

**Finding of No Significant Impact
For the Missouri River Recovery Program
Lower Little Sioux Bend Shallow Water Habitat Construction Project
Final Project Implementation Report
July 2011**

Project Summary

The Omaha District of the U.S. Army Corps of Engineers (USACE) proposes to create new shallow water habitat (SWH) on the Lower Little Sioux Reach of the Missouri River near the town of Little Sioux, Iowa between river miles 670.7 and 672.8 as part of the Missouri River Recovery Program (MRRP). This project would be constructed in response to The U.S. Fish and Wildlife Service (USFWS) amended Biological Opinion (BiOp) for the Operation of the Missouri River Mainstem and Bank Stabilization and Navigation Project (BSNP).

The proposed project entails significant topwidth widening of the Missouri River. The topwidth widening would create a shallow bench approximately 2 miles long and 300-700 feet wide depending on location. The project would potentially create 182 acres of new SWH. Other primary project features include approximately 60 large woody debris (LWD) and stone riprap structures and three 75 foot wide integrated chutes. The project would be constructed entirely on the Deer Island State Game Management Area (GMA) managed by the Iowa Department of Natural Resources (IDNR).

Alternatives

Through the planning process it was determined that a mechanical top-width widening project incorporating rootless vane and LWD structures would best achieve site specific project objectives and SWH program learning objectives. A need to learn about the biological productivity and physical sustainability of mechanically widening the top-width of the river has been identified by the USACE and partner agencies. Three alternatives were evaluated in detail: (1) The No Action Alternative as required by the National Environmental Policy Act (NEPA), (2) the medium width shallow bench alternative; and (3) the wide shallow bench alternative. Both development alternatives were deemed technically feasible. Alternative 3, the wide shallow bench alternative is proposed for implementation because it provides maximum benefits to pallid sturgeon and other native fish species by creating the largest amount of new SWH and best meets the system learning objectives as outlined in the Project Implementation Report (PIR).

Public Availability

Coordination between the Omaha District USACE and the IDNR has been occurring throughout the planning process for development of the Lower Little Sioux Bend project. Agency coordination letters were sent to the appropriate Federal and state resource agencies requesting information and their comment regarding the Proposed Action. The agencies provided

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information on federally listed and candidate threatened and endangered species, state species of special concern, natural communities, areas classified as prime farmland, and historic resources. The USACE and IDNR held a public meeting in Little Sioux, Iowa on October 14, 2010 to inform the public about the proposed project and to gather comments. The meeting was attended by 21 members of the public and USACE and IDNR staff. In addition to the public meeting and directly notifying the IDNR, Nebraska Department of Environmental Quality (NDEQ), Nebraska Game and Parks Commission (NGPC), and USFWS, the Draft Project Implementation Report (PIR) was posted for comment on the MRRP website, direct notice was mailed to adjacent landowners, and notice and request for comment was sent to members of the Missouri River Recovery Implementation committee (MRRIC).

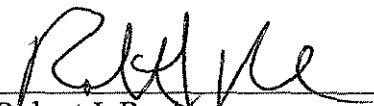
Summary of Environmental Impacts

Construction of the proposed project would result in disturbance of alluvial soils and existing terrestrial habitat due to SWH creation. Impacts would be minor/long-term and minor/short-term impacts related to construction activities. The minor long-term impacts are outweighed by the overall long-term environmental benefits from creation of new SWH, a type of habitat that is severely lacking in the channelized reaches of the Missouri River, and the net environmental benefits to the Missouri River and its floodplain from implementation of the overall MRRP.

Conclusion

It is my finding, based on the Project Implementation Report/Environmental Assessment, that the proposed Federal activity will not have any significant adverse impacts on the environment and that the proposed project will not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an Environmental Impact Statement is not required.

30 JUL 11
Date


Robert J. Ruch
Colonel, Corps of Engineers
District Commander



**US Army Corps
of Engineers®**
Omaha District

**Final Project Implementation Report and
Environmental Assessment with
Finding of No Significant Impact**

**Lower Little Sioux Bend
Shallow Water Habitat Construction Project
Missouri River Recovery Program
July, 2011**

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(*required by NEPA)

Acronyms and Abbreviations

ACT	Agency Coordination Team
BiOP	Biological Opinion
BSNP	Bank Stabilization and Navigation Project
C	Celsius
CA	Conservation Area
USACE	U.S. Army Corps of Engineers
CRP	Construction Reference Plane
CWA	Clean Water Act
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
GIS	Geographic Information Systems
GMA	Game Management Area
IDNR	Iowa Department of Natural Resources
M&E	Monitoring and Evaluation
mg/l	Milligrams per liter
MRRP	Missouri River Recovery Program
NAAQS	National Ambient Air Quality Standards
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NGPC	Nebraska Game and Parks Commission
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSHS	Nebraska State Historical Society
NWI	National Wetland Inventory
NWP	Nationwide Permit
NWR	National Wildlife Refuge
O&M	Operation & Maintenance
PgMP	Program Management Plan
pH	Potential of Hydrogen
PIR	Project Implementation Report
PL	Public Law
RM	River Mile
ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SWH	Shallow Water Habitat
SWPPP	Stormwater Pollution Prevention Plan
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WRDA86	Water Resources Development Act of 1986
WRDA99	Water Resources Development Act of 1999

EXECUTIVE SUMMARY

The Omaha District of the U.S. Army Corps of Engineers proposes to create new shallow water habitat (SWH) on the Lower Little Sioux Reach of the Missouri River near the town of Little Sioux, Iowa between river miles 670.7 and 672.8 as part of the Missouri River Recovery Program (MRRP). This project would be constructed in response to The U.S. Fish and Wildlife Service (USFWS) amended Biological Opinion (BiOp) for the Operation of the Missouri River Mainstem and Bank Stabilization and Navigation Project (BSNP). Part of this BiOp included the restoration of 20% of the SWH which existed prior to the BSNP to benefit the endangered pallid sturgeon and other native fish species. In general, SWH includes sidechannels, backwaters, depositional sandbars detached from the bank, and low-lying depositional areas adjacent to shorelines (USFWS, letter dated June 29, 2009).

The proposed project entails significant topwidth widening of the river. The topwidth widening would create a shallow bench approximately 2 miles long and 300-700 feet wide depending on location. The project would potentially create 182 acres of new SWH. Other primary project features include approximately 60 large woody debris (LWD) and stone riprap structures and three 75 foot wide integrated chutes. The project would be constructed entirely on the Deer Island State Game Management Area (GMA) managed by the Iowa Department of Natural Resources (IDNR). The project would cost approximately \$22 million and would be entirely federally funded.

Three alternatives were evaluated in detail: (1) The No Action Alternative, (2) the medium width shallow bench alternative; and (3) the wide shallow bench alternative. Both development alternatives were deemed technically feasible. However, Alternative 3, the wide shallow bench alternative is proposed for implementation because it provides maximum benefits to pallid sturgeon and other native fish species by creating the largest amount of new SWH and best meets the system learning objectives as outlined in Section 2.1 of this report.

Construction of the proposed project would result in disturbance of alluvial soils and existing terrestrial habitat due to SWH creation. Impacts would be minor/long-term and minor/short-term impacts related to construction activities. The minor long-term impacts are outweighed by the overall long-term environmental benefits from creation of new SWH, a type of habitat that is severely lacking in the channelized reaches of the Missouri River, and the net environmental benefits to the Missouri River and its floodplain from implementation of the overall MRRP.

CHAPTER - 1 INTRODUCTION

Pursuant to the National Environmental Policy Act of 1969 (NEPA) and Engineer Regulation 1105-2-100 (ER 1105-2-100) the purpose of this Project Implementation Report (PIR) is to provide documentation of the planning process conducted by the U.S. Army Corps of Engineers, Omaha District (USACE) in reaching a proposal to construct a shallow water habitat (SWH) project on the Lower Little Sioux Reach of the Missouri River near the town of Little Sioux in Harrison County, Iowa. The proposed project would be constructed as part of the Missouri River Recovery Program (MRRP).

The proposed project is intended to help meet the SWH acreage goal of the U.S. Fish and Wildlife Service (USFWS) Biological Opinion for the Missouri River (BiOp) (USFWS 2000, 2003) and thus provide habitat for the endangered pallid sturgeon (*Scaphirhynchus albus*) and other native fish and aquatic species. It is hypothesized that SWH benefits pallid sturgeon by slowing larval drift, providing larval fish habitat, and increasing the forage base of the river. The pallid sturgeon was listed as endangered throughout its entire range on September 6, 1990. Destruction and alteration of big-river ecologic functions and habitat once provided by the Missouri and Mississippi Rivers is believed to be the primary cause of declines in reproduction, growth, and survival of pallid sturgeon (USFWS 1993).

A major element of the reasonable and prudent alternative from the 2000 BiOp issued by the U.S. Fish and Wildlife Service (USFWS) includes the restoration of 20-30 acres per mile of SWH on the lower Missouri River by 2020. Key physical components of SWHs are their dynamic nature with depositional and erosive areas, predominance of shallow depths intermixed with deeper holes and secondary side channels, and lower velocities and higher water temperatures than main-channel habitats. SWH general criteria include depths less than 1.5 meters (or approximately 5 feet) and current velocities of less than 0.6 meters/second (or approximately 2 feet/second (USFWS letter dated June 29, 2009.)) SWH may be restored through flow management, increasing the top width of the channel (widening), restoring chutes and side channels, manipulation of summer flows, or a combination thereof (USFWS, 2003, pg. 193).

The MRRP was developed to address actions included in the 2000 and 2003 Amended Biological Opinions (BiOp) on the Operation of the Missouri River Reservoir System and the Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project (Mitigation Project) authorized by the Water Resources Development Acts of 1986 and 1999 (WRDA86 and WRDA99). The BiOp and Mitigation Project provide authority and direction to complete projects for fish and wildlife habitat along Missouri River, including the creation of SWH. Actions under the MRRP are being undertaken to mitigate for the loss of floodplain and main-channel habitat such as: backwaters, chutes, sloughs, islands, sandbars, lower velocity margins of banklines, snags, pools, and overflow areas on the floodplain that resulted from construction, operation, and maintenance of the Missouri River Bank Stabilization and Navigation Project (BSNP).

This PIR includes an Environmental Assessment (EA) consistent with NEPA. It provides an analysis of alternatives and a detailed description of the recommended plan for a SWH project at Lower Little Sioux Bend. This PIR also contains an evaluation of environmental impacts consistent with the requirements of pertinent Federal laws and regulations including NEPA, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and Section 404 of the Clean Water Act (CWA).

1.1 BACKGROUND

Historically, the dynamic nature of the Missouri River created an environment of braided, sinuous channels, sloughs, chutes, oxbows, sand and gravel bars, alluvial islands, deep pools, and marshlands. Since the early 20th century, the natural fluvial processes of predictable seasonal flooding into overbank areas, cut-and-fill alluviation associated with river meandering, and channel avulsion have been interrupted by efforts to redirect the energy of the river under the auspices of the BSNP and to control the flows through the construction and operation of a system of six large mainstem dams. The Rivers and Harbors Act of 1912, 1925, 1927, and 1945 authorized the BSNP.

The existing BSNP extends 735 miles from Sioux City, Iowa to the mouth near St. Louis, Missouri and maintains a nine-foot deep by 300-foot wide navigation channel. The BSNP consists mainly of revetments along the outsides of bends and transverse dikes along the insides of bends to force the river into a single self-maintaining active channel. This has resulted in a river with a single channel that is maintained along a pre-determined design alignment and flows that are suppressed in the spring and augmented in late Summer by reservoir releases. The original channel that once ranged from 1,200 feet to 2 miles wide is now 600 to 1,100 feet wide, with a majority of the water consisting of a deep main channel. This narrowing, along with controlled flows, resulted in the loss of approximately 168,000 acres of shallow open water habitat and has greatly homogenized the habitat available to riverine species.

1.2 PROJECT AUTHORITY

The MRRP was established by the USACE in 2003, essentially combining two related efforts including the responsibilities of compliance with the 2003 amended BiOp and acquiring and developing lands to produce habitat as directed by the BSNP Fish and Wildlife Mitigation Project.

The Missouri River BSNP Fish and Wildlife Mitigation Project of Missouri, Kansas, Iowa, and Nebraska was authorized by Section 601 (a) of the Water Resources Development Act of 1986 [Public Law (PL) 99-662]. The authorization included the acquisition and development of 29,900 acres of land, and habitat development on an additional 18,200 acres of existing public land in the states of Iowa, Kansas, Missouri, and Nebraska. The total amount of land authorized for mitigation by WRDA86 was 48,100 acres. Section 334(a) of WRDA99 (PL 106-53) modified the Mitigation Project by increasing the amount of acreage to be acquired and/or mitigated to 166,750 acres.

The USACE prepared a Feasibility Report and Environmental Impact Statement (USACE 1981) on the original Mitigation Program of 48,100 acres. After Congress modified the Mitigation Project in WRDA99, the USACE initiated a Supplemental Environmental Impact Statement (SEIS; USACE 2003a) in September 2001 for the additional 118,650 acres. The SEIS was completed in early 2003 and the Record of Decision (ROD) was signed in June 2003.

Section 3176(a) of WRDA 2007 further amended the Mitigation Project authorization allowing funds made available for recovery or mitigation activities in the lower basin of the Missouri River to be used for recovery or mitigation activities in the upper basin of the Missouri River, including the states of Montana, North Dakota, and South Dakota.

1.3 PROJECT DESCRIPTION AND LOCATION

The USACE proposes the creation of new SWH at the Deer Island State Game Management Area on the Lower Little Sioux Reach of the Missouri River near the town of Little Sioux, Iowa (see Figure 1.1: Regional Location Map). The Deer Island Game Management Area is managed by the Iowa Department of Natural Resources (IDNR). The property includes approximately 773 acres along the left descending bank of the river. The property currently provides habitat for numerous terrestrial wildlife species including game species such as whitetail deer and turkey.

The SWH would be created by mechanically widening the River channel by 400-700 feet, which would create a shallow water bench from river mile 670.7 to 672.8, a reach of 2.1 miles (construction plans provided in Appendix B). The project will also include 50 to 60 structures consisting of riprap and/or LWD. About half of the structures will be located within the existing river section with the remainder located within the excavated bank portion of the channel. This mechanical top-width widening project would be unique compared to other in-channel SWH projects which achieve bank erosion and channel widening by removing structure control and allowing the river to perform material removal through erosion.

