioux Nation / Santee Sioux Tribe of Nebraska	Mr. Butch Denny	Tribal Historic Preservation Officer	ssn.thpo@gmail.com
Shakopee Mdewakanton Sioux Community	Mr. Leonard Wabasha	Cultural Resource Director	leonard.wabasha@shakopeedakota.org
Shawnee Tribe	Ms. Tonya Tipton	Historic Preservation Office	section106@shawnee-tribe.com
Sisseton-Wahpeton Oyate	Ms. Dianne Desrosiers	Tribal Historic Preservation Officer	DianneD@swo-nsn.gov
Sokaogon Chippewa Community - Mole Lake Band of Lake Superior Chippewa	Mr. Michael LaRonge	Tribal Historic Preservation Officer	Michael.LaRonge@scc-nsn.gov
Spirit Lake Tribe	Mr. Kenneth Graywater, Jr.	Tribal Historic Preservation Officer	thpo@spiritlakenation.com
St. Croix Band of Chippewa Indians	Ms. Wanda McFaggen	Tribal Historic Preservation Officer	thpo@stcroixtribalcenter.com
The Osage Nation	Dr. Andrea Hunter	Tribal Historic Preservation Officer	ahunter@osagenation-nsn.gov
The Osage Nation	Ms. Caitlin Nichols	Archaeologist	caitlin.nichols@osagenation-nsn.gov
The Osage Nation	Ms. Sarah O'Donnell	Preservation Office	sodonnell@osagenation-nsn.gov

Attachment D: Continued			
Tribe	**Name**	**Title**	**Email**
United Keetoowah Band of Cherokee of Oklahoma	Mr. Acee Watt	Tribal Historic Preservation Officer	awatt@uk-nsn.gov
Upper Sioux Community	Ms. Samantha Odegard	Tribal Historic Preservation Officer	THPO@uppersiouxcommunity-nsn.gov
White Earth Band of Ojibwe	Ms. Jaime Arsenault	Tribal Historic Preservation Officer	Jaime.Arsenault@whiteearth-nsn.gov
Winnebago Tribe of Nebraska	Ms. Sunshine Thomas-Bear	Cultural Preservation Director	sunshine.bear@winnebagotribe.com

Appendix J
Cost

Table of Contents

1 Cost Estimate Summary 3
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1.2 Basis of Cost Estimate 3
1.3 Contingencies 5
1.4 Planning, Engineering, and Design (PED) 5
1.5 Construction Management 5

1 COST ESTIMATE SUMMARY

1.1 GENERAL

The Project is located on the right descending bank of the Mississippi River, near Foley, Missouri, in Lincoln County, Missouri. The proposed project lies in the lower portion of Pool 25 between River Miles (RM) 248 and 245. Project features will be located 100% below the Ordinary High-Water Mark (OHWM); therefore, the construction of this project would be 100% federal and does not require a Sponsor. The approximate 250-acre area consists of side channels and connected backwaters in the vicinity of Hausgen and Jim Crow Islands.

The objectives for the NESP Hausgen Island project are as follows:

a. Restore side channel sediment transport and geomorphic diversity.
b. Increase side channel habitat quantity and quality for native fish and mussel species.
c. Increase side channel habitat quality for native fish spawning, rearing, juvenile, or overwintering habitat.
d. Increase side channel area, flow diversity, quality, and clarity for native mussel species habitat.
e. Reduce sediment deposition within side channel flowing water habitats to maintain and restore main channel connectivity and increase quality of habitat for riverine dependent native fish.

The final array of alternatives include:

- No Action
- Alternative 1 – Minimum
- Alternative 2 – Maximum

The measures included in each Alternative are listed below:

<u>Alternative 1 – Minimum</u>:

- Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement)

<u>Alternative 2 – Maximum</u>:

- Partial Degradation/Notching
- Hard Points
- Mussel Habitat Enhancement (Rock-Gravel Substrate Enhancement)
- Bank Stabilization

A detailed cost estimate, abbreviated risk analysis, and construction schedule were developed for the recommended plan: Alternative 2 – Maximum.

1.2 BASIS OF COST ESTIMATE

The cost estimate has been prepared based on current concept designs and site-specific information available to date.

Quantities were developed by the MVS Civil Design Section. The Cost estimate was developed using MCACES. The wage rates were developed using Davis Bacon, Heavy & Highway construction for Lincoln County, MO MO20250001 Last Revised April 11, 2025. The MII 2024 Equipment Region 5 was used for equipment rates. The 2024 Cost Book was used.

It is assumed that the stone for the hard points, revetment, and the mussel substrate will be furnished by a quarry near Ste. Genevieve, MO and delivered via barge to the project area. A quote was received for the stone required for this project. It is assumed that all work will take place on barges and will be in shallow draft conditions leading to lower production times.

At this stage of design, it is assumed the dikes will be notched and dragged downstream from the notch. There is a risk captured in the abbreviated risk analysis (ARA) for a significant cost increase if this stone needs to be handled multiple times to relocate the stone somewhere else on the project area.

1.3 CONTINGENCIES

The Abbreviated Risk Analysis process indicated a 36% construction contingency based on associated project risks for the Recommended Plan. The total project contingency is 34%. A 25% contingency was applied to planning, engineering, and design and construction management had a contingency of 32%.

1.4 PLANNING, ENGINEERING, AND DESIGN (PED)

Planning, engineering, and design costs are based on historical data of similar projects in the St. Louis District. Recommended percentages by the cost MCX were taken into consideration as well. 15% of the construction cost was used to determine the PED costs. The Adaptive Management and Monitoring costs are not included in the total project costs for this project as they are captured by in the NESP programmatic costs.

1.5 CONSTRUCTION MANAGEMENT

Construction Management costs are based on historical data of similar projects in the St. Louis District. Recommended percentages by the cost MCX were taken into consideration as well. 10% of the construction cost was used to determine the CM costs.

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **NESP Hausgen Island**
PROJECT NO: P2 514197
LOCATION: Lincoln County, Missouri

DISTRICT: **St. Louis District** **PREPARED:** **5/5/2025**
POC: **CHIEF, COST ENGINEERING, Drew Collins**

This Estimate reflects the scope and schedule in report; Hausgen Island PIR Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2026									
						Effective Price Level Date: 1 OCT 25									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-24** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$1,788	$644	36.0%	$2,432	2.6%	$1,835	$660	$2,495	$0	$2,495	4.6%	$1,919	$691	$2,610
	CONSTRUCTION ESTIMATE TOTALS:	$1,788	$644		$2,432	2.6%	$1,835	$660	$2,495	$0	$2,495	4.6%	$1,919	$691	$2,610
30	PLANNING, ENGINEERING & DESIGN	$268	$67	25.0%	$335	3.2%	$277	$69	$346	$0	$346	2.5%	$284	$71	$355
31	CONSTRUCTION MANAGEMENT	$179	$57	32.0%	$236	3.2%	$185	$59	$244	$0	$244	5.5%	$195	$62	$257
	PROJECT COST TOTALS:	$2,235	$768	34.0%	$3,003		$2,296	$789	**$3,085**	$0	**$3,085**	4.4%	$2,398	$824	$3,222

_____ **CHIEF, COST ENGINEERING, Drew Collins**

_____ **PROJECT MANAGER, Shane Simmons**

_____ **CHIEF, REAL ESTATE, Jennifer Wils**

_____ **CHIEF, PLANNING, Elisa Royce**

_____ **CHIEF, ENGINEERING, Susan Wilson**

_____ **CHIEF, OPERATIONS, Lou Dell'Orco**

_____ **CHIEF, CONSTRUCTION, Tony Jones**

_____ **CHIEF, CONTRACTING, Aaron Sanford**

_____ **CHIEF, PM-PB, xxxx**

_____ **CHIEF, DPM, John Peukert**

ESTIMATED TOTAL PROJECT COST: **$3,222**

NESP FEASIBILITY STUDY COST: **$700**

ESTIMATED FEDERAL COST OF PROJECT: **$3,922**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: NESP Hausgen Island
LOCATION: Lincoln County, Missouri
This Estimate reflects the scope and schedule in report; Hausgen Island PIR Report

DISTRICT: St. Louis District
POC: CHIEF, COST ENGINEERING, Drew Collins

PREPARED: 5/5/2025

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 5-May-25 Effective Price Level: 1-Oct-24				Program Year (Budget EC): 2026 Effective Price Level Date: 1 OCT 25								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$1,788	$644	36.0%	$2,432	2.6%	$1,835	$660	$2,495	2027Q4	4.6%	$1,919	$691	$2,610
	CONSTRUCTION ESTIMATE TOTALS:	$1,788	$644	36.0%	**$2,432**		$1,835	$660	$2,495			$1,919	$691	$2,610
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$45	$11	25.0%	$56	3.2%	$46	$12	$58	2026Q4	2.3%	$47	$12	$59
0.5%	Planning & Environmental Compliance	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2026Q4	2.3%	$9	$2	$12
9.0%	Engineering & Design	$161	$40	25.0%	$201	3.2%	$166	$42	$208	2026Q4	2.3%	$170	$42	$212
0.5%	Reviews, ATRs, IEPRs, VE	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2026Q4	2.3%	$9	$2	$12
0.5%	Life Cycle Updates (cost, schedule, risks)	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2026Q4	2.3%	$9	$2	$12
0.5%	Contracting & Reprographics	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2026Q4	2.3%	$9	$2	$12
0.5%	Engineering During Construction	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2027Q4	5.5%	$10	$2	$12
0.5%	Planning During Construction	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2027Q4	5.5%	$10	$2	$12
0.5%	Project Operations	$9	$2	25.0%	$11	3.2%	$9	$2	$12	2026Q4	2.3%	$9	$2	$12
31	CONSTRUCTION MANAGEMENT													
7.5%	Construction Management	$134	$43	32.0%	$177	3.2%	$138	$44	$183	2027Q4	5.5%	$146	$47	$193
1.0%	Project Operation:	$18	$6	32.0%	$24	3.2%	$18	$6	$24	2027Q4	5.5%	$19	$6	$26
1.5%	Project Management	$27	$9	32.0%	$35	3.2%	$28	$9	$37	2027Q4	5.5%	$29	$9	$39
	CONTRACT COST TOTALS:	$2,235	$768		$3,003		$2,296	$789	**$3,085**			$2,398	$824	**$3,222**

Abbreviated Risk Analysis

Project (less than $40M): **NESP - Hausgen Island Recommended Plan** **Alternative: Maximum Habitat Benefit**

Project Development Stage/Alternative: **Feasibility (Recommended Plan)**

Risk Category: **Moderate Risk: Typical Project Construction Type** **Meeting Date: 5/6/2025**

Total Estimated Construction Contract Cost = $ 1,788,000

	CWWBS	Feature of Work	Contract Cost	% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -	0.00%	$ -	$ -
1	06 FISH AND WILDLIFE FACILITIES	**Mob/Demob**	$ 275,000	28.45%	$ 78,247	$ 353,247
2	06 FISH AND WILDLIFE FACILITIES	**Gradual Slope Revetment**	$ 893,000	42.07%	$ 375,720	$ 1,268,720
3	06 FISH AND WILDLIFE FACILITIES	**Hard Points**	$ 97,000	23.02%	$ 22,325	$ 119,325
4	06 FISH AND WILDLIFE FACILITIES	**Mussel Substrate**	$ 77,000	34.63%	$ 26,667	$ 103,667
5	06 FISH AND WILDLIFE FACILITIES	**Dike Notching**	$ 446,000	30.56%	$ 136,312	$ 582,312
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ 268,000	24.68%	$ 66,154	$ 334,154
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	$ 179,000	32.21%	$ 57,649	$ 236,649
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)				$ -	

Totals				
Real Estate	$ -	0.00%	$ -	$ -
Total Construction Estimate	$ 1,788,000	35.75%	$ 639,270	$ 2,427,270
Total Planning, Engineering & Design	$ 268,000	24.68%	$ 66,154	$ 334,154
Total Construction Management	$ 179,000	32.21%	$ 57,649	$ 236,649
Total Excluding Real Estate	**$ 2,235,000**	**34.14%**	**$ 763,072**	**$ 2,998,072**

NESP - Hausgen Island Recommended Plan Maximum Hab

Feasibility (Recommended Plan)
Abbreviated Risk Analysis
Meeting Date: 6-May-25

Risk Level

	Negligible	Marginal	Moderate	Significant	Critical
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Register

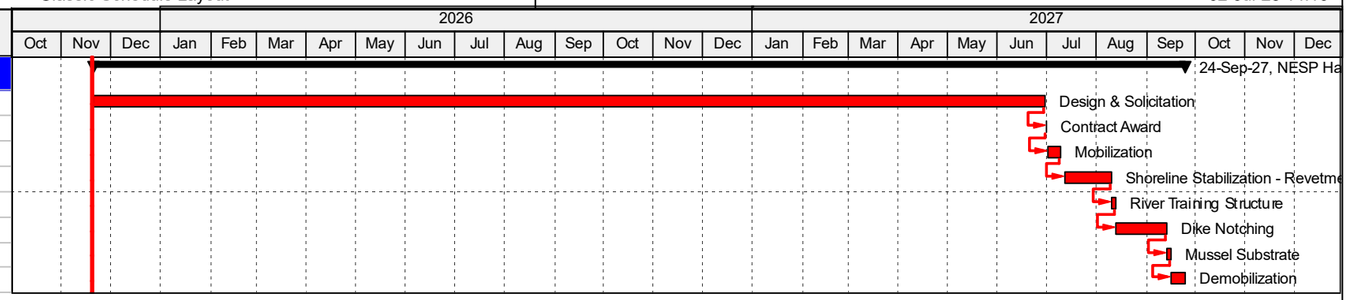
34%

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Project Management & Scope Growth				**Maximum Project Growth**		**75%**	
PS-1	Mob/Demob	Potential for scope growth, added features? Project accomplished intent?	Minimal concern for scope growth to mob/demob. No feature of work for temporary mob/demob based on water levels, so impact was increased to moderate	Moderate	Possible	2	$275k
PS-2	Gradual Slope Revetment	Potential for scope growth, added features? Project accomplished intent?	If GSR was extended to additional areas, quantities would increase. There is noticeable erosion along the bank of Hausgen Island, therefore, it is possible that the gradual slope revetment would need to be extended further than what is currently modeled. Although there could be more erosion, it does not necesarily mean that it will be captured under this project.	Significant	Possible	3	$893k
PS-3	Hard Points	No concerns.	No concerns	Negligible	Unlikely	0	$97k
PS-4	Mussel Substrate	Potential for scope growth, added features? Project accomplished intent?	Not a typical MVS construction measure. Uncertain how contractor will approach this measure. Additional requirements may be determined during design.	Moderate	Likely	3	$77k
PS-5	Dike Notching	• Potential for scope growth, added features?	Quantities could change in PED when more modeling is completed. Between feasibility and construction, site conditions could change, a structure could be eliminated or modified in order to serve other district mission requirements.	Moderate	Possible	2	$446k
PS-13	Planning, Engineering, & Design	Potential for scope growth, added features? Project accomplished intent?	Construction funding is currently uncertain. It does not appear likley that this project will receive construction funding as originally anticipated. It is not possible at this time to determine when construction funding will be received, which could delay PED. The longer PED is delayed, the higher costs will be to complete PED	Moderate	Likely	3	$268k
PS-14	Construction Management	Potential for scope growth, added features? Project accomplished intent?	Construction funding is currently uncertain. It does not appear likley that this project will receive construction funding as originally anticipated. It is not possible at this time to determine when construction funding will be received, which could delay CM. The longer CM is delayed, the higher costs will be to complete CM	Moderate	Likely	3	$179k
Acquisition Strategy				**Maximum Project Growth**		**30%**	
AS-1	Mob/Demob	Contracting plan firmly established? Limited bid competition anticipated?	In the feasibility phase the contracting plan has not been established.	Marginal	Likely	2	$275k
AS-2	Gradual Slope Revetment	Contracting plan firmly established? Limited bid competition anticipated?	In the feasibility phase the contracting plan has not been established.	Marginal	Likely	2	$893k
AS-3	Hard Points	Contracting plan firmly established? Limited bid competition anticipated?	In the feasibility phase the contracting plan has not been established.	Marginal	Likely	2	$97k
AS-4	Mussel Substrate	Contracting plan firmly established? Limited bid competition anticipated?	In the feasibility phase the contracting plan has not been established.	Marginal	Likely	2	$77k
AS-5	Dike Notching	Contracting plan firmly established? Limited bid competition anticipated?	In the feasibility phase the contracting plan has not been established.	Marginal	Likely	2	$446k