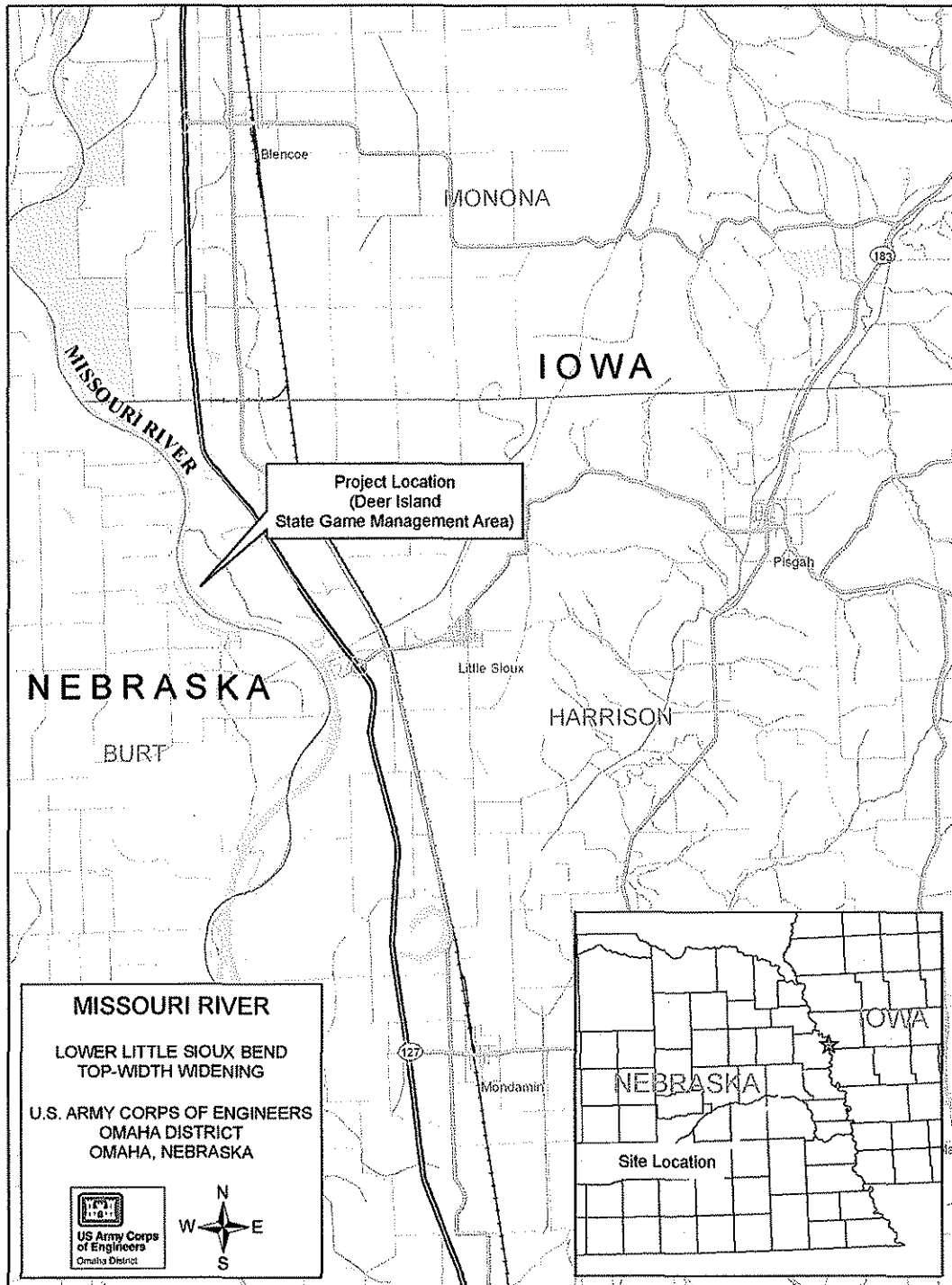


Figure 1.1: Regional Location Map

1.4 SCOPE OF STUDY

The geographic scope of this study is focused on the project area shown below in Figure 1.2. Preliminary measures considered in this study included backwaters, structure modifications, top-width widening, and flow-through chutes. As a result of preliminary screening, during the early planning stages it was determined that a top-width widening project would be most effective in meeting project goals and objectives. All permanent project features would be constructed in-channel or on IDNR lands.



Figure 1.2: Local Site Reference – 2005 Aerial Imagery (USDA)

1.5 SITE SELECTION

The resource agencies comprising the Agency Coordination Team (ACT), including the IDNR, have requested that the USACE take a more aggressive approach to in-channel SWH projects (see Section 2.5 for a complete listing of ACT agencies). Typically, river top-width widening is achieved by modifying river control structures and relying on the erosive force of the river to widen the river's top-width over time. The IDNR suggested that the USACE construct an aggressive top-width widening project at the Deer Island Game Management Area located on Lower Little Sioux Bend.

The Lower Little Sioux reach lies in USGS River Segment 15, a channelized segment of the river between Dakota City, NE and Blair, NE. According to the National Academy of Sciences (*The Missouri River Ecosystem: Exploring the Prospects for Recovery*, 2002) the potential to enhance the abundance of native fish species is very high in this segment of the River because human alterations are as great here as in any reach of the River.

The Lower Little Sioux (Deer Island) site was selected as a high-potential candidate site for SWH construction due to the large amount of available, low-lying accreted land on the inside bend of the river. The site is also situated in close proximity to other constructed and planned SWH projects, thereby increasing the habitat value of this location by forming a complex of SWH projects rather than a single isolated project (see Figure 1.3 on following page). Additionally, the site is part of a large patch of riparian habitat (in a relatively intact riparian corridor) that could serve to insulate the SWH site from surrounding land uses and provide nutrient input and aquatic habitat in the form of woody debris and other organic material. Aerial photos of the property examined from the 1960's (Iowa DNR GIS Library) depict a formerly existing chute and an accreted island (Deer Island) between the main channel and chute. River control structures installed as part of the Bank Stabilization Project caused river sediment to settle from the water column and accumulate (accrete) essentially creating new stable land in the once shifting river floodplain. A relatively small portion of this accreted land would be removed by the proposed project and returned to the River.

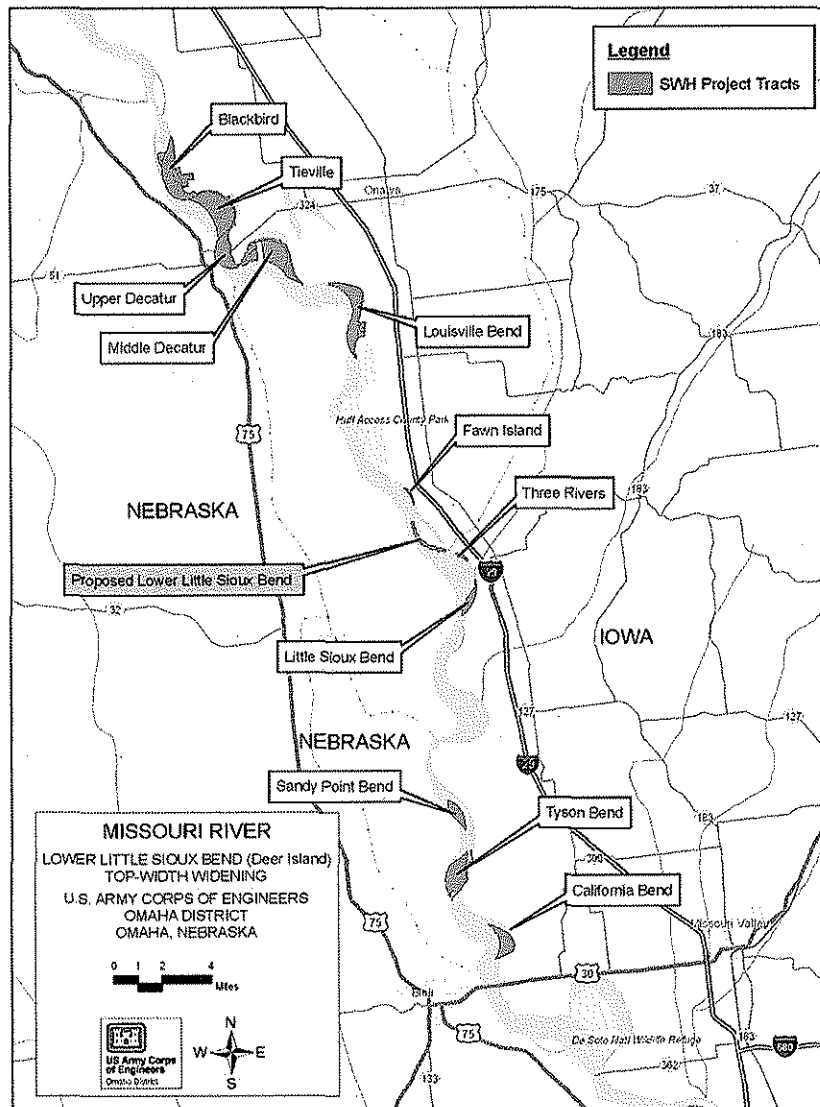


Figure 1.3: Shallow Water Habitat Projects in Vicinity

The IDNR would grant a construction easement to the USACE for construction and operation of the project. Standardized site selection criteria for the Mitigation Program are outlined in Real Estate Design Memorandum No. 1 (1990) and Supplement No. 1 to Real Estate Design Memorandum No. 1 (2002). Further criteria resulted from the Joint Real Estate Project Management Plan (2002), the SEIS (2003), and the Program Management Plan (PgMP; 2005). The following applicable criteria are provided:

- The size of the area is greater than 100 acres
- The area would not adversely affect navigation, carrying capacity of existing levees, or flood-carrying capacity of the existing floodway.
- The area was part of the meander belt of the Missouri River.
- Sites chosen for acquisition or development will be based on state and Federal agency input and support.
- Projected operation and maintenance costs will be considered in the selection of acquisition and development sites.

CHAPTER 2 - PROJECT GOALS AND OBJECTIVES

2.1 PURPOSE AND NEED FOR ACTION

The purpose of site-specific Recovery Program SWH projects such as Lower Little Sioux Bend is to benefit the federally endangered pallid sturgeon and other native aquatic species. SWH generally refers to mainstem and off channel areas where water depth is relatively shallow and current velocities are low. SWH is the type of aquatic habitat most significantly reduced from historic river conditions and necessary to restore a semblance of natural form and function to the River. It is hypothesized that SWH benefits pallid sturgeon by slowing larval drift, providing larval fish habitat, and increasing the forage base of the river. The loss in SWH is hypothesized to have contributed to the decline in pallid sturgeon populations by reducing the aforementioned benefits. In general, restoring SWH benefits native aquatic species by creating the types of habitat that existed prior to the BSNP including: side channels, backwaters, depositional sandbars detached from the bank, and low lying depositional areas adjacent to shorelines. In addition, the project will address the BiOp Reasonable and Prudent Alternative (RPA) element calling for the creation of 20-30 acres of SWH per river mile.

The need for SWH projects such as Lower Little Sioux Bend rests in the loss of a large river ecosystem that included diverse fish and wildlife habitat and species, and the changing public values that have placed significant importance on reestablishing native fish and wildlife species. The historic variety and quality of aquatic habitats have been eliminated or altered by construction of the navigation channel and reservoir system, resulting in the Federal listing of the pallid sturgeon. Dikes and revetments have greatly reduced the meandering of the river, and flooding of the river has resulted in accretion of lands that have significantly altered aquatic habitats and allowed for expansion of agricultural practices into the historic floodplain. The BSNP affected 735 miles of river, and shortened it by approximately 72 miles. In 1981, The USACE estimated that

approximately 522,000 acres of fish and wildlife habitat in the natural channel and meander belt of the Missouri River would have been lost along this stretch of the river, including 354,000 acres of meander belt habitat and 168,000 acres of riverine habitat. It is estimated that for each linear mile of channel, one square mile of habitat was lost (USACE 1981; USACE 2005 and USFWS 2000, citing others)).

Additional impetus for the creation of SWH is derived from the 2000 and 2003 BiOP. The BiOP presents reasonable and prudent alternative requirements for habitat restoration, creation, and acquisition related to restoration of SWH in the channelized river. Habitat loss and resultant adverse impacts to fish and wildlife, including threatened and endangered species, needs to be addressed and mitigated as authorized by Congress through WRDA86 and amended in WRDA99 and WRDA07. Acquisition and development of lands along the Missouri River need to occur to benefit endangered species and mitigate the resources lost to channelization and bank stabilization. The Recovery Program was established to accomplish these needs.

Development of the Lower Little Sioux Project would contribute to achieving the goals of the MRRP which are to: benefit endangered species and mitigate for the loss habitat resulting from the BSNP.

Project goals stem from the primary goals of the MRRP. The project goals are to:

1. Benefit the endangered pallid sturgeon and other native aquatic species.
2. Mitigate for the loss of aquatic habitat resulting from the BSNP.

The objectives for the Lower Little Sioux Project were developed in part to meet the BiOp elements and Mitigation Program authorization. They were also developed to help address uncertainties about the eventual biological productivity and physical sustainability of in-channel SWH projects that rely on structure modification and erosion to create SWH. The SWH program is an adaptive management program (AM). The SWH AM process evaluates species and habitat responses to management actions within the river to continually provide knowledge for the decision-making process. The SWH program is based on the premise that increased physical habitat complexity in the river will increase the abundance of pallid sturgeon and other native fish species. The biological response and physical habitat characteristics are monitored to measure the success of management actions.

The site specific objectives include:

- 1) Replace SWH lost by construction and operation of the BSNP.
- 2) Improve aquatic habitat quality and diversity for pallid sturgeon and other native aquatic species.
- 3) Maximize the amount of biologically productive and physically sustainable SWH while maintaining a properly functioning navigation channel.

- 4) SWH Program system learning objectives include:
- 5) Determine the level of biological productivity and physical sustainability of maximum top-width widening.
- 6) Gain a better understanding of the eventual biological productivity and physical sustainability of other in-channel SWH projects.

2.2 CONSTRAINTS

The following constraints have been identified for the system and individual projects:

Navigation Channel: Avoid actions that would adversely affect the Navigation Channel including requiring excessive maintenance activities.

Flood Elevations: Avoid increases in flood elevations that would require mitigation of adverse effects. Because of the potential high cost and risk associated with flood mitigation actions, efforts will be made to avoid this threshold.

Legal Compliance: All efforts conducted in the implementation of the BiOp and the Mitigation Project shall comply with all Federal, state, and local regulations pertaining to the activities undertaken by the USACE of Engineers.

2.3 RESOURCE SIGNIFICANCE

The Missouri River is the nation's longest river, flowing roughly 2,300 miles from the Rocky Mountains in Montana to the Mississippi River near St. Louis, Missouri. The basin encompasses 560,000 square miles, approximately 1/6th of the continental US and portions of 10 states and 2 Canadian provinces. The following sections clearly identify the significance of the environmental resources that are associated with the Missouri River and proposed project. The Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) defines significance in terms of institutional, public, and technical recognition of the resources.

2.3.1 Institutional Recognition

Institutional recognition is based on the significance of resources acknowledged in laws, adopted plans and other policy statements by agencies both public and private. The formal recognition of the Missouri River Basin by Congress and the following agencies and private groups illustrates the significance of the basin to these institutions.

The U.S. Congress has repeatedly recognized the significance of the Missouri River Basin through continued authorizations and appropriations for study and implementation of water resources projects. Recent authorizations include Section 108 of the Omnibus Appropriations Act of 2009 establishing the Missouri River Authorized Purposes Study (MRAPS), Section 5018 of WRDA 2007 authorizing the Missouri River Ecosystem

Implementation Committee (MRRIC), and Section 3176 of WRDA expanding the BSNP authorization to cover upper basin Recovery Activities, and continued funding and support for the MRRP. The Missouri River currently has two segments designated as National Wild and Scenic Rivers including a total of 34,159 acres.

The creation of MRRIC established a formal institutional framework at the direction of Congress and as chartered by the Assistant Secretary of the Army for Civil Works (ASA(CW)). MRRIC was established under the provisions of Section 5018 of the Water Resources Development Act of 2007 to provide guidance to the Secretary with respect to the Missouri River Recovery and Mitigation Plan in existence on the date of enactment of the act (November 9, 2007) and to provide guidance to the Secretary and any affected Federal agency, State agency, or Indian tribe with respect to a study of the Missouri River and its tributaries, to be conducted in consultation with the MRRIC, to determine actions required to mitigate losses of aquatic and terrestrial habitat; recover federally listed species protected under the Endangered Species Act (ESA); and restore the ecosystem to prevent further declines among other native species. The 70 members include representatives from eight basin states, 16 basin tribes, 15 federal agencies, and 28 stakeholder categories. Commencing in 2005, the USACE, USFWS, Environmental Protection Agency (EPA) and other federal agencies enlisted the assistance of the U.S. Institute for Environmental Conflict Resolution (USIECR) to develop a process for establishing MRRIC and currently oversees facilitation.