AS-13	Planning, Engineering, & Design	Contracting plan firmly established? Limited bid competition anticipated?	No concern that the acquisition strategy will affect the planning, engineering, and design.	Negligible	Unlikely	0	$268k
AS-14	Construction Management	Contracting plan firmly established? Limited bid competition anticipated?	In the feasibility phase the contracting plan has not been established.	Marginal	Likely	2	$179k
Construction Elements				**Maximum Project Growth**		**25%**	
CE-1	Mob/Demob	Accelerated schedule or harsh weather schedule?	The contractor may need to wait to water levels reach a certain height prior to mobbing equipment in via bage.	Marginal	Likely	2	$275k
CE-2	Gradual Slope Revetment	Accelerated schedule or harsh weather schedule?	Schedule constraints. Will be difficult to perfrom in low water.	Marginal	Likely	2	$893k
CE-3	Hard Points	Accelerated schedule or harsh weather schedule?	Schedule constraints. Will be difficult to perfrom in low water.	Marginal	Likely	2	$97k
CE-4	Mussel Substrate	Unique construction methods?	Not a typical MVS construction measure. Uncertain how contractor will approach this measure. Quantity of rock unlikely to change, but difficult to estimate time to place rock .	Marginal	Possible	1	$77k
CE-5	Dike Notching	High risk or complex construction elements, site access, in-water?	Flood/river level may impact the available times to do the work. Most work can only be done during higher water months	Moderate	Possible	2	$446k
CE-13	Planning, Engineering, & Design		No concern that the construction elements will affect the planning, engineering, and design.	Negligible	Unlikely	0	$268k
CE-14	Construction Management		Flood/river level will impact construction. Assumed to be shallow draft worksites. Threatened & endangered species may also impact the construction schedule.	Marginal	Likely	2	$179k
Specialty Construction or Fabrication				**Maximum Project Growth**		**65%**	
SC-1	Mob/Demob		Not applicable for this project.	Negligible	Unlikely	0	$275k
SC-2	Gradual Slope Revetment		Not applicable for this project.	Negligible	Unlikely	0	$893k
SC-3	Hard Points		Not applicable for this project.	Negligible	Unlikely	0	$97k
SC-4	Mussel Substrate		Not applicable for this project.	Negligible	Unlikely	0	$77k
SC-5	Dike Notching		Not applicable for this project.	Negligible	Unlikely	0	$446k
SC-13	Planning, Engineering, & Design		Not applicable for this project.	Negligible	Unlikely	0	$268k
SC-14	Construction Management		Not applicable for this project.	Negligible	Unlikely	0	$179k
Technical Design & Quantities				**Maximum Project Growth**		**30%**	
T-1	Mob/Demob	Level of confidence based on design and assumptions?	A project specific crew will need to be developed for this feature. Temporary mob/demobs may be needed to capture different construction seasons.	Moderate	Possible	2	$275k
T-2	Gradual Slope Revetment	Level of confidence based on design and assumptions?	Terrain data collection over a span of years may not accurately reflect current conditions of the bankline and land. The methodologies of construction may not match design methods/assumptions.	Significant	Possible	3	$893k
T-3	Hard Points	Possibility for increased quantities due to loss, waste or subsidence?	Concern based on typical construction waste and current river bathymetric conditions.	Marginal	Possible	1	$97k
T-4	Mussel Substrate	Level of confidence based on design and assumptions?	Rock quantity has been modeled and there is a marginal risk of the quanity increasing.	Marginal	Possible	1	$77k
T-5	Dike Notching	Level of confidence based on design and assumptions?	More in depth design is necessary to determine if the quanitity of stone is accurate.	Moderate	Possible	2	$446k

T-13	Planning, Engineering, & Design	Possibility for increased quantities due to loss, waste or subsidence?	The PED of this project may change based on the quantities developed for this project.	Marginal	Possible	1	$268k
T-14	Construction Management	Possibility for increased quantities due to loss, waste or subsidence?	The CM of this project may change based on the quantities developed for this project.	Marginal	Possible	1	$179k
Cost Estimate Assumptions				**Maximum Project Growth**		**35%**	
EST-1	Mob/Demob	Assumptions reagrding crew, productivity, overtime? Site accessibility, transport delays, congestion?	A project specific crew was developed for river work projects. Minimal concern for large cost growth here.	Moderate	Unlikely	1	$275k
EST-2	Gradual Slope Revetment	Assumptions reagrding crew, productivity, overtime? Site accessibility, transport delays, congestion?	Estimate received a quote for rirpap delviery and hauling via barge. Hauling time could be increased if all hauling is done if the amount of material barge crew moves is less than the government estimate.	Moderate	Possible	2	$893k
EST-3	Hard Points	Assumptions reagrding crew, productivity, overtime? Site accessibility, transport delays, congestion?	Estimate has site specific crews built for river training structures based off MVS IDIQ dike & revetment production rates. Estimate has a quote for stone and hauling included via barge from the quarry to the jobsite.	Moderate	Possible	2	$97k
EST-4	Mussel Substrate	Assumptions reagrding crew, productivity, overtime? Site accessibility, transport delays, congestion?	Estimate received a quote for 2200 lb riprap that will be hauled to the site via barge. However, this type of rock placement is different than typical MVS riprap projects and the entire gradation does not need to be 2200 lb riprap. A specification on placement of riprap for mussel riffles is currently being written. There is a moderate risk that the production rate will be much slower than the historical average for riprap placement projects.	Moderate	Possible	2	$77k
EST-5	Dike Notching	Assumptions reagrding crew, productivity, overtime? Site accessibility, transport delays, congestion?	It is assumed that all rock will be notched from existing dike's and dragged to different locations in the project area nearby the notch location. If material needs to be loaded on to a barge and taken elsewhere, costs will be increased	Moderate	Possible	2	$446k
EST-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0	$268k
EST-14	Construction Management	No concerns.		Negligible	Unlikely	0	$179k
External Project Risks				**Maximum Project Growth**		**40%**	
EX-1	Mob/Demob	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	Adversse weather could effect the contract duration impacting the overall cost of construction. Escalation of material costs and labor rates would increase overall costs. There is also the continued risk of inflation/labor shortages.	Moderate	Possible	2	$275k
EX-2	Gradual Slope Revetment	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	Adversse weather could effect the contract duration impacting the overall cost of construction. Escalation of material costs and labor rates would increase overall costs. There is also the continued risk of inflation/labor shortages.	Moderate	Possible	2	$893k
EX-3	Hard Points	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	Adversse weather could effect the contract duration impacting the overall cost of construction. Escalation of material costs and labor rates would increase overall costs. There is also the continued risk of inflation/labor shortages.	Moderate	Possible	2	$97k
EX-4	Mussel Substrate	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	Adversse weather could effect the contract duration impacting the overall cost of construction. Escalation of material costs and labor rates would increase overall costs. There is also the continued risk of inflation/labor shortages.	Moderate	Possible	2	$77k
EX-5	Dike Notching	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	Adversse weather could effect the contract duration impacting the overall cost of construction. Escalation of material costs and labor rates would increase overall costs. There is also the continued risk of inflation/labor shortages.	Moderate	Possible	2	$446k
EX-13	Planning, Engineering, & Design	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	If archaelogical surveys reveal sensitive area then design will have to work around cultural area. The impact will be moderate but chance is unlikely.	Moderate	Possible	2	$268k
EX-14	Construction Management	Potential for Severe Adverese Weather? Potential for market volatility impacting competition, pricing?	Adversse weather could effect the contract duration impacting the overall cost of construction. Escalation of material costs and labor rates would increase overall costs. There is also the continued risk of inflation/labor shortages.	Moderate	Possible	2	$179k

#	Activity ID	Activity Name	Original Duration	Start	Finish
1	NESP Hausgen NESP Hausgen Island		4757	20-Nov-25	24-Sep-27
2	A0900	Design & Solicitation	4200	20-Nov-25	30-Jun-27
3	A1000	Contract Award	10	01-Jul-27	01-Jul-27
4	A1005	Mobilization	50	02-Jul-27	09-Jul-27
5	A1010	Shoreline Stabilization - Revetment	202	12-Jul-27	10-Aug-27
6	A1020	River Training Structure	20	10-Aug-27	13-Aug-27
7	A1030	Dike Notching	205	13-Aug-27	13-Sep-27
8	A1040	Mussel Substrate	20	13-Sep-27	16-Sep-27
9	A1050	Demobilization	50	16-Sep-27	24-Sep-27



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NESP Hausgen Island

Minimum Habitat Benefit (Alternative 1) 11/6/2024

**Excludes Real Estate & Mitigation Costs

ITEM	ESTIMATED AMOUNT	
Mobilization and Demobilization	$250,000	
Gradual Slope Revetment	$1,090,000	
Mussel Substrate		
R650 Riprap	$80,000	
SUBTOTAL:	$1,420,000	
Contingency:	$497,000	35%
SUBTOTAL:	$1,917,000	
E & D	$288,000	15%
S & A	$192,000	10%
MAM	$58,000	3%
TOTAL COST:	**$2,455,000**	

NESP Hausgen Island

Maximum Habitat Benefit (Alternative 2) 11/6/2024

**Excludes Real Estate & Mitigation Costs

ITEM	ESTIMATED AMOUNT	
Mobilization and Demobilization	$250,000	
Gradual Slope Revetment	$1,090,000	
River Training Structures		
R400 Riprap	$150,000	
Dike Notching	$330,000	
Mussel Substrate		
R650 Riprap	$80,000	
SUBTOTAL:	$1,900,000	
Contingency:	$665,000	35%
SUBTOTAL:	$2,565,000	
E & D	$385,000	15%
S & A	$257,000	10%
MAM	$77,000	3%
TOTAL COST:	**$3,284,000**	

Pool 25 - Hausgen Island Complex - Resiliency - NESP Program

ECB 2018-14 Analysis of Potential Vulnerabilities

This assessment is performed to highlight existing and future challenges facing the study area due to changing conditions and is conducted in accordance with United States Army Corps of Engineers' (USACE) Engineering Construction Bulletin (ECB) 2018-14, revised 19 August 2022. In accordance with ECB 2018-14, this evaluation identifies potential vulnerabilities for the Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project. The project area is located between Mississippi River miles (RM) 248 and 245 on the right descending bank in the southernmost portion of Pool 25 near Foley, Missouri. This assessment highlights risks driven by existing and future trends in weather variability for the study area. Study background information can be found in the main report, and more general background information on changing environmental conditions driven risk can be found in ECB 2018-14.

Study Background

The Pool 25 Hausgen Island Complex Channel Restoration Ecosystem Restoration Project objectives include to restore side channel connectivity and flow to benefit native riverine fish and wildlife; and improve side channel habitat, including substrate stability, to benefit native freshwater mussels.

The river ecosystem within Pool 25 has been significantly affected by impoundment of the pool and the permanently higher water tables maintained by Lock and Dam (L&D) 25. Geomorphic features, such as sandbar accretion and backwater deposition, are forming in the project area as sediment from the river deposits; however, pool impoundment, high water levels, and flow diversity prevent the exposure of these evolving features. Side channels are important aquatic habitat for many native species including Upper Mississippi River (UMR) riverine fishes and freshwater mussels. Historically, the study area had freshwater mussel beds, but these beds have been impacted through time due to degraded side channel conditions (e.g., increased siltation, sediment homogenization). Sediment deposition, and high turbidity degrade the backwaters adjacent to these channels. Restoring side channels to promote freshwater mussel habitat has been identified as a resource need within the Lower Impounded Reach of the Mississippi River.

Ecosystem restoration is the focus of this analysis because the proposed project seeks to restore side channel habitat within the Hausgen Island Complex. Future hydrological and meteorological conditions may impact the establishment and design of project features. As indicated by the U.S Geological Survey (USGS) in their 2022 report, *Ecological Status and Trends of the Upper Mississippi and Illinois Rivers*, hydrologic indicator variables most relevant to the ecological health of a watershed are defined as annual discharge (maximum, mean, and minimum), duration of high discharges (exceeding the 20% annual exceedance probability (AEP) discharge), and monthly mean discharge. Thus, to analyze the effects of changing weather conditions on ecosystem restoration features for this study, the annual average streamflow records are evaluated since they are representative of flows impacting project features throughout the year.

Literature Review

The *Fifth National Climate Assessment* (NCA5) and the USACE *Civil Works Technical Report CWTS-2015-13,* as well as state and watershed specific resources published by the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI), and the Missouri Department of Natural Resources (MODNR) are the basis for this literature review. The focus of

these references is on summarizing trends in historic, observed temperature, precipitation, and streamflow records, as well providing an indication of future, changed hydrology based on the outputs from Coupled Model Intercomparison Project Phase 5 (CMIP5) meteorological models. For this assessment, background on observed and projected temperature and precipitation is provided as context for the impact that they have on observed and projected streamflow.

The NCA5 considers hydrological and meteorological research at both a national and regional scale (USGCRP, 2023). *Civil Works Technical Report CWTS-2015-13* was published as part of a series of regional summary reports covering peer-reviewed climate literature. The 2015 USACE Technical Reports cover 2-digit, United States Geological Survey (USGS), hydrologic unit code (HUC) watersheds in the United States (U.S). Hausgen Island Complex is located in 2-digit HUC 07, the Upper Mississippi Region (USACE, 2015) and in the NCA5 Midwest climate region.