2.3.2 Public Recognition

Public recognition means that some segment of the public either individually or as a group recognizes some importance of an environmental resource. In the Missouri River Basin the public widely acknowledges the importance of the river, its associated activities, uses, resources and ecosystem services as something that provides benefits to people and their well-being. The Missouri River has strong and vocal support of its uses and activities including navigation, flood risk management, agriculture, hydropower, thermal power, water supply for municipal and industrial use, public use, and irrigation, water quality, fish and wildlife, recreation, commercial fishing, plant gathering, and cultural resources, among others.

2.3.3 Technical Recognition

Technical Recognition is determined through review of relevant published and non-published literature and documents. Numerous scientific analyses and long-term evaluations of the Missouri River Basin have documented many of these significant resources.

In a 1995 report, the U.S. Department of the 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. In particular, large floodplain-river ecosystems have become increasingly rare worldwide. In 2002, the National Academy of Sciences Water Science and Technology Board (WSTB)

published Missouri River Ecosystem: Exploring the Prospects for Recovery that describes the Missouri River ecosystem—the Missouri River's main channel and its flood-plain—as having experienced significant reductions in natural habitat and in the abundance of native species and communities.

The historic Missouri River aquatic and terrestrial habitats provided a unique large-river ecosystem including braided channels and chutes, backwaters, oxbow lakes, wetlands, islands, sand bars, riparian forests, and prairie grasses (NRC, 2002). The natural hydrology of the river maintained connectivity between and the terrestrial and aquatic habitats, and sustained the natural floodplain communities. Channels and backwater areas provided slower-moving waters; critical for the reproduction, shelter, and feeding of fish species. The Missouri river with its ephemeral sand bars, islands, chutes, wetland, and incredibly diverse riparian zone once served as a major migration corridor for nearly 90 species of water birds, or 40 percent of all those in North America. Many of these reproduced in great numbers along the river. The Missouri River continues to be a major migration corridor for these species.

The significance of the Missouri River is also emphasized by its provision of critical habitat for three listed species: the endangered Interior least tern (*Sterna antillarum*), threatened Northern Great Plains piping plover (*Charadrius melodus*), and the endangered pallid sturgeon (*Scaphirhynchus albus*).

Modifications to the system have resulted in significant impacts to the Missouri River ecosystem such as, alteration of three million acres of natural river habitat; 51 of 67 native fish species now listed as rare, uncommon or decreasing; reproduction of cottonwoods, the dominate floodplain tree along much of the river, has largely ceased; and aquatic insects, a key link in the food chain, have been reduced by an estimated 70 percent. The Natural Resource Council concluded their 2002 report stating “this report recommends the use of an adaptive management approach to reverse the ecological decline of the Missouri River.”

2.4 PRIOR REPORTS

The following previous reports are related to this PIR:

- U.S. Fish and Wildlife Service, 1980. *Missouri River Stabilization and Navigation Project, Sioux City, Iowa to Mouth Detailed Fish and Wildlife Coordination Act Report.*
- U.S. Army USACE of Engineers, Missouri River Division, 1981. *Missouri River Bank Stabilization and Navigation Project Final Feasibility Report and Final EIS for the Fish and Wildlife Mitigation Plan.*
- U.S. Army USACE of Engineers, Kansas City District, 1990a. *Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project, Reaffirmation Report.*

- U.S. Army USACE of Engineers, Missouri River Division, 1990b. *Missouri River Bank Stabilization and Navigation, Fish and Wildlife Mitigation Project, Real Estate Design Memorandum #1.*
- U.S. Fish and Wildlife Service, 2000. *Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System.*
- U.S. Army USACE of Engineers, Kansas City and Omaha Districts, 2003. *Missouri River Fish and Wildlife Mitigation Project, Final Supplemental Environmental Impact Statement and Record of Decision.*
- U.S. Army USACE of Engineers, 2003. *Biological assessment on the operation of the Missouri River mainstem reservoir system, the operation and maintenance of the bank stabilization and navigation project, and the operation of Kansas River reservoir system.*
- U.S. Fish and Wildlife Service, 2003. *Amendment to the Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System.*
- U.S. Army USACE of Engineers, Northwestern Division, 2004. *Missouri River Mainstem Reservoir System Master Water Control Manual, Missouri River Basin.*
- U.S. Army USACE of Engineers, Omaha District, 2010. *Draft Programmatic Environmental Impact Statement for Mechanical Creation and Maintenance of Emergent Sandbar Habitat on the Upper Missouri River.*

2.5 AGENCY and PUBLIC COORDINATION

Representatives from the U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), Natural Resource Conservation Service (NRCS), Iowa Department of Natural Resources (IDNR), Kansas Department of Wildlife and Parks (KDWP), Missouri Department of Conservation (MDC), and the Nebraska Game and Parks Commission (NGPC) along with the Kansas City and Omaha Districts of the USACE comprise the ACT. The initial responsibility of the ACT was to develop selection criteria for screening and prioritizing general areas to identify willing sellers for potential mitigation sites. The ACT also meets to discuss future activities, priorities, funding, and other issues related to implementing, managing, and monitoring the Mitigation Program. The potential development of SWH at Lower Little Sioux Bend has been coordinated with the ACT.

Coordination between the Omaha District USACE and the IDNR has been occurring throughout the planning process for development of Lower Little Sioux (Deer Island). Agency coordination letters were sent to the appropriate Federal and state resource agencies requesting information and their comment regarding the Proposed Action. The agencies provided information on federally listed and candidate threatened and endangered species, state species of special concern, natural communities, areas classified as prime farmland, and historic resources (Agency Correspondence Appendix A).

The USACE and IDNR held a public meeting in Little Sioux, Iowa on October 14, 2010 to inform the public about the proposed project and to gather comments. Potential issues raised during the meeting included: sedimentation of the Harbor 671 side-channel located just downstream from the project; concerns about boating hazards from rock-riprap structures placed in the channel; and loss of access to the Deer Island Game Management Area and the adjoining Missouri River. Comment forms were distributed at the meeting, but no written comment forms were received. A list of meeting attendees is included in Appendix A.

In addition to directly notifying the IDNR, NDEQ, NGPC, and USFWS, the Draft Project Implementation Report (PIR) was posted for comment on the Missouri River Recovery Program website, direct notice was mailed to adjacent landowners through the Section 404 permitting process, and notice and request for comment was sent to members of the Missouri River Recovery Implementation committee (MRRIC).

A total of three comments were received from the public during the public notice period. The central concerns related to the project included potential boating hazards from rock-riprap structures placed in the channel; sedimentation/siltation of downstream chutes, canals, and channels, and potential exacerbation of flooding from the proposed project. Comment letters are provided in Appendix A.

2.6 EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS

The project site is located in the channelized reach of the Missouri River which runs roughly from Sioux City to the Mississippi River. The flow in this reach is controlled by regulation from upstream reservoirs, channelization, bank stabilization, and levees; which has caused greatly reduced river/floodplain connectivity in this reach. The Deer Island GMA consists of approximately 625 acres of Eastern Riparian Woodland (upland), 26 acres of Reed canarygrass dominated wetlands, 65 acres of willow shrublands (wetland) and 75 acres of leased farmland. The site is currently managed by the IDNR for terrestrial wildlife species. A detailed account of existing conditions is provided in Chapter 4 Affected Environment.

Without a project, native fish species that rely on more natural river conditions would continue to be adversely affected by ongoing operations of the BSNP. Invasive, non-native, and generalist species (species with less-specific habitat requirements) would continue to dominate fish populations. The establishment of wetlands and aquatic habitat would be limited to natural processes; which as explained earlier, have been

impaired by the BSNP. By taking no action, the mitigation of the aquatic and wetland habitats lost due to the BSNP would occur to a much lesser degree. Without construction of a shallow water habitat project, Deer Island GMA would continue to be managed by the Iowa DNR as a game management area. Activities to develop habitat that would benefit the endangered pallid sturgeon and other native fish species would not be undertaken. The existing riparian woodland community would develop through natural succession, likely transforming from a predominance of mature cottonwoods to green ash, mulberry, and dogwoods. Low-lying accreted soils adjacent to the channel would likely continue to be dominated by a monotypic stand of reed canarygrass as new sediment is deposited through occasional flooding. Minimal disturbance to migratory birds would be expected under the No Action Alternative. The site would continue to provide habitat for raptors and migratory songbirds. In the future, the site would likely provide less suitable nesting habitat for bald eagles and other raptors that utilize large cottonwoods as the tree canopy transitions from large mature cottonwoods to green ash, elms, mulberry, and dogwoods.

CHAPTER 3 - ALTERNATIVES

3.1 INTRODUCTION

This chapter describes the measures and alternatives considered for the development of SWH at Lower Little Sioux Bend, and compares the alternatives in terms of their environmental impacts and achievement of site objectives. When formulating a SWH project, the project team considers potential categories of SWH development measures including: constructing backwaters, top-width widening, and chute construction in order to determine which habitat type best fits the project site, the project purpose and need, and project objectives. As required by NEPA, the No Action Alternative is also considered.

Backwater development, river control structure modification to achieve top-width widening, mechanical top-width widening, and chute construction represent the categories of development measures. These measures were evaluated against their ability to fulfill the site objectives which stem from the broad MRRP goals and project Purpose and Need as previously defined in Chapter 2. This chapter includes a description of each measure, each alternative, an evaluation of the alternatives, and a detailed description of the recommended alternative.

3.2 PRELIMINARY MEASURES CONSIDERED

This section provides a brief description of the categories of primary and secondary SWH measures that were considered in preliminary planning. As used in this report, the term primary measures represents the different categories of SWH and secondary measures are features used to enhance the function of the primary measure.

3.2.1 Primary Measures

3.2.1.1 Backwater Development

This measure would involve construction of a backwater at Lower Little Sioux Bend. Construction of a backwater would include the excavation of off-channel aquatic habitat with one connection to the Missouri River and relatively still water. Backwaters provide habitats protected from high flows and offer high primary and secondary productivity. In general, these habitats simulate lost oxbow lakes and abandoned channel habitats.

3.2.1.2 River Control Structure Modification to Achieve Top-Width Widening

This measure would involve the modification of the river control structures along the shoreline at Lower Little Sioux Bend. Modifying the structures by creating notches or lowering the structures encourages erosion of the river bank causing the top-width of the river to increase. These erosional areas create shallow low-velocity benches

adjacent to the main channel of the river to provide habitat for pallid sturgeon and other native fish species.

3.2.1.3 Mechanical Top-Width Widening

This measure would involve excavation of accreted soils by mechanical means to widen the top-width of the river channel. Typically, channel training structures are modified or new structures are added to encourage the river to erode the bank and widen the top-width of the river; however, using those methods, the river could potentially take decades to fully erode the bend to its highest potential width. Therefore, mechanically removing sediment to the desired end condition (width) was considered as a way to achieve near-term benefits.

3.2.1.4 Flow-Through Chute Construction

This measure would involve excavation of side channels with possible multiple connections to the Missouri River in addition to the entrance and exit. The multiple connections are referred to as secondary connections or tie channels. Chutes provide a dynamic environment with active bank and bar building processes. A properly formulated chute will function in both normal and high flow events. Chutes typically include one or more grade control structures to limit degradation within the chute and maintain the proper flow split between the chute and the main channel. Chutes provide highly productive SWH; benefitting the pallid sturgeon and other native Missouri River fish species.

3.2.2 Secondary Measures

3.2.2.1 Chevron

A chevron is a "U" or "V" shaped rock structure that points upstream and is intended to induce deposition of substrate to form SWH as well as widening of the adjacent bank. Chevron can be either closed or opened and may be modified to include wings or rootless-dike like structures.

3.2.2.2 Rootless Vanes

A rootless vane is a stone structure perpendicular to the flow of the river that is completely detached from the bank. These structures increase the amount of SWH by causing river widening on the landward side of the vane and deposition of sediment downstream of the vane.

3.2.2.3 Rootless Vane with Large Woody Debris

These features incorporate LWD into the rootless vane structures to increase the habitat value of the structures. Woody debris was historically more abundant in the

Missouri River and provides habitat for macroinvertebrates as well as native fish species.

3.2.2.4 Reverse Sills

Reverse sills are similar structures to rootless vanes except that they are placed atop an existing dike and so are attached to the bank via a lower elevation dike.

3.2.2.5 Integrated Chutes

This measure would include excavating chutes (channels) within the SWH zone. Integrated chutes were identified as a measure that could provide depth diversity, discourage excess sedimentation of the shallow bench, and also to facilitate construction access for larger dredges.

3.3 PRELIMINARY SCREENING of PRIMARY MEASURES

This section briefly discusses the measures that were considered but eliminated from further consideration. Measures were evaluated based on their ability to meet project goals, objectives, and the purpose of the project as outlined in Chapter 2 of this report.

3.3.1 Backwater Development

Backwater habitats are an extremely productive type of off-channel SWH that could be successfully implemented at this location. The backwater development measure was eliminated from further consideration because the system learning objectives for this project are centered on in-channel SWH. Additionally, the Deer Island GMA stretches the entire length of Lower Little Sioux Bend. The willingness of the IDNR to grant an easement for the proposed project offers a relatively rare opportunity to widen the top-width of an entire bend.

3.3.2 River Control Structure Modification to Achieve Top-Width Widening

The river control structure modification measure was eliminated from further consideration at this site because using this method, there is uncertainty regarding the amount of time required for the desired amount of habitat to develop. Using this method it could potentially take decades for the bank to erode to the desired top-width. Additionally, many of the dikes along Lower Little Sioux Bend have already been notched, limiting the opportunity to modify additional structures. This measure would not fulfill the objective of gaining a better understanding of the eventual biological productivity and sustainability of in-channel SWH projects to the same degree as the mechanical top-width widening measure.

3.3.3 Flow-Through Chute Construction

A formerly existing chute runs along the east boundary of the Deer Island GMA. The flow-through chute option could potentially be successfully implemented at this location; however, it was eliminated from further consideration because this measure does not meet the system learning objectives of determining the level of biological productivity and physical sustainability of maximum top-width widening and gaining a better understanding of the eventual biological productivity and physical sustainability of other in-channel SWH projects. Through coordination with the IDNR it was also determined that the flow through chute option may also cause an unacceptable access barrier for public use of Deer Island GMA.

TABLE 3-1: Primary Measures and Screening Criteria

Measures	MRRP Goals 1. benefit pallid sturgeon 2. mitigate for loss of fish and wildlife habitat due to BSNP	Site Specific Objectives 1. Replace SWH lost due to BSNP 2. Improve aquatic habitat quality and diversity 3. maximize amount of biologically productive and physically sustainable SWH while maintaining navigation channel	MRRP Learning Objectives 1. Determine level of biological productivity and physical sustainability of maximum topwidth widening 2. Gain a better understanding of the eventual biological productivity and physical sustainability of other in-channel SWH projects
Backwater Development	Would achieve MRRP goals	Could be designed to achieve all site specific objectives	Would not achieve either learning objective
Structure Modification to Achieve Top-width Widening	Would achieve MRRP goals	Could achieve all, but could potentially take decades to realize #3	Could achieve both objectives, but could potentially take decades to develop
Flow-Through Chute	Would achieve MRRP goals	Could be designed to achieve all site specific objectives	Would not achieve either learning objective
Mechanical Top-width Widening	Would achieve MRRP goals	Would achieve all site specific objectives	Would achieve both learning objectives in an acceptable timeframe

3.4 PRELIMINARY SCREENING OF SECONDARY MEASURES

Secondary measures were chosen for this project based on the objectives of encouraging additional river widening on the site, encouraging deposition of sediment to

create additional SWH, maintaining flows in the new SWH, maintaining flows in the navigation channel, and providing enhanced habitat benefits to the newly created SWH. Selection of secondary measures also takes into account site specific flow conditions and constructability in addition to objectives. With the aforementioned objectives in mind and taking into consideration flow conditions and constructability it was determined that a combination of rootless vanes and rootless vanes with LWD incorporated would provide the most sustainable SWH and an additional benefit to the ecosystem from the inclusion of LWD. The rootless vane structures would be placed perpendicular to flow and would cause more landward river widening, divert more current into the navigation channel, and cause a greater amount of sediment deposition in the SWH area than the chevron measure. The rootless vane structures also allow more flexibility in placement than reverse sill structures because they do not need to be placed on top of an existing dike structure. Integrated chutes were included to provide depth diversity, discourage excess sedimentation of the shallow bench, and also to facilitate construction access for larger dredges.

The final number and placement of these measures was determined through computer modeling. The configuration that produced the greatest amount of sustainable SWH was incorporated into the design of the preferred alternative. The primary purpose of the measures included in the design is to achieve the desired hydraulic functions for the project. LWD was added to the rootless vanes where it was anticipated to be constructible. The LWD structures would be more feasible to construct in areas of lower current velocity and depth (See Appendix B for LWD typical drawing).

3.5 FINAL ALTERNATIVES

Through the planning process it was determined that a mechanical top-width widening project incorporating rootless vane and LWD structures would best achieve site specific project objectives and SWH program learning objectives. A need to learn about the biological productivity and physical sustainability of maximum top-width widening has been identified by IDNR and other partner agencies. The Lower Little Sioux Project was selected, in part, because it would provide an opportunity to monitor the biological and physical response of maximum top-width widening.

This project would be unique compared to other in-channel SWH projects which achieve bank erosion and channel widening by removing structure control and allowing the river to perform material removal through erosion. This erosion process is lengthy; the rate of bank erosion is directly correlated to excess energy and higher river flows. To create new SWH at the Deer Island site, the embankment needs to be excavated from 2 to 5.5 feet below CRP (note: Construction Reference Plane (CRP) is a sloping datum representing the water surface elevation met or exceeded 75% of the time during navigation season (April to November)). The river could potentially take decades to erode the embankment to this level. Because the erosion process is lengthy, there are no ideal reference sites to address existing uncertainties about the eventual productivity and physical sustainability of the end-state of in-channel SWH projects. This proposed project is intended to help address these uncertainties by creating a SWH area that

closely resembles the desired end-state of SWH projects that rely on structural modifications and the erosive force of the river. The Lower Little Sioux project area can then be monitored to help gauge the eventual biological productivity and physical sustainability anticipated of other SWH projects constructed with more-passive means. This information is critical because it could help to forecast the future success of many in-channel SHW projects as they are currently being implemented. Detailed monitoring of the completed project would also help to determine if the biological response gained from aggressively widening the top-width of the river by mechanical means is worth the expenditure.

Lower Little Sioux Bend provides an opportunity to construct a major top-width widening project because of the availability of a large tract of low-lying accreted land (Deer Island Game Management Area (GMA)) on the inside bend of the River; therefore the final alternatives are mechanical top-width widening variations. In an effort to maximize biological output and sustainability, and to analyze the environmental consequences of different top-width widening configurations, three different alternatives ranging from No Action to a maximum top-width widening of 700 feet were considered. Both action alternatives include integrated chutes that serve to diversify depth and flow in the newly created SWH and to allow access for hydraulic dredges. As required by NEPA, the No Action alternative was also analyzed. The No Action alternative serves as a baseline for comparison of the impacts of the proposed action alternatives.

Hydrologic modeling was performed on multiple top-width widening configurations to determine which offered the most sustainable SWH without adversely impacting the navigation channel. The analysis showed that the channel could be widened up to 700 feet in some areas without adversely affecting the navigation channel. After multiple modeling iterations, two final potential action alternatives were identified. Both alternatives use similar strategies to meet the purpose and need and objectives of the project as outlined in Chapter 2; they differ primarily in width and length of the proposed dredging area, number of habitat structures, and in configuration of the integrated chutes. The No Action Alternative and the two action alternatives were analyzed to display the benefits and impacts of creating differing levels of SWH at the Deer Island site. The alternative that offered the most diverse, sustainable SWH without causing unacceptable adverse impacts to the navigation channel or the environment was chosen as the preferred alternative.

3.5.1 Alternative 1 (No Action Alternative)

Under the No Action Alternative, no activities to develop aquatic habitat at Lower Little Sioux Bend would occur. The property includes approximately 773 acres of riparian habitat along the left descending bank of the river. The property currently provides habitat for numerous terrestrial wildlife species including game species such as whitetail deer and turkey. The proposed construction site does not currently provide aquatic habitat.

Without construction and operation of the proposed Lower Little Sioux Project, the site would continue to provide terrestrial habitat. The IDNR would continue to manage the property as a game management area for terrestrial species. The establishment of aquatic habitat would be limited to natural processes; which as explained earlier, have been impaired by the BSNP. By taking no action, the mitigation of the aquatic habitats lost due to the BSNP would not occur at this site and would occur to a much lesser degree in this stretch of river. A detailed account of the existing site condition is available in Chapter 4, Affected Environment.

3.5.2 Alternative 2 - (Medium Width Shallow Bench with Integrated Chutes)

The Alternative 2 excavation zone would be approximately 1.5 miles long and would include three 100 foot-wide chutes within a shallow 400-500 foot wide bench excavated from 2 to 5.5 feet below CRP. Approximately 59 acres of woodlands would be converted to SWH. The chutes would be excavated 2 to 4 feet deeper than the shallow bench (see Figure 3.1 on the following page for conceptual drawing). Approximately 1.5-2 million cubic yards of material would be excavated from the bank using hydraulic dredges. Material would be distributed in the main channel adjacent to the excavation zone until the design grade is reached. Discharging this material among the various stone riprap structures would allow sediment to settle from the water column, potentially creating additional SWH. The remaining material would be discharged into the thalweg of the Missouri River where it would become entrained into the bedload of the river. Large woody debris (LWD) and stone riprap structures would be placed in the channel to provide aquatic habitat, to create a diversity of flow, and to maintain depths in the existing navigation channel by partially diverting current back into the navigation channel. Trees and brush cleared from lowering of the bank line would be salvaged for use as LWD structures in the channel. The remainder would be placed in piles selectively located throughout the project to serve as habitat for birds and small mammals. Approximately 77 acres of SWH would be created initially through sediment removal, with an estimate of an additional 30 acres of SWH forming as sediment is deposited among the stone riprap structures.

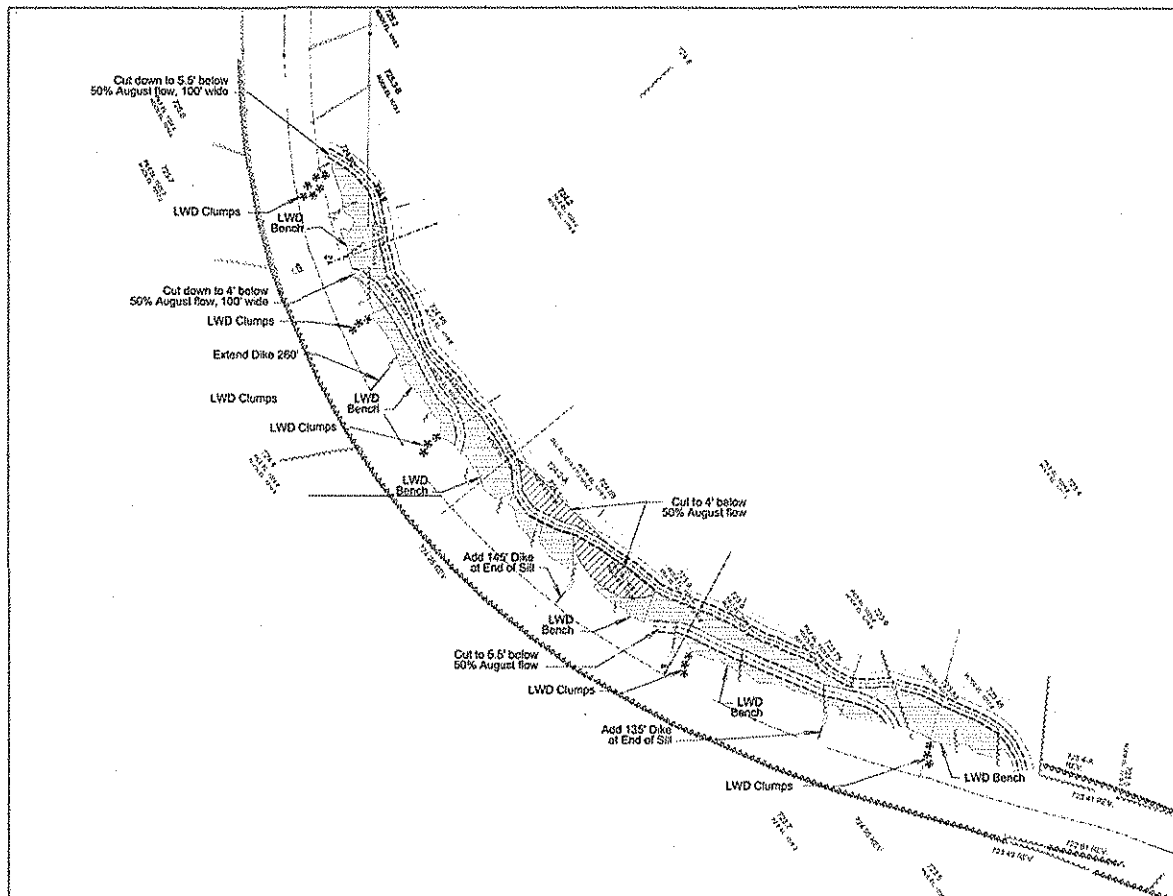


Figure 3.1: Alternative 2 Conceptual Drawing

3.5.3 Alternative 3 - (Wide Shallow Bench with Integrated Chutes)

Alternative 3 would consist of a project that would be approximately 2 miles long and 400-700 feet wide (width would vary depending upon location – see Figure 3.2 on the following page for conceptual drawing). Approximately 103 acres of woodlands would be converted to SWH. Large woody debris (LWD) and stone riprap structures would be placed in the channel to provide aquatic habitat, to create a diversity of flow, and to maintain depths in the existing navigation channel by partially diverting current back into the navigation channel. Trees and brush cleared from lowering of the bank line would be salvaged for use as LWD structures in the channel. The remainder would be placed in piles selectively located throughout the project to serve as habitat for birds and small mammals.

The excavation zone would include 2-3 approximately 75 foot-wide chutes and a 300-700 foot-wide shallow bench excavated from 2 to 5.5 feet below Construction Reference Plane. The chutes would be excavated 2 to 4 feet deeper than the shallow bench, and are intended to provide depth diversity and also to enhance construction efficiency by allowing access for larger dredges. Approximately 2.5 to 3.0 million cubic yards of material would be excavated from the bank using hydraulic dredges. Material would be

distributed in the main channel adjacent to the excavation zone until the design grade is reached. Discharging this material among the various stone riprap structures would allow sediment to settle from the water column, potentially creating additional SWH. The remaining material would be discharged into the thalweg of the Missouri River where it would become entrained into the bedload of the river. Approximately 132 acres of SWH would be created initially through sediment removal, with an estimate of an additional 50 acres of SWH forming as sediment is deposited among the stone riprap structures.

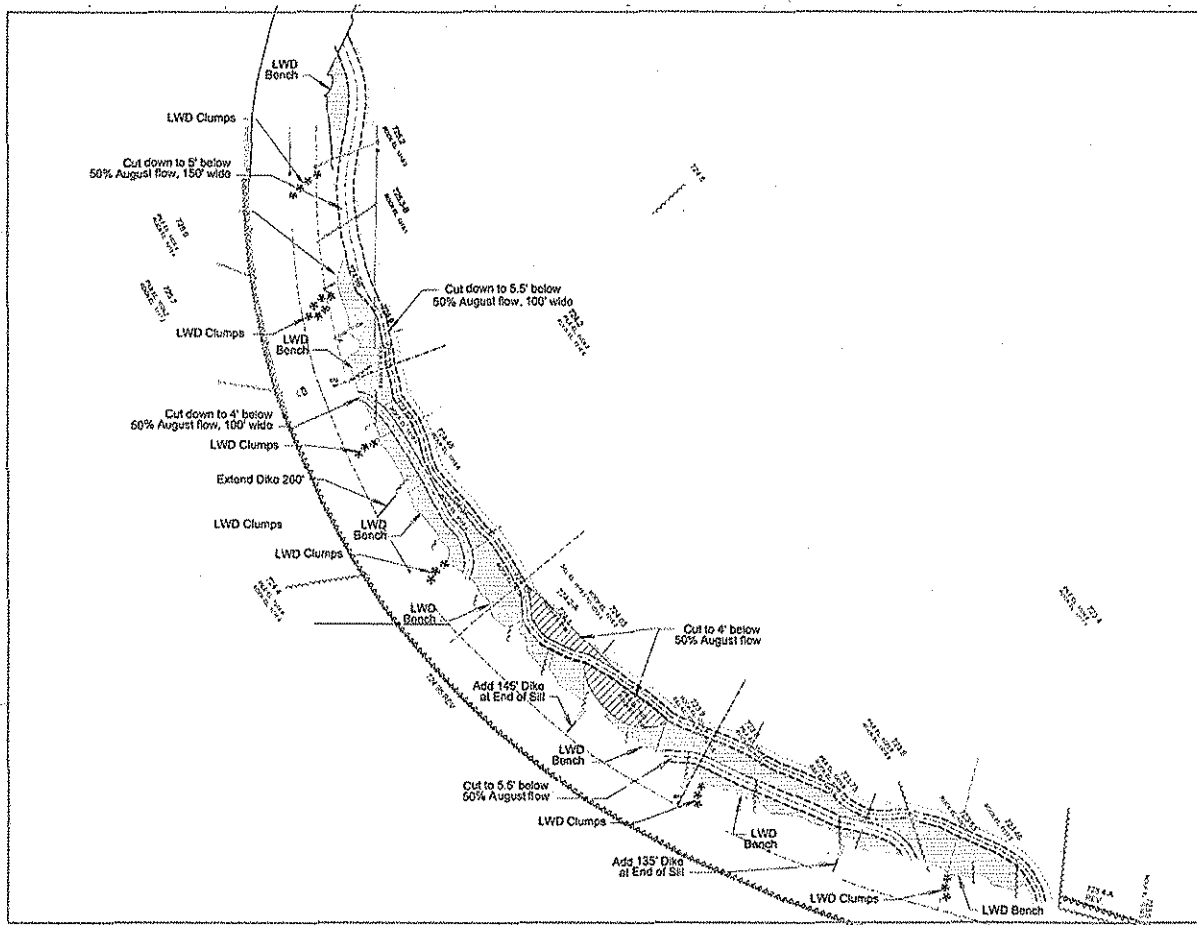


Figure 3.2: Alternative 3 Conceptual Drawing

3.6 MITIGATION FEATURES OF ALTERNATIVES

Mitigation, as defined in Engineering Regulation (ER) 1105-2-100, includes:

- (a) Avoiding the impact altogether by not taking a certain part of an action
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- (e) Compensating for the impact by replacing or providing substitute resources or environments. "Replacing means the replacement of fish and wildlife resources in-kind. "Substitute" means the replacement of fish and wildlife resources out-of-kind. Substitute resources, on balance, shall be at least equal in value and significance as the resources lost.

Both of the action alternatives would impact an existing boatramp and include clearing of woodlands and excavation of reed canarygrass dominated wetlands in order to create SWH. Actions proposed to mitigate the effects of these impacts would be the same under each of the build alternatives. These features and activities include:

- Re-location of the existing boat ramp and access road.
- Planting a portion of the site currently utilized for row-crop agriculture to native hardwood tree species.
- Gradual sloping of the new River embankment in targeted locations to encourage wetland development and floodplain connectivity
- Clearing and grubbing of vegetation outside of the primary migratory bird nesting season and conducting a survey for nesting migratory birds prior to construction to minimize the possibility of impacts.