In many areas, temperature, precipitation, and streamflow have been measured since the late 1800s and provide insight into how the hydrology in the study area has changed over the past century. CMIP5 are used in combination with different representative concentration pathways (RCPs) reflecting projected radiative forcings up to year 2100 to model future changing conditions. Radiative forcings encompass the change in net radiative flux due to external drivers of long term weather variability, such as, for example changes in carbon dioxide or land use/land cover. Projected temperature and precipitation results can be transformed to regional and local scales (a process called downscaling) for use as inputs in precipitation-runoff models (Graham, Andreasson, and Carlsson, 2007). Uncertainty is inherent to projections of temperature and precipitation due to the CMIP5, RCPs, downscaling methods, and many assumptions needed to create projections (USGCRP, 2017). When applied, precipitation-runoff models introduce an additional layer of uncertainty. However, these methods represent the best available science to predict future hydrologic variables (e.g. precipitation, temperature, streamflow). Many researchers use multiple CMIP5s and RCPs in their studies to understand how various model assumptions impact results (Gleckler et al., 2008).

Temperature. Based on observed temperature records, the annual, average air temperature between 1986 and 2016 for the Midwest has increased by 1.26°F from the 1901-1960 annual average temperature (USGCRP, 2017). Increasing temperatures can accelerate snowmelt and lengthen the frost-free season (Carelton and Hsiang, 2019; Liu, Goodrick, and Stanturf, 2013; Woodward, Perkins, and Brown, 2010). Many studies indicate a change in the seasonality in the region, marked by increasing winter temperatures and early spring melt (Schwartz, Ault, and Betancourt, 2013; Wang et al., 2009; Wolter et al., 2015; Westby, Lee, and Black, 2013). GCM based, projections of temperature for the Midwest show a statistically significant increase in both annual, average temperature and the number extreme heat days over the next century (Vavrus and Behnke, 2014).

Missouri's location in the interior of North America and the lack of mountain barriers to the north and south expose the state to incursions of cold arctic air masses in the winter and warm, moist air masses from the Gulf of Mexico in the summer. Annual average temperatures across the state vary by about 10°F from north to south. The hottest year on record was 2012, with an annual average temperature of 58.5°F, which is 3.9°F higher than the long-term (1895–2020) average (NOAA, 2022).

Since the beginning of the 20th century, temperatures in Missouri have risen almost 1°F (NOAA 2022), and temperatures in the 2000s have been higher than in any other historical period with the exception of comparable temperatures in the early 1930s Dust Bowl era. This warming has been concentrated in the winter and spring. Summer temperatures have recently been slightly above the long-term average

but below levels experienced during the 1930s, a feature characteristic of much of the Midwest. Due to extreme drought and poor land management practices, the summers of the 1930s remain the warmest on record. Recent summer temperatures have been characterized by much higher nighttime minimum temperatures (slightly above Dust Bowl levels), while daytime maximum temperatures have been near the long-term average. The state has also experienced a below average number of extremely hot days. In addition to the overall trend of higher average temperatures, the state has seen an above average number of very warm nights. At St. Louis Lambert International Airport, the number of very warm nights has increased from 13 per year during 1961–1990 to 20 per year during 1991–2020 (NOAA 2022). There is also an upward trend in summer humidity since the mid-20th century. The winter warming trend is reflected in a below average number of very cold nights since 1990.

Precipitation. Average, annual precipitation in the Midwest has increased by 5% to 15% from the first half of the last century (1901–1960) as compared to present day (1986–2015). The amount of rain falling in extreme rain events (1% AEP storm events), has increased by 42% from 1958 to 2016 (USGCRP, 2018). According to the NCA4, GCM based projections indicate that winter and spring precipitation in the Midwest could increase by up to 30% by the end of the century. Precipitation increases of 10-15% are projected in winter and spring for 2-digit HUC 07 from 2070–2099 relative to 1986–2015. However, in the summer and fall, projected precipitation amounts are not expected to change significantly. A northward shift in the rain–snow transition zone in the central and eastern United States is projected by end of the 21st century causing large areas that are currently snow dominated in the cold season to be rainfall dominated (USGCRP, 2017; Ning and Bradley, 2015).

Annual average precipitation varies widely across the state of Missouri, from a low of 35 inches in the northwest to a high of 55 inches in the southeast. The northern part of the state receives more snowfall, with an annual average of more than 20 inches compared to less than 5 inches in the south. Statewide, total annual precipitation has ranged from a low of 25.1 inches in 1953 to a high of 57.1 inches in 1973. The driest consecutive 5-year interval was 1952–1956, and the wettest was 2007–2011. Summer precipitation exhibits no overall trend. For large portions of the state, more than 40% of the total annual precipitation occurs on the 10 wettest days of the year (NOAA, 2022).

Because agriculture is an important sector of Missouri's economy, the state is particularly vulnerable to extreme precipitation conditions. Both floods and droughts can result in billions of dollars in losses. In 2012, a severe drought across the Midwest had large impacts on Missouri. Rainfall for the critical growth period of May–July totaled only 5.8 inches, several inches below average, resulting in the third-driest growth period (after 1901 and 1936) in 126 years of record keeping. The drought was the worst Missouri had seen in 30 years. By the end of July, all 114 counties had been declared disaster areas (NOAA, 2022).

Missouri has experienced a dramatic increase in the number of 2-inch extreme precipitation events, which can cause severe flooding. In the summer of 1993, persistent heavy rainfall over the upper Midwest caused severe flooding along the Mississippi River. The 1993 flood was one of the greatest natural disasters in U.S. history, causing billions of dollars in damages to homes, businesses, agriculture, and infrastructure.

Although projections of overall annual precipitation are uncertain, winter and spring precipitation is projected to increase, while summer precipitation may decrease. The intensity of droughts is projected to increase. Even if precipitation increases in the future, rising temperatures will increase evaporation rates, resulting in more rapid loss of soil moisture. Thus, future summer droughts, a natural part of Missouri's climate, are likely to become more intense.

Streamflow. Observed streamflow trends are strongly influenced by precipitation, temperature, and other factors such as land use and land cover in a region, groundwater dynamics, drainage patterns, channel geomorphology, and regulation. In the Upper Mississippi Region (2-digit HUC 07), multiple studies have identified increasing trends in the observed, annual, average streamflow (Novotny and Stefan, 2007; Mauget, 2004; Small, Islam, and Vogel, 2006) and in the observed, annual, mean/median baseflow (Juckem et al., 2008; Xu et al., 2013). Seasonally, studies have reported increasing annual, minimum, 7-day, low flows in the fall (Small, Islam, and Vogel, 2006) and annual, average, 7-day, low flows in the fall and winter (Novotny and Stefan, 2007). Some studies have found that annual peaks are increasing in the spring and summer (Novotny and Stefan, 2007).

The 2020, USACE *Mississippi River Geomorphology and Potamology* (MRG&P) *Study* also indicates that annual water yield, annual maximum daily water yield, and annual maximum 7-day water yield are increasing throughout the Upper Mississippi River Basin (USACE, 2020). Water yield represents discharge per unit of watershed area. For the 2020 USGS study, water yield was normalized by total annual precipitation to differentiate between the influence of altered precipitation versus other drivers of change in hydrologic response. Evaluations of precipitation-normalized water yield indicate that changes to water management and land use/cover in the Upper Mississippi River Basin are exacerbating increases in water yield (Simon et al., 2020). There is little to no consensus in the literature regarding changes in projected streamflow in the Upper Mississippi Region.

Ecosystem Health. Based on a 2022 report generated by the USGS, the following variables are critical to ecosystem health and have changed overtime: annual discharge (maximum, mean, and minimum), duration of high discharges (exceeding the 20% AEP discharge), and monthly mean discharge. Results from the 2022 USGS report indicate that mean and minimum annual discharges are increasing at the USGS gages at Winona, Minnesota (05378500) and Keokuk, Iowa (05474500). The duration of high discharges has also increased from 1940 to 2019 for all gages analyzed. Significant increases in annual maximum discharges were detected for the Keokuk, Iowa (05474500) and Valley City, Illinois (05586100) USGS gages. Based on an analysis of monthly, mean discharges, large increases in May mean discharges were identified for all three Mississippi River gages analyzed. There is some evidence that the maximum in monthly, mean discharge for a given year has shifted from occurring in April to either May or June.

Water quality analysis presented in the 2022 USGS report indicates that total suspended sediment (TSS) concentrations associated with mean discharges have decreased long-term in many reaches and tributaries of the Upper Mississippi River. The most significant changes have been observed in L&D pools 4 and 8. Phosphorus loads in all the L&D pools analyzed (pools 4, 8, 13, and 26) on the Upper Mississippi River have also decreased long-term. Although there are no long-term, significant trends in dissolved oxygen (DO) for the portions of the Upper Mississippi River assessed, low DO in backwater areas has been observed more frequently in the summer than in winter.

The concentration of submersed aquatic vegetation (SAV) is considered the primary indicator of aquatic vegetative health in the Upper Mississippi River. High prevalence of SAV (generally >50-percent) indicates quality habitat for waterfowl. Aquatic vegetation analysis identified trends in SAV in L&D pools 4, 8, and 13. The prevalence of SAV in L&D pools 4 and 8 increased by 30% from 2002 to 2010. Since 2010, SAV concentrations at these two locations have plateaued. The prevalence of SAV in L&D 13 ‘s pool increased from 1998 to 2008. Since 2009, SAV concentrations have been decreasing in L&D 13’s pool. Additionally, since 2000, increases in aquatic plant species diversity have been observed in L&D pools 4 and 8. In the L&D 8 and 13’s pools, a positive trend in emergent vegetation has been recorded.

Emergent vegetation provides habitat for aquatic species. No trends in aquatic vegetation were found within the lower portion of the Upper Mississippi River (L&D Pool 26).

Summary. Within the literature reviewed, there is evidence that temperature, precipitation, and streamflow have increased over the observed period of record within the Upper Mississippi Watershed. Trends in water quality within the Upper Mississippi Watershed indicate decreases in total phosphorus and total suspended solids. Aquatic vegetation analysis indicates increases in SAV in L&D pools 4, 8, and 13 in early 2000s through 2010. SAV concentrations have plateaued through 2019. Projections of future hydrological and meteorological conditions show strong consensus on increases in future temperature, and moderate consensus on increases in future precipitation. There is little to no consensus related to trends in future streamflow. Figure 1 from the 2015 USACE *Civil Works Technical Report CWTS-2015-13* provides a visual summary of the trends in observed and projected hydrometeorological variables for 2-digit HUC 07, the Upper Mississippi Region.

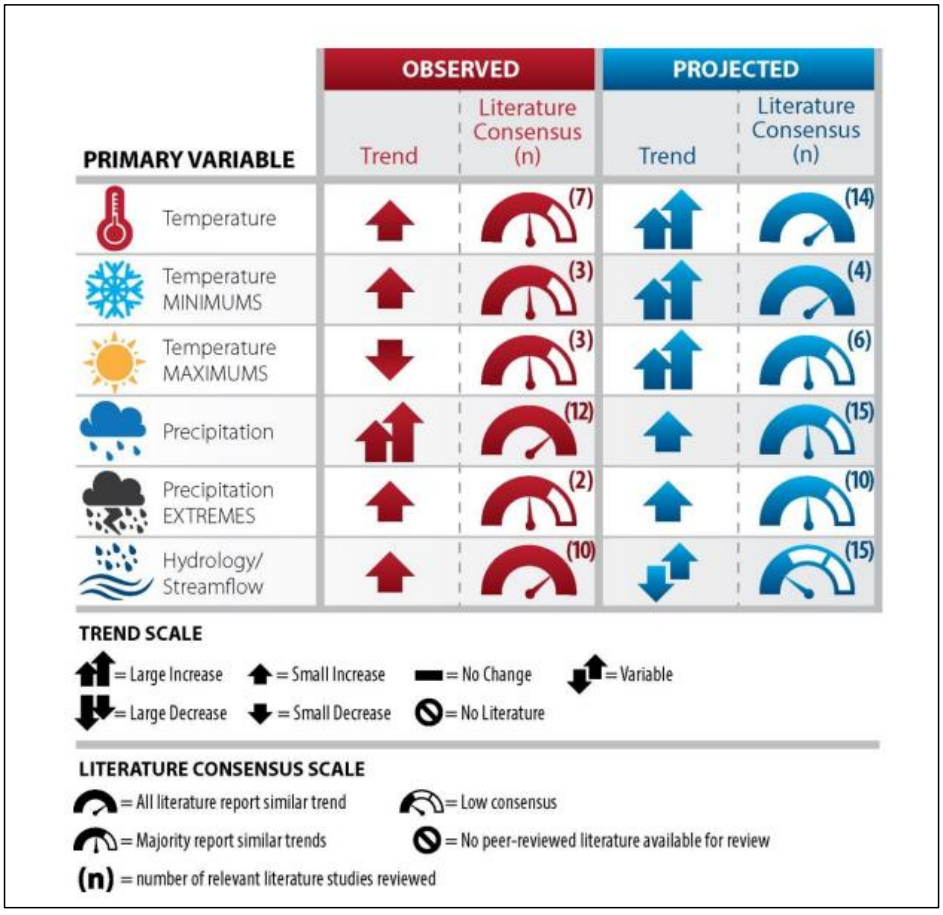


Figure 1. Summary matrix of UMR (HUC 07) observed and projected trends (USACE, 2015)

Nonstationarity Detection and Trend Analysis

The assumption that hydrologic timeseries are stationary (their statistical characteristics are unchanging) in time underlies many traditional hydrologic analyses. Statistical tests can be used to test this assumption using the techniques outlined in USACE Engineering Technical Letter (ETL) 1100-2-3, *Guidance for Detection of Nonstationarities* (2017). The USACE Time Series Toolbox (TST) tool is a web-based tool that performs the statistical tests described in the guidance. Average, annual streamflow is analyzed for the Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project because project features are vulnerable to damage from flows during the first few years of establishing habitat. In the long-term, project feature elevations need to be designed so that they can withstand future conditions. More frequent siltation of project features can have adverse effects on overwintering habitats.

Observed, average, annual discharge for the L&D 24 tailwater (TW) is aggregated from the mean daily flow values computed by USACE from observed, mean daily, stage measurements. Because the streamflow record analyzed has been generated based on a flow-stage rating curve, the quality of the data was verified using observed, USACE streamflow records recorded at locations upstream and downstream between L&D 24 TW and L&D 25 upper pool. If unverified, changes in the flow-stage rating curve applied can introduce a source of nonstationarity and/or uncertainty into the streamflow record. This should be taken into consideration when interpreting the results of trend and nonstationarity analysis. Based on this evaluation no discrepancies were found the L&D 24 TW streamflow record.

The USACE L&D 24 gage captures 140,700 square miles of drainage area and is influenced by regulation from the L&D 25 on the Mississippi River. The L&Ds were constructed and placed into operation in 1940. The general objective of the L&Ds 24 and 25 is to maintain the authorized, nine-foot, navigation channel. The L&Ds maintain the minimum storage of water required for navigation at all times and any additional water volume is outflowed. Consequently, operation of the L&Ds does not have a significant impact on annual, average streamflow. The TST tool is applied to detect nonstationarities and trends for the period of record from 1960 to 2023.