3.7 COMPARISON OF ALTERNATIVES

Both action alternatives would fulfill the overall MRRP program goal of providing fish and wildlife habitat; however each alternative would provide varying degrees of habitat diversity and habitat quantity, and would have differing effects on several resource categories. The No Action alternative does not fulfill overall MRRP program goals, site specific goals, or meet site specific objectives. As part of the annual MRRP Performance Assessment, the quantity of SWH habitat constructed annually is used to measure progress towards the overall BiOp SWH goal of 20-30 acres of SWH restored per river mile.

A central objective of this project, as stated in Chapter 2, is to help address program-level uncertainties about the eventual biological productivity and physical sustainability of other in-channel SWH projects such as those that rely predominately on the erosive force of the river. Alternative 3 best achieves this central objective and also the

objectives of maximizing the amount of biologically productive and physically sustainable SWH while maintaining a properly functioning navigation channel and determining the level of biological productivity and physical sustainability of maximum top-width widening.

In addition, beneficial impacts to fisheries, including the endangered pallid sturgeon, resulting from shallow water and other aquatic habitat development would be greatest for Alternative 3. The habitat produced by this alternative would most closely restore key historic river conditions within a widened channel with dynamic habitats associated with the riprap and large woody debris structures. This alternative will also create a diverse array of depths and velocities. Key physical components of shallow water habitats are their dynamic nature with depositional and erosive areas, predominance of shallow depths intermixed with deeper holes and secondary side channels, lower velocities and higher water temperatures than main-channel habitats (USFWS SWH definition clarification letter dated June 29, 2009).

Alternative 3 is more cost-effective than Alternative 2 when comparing cost per acre gained of SWH. Additionally Alternative 3 would best meet the site specific and SWH Program system learning objectives identified in Chapter 2. Under Alternative 3, the channel's top-width would be widened as much as possible without adversely affecting the navigation channel. Table 3-1 presented on the following page serves to draw contrasts between the alternatives in meeting aquatic habitat quantity and diversity goals. No unacceptably adverse impacts are anticipated to result from implementing Alternative 3. A detailed description of the environmental consequences of all alternatives including a detailed effects matrix is provided in Chapter 5 of this report.

Table 3 -2
Comparison of Alternatives Summary

Note: Some of the costs associated with the alternatives are to provide features that produce qualitative rather than quantitative habitat benefits. While acreage numbers shown are for the created habitat, additional benefits are anticipated for areas upstream and downstream of the project.

Alternatives	Est. Construction and Adaptive Management Cost	Est. Cost Per Acre	Acres SWH	Aquatic Habitat Quantity and Diversity (as compared to each other)	Effects to Navigation Channel	Environmental Effects (see Section 5 and table 5.3 for detailed environmental effects)
Alternative 1 (No Action)	0	0	0	Low –would result in continuing low aquatic habitat diversity	No adverse effects	Continued adverse effects to aquatic communities due to maintaining a narrow, fixed width navigation channel
Alternative 2	\$16.4 mil	\$143,636 - \$205,194	77-110	Moderate/High due to shallow bench, multiple integrated chutes of varying depth, multiple LWD/stone riprap structures, and sediment discharge	No adverse effects are anticipated	Minor long-term impacts to Riparian Woodland Community; reed canarygrass wetland community; and willow shrubland. Minor short-term impacts to fish and wildlife and recreation from construction activities long-term benefits to pallid sturgeon and other native aquatic species that rely on SWH
Alternative 3	\$ 22.6 mil	\$ 120,879- \$166,666	132- 182	High – due to larger shallow bench, greater quantity of LWD/rock riprap structures, integrated chutes of varying depth and greater amount of sediment discharge	No adverse effects are anticipated	Minor long-term impacts to Riparian Woodland Community; reed canarygrass wetland community; and willow shrubland. Minor short-term impacts to fish and wildlife and recreation from construction activities long-term benefits to pallid sturgeon and other native aquatic species that rely on SWH

3.8 DESCRIPTION OF RECOMMENDED ALTERNATIVE

Alternative 3 is the recommended alternative for implementation at Lower Little Sioux Bend (See Figure 3.1 below). Detailed project plans are provided in Appendix B. The following features would be part of the recommended alternative.

The recommended alternative consists of a wide excavated zone along the inside of the bend for a length of approximately 2 miles. The shallow bench excavation zone would include 3 separate 75-100 foot-wide integrated chutes designed to provide depth diversity and also to facilitate construction access. The chutes will be constructed at a depth of 4 to 6 feet below CRP. The remainder of the wide bench will be excavated from 2 to 5.5 feet below CRP.

Approximately 2.5 to 3.0 million cubic yards of material would be excavated using hydraulic dredges over a two to five year construction period. Discharge would occur during and throughout the navigation season. The material would be distributed in the main channel among the various stone riprap and LWD structures (to create additional SWH) until the design grade is reached. The remaining material would be discharged into the thalweg of the Missouri River where it would become entrained into the bedload of the river. Monitoring during construction will be included to prohibit elevated amounts of material deposition within the navigation channel and within the Harbor 671 channel (a private access channel located across the river from Deer Island GMA). It is important to note that some sedimentation of these channels occurs naturally and would be expected even in the absence of a project.

The project will also include 50 to 60 structures consisting of riprap and/or LWD. About half of the structures will be located within the existing river section with the remainder located within the excavated bank portion of the channel. Structure location is designed to optimize benefits to aquatic species and maintain the navigation channel.

Trees and brush cleared prior to lowering of the bank line would be salvaged for use as LWD structures in the channel. The remainder would be placed in piles selectively located throughout the project to serve as habitat for birds and small mammals, helping to minimize the impact from the loss of trees and shrubs due to excavation of the bank. The majority of clearing of trees and brush would occur between September 15 and January 31 in order to avoid the primary nesting season for raptors and migratory birds.

This project would initially produce approximately 132 acres of SWH. An additional amount of SWH up to 50 acres is anticipated to form in the adjacent channel as sediment settles from the water column among the riprap and LWD structures. Riprap and LWD structures placed in the adjacent channel would slow the river's current allowing sediment to settle out of the water column, creating more SWH in the adjacent channel. The expected life of the project is at least 25 years as structure placement is designed to keep the SWH area from accreting, but slow enough to allow some sediment to settle from the water column. Additionally, the site will be monitored and adaptively managed.

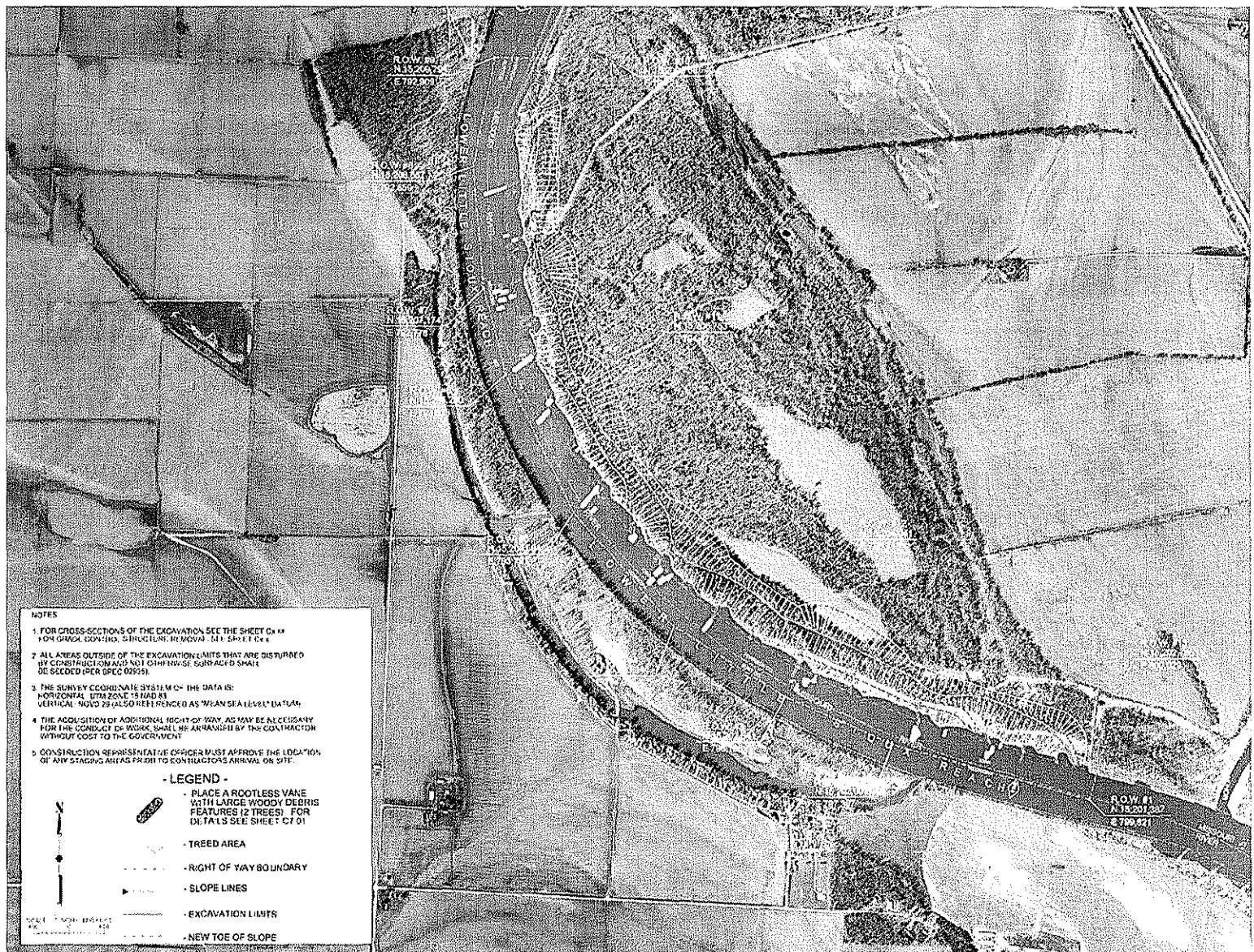


Figure 3.3: Recommended Alternative (Alternative 3) Overview

3.8.1 Design and Construction Considerations

Design of the recommended alternative was extremely challenging with the objective to obtain the maximum top-width and amount of SWH without adversely affecting the navigation channel. Multiple models and evaluation scenarios were performed with both HEC-RAS, a steady flow one-dimensional model, and ADH, a two-dimensional model with the ability to simulate hydrographs and sediment transport. The placement,

dimensions, and number of the Large Woody Debris and stone riprap structures and the placement, number, and dimensions of the integrated chutes were determined through multiple evaluation scenarios.

Construction of the project would likely be performed over multiple construction seasons, between two and five years, due to funding constraints and the large project size. Construction specifications and requirements will address issues such as river shoaling, especially in the navigation channel or Harbor 671 access channel, during project construction.

Due to the physical changes that may occur in the river over the long construction period and the inherent uncertainties of modeling, substantial changes to the original placement of riprap and LWD structures is likely during the construction process. Physical channel conditions will be monitored during initial project construction phases. Alterations to project geometry and structure location will be performed to optimize project performance and sustainability.

3.8.2 Risk and Uncertainty

Risk and uncertainty for this project is derived from three main areas: risks that restoration efforts may not be fully successful, modifications may adversely affect the navigation channel and/or the nearby Harbor 671 access channel requiring subsequent modifications, and uncertainty associated with modeling as well as the implementation. Underlying all the factors, however, is the greater risk associated with not enhancing the environment in compliance with BiOp RPA elements and providing habitat to mitigate the fish and wildlife impacts of the BSNP. The risk of doing nothing far outweighs all risks posed by implementing this project. An adaptive management approach is discussed in chapter 7 and is included to address these risks.

CHAPTER 4 – AFFECTED ENVIRONMENT

4.1 HISTORY OF PROJECT AREA

Historically, the dynamic nature of the Missouri River created an environment of braided, sinuous channels, sloughs, chutes, oxbows, sand and gravel bars, alluvial islands, deep pools, and marshlands. Since the early 20th century, the natural fluvial processes of predictable seasonal flooding into overbank areas, cut-and-fill alluviation associated with river meandering, and channel avulsion have been interrupted by efforts to redirect the energy of the river to support the BSNP and to control the flows through the construction and operation of the dams. This has resulted in a river with a single channel that is maintained along a pre-determined design alignment and flows that are suppressed in the spring and augmented in late summer. The original channel that once ranged from 1,200 feet to 2 miles wide is now 600 to 1,100 feet wide, with the majority of the water consisting of a deep main channel. This narrowing, along with controlled flows, resulted in the loss of approximately 168,000 acres of shallow open water habitat and has greatly homogenized the habitat available to riverine species.

The pre-regulation channel and erosion zone in this river reach was as wide as 6,000 feet. The same zone today is 600 feet wide (National Research Council, 2002). Aerial photography of the Lower Little Sioux Bend from the 1930's depicts the river as a wide, shallow channel with numerous sandbars and a relatively wide riparian corridor. Post BSNP aerial photography from the 1960's depicts the same river reach as having a much narrower, deeper channel and a much narrower riparian corridor (see Figures 4.1 and 4.2 on the following page). The 1960's photo depicts a flow-through chute on the east property boundary of the Deer Island WMA and an accreted island (Deer Island) situated between the chute and the main channel. More recent aerial photography and on-site visits revealed that this chute has since naturally filled with sediment and the island has accreted to the bank.