As shown in *Figure* 2, the average flow record observed at L&D 24 has little evidence of a nonstationarity. A strong nonstationarity is one that demonstrates a degree of consensus, robustness and a significant increase or decrease in the sample mean and/or variance. While a small change in distribution, mean, and variance can be observed in the data the data does not change significantly. There was no potential breakpoint identified and the p-values do not meet significance requirements for consideration. Linear and monotonic trends are evaluated using the t-test, Mann-Kendall and Spearman Rank Order tests. The significance of trends is evaluated using a 0.05 level of significance threshold (p-value<0.05 is considered statistically significant). Trend analysis indicates a statistically significant, positive trend for the 1960-2023 period of record by the t-Test (p-value= 0.082396), Mann-Kendall test(p-value=0.1247), and Spearman Rank-Order (p-value=0.10953) test, see trendline in Figure 3. There is no statistically significant trend in the data recorded between 1960-2023.

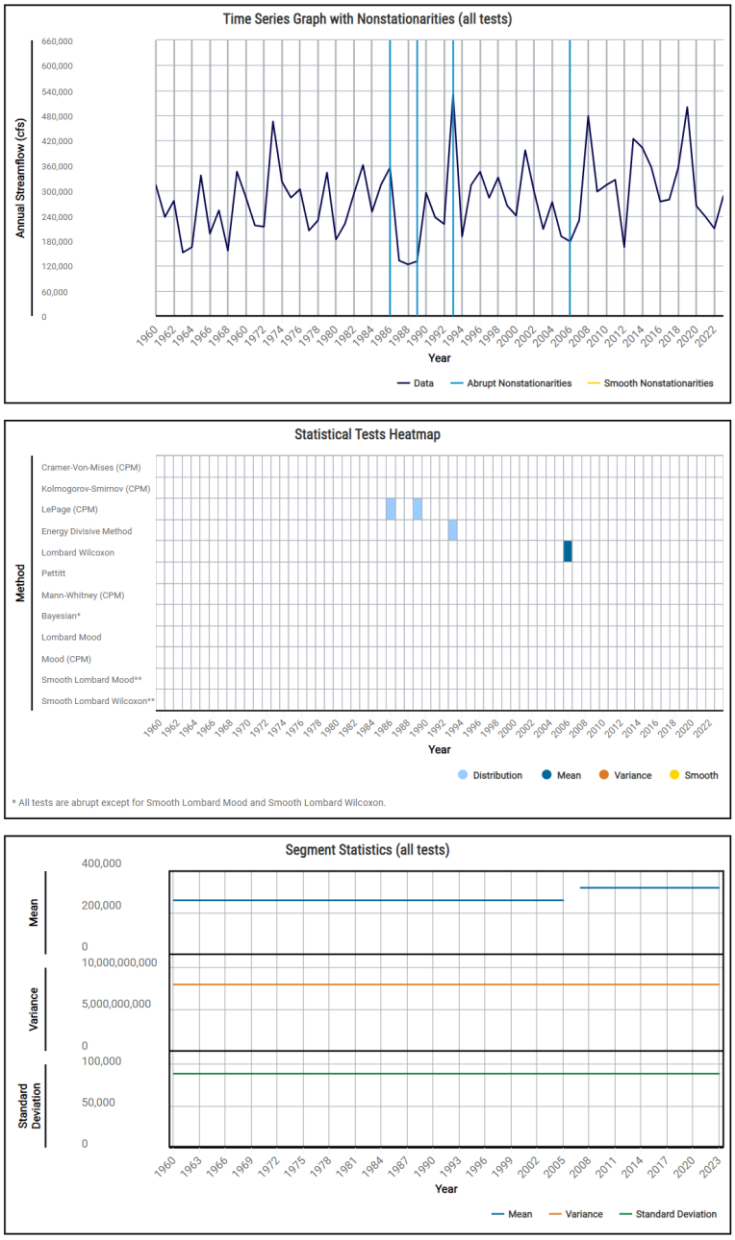


Figure 2. Time Series Toolbox Output for Annual Streamflow for L&D 24.

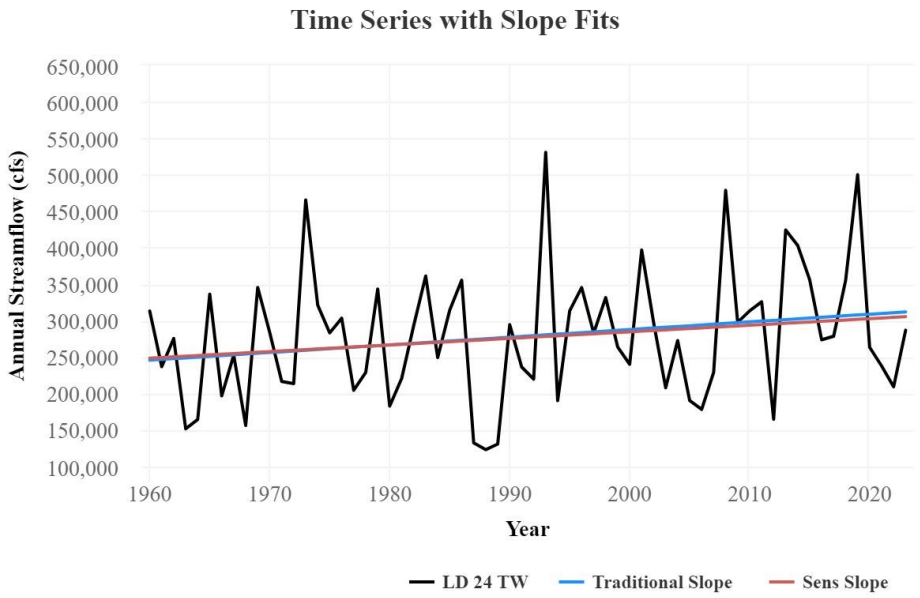


Figure 3. Trend Analysis for Annual Streamflow for L&D 24.

Climate Hydrology Assessment Tool (CHAT)

The USACE Climate Hydrology Assessment Tool (CHAT) displays various simulated, historic and future streamflow, temperature, and precipitation outputs derived from 32 GCMs. The CHAT uses Coupled Model Intercomparison Project Phase 5 (CMIP5) GCM meteorological data outputs that have been statistically downscaled using the Localized Constructed Analogs (LOCA) method. CMIP5s rely on scenarios representing different pathways to a given atmospheric concentration of greenhouse gas emissions (GHG) referred to as representative concentration pathways (RCPs). RCPs describe the change in radiative forcing at the end of this century, as compared with pre-industrial conditions. Projected hydroclimate data in the CHAT for 2006 to 2099 are produced using two future scenarios: RCP 4.5 (where greenhouse gas emissions stabilize by the end of the century) and RCP 8.5 (where greenhouse gas emissions continue to increase throughout the century). Simulated output representing the historic period of 1951 to 2005 is generated using a reconstitution of historic GHG emissions.

To analyze runoff, LOCA-downscaled GCM outputs are used to force an unregulated, Variable Infiltration Capacity (VIC) hydrologic model. Areal runoff from VIC is then routed through a stream network using MizuRoute. Outputs represent the daily in-channel, routed streamflow for each stream segment – valid at the stream segment endpoint. Since the runoff is routed, the streamflow value associated with each stream segment is a representation of the cumulative flow, including all upstream runoff, as well as the local runoff contributions to that specific segment. Within the CHAT, streamflow output can be selected by stream segment and precipitation/temperature output can be selected for a given 8-digit HUC watershed.

Hausgen Island Complex is in 4-digit HUC 0711 (Upper Mississippi-Salt). The 8-digit HUC of interest specific to the study area is The Sny watershed (HUC07110004). Mississippi River stream segment 07000604 transects the study area. Figure 4 and Figure 5 show the range of the modeled, annual-mean 1-day streamflow and annual-maximum 1-day temperature output presented for the historic period (1951-2005) and the future period (2006-2099). The annual-mean 1-day streamflow is analyzed for this assessment to investigate if and how potential, future streamflow conditions will change. Maximum-annual 1-day temperature is analyzed for this assessment as a proxy for water temperature. Warmer water holds less dissolved oxygen (DO) which affects the survival of aquatic life (USGS 2018). The range of data is indicative of the uncertainty associated with projected streamflow and temperature.

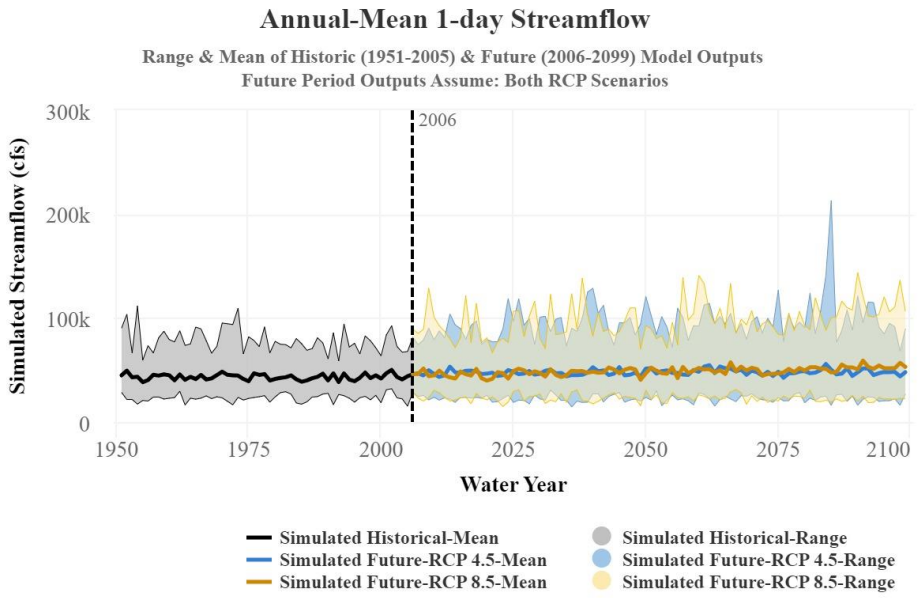


Figure 4. Range of Annual-Mean 1 day Streamflow Model Output for The Sny watershed (HUC07110004) Stream Segment: 07000604

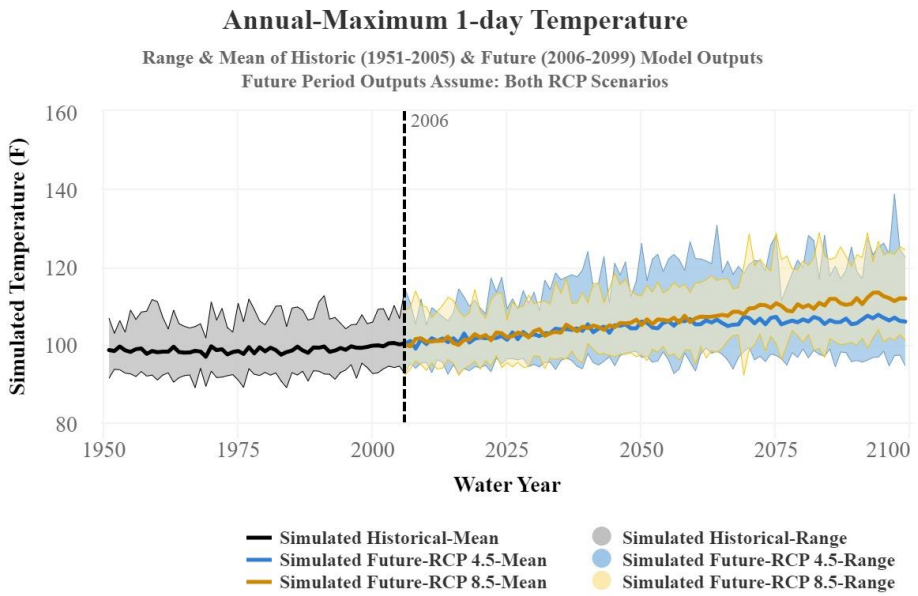


Figure 5. Range of Annual Maximum Temperature Model Output for The Sny watershed (HUC07110004)

For The Sny watershed (HUC07110004) trends are evaluated using the t-Test, Mann-Kendall and Spearman Rank-Order tests. All three statistical tests are applied using a 0.05 level of significance (p-values < 0.05 are considered statistically significant). As displayed in Figure 6, the directionally and magnitude of change in statistically significant trends in annual-mean streamflow are evaluated using the slope of the fitted linear regression relationship. The results of the three statistical tests and the slopes associated with identified, statistically significant trends are presented in Table 1. The mean of the 32 projections of simulated, annual-mean streamflow for the future period (2006-2099) shows a statistically significant, positive trend for The Sny watershed (HUC07110004) Stream Segment-07000604 when RCP 8.5 is assumed. The trendline has a slope of 79.8 cfs a year, which equates to a 3,990 cfs change in the average annual- mean streamflow over a 50-year period. When the CHAT is used to evaluate the change in Epoch-Mean of simulated annual-mean streamflow for RCP 8.5, it is found that the median change from the base Epoch (1950-2005) to the mid-century epoch (2035-2064) is 11.2%. By the end-century epoch (2070-2099) the change relative to the base period is 15.8%. There is no statistically significant trend in simulated, historic flows (1951-2005) or annual-mean streamflow for the future period (2006-2099) when RCP 4.5 is assumed.

Table 1. Trend Analysis of Average Model Output: Annual – Mean Streamflow The Sny watershed (HUC07110004) Stream Segment: 07000604

Trend Analysis	Historic (1951-2005)	Future (2006-2099)		Historic (1951-2005)			Future (2006-2099)					
		RCP 4.5	RCP 8.5				RCP 4.5			RCP 8.5		
	p-values			Statistically Significant? (<0.05)	Slope (cfs/year)	Direction	Statistically Significant? (<0.05)	Slope (cfs/year)	Direction	Statistically Significant? (<0.05)	Slope (cfs/year)	Direction
t-Test	0.853	0.183	8.62×10^{-10}	No	-4.5975	↓	No	13.691	↑	Yes	79.791	↑
Mann-Kendall	0.919	0.170	$<2.2 \times 10^{-16}$	No			No			Yes		
Spearman Rank Order	0.812	0.156	4.06×10^{-10}	No			No			Yes		

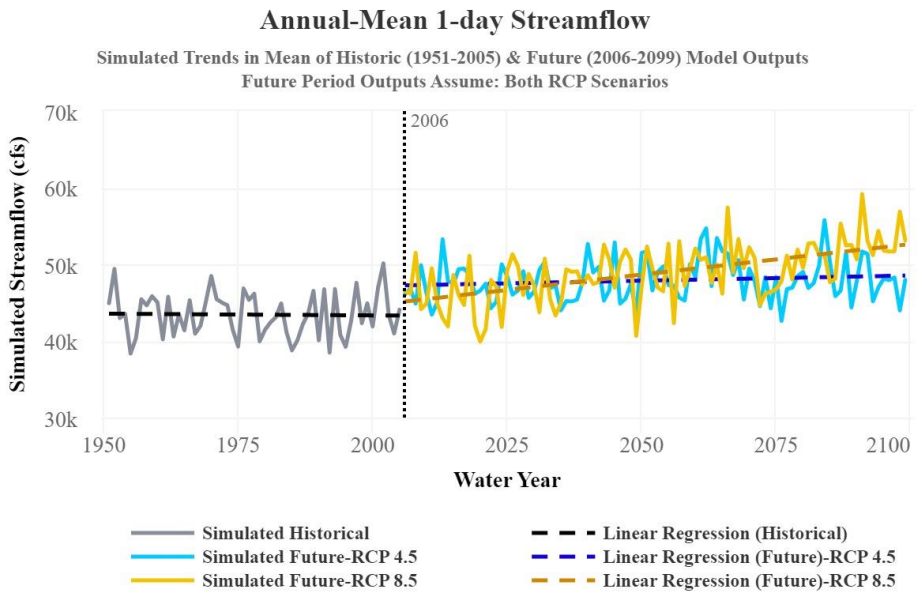


Figure 6. Trend Analysis of Average Model Output: Annual-Mean 1-day Streamflow The Sny watershed (HUC07110004) Stream Segment: 07000604

For the mean of the 32 projections (per RCP) of annual-maximum temperatures, the results of the three statistical tests and the slopes associated with statistically significant trends are presented in Table 2 and Figure 7. The mean of the simulated, annual-maximum temperature projections (future period: 2006-2099) shows a statistically significant, positive trend for The Sny watershed under both the moderate (RCP 4.5) and higher (RCP 8.5) radiative forcings. Both outputs project a significant magnitude of change in temperature over the next fifty years. The CHAT computes a trendline slope of 0.07 °F per year for the lower radiative forcings, which would be a 3.5 °F increase in maximum temperature over a 50-year period. The CHAT computes a trendline slope of 0.13 °F per year for the RCP 8.5 radiative forcings, which would be a 6.8 °F increase in maximum temperature over a 50-year period. There is also a statistically significant increasing trend in simulated, historic temperatures between 1951 and 2005 (slope of 0.02 °F per year). When the CHAT is used to evaluate the change in Epoch-Mean of simulated annual-maximum temperature it is found that the median change from the base Epoch (1950-2005) to the mid-century epoch (2035-2064) is 5.2 °F for RCP 4.5 and 6.5 °F for RCP 8.5. By the end-century epoch (2070-2099) the change relative to the base period is 6.1 °F for RCP 4.5 and 11.1 °F for RCP 8.5.

Table 2. Trend Analysis of Average Model Output: Annual Maximum Temperature for The Sny watershed (HUC07110004)

Trend Analysis	Historic (1951-2005)	Future (2006-2099)		Historic (1951-2005)			Future (2006-2099)					
		RCP 4.5	RCP 8.5				RCP 4.5			RCP 8.5		
	p-values			Statistically Significant? (<0.05)	Slope (°F/year)	Direction	Statistically Significant? (<0.05)	Slope (°F/year)	Direction	Statistically Significant? (<0.05)	Slope (°F/year)	Direction
t-Test	6.07×10^{-5}	2.2×10^{-16}	2.2×10^{-16}	Yes	0.0248	↑	Yes	0.0699	↑	Yes	0.1357	↑
Mann-Kendall	0.00026	2.2×10^{-16}	2.2×10^{-16}	Yes			Yes			Yes		
Spearman Rank Order	0.000169	2.2×10^{-16}	2.2×10^{-16}	Yes			Yes			Yes		

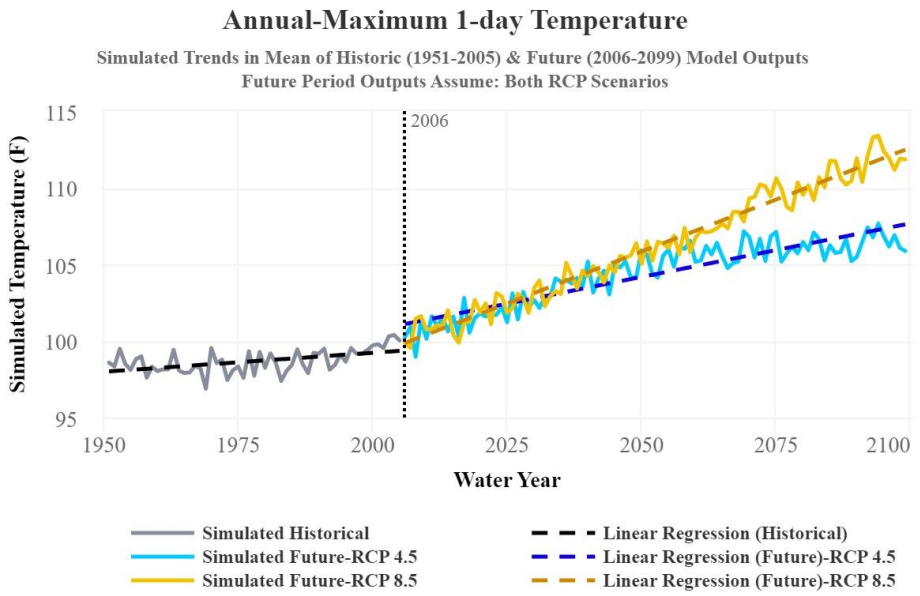


Figure 7. Historic and Projected trends in historic and projected mean annual maximum temperatures for The Sny watershed (HUC07110004)

The CHAT provides streamflow and temperature outputs analyzed comparatively by describing simulated changes in monthly streamflow and temperature between different epochs (time periods). Monthly streamflow and temperature output is analyzed by determining the mean of the monthly value for the variable of interest for each GCM for three epochs: 1950-2005 (baseline), 2035-2064 (mid-century), and 2075-2099 (end of century). The difference between GCM/Month/Epoch means are determined for both the baseline vs. mid-century and baseline vs. end of century epochs and results are presented as boxplots. These boxplots provide insight into both the range of results and the seasonality of changes in streamflow and temperature overtime.

For stream segment 07000604 in The Sny watershed (HUC07110004), changes in epoch-mean of simulated monthly mean streamflow are presented in Figure 8. For the stream segment of the Mississippi River analyzed, it appears that for both the mid-century and end-century epochs November through May mean flows are increasing with those flows derived using RCP 8.5 than those derived by assuming RCP 4.5. Greater increases are observed during December through May for the end of the century epoch. August-September flows appear to be decreasing regardless of what RCP is assumed for both epochs and RCPs analyzed.

For The Sny watershed, simulated maximum temperatures for both the mid-century epoch (2035-2064) and the end-century epoch (2070-2099) are increasing relative to historic temperature simulations (1950-2005) for all months and both RCPs. For the mid-century comparisons, 3.9° F increases or greater in temperature are projected under RCP 8.5 for all months. Larger changes in temperature are projected

by the end of century. As compared to the temperature changes projected by mid-century, for the 2070-2099 epoch, there are larger differences in results where RCP 8.5 was assumed versus RCP 4.5. When RCP 8.5 is assumed, over 10° F of warming is projected from June through October. All RCP 8.5 comparisons show greater than 5° F of warming. When RCP 4.5 is assumed, between 5° F to 10° F of warming is projected for all months except March, April, May, and November. Increases in maximum air temperature, particularly in the summer (June-August), are likely to increase water surface temperatures. This has the potential to adversely impact water quality by decreasing DO in backwater areas within the study area.

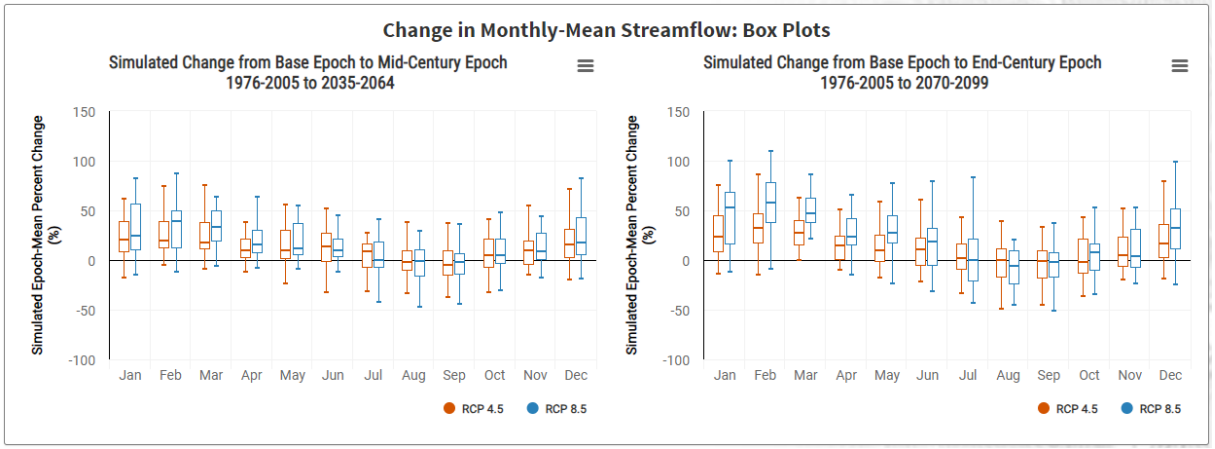


Figure 8. Change in Epoch-Mean of Simulated Monthly Mean Streamflow - HUC 07110004 – The Sny - Stream Segment ID: 07000604

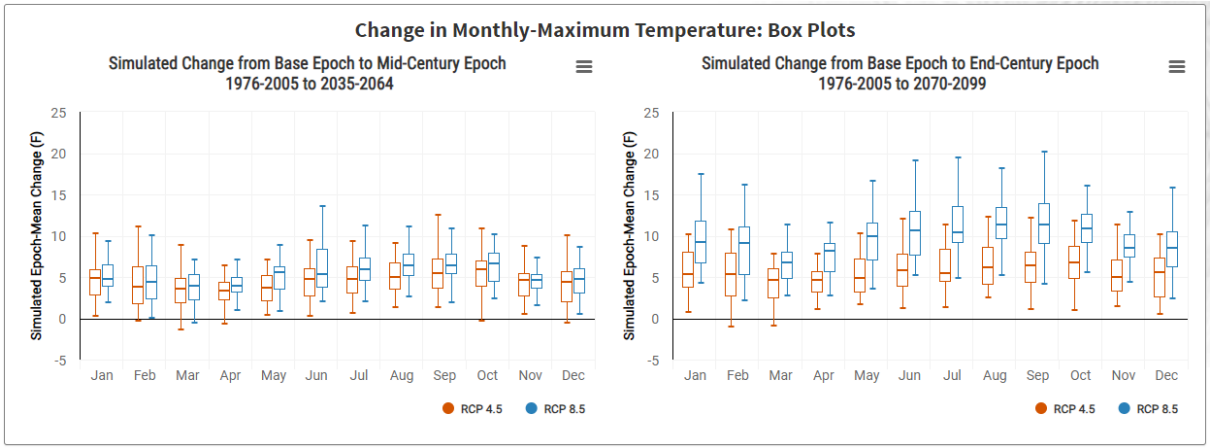


Figure 9. Change in Epoch-Mean of Simulated Monthly Maximum Temperature- HUC 07110004 – The Sny

Vulnerability Assessment

The USACE Vulnerability Assessment (VA) Tool facilitates a screening level, comparative evaluation of projects' exposure to long term weather variability for a selected USACE business line in a given 4-digit HUC watershed relative to the other 4-digit HUC watersheds within the continental United States (CONUS). A series of indicator variables are computed and aggregated into a vulnerability score using the weighted-order, weighted-average (WOWA) approach. The tool uses the CMIP5 GCM based Bias Corrected, Spatially Disaggregated (BCSD) VIC dataset (2014) to define projected, hydrologic, and meteorologic inputs to the tool's WOWA scores.

The WOWA scores and indicator variable values are available for two subsets of simulations (wet- top 50% by cumulative runoff projections and dry- bottom 50% by cumulative runoff projections). Data are available for three epochs. The epochs include a historic period (Base epoch) and two 30-year, future epochs (centered on 2050 and 2085). The Base epoch is not based on projections and so it is not split into a wet and dry subset. Watersheds with WOWA scores specific to a given business line, that fall within the top 20% of WOWA scores for watersheds in the CONUS are identified as being vulnerable to impacts from long term weather variability. The projected datasets incorporated into VA scores contain considerable uncertainty. Some of this uncertainty is reflected by the differences in results for each of the subset-epoch combinations.

The tool is applied using the default, National Standards Settings and for the ecosystem restoration business line. Indicators used to compute the Ecosystem Restoration WOWA score include: change in sediment load due to change in future precipitation, cumulative monthly runoff variation relative to mean annual runoff, runoff elasticity (ratio of streamflow runoff change to precipitation change), macroinvertebrate index of biotic condition, local mean annual runoff, low flow reduction, percent of freshwater plant communities at risk, and two indicators of flood magnification (indicator of how much high flows are projected to change over time).

As shown in Figure 10, compared to the other 4-digit HUC watersheds in the CONUS, the Upper Mississippi-Salt (HUC 0711) watershed does not have a vulnerability score in the top 20% for the ecosystem restoration business line. This is a comparative evaluation and thus does not imply that the watershed is not vulnerable to future, climate change impacts. Results indicate that for the select metrics incorporated into the tool, this watershed may be less exposed to potential long term weather variability relative to other watersheds in the CONUS. This is true for both the wet and dry subsets and both the 2050 and 2085 epochs.

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As can be seen in Figure 10 and Table 3, the dominant indicator variable contributing to the Ecosystem Restoration business line VA score for the Upper Mississippi-Salt (HUC 0711) watershed is (8) At Risk Freshwater Plants for all epoch and subset combinations. The WOWA score changes by more than 1% between the 2050 and 2085 epochs for both the wet and dry subsets. The percentage by which the indicator variable contributes to the VA score does not significantly change overtime. Because this indicator variable is not dependent on computed, GCM based changes in future hydrology (temperature, precipitation, streamflow) this indicator variable value is constant over time.