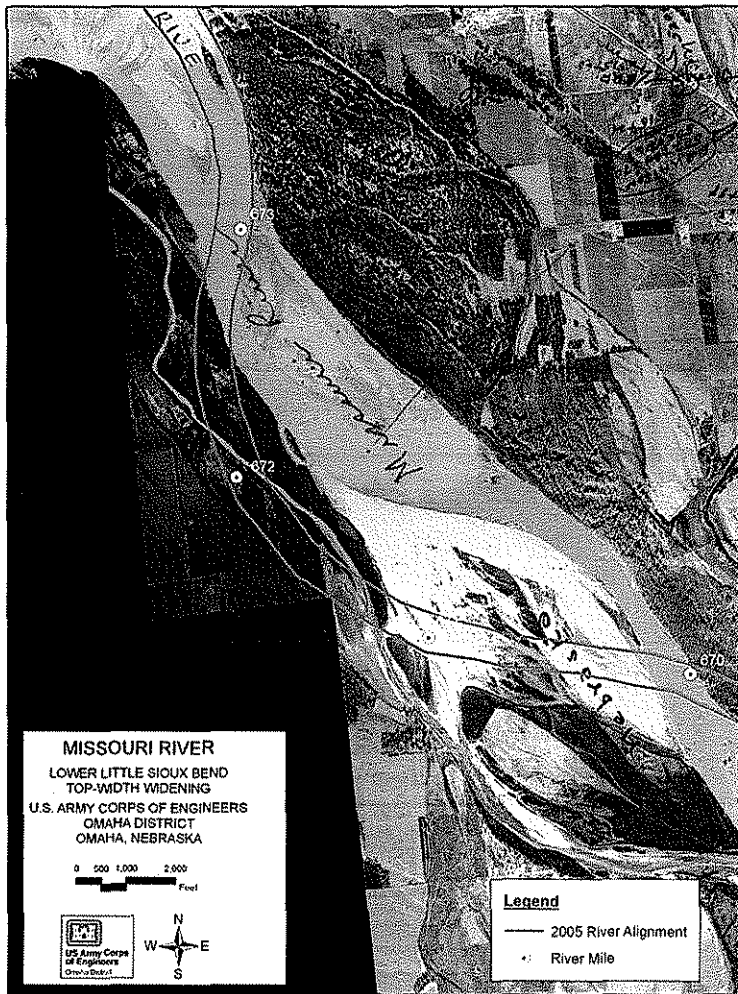


Figure 4.1: 1930's Aerial Imagery (Iowa DNR)

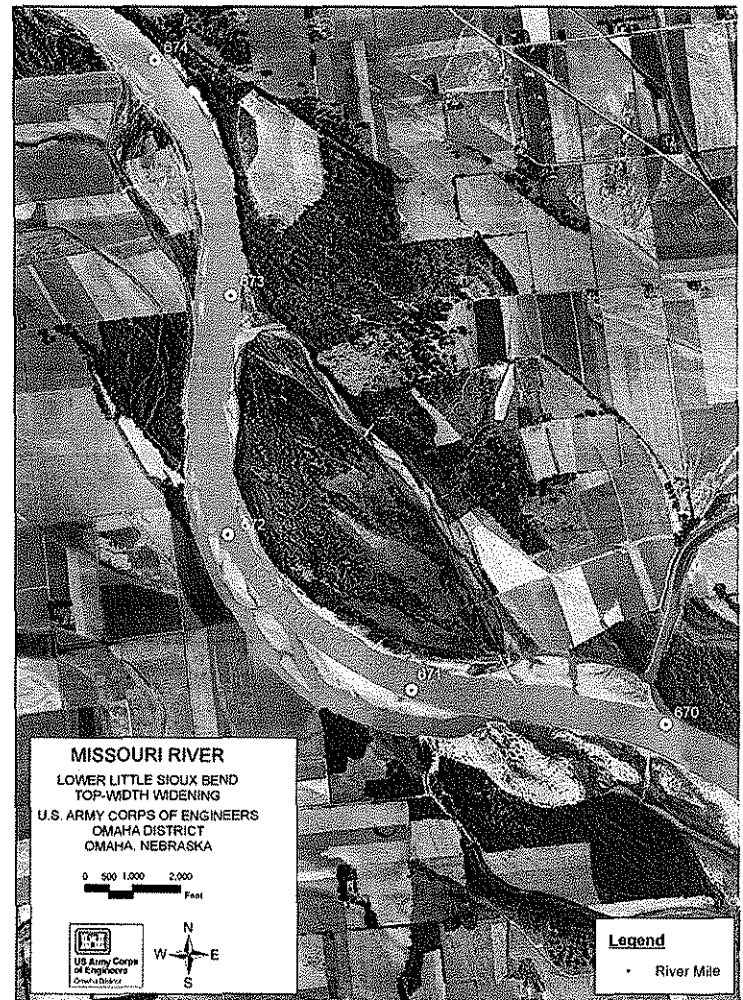


Figure 4.2: 1960's Aerial Imagery (Iowa DNR)

4.2 BIOLOGICAL RESOURCES

The Missouri River has historically been a turbid and widely meandering river, but the placement of dams has reduced the sediment load by dropping it in the reservoir basins and the bank stabilization and navigation project has trained the river into a single self-scouring channel. The lowered sediment load and turbidity in the modern river have made fish species that evolved in dark turbid environments more vulnerable to predation and competition from sight-feeding predators.

The historic flood plain habitat of the Missouri River also provided important habitat features and functions for riverine fishes. Cottonwoods and other trees washed into the river during floods and collected in side channels along inside bends or behind sandbars and islands. As the trees decomposed, food and substrate areas were provided for insects and other organisms, which were in turn consumed by fish. The

trees also created a complex habitat used by fish for cover. The main channel border areas and available side channels provided a diversity of depths and flows and probably served as nursery and feeding areas for many species of fish (Funk and Robinson 1974). Specifically, depth and flow diversity in the main channel border area are thought to be important habitat elements to endangered pallid sturgeon.

4.2.1 Aquatic Resources

The project site is located in the channelized reach of the Missouri River which runs roughly from Sioux City to the Mississippi River. The flow in this reach is controlled by regulation from upstream reservoirs, channelization, bank stabilization, and levees.

In addition to the federally endangered pallid sturgeon, declines in main-stem Missouri River fishes in this reach include paddlefish, sauger, flathead catfish, blue sucker, flathead chub, speckled chub, sturgeon chub, sicklefin chub, and silver chub (Hesse and Mestl, 1993). Widely cited reasons for native fish species decline include removal of snags; cessation of organic matter and sediment transport caused by upstream dams; cutoff of floodplain connection through channelization, degradation, and the cessation of flooding; alternation of the natural hydrograph, and reduction of the natural water temperature (Hesse et al 1993).

The Iowa Department of Natural Resources and the Nebraska Game and Parks Commission monitored the fish community of off-channel mitigation sites upstream and downstream of the proposed Lower Little Sioux site from April 2006 to October 2008. Based on the close proximity of the monitoring to Lower Little Sioux bend, the species presented below in Table 4-1 are likely to occur near the proposed project site.

Table 4-1: Fish Species Collected at Tieville Bend, Decatur Bend, Louisville Bend, Tyson Island and California Bend 2006-2008

Common Name	Scientific Name	Common Name	Scientific Name
Bighead carp	<i>Hypophthalmichthys nobilis</i>	Paddlefish	<i>Polyodon spathula</i>
Black bullhead	<i>Ameiurus melas</i>	Quillback	<i>Carpodes cyprinus</i>
Black crappie	<i>Pomoxis nigromaculatus</i>	Red shiner	<i>Cyprinella lutrensis</i>
Bluegill	<i>Lepomis macrochirus</i>	River carpsucker	<i>Carpodes carpio</i>
Blue sucker	<i>Cycleptus elongatus</i>	Slender madtom	<i>Noturus exilis</i>
Bigmouth buffalo	<i>Ictiobus cyprinellus</i>	Spotfin shiner	<i>Cyprinella spiloptera</i>
Bluntnose minnow	<i>Pimephales notatus</i>	Sauger	<i>Sander Canadensis</i>
Brassy minnow	<i>Hyognathus hankinsoni</i>	Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
Brook silverside	<i>Labidesthes sicculus</i>	Skipjack herring	<i>Alosa chrysochloris</i>
Common carp	<i>Cyprinus carpio</i>	Smallmouth buffalo	<i>Ictiobus bubalus</i>
Channel catfish	<i>Ictalurus punctatus</i>	Smallmouth bass	<i>Micropterus dolomieu</i>
Creek chub	<i>Semotilus atromaculatus</i>	Shortnose gar	<i>Lepisosteus platostomus</i>
Emerald shiner	<i>Notropis atherinoides</i>	Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>
Flathead catfish	<i>Pylodictus olivaris</i>	Silver carp	<i>Hypophthalmichthys molitrix</i>
Fathead minnow	<i>Mimephales promelas</i>	Sand shiner	<i>Notropis stramineus</i>
Freshwater drum	<i>Aplodinotus grunniens</i>	Silver chub	<i>Macrhybopsis storeriana</i>
Goldeye	<i>Hiodon alosoides</i>	Stonecat	<i>Noturus flavus</i>
Golden shiner	<i>Notemigonus crysoleucas</i>	Tadpole madtom	<i>Noturus gyrinus</i>
Green sunfish	<i>Lepomis cyanellus</i>	Walleye	<i>Sander vitreum</i>
Grass carp	<i>Ctenopharyngodon idella</i>	Western silvery minnow	<i>Hybognathus argyritis</i>
Gizzard shad	<i>Dorosoma cepedianum</i>	White bass	<i>Morone chrysops</i>
Johnny darter	<i>Etheostoma nigrum</i>	White crappie	<i>Pomoxis annularis</i>
Largemouth bass	<i>Micropterus salmoides</i>	White sucker	<i>Catostomus commersoni</i>
Longnose gar	<i>Lepisosteus osseus</i>	Yellow	<i>Ameiurus natalis</i>

		bullhead	
Northern pike	<i>Esox lucius</i>	Yellow bass	<i>Morone mississippiensis</i>
Orangespotted sunfish	<i>Lepomis humilis</i>	Yellow perch	<i>Perca flavescens</i>
River shiner	<i>Notropis blennius</i>		

Benthic macroinvertebrates in the channelized portion of the Missouri River consist predominately of Hydropsychidae caddisflies, aquatic worms (Oligochaetes), non-biting midges, and burrowing mayflies in the rocky substrate and dike habitats of the channelized river; and non-biting midges and burrowing mayflies generally in the channel margins. Hydropsychidae caddisflies are common among the rocks and boulders placed along the shoreline for bank stabilization, making up over 90% of the macroinvertebrate abundance on rock habitat. The observed presence of terrestrial insects among the benthos and drift has been between 20% to 45% of the organisms sampled in the lower river, emphasizing the important contribution of floodplain terrestrial insects to the aquatic food web.

4.2.2 Wetlands and other Riparian Habitat

An evaluation of potential wetlands on the site was conducted through review of National Wetlands Inventory (NWI) maps and through on-site visits. The NWI depicts several different wetland types on the property including scrub/shrub, forested, and emergent wetland types (see Figure 4.3). According to the NWI map, the site is predominately upland; the mapped wetlands are generally associated with the formerly existing chute and with areas directly abutting the river channel.

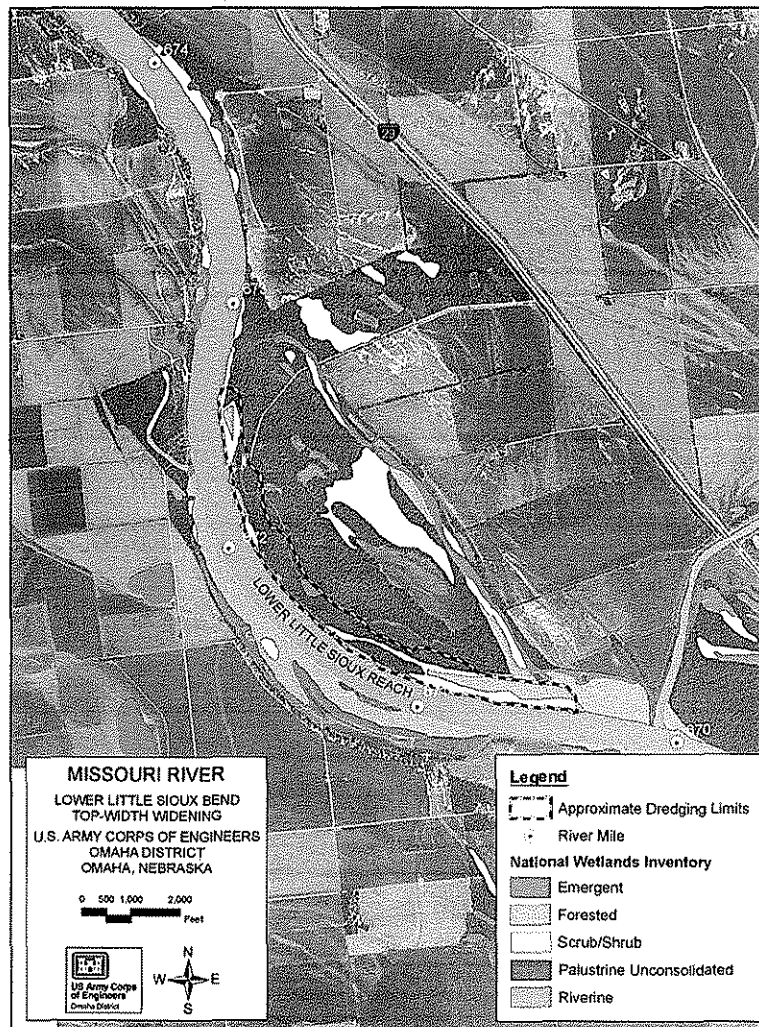


Figure 4.3 National Wetlands Inventory Map

Conditions observed during the site visits were generally consistent with the NWI depiction of the site. The majority of wetlands observed consist of a monotypic stand of reed canarygrass (*Phalaris arundinacea*) associated with a low-lying bench above the river embankment. At the time of the September 2010 site visit, the previously identified stand of reed canarygrass was completely inundated due to a 45,000+ cfs discharge. With the exception of the reed canarygrass monoculture, vegetative communities described below follow community classifications from *Terrestrial Natural Communities of Nebraska* (Steinauer, Rolfsmeier 2003). Vegetative community boundaries were identified through examination of 2009 Farm Service Agency (FSA) 1-meter resolution aerial photography, National Wetlands Inventory maps, and refined through on-site identification of plant species. The vegetative community boundaries were then digitized using GIS software.

Reed Canarygrass Monoculture

A low-lying accreted bench on the proposed project site is dominated by an almost monotypic stand of reed canarygrass (*Phalaris arundinacea*). Sandbar willow (*Salix exigua*) and peachleaf willow saplings (*Salix amygdaloides*), and scouring rush (*Equisetum arvense*) were observed among the reed canarygrass monoculture in a few locations. Soils are poorly developed and composed of sand with lesser amounts of clay, silt, and gravel formed in alluvium. Through on-site visits it was determined that the reed canarygrass monoculture meets wetland vegetation, hydrology, and hydric soil indicators, and therefore should be considered a wetland.



Figure 4.4: Typical view depicting monotypic stand of reed canarygrass (*Phalaris arundinacea*) on low-lying accreted soils. Sandbar willow (*Salix exigua*) saplings are visible at left center. Dashed yellow lines mark community boundary. Photo is oriented north.

Eastern Riparian Woodland

The canopy of wooded areas on the site is dominated by mature cottonwoods (*Populus deltoides*) with an understory of white mulberry (*Morus alba*), American elm (*Ulmus americana*), green ash (*Fraxinus pensylvanica*) and roughleaf dogwood (*Cornus drummondii*) shrubs. Herbaceous vegetation and vines in the forested areas are dominated by a mixture of stinging nettles (*Urtica dioica*), poison ivy (*Toxicodendron radicans*), reed canarygrass, bedstraw (*Galium aparine*), Virginia creeper (*Parthenocissus quinquefolia*), and scouring rush (*Equisetum hyemale*).

Nearly all of the cottonwoods are mature and there does not appear to be any regeneration on the majority of the site. As this community ages the canopy will likely be dominated by American Elm (*Ulmus Americana*), Green Ash (*Fraxinus pennsylvanica*), and white mulberry (*Morus alba*). Selected areas in this community were evaluated for wetland hydrology, hydric soils, and wetland vegetation indicators using the Midwest Supplement to the Army USACE of Engineers Wetland Delineation Manual. It was determined that this is not a wetland community (lacking hydrology and hydric soil indicators). A sharp wetland/non-wetland interface exists between the reed canarygrass monoculture and the Woodland community.



Figure 4.5: View of forested area along north edge of proposed project site. Photo is oriented north.

Sandbar Willow Shrubland

A Sandbar Willow (*Salix exigua*) Shrubland community is located within the lower 1/3 of the site. This community is dominated by sandbar willow shrubs with invasive reed canarygrass dominating the herbaceous understory. The area supporting this community appears to be wetter and lower in elevation than the majority of the site. It likely receives hydrology from the formerly existing chute and occasional overbank flooding. Due to the dominance of obligate and facultative wetland species and observed standing water and saturated soils in several areas it was determined that this is a wetland community.



Figure 4.6: Typical view of sandbar willow shrubland community. Photo is oriented west.

Table 4-2. Commonly Observed Plant Species During Site Visit

Reed Canarygrass Monoculture	
Reed canarygrass (98%)	<i>Phalaris arundinacea</i>
Sandbar Willow	<i>Salix exigua</i>
Scouring rush	<i>Equisetum hyemale</i>
Peachleaf Willow	<i>Salix amygdaloides</i>
Eastern Riparian Woodland	
Eastern Cottonwood	<i>Populus deltoides</i>
White mulberry	<i>Morus alba</i>
Green Ash	<i>Fraxinus pennsylvanicum</i>
American elm	<i>Ulmus americana</i>
Rough leaf dogwood	<i>Cornus drummondii</i>
Stinging Nettle	<i>Urtica dioica</i>
White snakeroot	<i>Ageratina altissima</i>
Poison ivy	<i>Toxicodendron radicans</i>
Ground ivy	<i>Glechoma hederacea</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
Scouring rush	<i>Equisetum hyemale</i>
Smooth sumac	<i>Rhus glabra</i>
Shortbeak sedge	<i>Carex brevior</i>
Bedstraw	<i>Galium aparine</i>
Smooth brome	<i>Bromus inermis</i>
Sandbar Willow Shrubland	
Sandbar willow	<i>Salix exigua</i>
Peachleaf willow	<i>Salix amygdaloides</i>
Reed canarygrass	<i>Phalaris arundinacea</i>
Rough leaf dogwood	<i>Cornus drummondii</i>

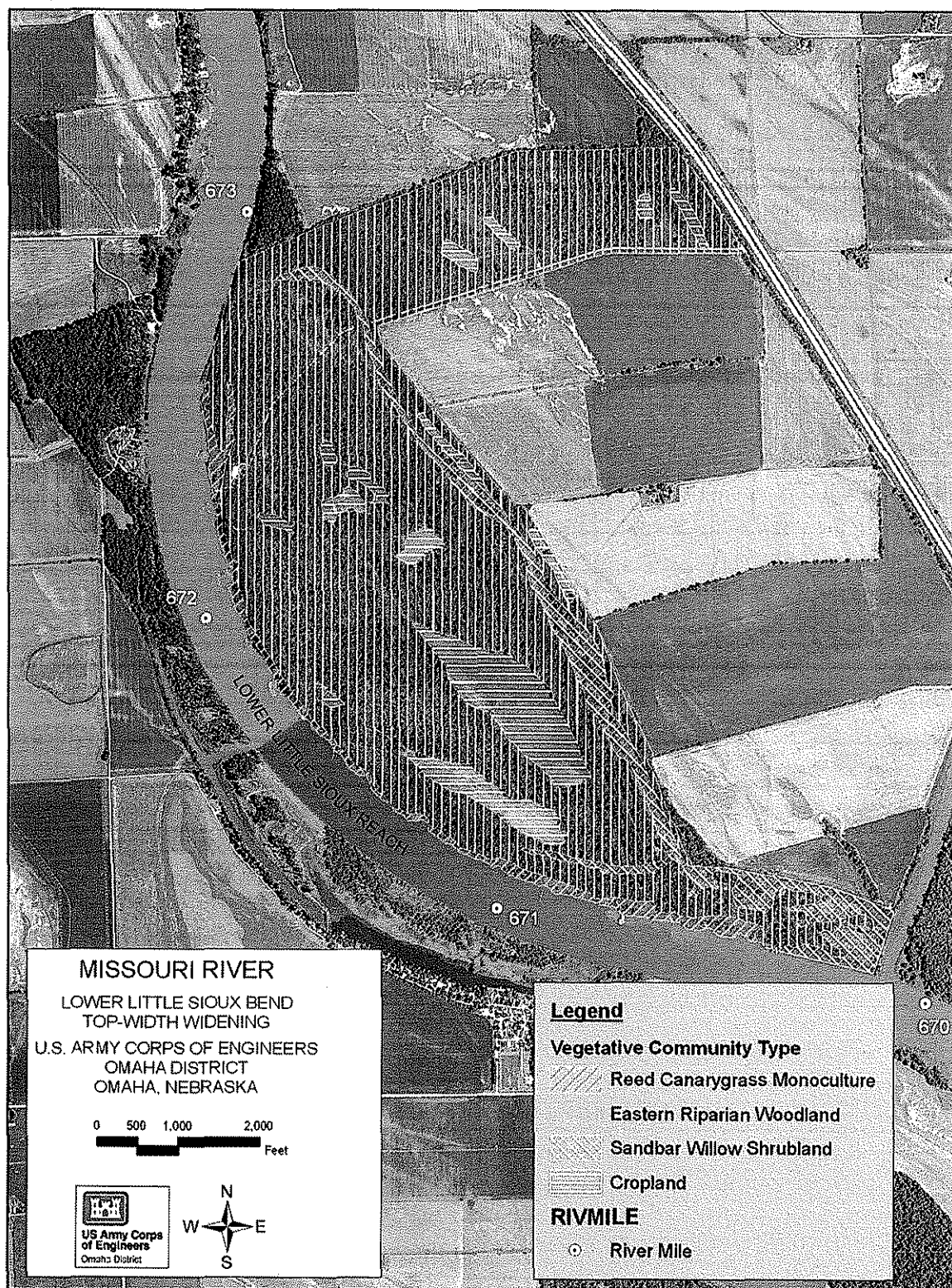


Figure 4.7: Vegetative Community Map of Deer Island WMA

4.2.3 Wildlife

The lands near the project site are likely inhabited by a variety of wildlife species typical to lowlands adjacent to the Missouri River. Brief descriptions of typical species are provided below.

Common mammals in this area include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail rabbit (*Sylvilagus floridanus*), fox squirrel (*Sciurus niger*), beaver (*Castor canadensis*), and muskrats (*Ondatra zibethicus*) (USACE, 2003). Some of the primary utilization of the project area for these species likely includes: providing a travel corridor, providing cover and foraging habitat, and providing breeding and denning habitat.

The project area lies within the Central Flyway and serves as a major forested corridor for migrating waterfowl, shorebirds, and Neotropical migrants during their annual migrations. The woodland community likely provides nesting habitat for a wide range of bird species. Hollow trunks and branches of older cottonwoods provide nesting cavities for woodpeckers and wrens (Knopf, 1986). Many neotropical migrants utilize the Missouri River floodplain as stopover habitat. The value of onsite wetlands as nesting habitat and cover are limited by the dominance of reed canarygrass, however, several species, such as red winged blackbirds are known to utilize reed canarygrass stands for nesting.

Table 4-3 lists specific bird species observed or heard during the site visit.

Table 4-3. Observed Bird Species

Blue Jay	<i>Cyanocitta cristata</i>
Mourning Dove	<i>Zenaida macroura</i>
American Goldfinch	<i>Carduelis tristis</i>
Northern Oriole	<i>Icterus galbula</i>
Yellow Warbler	<i>Dendroica petechia</i>
Rose-Breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Vireo	<i>Vireo spp.</i>
Northern Flicker	<i>Colaptes auratus</i>
Red Headed Woodpecker	<i>Melanerpes erythrocephalus</i>
Great Horned Owl	<i>Bubo virginianus</i>
Yellow Throat	<i>Dendroica dominica</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Killdeer	<i>Charadrius vociferus</i>
Cardinal	<i>Cardinalis cardinalis</i>
Swallows	<i>Hirundo spp.</i>
Bobwhite Quail	<i>Colinus virginianus</i>

Waterfowl and shorebirds commonly seen along the river bank within the dike field include mallard ducks (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), Canada geese (*Branta Canadensis*), spotted sandpipers (*Actitis macularia*), and great blue herons (*Ardea Herodias*). Waterfowl use slower current areas for stopover and feeding habitat and shorebirds use mudflats and shallow current areas for feeding. These types of habitat are currently uncommon on the project site due to the narrow, swift, and deep adjacent river channel.

Raptor species likely to occur within and near the project area include red-tailed hawks (*Buteo jamaicensis*), bald eagles (*Haliaeetus leucocephalus*), American kestrels (*Falco sparverius*), Swainson's hawks (*Buteo swainsoni*), peregrine falcons (*Falco peregrinus*), and several owl species including great-horned owls (*Bubo virginianus*) (USACE 2003). Raptor species likely use the site primarily for roosting, nesting, feeding, and perching habitat.

Several species of reptiles and amphibians may be found at the site or in the adjacent Missouri River. These include northern leopard frogs (*Rana pipiens*), bullfrogs (*Rana catesbeiana*), northern cricket frogs (*Acris crepitans*), American toads (*Bufo americanus*), western painted turtles (*Chrysemys picta belli*), snapping turtles (*Chelydra serpentina*), spiny softshell turtles (*Trionyx spiniferus*), false map turtles (*Graptemys pseudogeographica*), garter snakes (*Thamnophis sirtalis sirtalis*), and bull snakes (*Pituophis catenifer sayi*) (USACE 2003). Relatively few of these species depend directly on the open river channel for survival. Most of these species utilize bank-side habitats, wetlands, and woodlands for breeding, feeding, and cover.

4.2.4 Federally Threatened and Endangered Species

The USFWS has already considered the biological effects of the construction of shallow water habitat in the development of the RPA for the BiOp and determined that it is an integral component to avoid jeopardy to listed species. Therefore, the USACE is not required to prepare a Biological Assessment (BA) for this action. However, for the purposes of the National Environmental Policy Act (NEPA), this environmental assessment discloses the effects/benefits of the project on threatened and endangered species.

Pallid Sturgeon, *Scaphirhynchus albus* (Endangered)

The pallid sturgeon was listed as an endangered species on September 6, 1990. It inhabits the Missouri River and the Mississippi River below the mouth of the Missouri. Pallid sturgeon abundance has declined throughout the Missouri River since construction of the BSNP (Carlson and Pflieger 1981). Over fishing, pollution, and hybridization that have occurred due to habitat alterations have also contributed to the population decline of the species (USFWS 1993). Destruction and alteration of habitats by human modification of the river system is believed to be the primary cause of declines in reproduction, growth and survival of pallid sturgeon, and the recovery of the species is unlikely if habitat elements of the Missouri and Mississippi River are not restored (USFWS 1993). This project proposes to restore SWH in the Sioux City to

Omaha reach, thus helping to restore a portion of the natural habitat elements of the Missouri River, which are thought to benefit pallid sturgeon.

Very little is known about the status of the pallid sturgeon in the Missouri River below Gavins Point Dam (USFWS 2000). Capture/recapture data are infrequent. Hatchery-raised juvenile pallid sturgeon were stocked below Gavins Point Dam and in the lower Platte River during the 1990s. Rough estimates of 1 to 5 pallid sturgeon per kilometer in the channelized river have been made to provide a total estimate of between 1,303 and 6,516 in this river section (Duffy et al. 1996). In a study conducted in the lower 200 miles of the Missouri River, it was noted the ratio of pallid sturgeon to all river sturgeon (including shovelnose, pallid, hybrid, and lake sturgeon) decreased from 1:311 in 1996 to 2000 to 1:387 in 2002 (USFWS 2003b).

In the Middle Missouri River, pallid sturgeon have been shown to prefer main channel border, downstream island tips, areas between wing dams, and scour areas off wing-dam tips (Sheehan et al. 2000). On the Platte River, observations of hatchery reared pallid sturgeon usually occurred in areas downstream of sandbars where currents converge (Snook and Peters 2000). The range of water depths shown to be used by pallid sturgeon varies across studies; for example, an average of 12.5 and 20 feet in Missouri River studies by the Missouri Department of Conservation and the USACE' Research and Development Center, respectively, and 1 to 3 feet in the Platte River (Snook and Peters 2000).

Interior least tern, *Sternula antillarum* (Endangered), and piping plover, *Charadrius melodus* (Threatened)

The least tern and piping plover nest on unvegetated or sparsely vegetated sandbars in river channels and occasionally along the shorelines of sandpits. The nesting season for the least tern and piping plover is from April 15 through September 15. Channel constrictions and obstructions that disrupt natural flows in the river and influence sandbar complexes in the river limit potential habitat for these birds. Human activity near feeding and nesting habitats can disturb least terns and piping plovers. Due to the fact that the river is channelized in the proposed project area, and there is no available nesting habitat, least terns and piping plovers may pass through the project area, but have not been observed nor are they expected to nest in this reach.

4.2.5 State Threatened and Endangered Species

In a letter dated March 22, 2010 (Appendix A) the IDNR reported that there are no site-specific records of rare species or significant natural communities that would be impacted by the project. However, the letter indicates that since the data reviewed was not the result of thorough surveys, additional studies and/or mitigation may be required if listed species or rare communities are found during the planning or construction phases.

4.2.6 Migratory Birds

All federal agencies are subject to the provisions of the Migratory Bird Treaty Act (16 U.S.C. 703-711) which regulates the take of any migratory bird species. If a USACE project is expected to impact any migratory bird species, coordination with the Service is typically initiated in order to minimize any impacts to these species. In a planning aid letter dated December 12, 2003, the Fish and Wildlife Service expressed to the USACE that, in this area, the main period of concern for affecting migratory birds is April 1-July 15. They also stated that raptors may nest from February 1-April 15 and that some wetland birds, such as sedge wrens, may nest from July 15-September 10.

On August 9, 2007, the bald eagle (*Haliaeetus leucocephalus*) was removed from the federal list of threatened and endangered species but continues to be protected under the Bald Eagle Protection Act, Migratory Bird Treaty Act, and Lacey Act -16 U.S.C. § 701, May 25, 1900. Bald eagles are known to inhabit forested areas along the Missouri river. These birds tend to construct their nests in mature trees near aquatic habitats, especially in cottonwood trees. Bald eagle nests are typically easily identified due to their large size (they can be eight feet or more in diameter) and their height (up to twelve feet or more). They feed primarily on fish and crippled waterfowl, but may feed on upland game birds and other birds, carrion, and small rodents. In an email dated April 9, 2010 (Appendix A), the U.S. Fish and Wildlife Service indicated that much of the area planned to be excavated appears to be riparian habitat preferred by bald eagles for nesting.

The IDNR, the resource agency that manages the Deer Island GMA, has indicated that there are currently no known bald eagle nests in the area marked for proposed tree clearing and excavation. The IDNR most recently surveyed the site on foot in February 2010 and did not detect any bald eagle nests (Doug Chafa, IDNR, personal communication). Aerial surveys conducted as recently as late January 2011 also did not reveal any bald eagle nests on the site (Doug Chafa, IDNR, personal communication). Prior to any construction or clearing activity, the project area would be surveyed again for migratory bird nests or nesting behavior.

4.3 PRIME FARMLAND

The U.S. Department of Agriculture considers prime farmland to be land that has the best combination of physical and chemical characteristics that is readily available for producing crops. Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. Prime farmlands are not excessively erodible or saturated with water for a long period, and they either do not flood frequently or are protected from flooding.

Soils on the project site are classified as Albaton, Sarpy, and Blake Series soils, and riverwash. Two clearings in the Deer Island GMA have been planted as food plots for wildlife. These two areas are outside of the area proposed for dredging. Blake series soils are classified as prime farmland and Sarpy and Albaton series soils are classified as farmland of statewide importance.