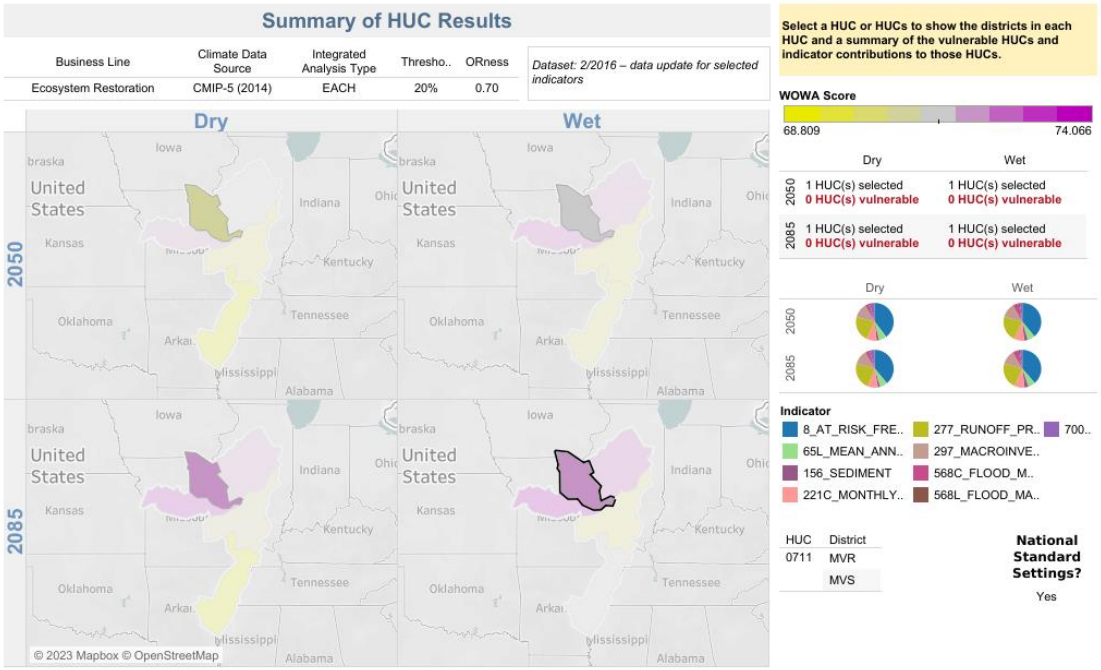


Figure 10. Output of the Vulnerability Assessment tool - Upper Mississippi-Salt watershed

Table 3. VA Tool Output- HUC 0711 Upper Mississippi-Salt Watershed- Ecosystem Restoration

Subset	Epoch	VA Score	% Change in VA Score (2050 to 2085)	Dominant Indicator	Dominant Indicator % Change (2050 to 2085): Contribution to Overall WOWA Score	Dominant Indicator % Change (2050 to 2085): Indicator Value
WET	2050	71.261	+1.11%	8- At Risk Freshwater Plants	0.00% (Constant)	56.524 (Constant)
WET	2085	72.053	+1.11%	8- At Risk Freshwater Plants	0.00% (Constant)	56.524 (Constant)
DRY	2050	70.646	+2.10%	8- At Risk Freshwater Plants	0.00% (Constant)	56.524 (Constant)
DRY	2085	72.130	+2.10%	8- At Risk Freshwater Plants	0.00% (Constant)	56.524 (Constant)

Conclusion

The purpose of the Hausgen Island Complex Side Channel Restoration Ecosystem Restoration Project is to restore side channel connectivity, diversity, quality, and flow to benefit native riverine fish and wildlife; and improve side channel habitat, including substrate stability, to benefit native freshwater mussels and create aquatic habitat.

Proposed project features include the following to improve side channel habitat:

- Mussel Habitat Enhancement with rock-gravel substrate,
- Bank Stabilization with gradual slope revetment,
- Constructing new river training structures utilizing hard points to direct flow,
- Altering existing dike structures through partial degradation and/or notching

Output based on both historic, observed hydrometeorological data and projected, changed hydrometeorological data was reviewed to support qualitative statements about how to incorporate resilience to climate change impacts over the Lower Pool 25 project's lifecycle.

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Increases in precipitation are projected for Missouri, most likely during the winter and spring (Figure 8). The frequency and intensity of extreme precipitation events are also projected to increase, potentially increasing the frequency and intensity of floods. Springtime flooding in particular could pose a threat to Missouri's important agricultural economy by delaying planting and reducing yields.

The intensity of future droughts is projected to increase even if precipitation increases. Rising temperatures will increase evaporation rates and the rate of soil moisture loss. Thus, future summer droughts, a natural part of Missouri's hydrological and meteorological conditions, are likely to be more intense.

Based on the weight of evidence presented in this assessment, long term weather variability impacts are anticipated to affect the study area's hydrology over the project's 50-year life cycle. Available literature suggests warmer and wetter hydrological and meteorological conditions in the future. There are statistically significant increasing trends in both the observed and projected flow data analyzed specific to this study area. As flow increases, floodplain forest habitat may be inundated more often. There is also evidence that temperatures are increasing in the study area which may negatively affect water quality and aquatic habitat.

Table 4 indicates potential residual risks for this project, along with a qualitative rating of how likely those residual risks are to materialize and undermine project features resulting in harm to the study area.

Within the Upper Mississippi River Region long term weather variability poses a potential risk to ecosystems due to the likelihood of the region experiencing shifts in the flow regime and increases in temperature in the future. Projects, like the Hausgen Island Complex project will serve to offset some of this risk by improving water quality and diversifying habitat. The standard practices used to design and construct USACE, ecosystem restoration projects include a degree of resilience because features are typically designed to accommodate a wide range of flow conditions. Thus, it is unlikely that long term weather variability induced increases in flow will undermine project features. It is likely that increasing temperatures will place added stress on the ecosystem in the future. Ecosystem restoration standard design practices have been generated based on lessons learned from successful projects constructed between 1981 and 2015. The majority of these standards are listed in the 2012 *Upper Mississippi River Restoration (UMRR) Design Handbook* (USACE 2012).

Even though USACE ecosystem restoration projects can already be considered inherently resilient, it would be worthwhile to consult with experts in floodplain habitat creation and maintenance to see if there are any additional opportunities to incorporate additional innovative, resilient features into the final design without incurring a significant change in cost. Added resilience should be targeted at ensuring project features can withstand higher flows (and higher water surface elevations) and greater periods of inundation. Additionally, opportunities to reduce potential future long term weather variability driven water quality impacts from rising water temperatures should be identified. A potential mechanism by which to accomplish this is to explore the development of an adaptive management plan, whereby if conditions are observed to be changing in the future, certain project features can be designed and/or flagged to accommodate the flexibility to be modified in response to changing future conditions.

Table 4. Residual Risk Due to Climate Change

Project Feature	Trigger	Hazard	Harm	Qualitative Likelihood[1]	Justification of Likelihood Rating
Mussel Habitat Enhancement - Rock-Gravel Substrate	Increased discharge and WSEL	Future flood volumes may be greater than at present.	Higher flows may cause erosion within the backwater channels. Additional placement of substrate may cause higher WSELs and slower flow velocities.	Unlikely	Proposed design would ensure quality habitat for mussels and fisheries.
Bank Stabilization - Gradual Slope Revetment	Increased discharge and WSEL	Future flood velocities and elevations may be higher.	Increased discharge and velocity will increase the shear stress on bank stabilization features and may overtop.	Unlikely	Riprap is sized and graded to ensure a robust design and reduce project feature damage.
River Training Structure – Hard Points, Partial Degradation or Dike Notching	Increased discharge and WSEL	Future flood velocities and elevations may be higher.	Flow may overtop rock hard points more frequently causing erosion of the backwater channels.	Unlikely	Riprap is sized and graded to ensure a robust design and reduce project feature damage. Orientation of hard points are designed to withstand high flows to minimize wave impacts.

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NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

PROJECT IMPLEMENTATION REPORT

WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

HAUSGEN ISLANDS
HAUSGEN ISLAND COMPLEX SIDE CHANNEL RESTORATION ECOSYSTEM RESTORATION PROJECT

Appendix L: Clean Water Act

US Army Corps of Engineers ®
St. Louis District

Mississippi River
River Miles 248-245
Lincoln County, Missouri

1. INTRODUCTION

The project would be constrained to meet the required terms and conditions of Nationwide Permit (NWP) 27, Aquatic Habitat, Restoration, Enhancement and Establishment Activities. A copy of the NWP 27 terms and conditions as well as the MO state 401 certification can be found in the following sections.

2. Nationwide Permit 27 Terms and Conditions, and MO state 401 WQC regional conditions. The proposed project must comply with all terms and conditions for NWP 27:

2022 Nationwide Permit Summary

U.S Army Corps
Of Engineers

Issued: February 25, 2022 **Expires: March 14, 2026**

No. 27. Aquatic Habitat Restoration, Enhancement, and Establishment Activities
(NWP Final Notice, 86 FR, 73576)

Activities in waters of the United States associated with the restoration, enhancement, and establishment of tidal and non-tidal wetlands and riparian areas, the restoration and enhancement of non-tidal streams and other non-tidal open waters, and the rehabilitation or enhancement of tidal streams, tidal wetlands, and tidal open waters, provided those activities result in net increases in aquatic resource functions and services.

To be authorized by this NWP, the aquatic habitat restoration, enhancement, or establishment activity must be planned, designed, and implemented so that it results in aquatic habitat that resembles an ecological reference. An ecological reference may be based on the characteristics of one or more intact aquatic habitats or riparian areas of the same type that exist in the region. An ecological reference may be based on a conceptual model developed from regional ecological knowledge of the target aquatic habitat type or riparian area.

To the extent that a Corps permit is required, activities authorized by this NWP include, but are not limited to the removal of accumulated sediments; releases of sediment from reservoirs to maintain sediment transport continuity to restore downstream habitats; the installation, removal, and maintenance of small water control structures, dikes, and berms, as well as discharges of dredged or fill material to restore appropriate stream channel configurations after small water control structures, dikes, and berms are removed; the installation of current deflectors; the enhancement, rehabilitation, or re-establishment of riffle and pool stream structure; the placement of in-stream habitat structures; modifications of the stream bed and/or banks to enhance, rehabilitate, or re-establish stream meanders; the removal of stream barriers, such as undersized culverts, fords, and grade control structures; the backfilling of artificial channels; the removal of existing drainage structures, such as drain tiles, and the filling, blocking, or reshaping of drainage ditches to restore wetland hydrology; the installation of structures or fills necessary to restore or enhance wetland or stream hydrology; the construction of small nesting islands; the construction of open water areas; the construction of oyster habitat over unvegetated bottom in tidal waters; coral restoration or relocation activities; shellfish seeding; activities needed to reestablish vegetation, including plowing or discing for seed bed preparation and the planting of appropriate wetland species; re-establishment of submerged aquatic vegetation in areas where those plant communities previously existed; re-establishment of tidal wetlands in tidal waters where those wetlands previously existed; mechanized land clearing to remove non-native invasive, exotic, or nuisance vegetation; and other related activities. Only native plant species should be planted at the site.

This NWP authorizes the relocation of non-tidal waters, including non-tidal wetlands and streams, on the project site provided there are net increases in aquatic resource functions and services.

Except for the relocation of non-tidal waters on the project site, this NWP does not authorize the conversion of a stream or natural wetlands to another aquatic habitat type (e.g., the conversion of a stream to wetland or vice versa) or uplands. Changes in wetland plant communities that occur when wetland hydrology is more fully restored during wetland rehabilitation activities are not considered a conversion to another aquatic habitat type. This NWP does not authorize stream channelization. This NWP does not authorize the relocation of tidal waters or the conversion of tidal waters, including tidal wetlands, to other aquatic uses, such as the conversion of tidal wetlands into open water impoundments.

Compensatory mitigation is not required for activities authorized by this NWP since these activities must result in net increases in aquatic resource functions and services.

Reversion. For enhancement, restoration, and establishment activities conducted: (1) In accordance with the

terms and conditions of a binding stream or wetland enhancement or restoration agreement, or a wetland establishment agreement, between the landowner and the U.S. Fish and Wildlife Service (FWS), the Natural Resources Conservation Service (NRCS), the Farm Service Agency (FSA), the National Marine Fisheries Service (NMFS), the National Ocean Service (NOS), U.S. Forest Service (USFS), or their designated state cooperating agencies; (2) as voluntary wetland restoration, enhancement, and establishment actions documented by the NRCS or USDA Technical Service Provider pursuant to NRCS Field Office Technical Guide standards; or (3) on reclaimed surface coal mine lands, in accordance with a Surface Mining Control and Reclamation Act permit issued by the Office of Surface Mining Reclamation and Enforcement (OSMRE) or the applicable state agency, this NWP also authorizes any future discharge of dredged or fill material associated with the reversion of the area to its documented prior condition and use (i.e., prior to the restoration, enhancement, or establishment activities). The reversion must occur within five years after expiration of a limited term wetland restoration or establishment agreement or permit, and is authorized in these circumstances even if the discharge of dredged or fill material occurs after this NWP expires. The five-year reversion limit does not apply to agreements without time limits reached between the landowner and the FWS, NRCS, FSA, NMFS, NOS, USFS, or an appropriate state cooperating agency. This NWP also authorizes discharges of dredged or fill material in waters of the United States for the reversion of wetlands that were restored, enhanced, or established on prior-converted cropland or on uplands, in accordance with a binding agreement between the landowner and NRCS, FSA, FWS, or their designated state cooperating agencies (even though the restoration, enhancement, or establishment activity did not require a section 404 permit). The prior condition will be documented in the original agreement or permit, and the determination of return to prior conditions will be made by the Federal agency or appropriate state agency executing the agreement or permit. Before conducting any reversion activity, the permittee or the appropriate Federal or state agency must notify the district engineer and include the documentation of the prior condition. Once an area has reverted to its prior physical condition, it will be subject to whatever the Corps Regulatory requirements are applicable to that type of land at the time. The requirement that the activity results in a net increase in aquatic resource functions and services does not apply to reversion activities meeting the above conditions. Except for the activities described above, this NWP does not authorize any future discharge of dredged or fill material associated with the reversion of the area to its prior condition. In such cases a separate permit would be required for any reversion.

Reporting. For those activities that do not require pre-construction notification, the permittee must submit to the district engineer a copy of: (1) The binding stream enhancement or restoration agreement or wetland enhancement, restoration, or establishment agreement, or a project description, including project plans and location map; (2) the NRCS or USDA Technical Service Provider documentation for the voluntary stream enhancement or restoration action or wetland restoration, enhancement, or establishment action; or (3) the SMCRA permit issued by OSMRE or the applicable state agency. The report must also include information on baseline ecological conditions on the project site, such as a delineation of wetlands, streams, and/or other aquatic habitats. These documents must be submitted to the district engineer at least 30 days prior to commencing activities in waters of the United States authorized by this NWP.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing any activity (see general condition 32), except for the following activities:

(1) Activities conducted on non-Federal public lands and private lands, in accordance with the terms and conditions of a binding stream enhancement or restoration agreement or wetland enhancement, restoration, or establishment agreement between the landowner and the FWS, NRCS, FSA, NMFS, NOS, USFS or their designated state cooperating agencies;

(2) Activities conducted in accordance with the terms and conditions of a binding coral restoration or relocation agreement between the project proponent and the NMFS or any of its designated state cooperating agencies;

(3) Voluntary stream or wetland restoration or enhancement action, or wetland establishment action, documented by the NRCS or USDA Technical Service Provider pursuant to Start Printed Page 73578 NRCS Field Office Technical Guide standards; or

(4) The reclamation of surface coal mine lands, in accordance with an SMCRA permit issued by the OSMRE or the applicable state agency.

However, the permittee must submit a copy of the appropriate documentation to the district engineer to fulfill the reporting requirement. (Authorities: Sections 10 and 404).

Note: This NWP can be used to authorize compensatory mitigation projects, including mitigation banks and in-lieu fee projects. However, this NWP does not authorize the reversion of an area used for a compensatory mitigation project to its prior condition, since compensatory mitigation is generally intended to be permanent.

C. Nationwide Permit General Conditions

(NWP Final Notice, 86 FR 2867-2874)

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his or her authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse

effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. Removal of Temporary Structures and Fills. Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers. (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. Permittees shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7

consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat or critical habitat proposed for such designation, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation), the pre-construction notification must include the name(s) of the endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or that utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. For activities where the non-Federal applicant has identified listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species (or species proposed for listing or designated critical habitat (or critical habitat proposed for such designation), or until ESA section 7 consultation or conference has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation or conference with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence

from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.nmfs.noaa.gov/pr/species/esa/ respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring that an action authorized by an NWP complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting the appropriate local office of the U.S. Fish and Wildlife Service to determine what measures, if any, are necessary or appropriate to reduce adverse effects to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. Historic Properties. (a) No activity is authorized under any NWP which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)(1)). If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts commensurate with potential impacts, which may include background research, consultation, oral history interviews, sample field investigation, and/or field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: No historic properties affected, no adverse effect, or adverse effect.

(d) Where the non-Federal applicant has identified historic properties on which the proposed NWP activity might have the potential to cause effects and has so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer

either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed. For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. Permittees that discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by an NWP, they must immediately notify the district engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, 52, 57 and 58 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed by permittees in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after she or he determines that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-

construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) Compensatory mitigation at a minimum one-for-one ratio will be required for all losses of stream bed that exceed 3/100-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. This compensatory mitigation requirement may be satisfied through the restoration or enhancement of riparian areas next to streams in accordance with paragraph (e) of this general condition. For losses of stream bed of 3/100-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. If restoring riparian areas involves planting vegetation, only native species should be planted. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification

request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). If permittee-responsible mitigation is the proposed option, and the proposed compensatory mitigation site is located on land in which another federal agency holds an easement, the district engineer will coordinate with that federal agency to determine if proposed compensatory mitigation project is compatible with the terms of the easement.

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan needs to address only the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state or federal, dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. (a) Where the certifying authority (state, authorized tribe, or EPA, as appropriate) has not previously certified compliance of an NWP with CWA section 401, a CWA section 401 water quality certification for the proposed discharge must be obtained or waived (see 33 CFR 330.4(c)). If the permittee cannot comply with all of the conditions of a water quality certification previously issued by certifying authority for the issuance of the NWP, then the permittee must obtain a water quality certification or waiver for the proposed discharge in order for the activity to be authorized by an NWP.

(b) If the NWP activity requires pre-construction notification and the certifying authority has not previously certified compliance of an NWP with CWA section 401, the proposed discharge is not authorized by an NWP until water quality certification is obtained or waived. If the certifying authority issues a water quality certification for the proposed discharge, the permittee must submit a copy of the certification to the district engineer. The discharge is not authorized by an NWP

until the district engineer has notified the permittee that the water quality certification requirement has been satisfied by the issuance of a water quality certification or a waiver.

(c) The district engineer or certifying authority may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). If the permittee cannot comply with all of the conditions of a coastal zone management consistency concurrence previously issued by the state, then the permittee must obtain an individual coastal zone management consistency concurrence or presumption of concurrence in order for the activity to be authorized by an NWP. The district engineer or a state may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its CWA section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is authorized, subject to the following restrictions:

(a) If only one of the NWPs used to authorize the single and complete project has a specified acreage limit, the acreage loss of waters of the United States cannot exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

(b) If one or more of the NWPs used to authorize the single and complete project has specified acreage limits, the acreage loss of waters of the United States authorized by those NWPs cannot exceed their respective specified acreage limits. For example, if a commercial development is constructed under NWP 39, and the single and complete project includes the filling of an upland ditch authorized by NWP 46, the maximum acreage loss of waters of the United States for the commercial development under NWP 39 cannot exceed 1/2-acre, and the total acreage loss of waters of United States due to the NWP 39 and 46 activities cannot exceed 1 acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

(Transferee)

(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a

mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation.

The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States. If an NWP activity also requires review by, or permission from, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission and/or review is not authorized by an NWP until the appropriate Corps office issues the section 408 permission or completes its review to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification. (a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) (i) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce

the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures.

(ii) For linear projects where one or more single and complete crossings require pre-construction notification, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters (including those single and complete crossings authorized by an NWP but do not require PCNs). This information will be used by the district engineer to evaluate the cumulative adverse environmental effects of the proposed linear project, and does not change those non-PCN NWP activities into NWP PCNs.

(iii) Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial and intermittent streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-federal permittees, if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat (or critical habitat proposed for such designation), the PCN must include the name(s) of those endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the "study river" (see general condition 16); and

(10) For an NWP activity that requires permission from, or review by, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction

notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from, or review by, the Corps office having jurisdiction over that USACE project.

(c) Form of Pre-Construction Notification: The nationwide permit pre-construction notification form (Form ENG 6082) should be used for NWP PCNs. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iii) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure that the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

D. District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the single and complete crossings of waters of the United States that require PCNs to determine whether they

individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings of waters of the United States authorized by an NWP. If an applicant requests a waiver of an applicable limit, as provided for in NWPs 13, 36, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects.

2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by an NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters. The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure that the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) That the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal

adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

E. Further Information

1. District engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

F. Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term "discharge" means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure,

or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has surface water flowing continuously year-round during a typical year.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those

aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: Re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized jurisdictional stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

Tribal lands: Any lands title to which is either: (1) Held in trust by the United States for the benefit of any Indian tribe or individual; or (2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a “water of the United States.” If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

US Army Corps
of Engineers
Kansas City District

STATE OF MISSOURI
2021 NATIONWIDE PERMIT REGIONAL CONDITIONS

For All Nationwide Permits

1. Stream Crossings. In addition to requirements of General Condition 2 and General Condition 9 of the Nationwide Permits, the following guidelines for stream crossings apply for regulated activities in waters of the United States (WOTUS). The guidelines are available at:
https://www.nwk.usace.army.mil/Portals/29/docs/regulatory/NWP/2021/MO/MORC1Streams.pdf

- Corps Districts may waive RC 1 when project site geomorphology (i.e. bedrock, gradient) or existing alterations (i.e. adjacent impoundment, as part of a dry detention basin) creates conflict with the guidelines. The applicant must provide Pre-construction Notification (PCN) to the District Engineer for any waiver request.

2. Seasonal Restrictions for Activities Proposed in Spawning Areas. In addition to the requirements of General Condition 3 of the Nationwide Permits, the following specific seasonal restrictions apply for regulated activities in WOTUS. Between the closed dates listed in the Missouri Combined Stream Spawning List, the permittee must not excavate from or discharge into the listed waters. The list of waters with seasonal restrictions is available on request from the Corps or at:
https://www.nwk.usace.army.mil/Portals/29/docs/regulatory/NWP/2021/MO/MORC2SpawningArea.pdf

- Corps Districts may waive RC 2 when the applicant demonstrates imminent threats to public safety and health, or to property. The Corps will consult with the U.S. Fish and Wildlife Service and Missouri Department of Conservation before granting the waiver and may add additional special conditions to protect aquatic life during the operation. The applicant must PCN to the District Engineer for any waiver request.

3. Suitable Material. In addition to the specific examples in General Condition 6 of the Nationwide Permits, the following materials are not suitable for fill activities in WOTUS: garbage, tires, treated lumber products that do not comply with the Registration Documents issued by the U.S. Environmental Protection Agency (USEPA) under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and that are not in accordance with standards issued by American Wood Protection Association of the International Code Council, liquid concrete not poured into forms, grouted riprap, bagged cement and sewage or organic waste.

- Broken concrete used as bank stabilization must be reasonably well graded, consisting of pieces varying in size from 20 pounds up to and including at least 150-pound pieces to withstand expected high flows. Applicants must break all large slabs to conform to the well graded requirement. Generally, the maximum weight of any piece should not be more than 500 pounds. Gravel and dirt should not exceed 15% of the total fill volume when using broken concrete as fill. All protruding reinforcement rods, trash, asphalt, and other extraneous materials must be removed from the broken concrete prior to placement in WOTUS.

4. Priority Watersheds. The applicant must provide PCN to the District Engineer for any regulated activity in a priority watershed. The list of priority watersheds requiring notification is available on request from the Corps or at:
https://www.nwk.usace.army.mil/Portals/29/docs/regulatory/NWP/2021/MO/MORC4PriorityWaters.pdf

5. Sensitive Aquatic Species. The applicant must provide PCN to the District Engineer for any regulated activity in waters listed at: https://www.nwk.usace.army.mil/Portals/29/docs/regulatory/NWP/2021/MO/MORC5AquaSpecies.pdf. The submitted PCN will be coordinated in accordance with General Condition 32(d) with the U.S. Fish and Wildlife Service as determined appropriate by the Corps.

For Specific Nationwide Permits:

6. Lake of the Ozarks. The applicant must provide a PCN to the District Engineer for any regulated activity associated with Nationwide Permit 12, 57, and 58 within Lake of the Ozarks. A copy of this notification must also concurrently be sent to Ameren Missouri. Nationwide Permits 29 and 44 are revoked in the Lake of the Ozarks. The Corps and Ameren Missouri, regardless of the request to use any Nationwide Permit, may verify the activity under the provisions of Regional General Permit 38M, which can be found at https://www.nwk.usace.army.mil/Missions/Regulatory-Branch/General-Permits/. Additional information on Ameren Missouri and Lake of the Ozarks permit requirements can be found at the following webpage: https://www.ameren.com/missouri/residential/lake-of-the-ozarks/permitting-process-forms.

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Note: PCN to the District Engineer must be in accordance with General Condition 32 of the Nationwide Permits.

Missouri Department of Natural Resources

CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION
2021 GENERAL AND SPECIFIC CONDITIONS

Water Protection Program 10/2021

Division of Environmental Quality PUB2947

Consistent with Section 401 of the Clean Water Act (CWA), 33 U.S.C. § 1341, the Missouri Department of Natural Resources (Department) has designed these precertified conditions to ensure activities carried out in Missouri pursuant to Nationwide Permits (NWPs) authorized by the U.S. Army Corps of Engineers (USACE) will comply with Missouri water quality requirements. Unless otherwise stated, these conditions are in addition to, not a replacement for, any federal requirements or conditions.

The conditions outlined in this programmatic WQC apply to those authorized projects where the project proponent has chosen to accept these conditions instead of pursuing an individual CWA Section 401 Water Quality Certification (WQC) for the following NWPs:

- Only General Conditions apply to projects authorized by NWPs 5, 6, 7, 13, 15, 16, 18, 19, 22, 23, 25, 27, 29, 30, 31, 36, 39, 40, 42, 43, 45, 46, 54, and 59.
- Both General and Specific Conditions apply to projects authorized by NWPs 3, 4, 12, 14, 20, 33, 41, 53, 57, and 58.

Alternatively, a project proponent may apply to the Department for individual WQC if it does not wish to accept the conditions outlined in this document.

NWPs 1, 2, 8, 9, 10, 11, 28, and 35 authorize projects pursuant to Section 10 of the Rivers and Harbors Act of 1899 only. These NWPs do not require CWA Section 401 WQC because they authorize activities which, in the opinion of the USACE, could not reasonably be expected to result in a discharge into waters of the United States. An activity needing only a Section 10 permit may require a WQC if that activity can reasonably be expected to result in any discharge either during construction or operation of the facility. Thus, if the USACE determines the activity is likely to result in a discharge during construction or operation, the Department has discretion to require a WQC for the Section 10 activity. The USACE may advise a Section 10 permit project proponent that it might need a WQC if there is a reasonable expectation that a discharge will occur either during the construction or operation of the project.

Pursuant to Section 644.037, RSMo, the Department shall certify without conditions NWPs as they apply to impacts on wetlands in Missouri. Because NWPs are minimal impact, Missouri does not have water quality standards specific to wetlands, and only the general criteria apply, discharges to wetlands from projects authorized by NWPs will comply with water quality requirements.

Pursuant to Section 644.038, RSMo, the Department shall certify without conditions all NWPs for impacts in all waters of the state for the construction of highways and bridges approved by the Missouri Highway and Transportation Commission. A Memorandum of Understanding between the Missouri Departments of Natural Resources and Transportation contains the requirements by which the Missouri Department of Transportation will design and construct such projects in order to protect the water quality of waters of the state. Therefore, as a result of this side agreement, the Department grants programmatic WQC for all NWPs without conditions for the construction of highways and bridges approved by the Missouri Highway and Transportation Commission, because any discharges from these projects will comply with water quality requirements.

GENERAL CONDITIONS

1. A stream's pattern, profile, and dimension, including but not limited to sinuosity, slope, and channel width, shall be maintained as much as practicable. Streambed gradient shall not be adversely impacted during project construction. No project shall accelerate bed or bank erosion. This will ensure compliance with the Missouri Water Quality Standards general criterion requiring waters to be free from physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

2. Channelization of streams is not allowed under this precertification. Channelization includes but is not limited to reducing the length of the channel, widening the channel for increased water storage or flow, and/or construction of hard structures which concentrate flow. Unless necessary for a stream crossing associated with infrastructure projects and contained within an associated right-of-way, construction easement, or permanent easement, bank stabilization activities only along one bank of a stream are permitted, including but not limited to bank sloping and riprapping. The redirection of flow by excavation of the opposite bank or a streambed is considered a channel modification and is not authorized by this WQC. This will ensure compliance with the Missouri Water Quality Standards general criterion requiring waters to be free from physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

3. No new or expanded wet stormwater retention basins or similar impoundment structures may be constructed unless they are located off-channel. In-channel dry stormwater detention basins are allowable if the stream channel is either temporarily or not adversely affected by the basin. This will ensure compliance with the Missouri Water Quality Standards general criterion requiring waters to be free from physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

4. Only clean, nonpolluting fill shall be used. The following materials are not suitable where contact with water is expected and shall not be used due to their potential to cause violations of the general criteria of Missouri's Water Quality Standards [10 CSR 20-7.031(4)]:
   a. Earthen fill, gravel and broken concrete where the material does not meet the Suitable Material specifications stated in the "Missouri Nationwide Permit Regional Conditions" (https://usace.contentdm.oclc.org/digital/collection/p16021coll11/id/2662/) in locations where erosive flows are expected to occur on a regular basis, such as streambanks and/or lake shorelines.
   b. Asphalt.
   c. Concrete with exposed rebar.
   d. Tires, vehicles or vehicle bodies, and construction or demolition debris are solid waste and are excluded from placement in the waters of the state. Properly sized, broken concrete without exposed rebar is allowed.
   e. Liquid concrete, including grouted riprap, if not placed in forms as part of an engineered structure.
   f. Any material containing chemicals that would result in violation of Missouri Water Quality Standards general criteria [10 CSR 20-7.031(4)] or specific criteria [10 CSR 20-7.031(5)].

5. Waste concrete or concrete rinsate shall be disposed of in a manner that does not result in discharge to any jurisdictional water ways. This will ensure compliance with the Missouri Water Quality Standards general criteria requiring waters be free from unsightly bottom deposits [10 CSR 20-7.031(4)(A)]; substances resulting in toxicity to human, animal, or aquatic life [10 CSR 20-7.031(4)(D)]; and physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

6. Missouri Water Quality Standards antidegradation requirements dictate all appropriate and reasonable Best Management Practices related to erosion and sediment control, project stabilization and prevention of water quality degradation are applied and maintained; for example, preserving vegetation, streambank stability and basic drainage [10 CSR 20-7.031(3)(D)]. Best Management Practices shall be properly installed prior to conducting authorized activities and maintained, repaired and/or replaced as needed during all phases of the project to limit the amount of discharge of water contaminants to waters of the state. The project shall not involve more than normal stormwater or incidental loading of sediment caused by project activities so as to comply with Missouri's general water quality criteria [10 CSR 20-7.031(4)]; https://www.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c20-7a.pdf

7. Clearing of vegetation and trees shall be the minimum necessary to accomplish the activity except for the removal of invasive or noxious species and placement of ecologically beneficial practices. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for Best Management Practices [10 CSR 20-7.031(3)(B)].

8. Care shall be taken to keep machinery out of the water way as much as possible. If work in the water way is unavoidable, it shall be performed in a way that minimizes the duration and amount of any disturbance to banks, substrate and vegetation to prevent increases in turbidity. Fuel, oil and other petroleum products, equipment, construction materials and any solid waste shall not be stored below the ordinary high water mark at any time or in the adjacent flood-prone areas beyond normal working hours. All precautions shall be taken to avoid the release of wastes or fuel to streams and other adjacent waters as a result of this operation. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for Best Management Practices [10 CSR 20-7.031(3)(B]) and Missouri Water Quality Standards general criteria requiring waters be free from substances preventing beneficial uses [10 CSR 20-7.031(3)(A)]; substances causing unsightly color or turbidity [10 CSR 20-7.031(4)(C)]; and physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

9. Petroleum products spilled into any water or on the banks where the material may enter waters of the state shall be immediately cleaned up and disposed of properly. Any such spills of petroleum shall be reported as soon as possible, but no later than 24 hours after discovery to the Department of Natural Resources' Environmental Emergency Response number at 573-634-2436 or website at http://dnr.mo.gov/env/esp/esp-eer.htm. This will ensure compliance with Missouri Environmental Improvement Authority to provide for the conservation of state water resources by the prevention of pollution and proper methods of disposal [Section 260.015, RSMo] and Missouri Water Quality Standards general criteria requiring waters be free from substances that prevent maintenance of beneficial uses; cause unsightly bottom deposits, color, turbidity or toxicity; and/or impair the natural biological community [10 CSR 20-7.031(4)(A), -(B), and -(H)].

10. All efforts shall be made to minimize exposure of unprotected soils. To the best of the project proponent's ability, project activity shall be conducted at times of little or no rainfall to limit the amount of overland flow and sediment disturbance caused by heavy equipment. This will ensure compliance with Missouri antidegradation requirements for Best Management Practices [10 CSR 20-7.031(3)(B)].

11. Programmatic WQC is denied for any NWP issued on a water that is listed for a sediment-related impairment, aquatic habitat alteration, channelization, or unknown impairment as listed in the most current Water Quality Report (Section 305(b) Report) at https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/impaired-waters. Although intended to result in minimal impacts, NWP authorizations in these waters may contribute to impairments and result in noncompliance with Missouri's general water quality criteria requiring waters be free from physical, chemical, and hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)] or exceedance of Missouri Water Quality Standards specific criteria [10 CSR 20-7.031(5)]. Since WQC General or Specific Conditions cannot be established to address all concerns from the variety of impairments and activities authorized by NWPs, individual review for WQC will be required. Requirements for individual WQC will be determined on a case-by-case basis based on the specific impairments, and additional testing, design, disposal, or BMP considerations may be required.

    To determine the location of the waters noted above, the Department's geospatial data is available upon request, and all published data is available on the Missouri Spatial Data Information Services website at msdis.missouri.edu/. Additional information to identify the project location, including stream reaches with listed impairments or special water designations, may be obtained from the Department's Water Protection Program at 573-522-4502.

12. Programmatic WQC is denied for projects authorized by NWPs 17, 21, 32, 34, 37, 38, 44, 48, 49, 50, 51, 52, 55, and 56. Although intended to result in minimal impacts, these NWPs authorize activities that may contribute to impairments and result in noncompliance with Missouri's general water quality criteria [10 CSR 20-7.031(4)], including the requirement that all waters of the state shall be free from physical, chemical, and hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)], or noncompliance with Missouri's specific water quality criteria [10 CSR 20-7.031(5)]. Because programmatic WQC General or Specific Conditions cannot be established to address all concerns from the variety of impairments and activities authorized by these NWPs, the Department requires individual review for WQC for these NWPs. Requirements for individual WQC will be determined on a case-by-case basis based on the specific projects, and additional testing, design, disposal, or BMP considerations may be required.

13. Mitigation for loss of stream resources should be in conformance with the compensatory mitigation guidance currently approved for use in Missouri, including guidance provided by the Missouri Stream Mitigation Method. Stream impacts shall require compensatory mitigation with only instream or riparian corridor credits. Compensatory mitigation shall be within the state of Missouri. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for maintenance and protection of designated uses [10 CSR 20-7.031(3)] Mitigation guidance documents can be located online at www.nwk.usace.army.mil/Missions/RegulatoryBranch/StateofMissouri.

SPECIFIC CONDITIONS

14. Nationwide Permit 3 *Maintenance*
    a. Silt, sediment, and debris removal shall be limited to a maximum of 200 LF upstream and 200 LF downstream of structures. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for maintenance and protection of designated uses [10 CSR 20-7.031(3)].

15. Nationwide Permit 4 *Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities*
    Any inorganic or extraneous debris, such as may be found on Christmas trees shall be removed to qualify as clean, nonpolluting fill. This will ensure compliance with the Missouri's Water Quality Standards general criteria that waters shall be free from unsightly bottom deposits [10 CSR 20-7.031(4)(A)] and solid waste [10 CSR 20-7.031(4)(I)].

16. Nationwide Permit 12 *Oil and Natural Gas Pipeline Activities*,
    Nationwide Permit 57 *Electric Utility Line and Telecommunications Activities,* and
    Nationwide Permit 58 *Utility Line Activities for Water and Other Substances*
    a. For project crossings that must disturb a water body, work shall be conducted in such a manner as to seal off the work area from flow and minimize sediment transport. Material resulting from the activity shall not be sidecast into waters of the state for more than one month. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for Best Management Practices [10 CSR 20-7.031(3)(B) and general criteria requiring waters be free from substances that prevent maintenance of beneficial uses; cause unsightly color, turbidity, or toxicity; and/or impair the natural biological community [10 CSR 20-7.031(4)(B), -(C), and -(H)].
    b. If Horizontal Directional Drilling is used, drilling mud and/or other materials shall not be discharged into waters of the state. Best Management Practices shall be implemented to prevent possible discharges from reaching waters of the state. In the event materials are inadvertently discharged to waters of the state, notification to the Department of Natural Resources is required within 24 hours by calling 573-634-2436. This will ensure compliance with Missouri Water Quality Standards antidegradation requirement for Best Management Practices [10 CSR 20-7.031(3)(B)] and Missouri Environmental Improvement Authority [Section 260.015, RSMo] to provide for the conservation of state air, land and water resources by the prevention of pollution and proper methods of disposal.
    c. Project crossings shall be placed as close to perpendicular as possible and shall be limited to a maximum crossing length of no more than one and one-half times the width of the stream. This will ensure compliance with the Missouri antidegradation requirement for maintenance and protection of designated uses [10 CSR 20-7.031(3)] and Best Management Practices [10 CSR 20-7.031(3)(B)].

17. Nationwide Permit 14 *Linear Transportation Projects*
    a. The permittee shall propose and employ measures to mitigate the removal of impounded sediment (e.g., sand, gravel) in the unstable area upstream of a proposed project to prevent it from being transported downstream and/or construct a notched weir to slow the release of impounded sediment from upstream of the proposed project. This will ensure compliance with the Missouri Water Quality Standards general criteria requiring waters be free from substances causing unsightly color or turbidity [10 CSR 20-7.031(4)(C)] and physical chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)]. Accumulated gravel may be allowed to naturally deposit into downstream plunge pool voids. Consultation with a hydrologist or other scientist is recommended if the amount of accumulated unconsolidated gravel exceeds the volume of plunge pool voids.
    b. Where this NWP is used to authorize bridge and culvert structures, stream channel work shall be limited to a maximum of 200 feet upstream and a maximum of 200 feet downstream of the bridge or culvert. For purposes of this condition, a channel modification is any activity that alters the width, depth, length and/or sinuosity of a water way. This will ensure compliance with the Missouri antidegradation requirement for maintenance and protection of designated uses [10 CSR 20-7.031(3)] and the Missouri Water Quality Standards general criterion requiring waters be free from physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

18. Nationwide Permit 20 *Response Operations for Oil and Hazardous Substances*
    Oil and hazardous substance releases shall be reported to the Department of Natural Resources' Environmental Emergency Response number at 573-634-2436. Continue to report updates with regard to the containment and cleanup of releases. This will ensure compliance with Missouri Environmental Improvement Authority [Section 260.015, RSMo] to provide for the conservation of state water resources by the prevention of pollution and proper methods of disposal.

19. Nationwide Permit 33 *Temporary Construction, Access and Dewatering*
    a. The use of this NWP shall be limited to impacts of six months or less in duration. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirements for maintenance and protection of designated uses [10 CSR 20-7.031(3)]
    b. Any removal of accumulated sediment (e.g., sand, gravel) upstream of a proposed project shall be limited to the quantity necessary to relieve any obstruction or to protect downstream habitat. The permittee must propose and employ measures to mitigate the removal of impounded sediment in the unstable area upstream of a proposed project to prevent it from being transported downstream and/or construct a notched weir to slow the release of impounded sediment from upstream of the proposed project. This will ensure compliance with the Missouri Water Quality Standards general criteria requiring waters be free from substances causing unsightly color or turbidity [10 CSR 20-7.031(4)(C)] and physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].

20. Nationwide Permit 41 *Reshaping Existing Drainage Ditches*
    In-channel disposal of excavated material not used for reshaping activities is prohibited. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for Best Management Practices [10 CSR 20-7.031(3)(B) and general criteria requiring waters be free from substances that prevent maintenance of beneficial uses; cause unsightly color, turbidity or toxicity; and/or impair the natural biological community [10 CSR 20-7.031(4)(B), -(C), and -(H)].

21. Nationwide Permit 53 *Removal of Low-Head Dams*
    a. The permittee must propose and employ measures to mitigate the removal of impounded sediment (e.g., sand, gravel) in the unstable area upstream of a proposed project to prevent it from being transported downstream and/or construct a notched weir to slow the release of impounded sediment from upstream of the proposed project. This will ensure compliance with the Missouri Water Quality Standards general criteria requiring waters be free from substances causing unsightly color or turbidity [10 CSR 20-7.031(4)(C)] and physical chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)]. Accumulated gravel may be allowed to naturally deposit into downstream plunge pool voids. Consultation with a hydrologist or other scientist is recommended if the amount of accumulated unconsolidated gravel exceeds the volume of plunge pool voids.
    b. Stream channel work shall be limited to a maximum of 100 feet upstream and a maximum of 100 feet downstream of the dam. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirement for maintenance and protection of designated uses [10 CSR 20-7.031(3)] and the Missouri Water Quality Standards general criterion requiring waters to be free from physical, chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)].
    c. Restoration of the stream channel to its former, natural state is authorized. Individual WQC is required for non-natural channel modifications. This will ensure compliance with the Missouri Water Quality Standards general criteria requiring waters be free from physical chemical, or hydrologic changes that would impair the natural biological community [10 CSR 20-7.031(4)(H)]. For purposes of this condition, a channel modification is any activity that alters the width, depth, length and/or sinuosity of a water way.

Unless the Department agrees to an alternative, requests for WQC should be sent electronically to wpsc401cert@dnr.mo.gov [Section 644.026.1(26), RSMo and 10 CSR 20-6.060(5)]. A request for WQC shall include all required information for a complete request for certification in compliance with 40 CFR Part 121. The Department may request additional information prior to providing a WQC decision to ensure Missouri water quality requirements are met, such as a response to comments from the Department, other resource agencies, and/or the public; planned compensatory mitigation; and/or an analysis of practicable alternatives.

An issued WQC, whether programmatically or individually issued, becomes part of and expires with the Section 404 and/or Section 10 permit unless explicitly stated in the WQC.

Acquisition of NWPs and the attendant WQCs shall not be construed or interpreted to imply the requirements for other permits are replaced or superseded, including Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits required under Missouri Clean Water Law [Sections 644.026.1 and 644.051, RSMo] for land disturbance or return water from material deposition. Permits or any other requirements shall remain in effect. Project proponents with questions are encouraged to contact the Department of Natural Resources' regional office in the project area. A regional office map with contact information is located at https://dnr.mo.gov/about-us/division-environmental-quality/regional-office.

Some localities are covered pursuant to Municipal Separate Storm Sewer System Permits with measures to control and possibly treat stormwater. If the project is located within one of these localities, project proponents must comply with all stormwater requirements of the locality's Stormwater Management Plan and any related ordinances. This ensures compliance with CWA Section 402 National Pollutant Discharge Elimination System Permit requirements and the Missouri Clean Water Law [Chapter 644, RSMo].

The Department encourages, but does not require, permittees to consider environmentally-friendly design techniques to include stormwater management strategies that maintain or restore the original site hydrology through infiltration, evaporation, or reuse of stormwater. Designs might include using porous pavement or creating vegetated swales and/or rain gardens. More information can be found at these websites: www.epa.gov/owow/NPS/lid/ and www.lid-stormwater.net/lid_techniques.htm.

The Department encourages the use of native vegetation to protect impacted areas from future water quality concerns. Native vegetation has evolved with Missouri's geology, climate, and wildlife to occur within a region as a result of natural processes rather than human intervention. For areas where direct impacts to streams are to be avoided, the Department recommends a minimum riparian buffer strip width of 50 feet as measured from top of bank.

The Department encourages the use of Horizontal Directional Drilling for stream and wetland crossings when practicable. If properly utilized, Horizontal Directional Drilling is an alternative to more traditional, open-trench methods and can result in significant minimization and/or complete avoidance of aquatic resource impacts.

The following publication provides guidance on how to protect water quality through Best Management Practices on project sites. For more information, please read: "Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri and Kansas" dated January 2011 and located online at https://dnr.mo.gov/document-search/protecting-water-quality-field-guide.

To help determine if a proposed activity could encounter species or sites of conservation concern within or near a project, including those that have not been recorded, the project proponent is encouraged to visit:

- Missouri Department of Conservation's "Natural Heritage Review" website at https://naturalheritagereview.mdc.mo.gov/.
- U.S. Fish and Wildlife Service's "Information, Planning and Conservation" website at http://ecos.fws.gov/ipac/.

If the proposed project encounters and will potentially affect a species of concern, please promptly report it to the Missouri Department of Conservation and the U.S. Fish and Wildlife Service.

For more information
Missouri Department of Natural Resources
Water Protection Program
P.O. Box 176
Jefferson City, MO 65102-0176
wpsc401cert@dnr.mo.gov
800-361-4827 or 573-522-4502
https://dnr.mo.gov/water