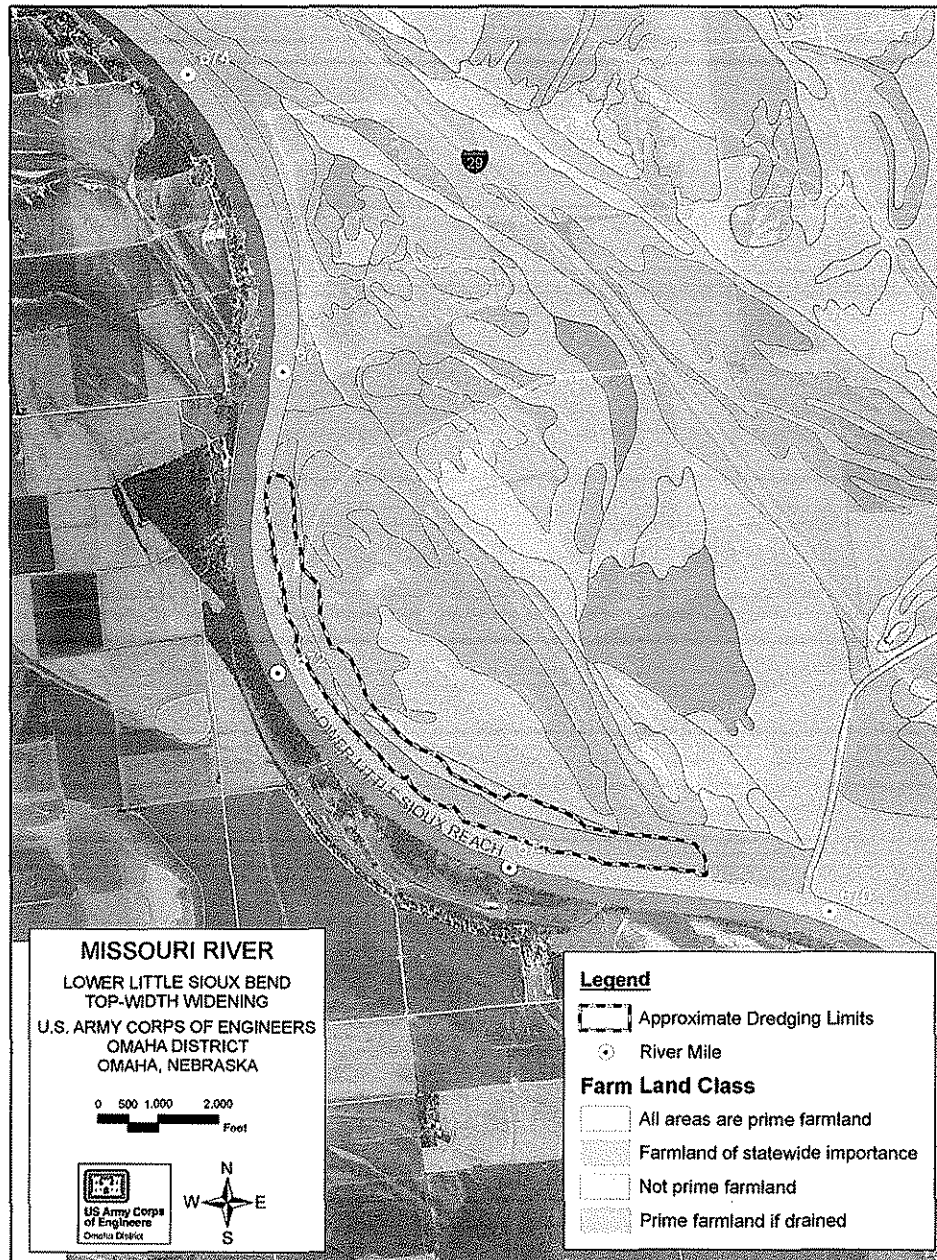


Figure 4.8 Prime Farmland and Farmland of Statewide Importance

4.4 WATER QUALITY

Prior to dam construction, the Missouri River was a dynamic, free-flowing river. Continuous bank erosion was common, and the Missouri River naturally tended to be a

turbid river. Many of the native fish species in the Missouri River, such as the pallid sturgeon, are specially adapted for life in turbid waters like those that were present in the historic river. Because of the upstream reservoirs being constructed in the mid-20th century, currently turbidity is lower than the natural condition. The suspended sediment load has decreased by 69 to 99 percent, depending on location and proximity to the main stem dams. Releases from Gavins Point Dam tend to be cooler than the historic river temperature, free of sediment, low in nutrients, and saturated with dissolved oxygen. With increasing distance from Gavins Point Dam, the water temperature, turbidity, and nutrients tend to increase due to tributary inputs.

Since the implementation of the Clean Water Act over the last 30 years, water quality has improved with regard to pollutant levels in the Missouri River. Primary sources of pollution in the river include runoff of fertilizer, pesticides, and herbicides from the predominantly agricultural watershed, as well as discharges from municipal wastewater treatment facilities and other urban industrial operations. A few reports are cited below to highlight the main pollutants that are known to occur in the Missouri River; however, the reports do not suggest any major impairment to the river due to pollution.

Water quality management of the Missouri River is under the jurisdiction of the states. As required by Section 303(d) of the Clean Water Act, in even numbered years the Nebraska Department of Environmental Quality (NDEQ) and the Iowa Department of Natural Resources (IDNR) must submit a list of lakes, wetlands, streams, rivers, and portions of rivers that do not meet state water quality standards (40 CFR 130.7). These are considered "impaired waterbodies" and states are required to calculate total maximum daily loads (TMDLs) for pollutants causing impairments in these waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards (EPA 2007).

The IDNR has placed the segment of the Missouri River between the Boyer River and the Little Sioux River, which includes the proposed project, on the state's draft 303(d) list for 2006 (IDNR 2006). This portion of the river is considered impaired for primary contact recreation because of indicator bacteria (IDNR 2006). This segment was not on the 2004 303(d) list (IDNR 2004).

The IDNR has also placed the segment of the Missouri River between the water supply intake at Council Bluffs (RM 619) to the confluence with the Boyer River, which includes the segment that borders the proposed project, on the state's 303(d) list for 2006 (IDNR 2006). This segment of the river is considered impaired for drinking water use because of arsenic levels and impaired for primary contact recreation because of indicator bacteria (IDNR 2006). The segment was listed on the 303(d) list in 2004 for the same reasons (IDNR 2004).

The NDEQ uses a different system for breaking the Missouri River into segments than the IDNR. The NDEQ has placed the segment of the Missouri River between the Big Sioux River and the Platte River on the state's 303(d) list for 2006. In 2006, this segment was listed as impaired for aquatic life because of PCBs (polychlorinated

biphenyl, an environmental pollutant) and dieldrin (a highly toxic insecticide) and impaired for public drinking water because of chlorodibromomethane (a chemical formed during the chlorination of water) (NDEQ 2006). In 2004, the NDEQ placed the same segment on the state's 303(d) list for primary contact recreation and aquatic life use because of fecal coliforms, dieldrin, and PCBs (NDEQ 2004). A fish tissue advisory was issued for the segment in both years (NDEQ 2004).

There were no elevated levels of contaminants, including Dieldrin or PCBs in the elutriate samples taken at the Lower Little Sioux Bend project site (see Appendix C for elutriate sampling results).

4.5 AIR QUALITY

Sources of suspended particulate matter and air pollutants in the project area include agricultural, industrial, and recreational boating activities near the dredging site. Harrison County complies with the National Ambient Air Quality Standards (NAAQS), based on air quality monitoring conducted by the IDNR (Russell 2006). Washington County is also in compliance with NAAQS (Hetzler 2006).

4.6 NOISE

Sources of noise in the project area result from recreational boating, commercial barges, hunting, and agricultural activities. These activities are seasonal. In the spring and fall, tractor and truck use increases on farms near the project site. Waterfowl are hunted on the property from September through January. Recreational boating on the Missouri River primarily occurs during the summer months. Background noise levels are generally low.

4.7 HISTORIC PROPERTIES and CULTURAL RESOURCES

In a letter dated June 11, 2010 (Appendix A) the State Historical Society of Iowa indicated there are not likely to be historic properties affected by the proposed project. Consistent with this letter, if project activities uncover an item(s) that may be of archeological, historical or architectural interest, reasonable efforts will be made to avoid further impacts to the property until an assessment can be made by a qualified archaeologist.

4.8 SOCIOECONOMIC RESOURCES

The proposed project area is located in Harrison County, Iowa. The population of Harrison County was 15,745 in 2006, a 0.5 percent increase over the 2000 population of 15,666 (U.S. Census Bureau 2006a). In 2006, 99.0 percent of Harrison County residents reported their race as Caucasian alone, while the remaining 1.0 percent consisted of other races or a mixture of races (U.S. Census Bureau 2006a).

In 1999, Harrison County had a per capita income of \$17,662 and in 2004 had a median household income of \$42,627, compared to \$19,674 and \$42,865 respectively for the State of Iowa (U.S. Census Bureau 2000, 2006a). In 2004, the percent of persons below poverty level was 9.9 percent in Harrison County, compared to 10.5 percent for the State of Iowa (U.S. Census Bureau 2006a). The major sources of employment in Harrison County in 2000 were: services, 34.9 percent; wholesale and retail trade, 15.2 percent; manufacturing, 13.6 percent; government (including military), 13.1 percent; transportation and utilities, 7.0 percent; and agriculture, forestry, fishing, hunting, and mining, 7.0 percent (U.S. Census Bureau 2000). The unemployment rate for Harrison County was the same as the statewide unemployment rate of 2.8 percent in 2000 (U.S. Census Bureau 2000). In 2002, 95 percent of the land in Harrison County was farmland; the average farm size was about 517 acres; and 85.8 percent of the farmland was planted with crops (NASS 2002, ISU 2006).

4.9 RECREATION

Existing recreation at Deer Island GMA consists of hunting, fishing, primitive camping, hiking, and bird watching. Visitors can access the GMA by boat or they may park at the parking lot. Deer Island features a boat ramp with access to the Missouri River. There are no facilities on site and the IDNR does not record visitation data (Weiner 2004).

4.10 NAVIGATION and SEDIMENTATION

Missouri River flows are managed in part, for commercial navigation on the Missouri River. Navigation on the Missouri River is limited to the normal ice-free season, with a full-length flow support season of 8 months (USACE 2001). At Sioux City, the full-length support season extends from March 23 to November 22 and at St. Louis the full-length support season extends from April 1 to December 1 (USACE 2001). In 1994, approximately 50 percent of the commercial tonnage moved on the Missouri River was in the Omaha to Kansas City reach. This reach was also the origin or destination for about 40 percent of Missouri River commercial tonnage (USACE 2001).

4.11 TOPOGRAPHY

The Lower Little Sioux project site is located in the Missouri River floodplain within the Dissected Till Plains section of the Central Lowland physiographic province (USGS 2003). The site relief varies moderately. The lowest portions of the site are associated with the formerly existing chute (1020 feet above msl) and a broad level area just above the river embankment. The site appears to drain to the southeast as the north half of the site is approximately 5 feet higher on average than the south half of the site (1030 msl vs. 1025 msl).

CHAPTER 5 – ENVIRONMENTAL CONSEQUENCES

This chapter presents the adverse and beneficial environmental effects of the recommended action (Alternative 3) and its alternatives, including the No Action alternative. The chapter is organized by resource category, with the effects of all alternatives combined under each resource category heading. The effects of the build alternatives (Alternatives 2 and 3) are nearly the same or very similar for each resource category except where explained otherwise. The effects of the build alternatives are generally presented first under each resource heading followed by a description of the effects of the No Action Alternative. Cumulative impacts, irreversible and irretrievable commitments of resources, short-term vs. long-term productivity, and adverse effects that cannot be avoided are provided as separate sections under this chapter. A summary of the environmental consequences of the alternatives is provided as Figure 5.1 on page 56.

Impacts are described in terms of duration and intensity

Impact Duration: The following terms will be used to describe the duration of an impact.

Short-term: temporary impacts caused by the construction and/or implementation of a selected alternative

Long-term: impact continues after the action has been completed and/or after the action is in full and complete operation

Impact Intensity and Context:

Negligible: Impacts may occur, but the change would be localized and so small that it would not be of any measurable or perceptible consequence.

Minor: Impact could result in a change to a population or individuals of a species, habitat, or resource. The change would be measurable but small, localized, and of little consequence to the resource.

Moderate: Impact could result in some change to a population or individuals of a species or habitat. The change would be measurable and of consequence, but would be of moderate scale and would occur over a limited area.

Major: Impact could result in a significant change to a population or individuals of a species or resource or habitat. The change would be measurable, very significant, and would occur over a wide geographic area.

5.1 BIOLOGICAL RESOURCES

5.1.1 Aquatic Resources

Shallow water habitat has become very rare along the channelized portion of the Missouri River, but remains crucial to a number of fish species. Many species utilize the shelter from the high velocity main channel and the high abundance of food provided by SWH during one or more stages of their life cycles.

Both of the build alternatives would positively affect fish species by creating new SWH. Alternative 2 would create 77-110 acres of SWH and Alternative 3 would create 132-182 acres of SWH. Alternative 3 features a larger shallow bench and a greater number of LWD and riprap structures than Alternative 2.

The larval stage is a bottleneck in the life cycle of many fish species, negatively affecting recruitment to the adult stage. The river's sandbars and the slow-moving, shallow water associated with them have historically provided larval fish with the habitat necessary for survival. By providing more of this currently lacking habitat, this project should benefit many species of fish. Aquatic vegetation on the shallow slopes and trees that erode into the river by floodwaters would add carbon to the river system and provide areas of complex habitat, substrate for invertebrates, shelter from current, and hiding places for forage fish.

Use of a dredge to excavate the area may impact invertebrates in the soil within the localized project area and fish have been known to be inhaled into a dredge. When comparing the acres dredged to the habitat available for fish, invertebrates, and other aquatic species, however, these impacts are considered insignificant at the regional level. Although there could be short-term minor impacts to invertebrates, fish, and other aquatic species in the project area, the net impact to the fishery is considered a beneficial long-term impact. For detailed information on benefits of the project to pallid sturgeon, please refer to the Federally Threatened and Endangered Species section of this environmental assessment.

Without a project, native fish species that rely on more natural river conditions would continue to be adversely affected by ongoing operations of the BSNP. Invasive, non-native, and generalist species (species with less-specific habitat requirements) would continue to dominate fish populations. The establishment of wetlands and aquatic habitat would be limited to natural processes; which as explained earlier, have been impaired by the BSNP. By taking no action, the mitigation of the aquatic and wetland habitats lost due to the BSNP would occur to a much lesser degree.

5.1.2 Wetlands and other Riparian Habitat

Each of the build alternatives would involve substituting new aquatic habitat for existing terrestrial habitat. Alternative 2 would substitute approximately 77 acres of shallow water aquatic habitat for approximately 59 acres of eastern riparian woodland

community, 16 acres of reed canarygrass monoculture, 1 acre of sandbar willow shrubland, and 1 acre of leased row crop land. Alternative 3 would substitute approximately 132 acres of shallow water aquatic habitat for approximately 103 acres of Eastern riparian woodland community, 24 acres of reed canarygrass monoculture, 1 acre of sandbar willow shrubland, and 4 acres of leased farmland.

Table 5.1: Impacts to Wetland and Riparian Vegetation

Vegetative Community Type	Existing on Site	Alternative 2 Impacts	Percentage of on-site Existing Impacted by Alternative 2	Alternative 3 Impacts	Percentage of on-site Existing Impacted by Alternative 3
Eastern Riparian Woodland (Upland)	625 acres	59 acres	10.6%	103 acres	16.5%
Reed Canarygrass Monoculture (PEMA Wetland)	26 acres	16 acres	62%	24 acres	92%
Willow Shrubland (PSSA Wetland)	65 acres	1 acre	0.01%	1 acre	0.01%
Leased Farmland	75 acres	1 acre	0.01%	4 acres	0.05%

Reed canarygrass is a common invasive wetland grass known to have little habitat value for wildlife. A reed canarygrass fringe growing on recently deposited soils is common along the channelized portion of the Missouri River. Construction of the proposed project would convert 24 acres of a reed canarygrass monoculture to a SWH area that would be highly beneficial to a variety of fish species, including the endangered pallid sturgeon. Because the reed canarygrass monoculture is common along the channelized portion of the Missouri River a loss of 24 acres is considered to be a long-term, but minor impact. Embankments along the completed project are eventually expected to develop a similar slope to the existing condition; therefore, it is anticipated that new wetlands could form as the lower portions of the embankment receive occasional overbank flooding. Additionally, gradual slopes will be incorporated where achievable to enhance floodplain connectivity and to encourage the development of wetlands along the new bankline.

Both of the proposed build alternatives would impact the riparian woodland community by removing 10.6% to 16.5% of this community type from the site. Wooded riparian habitats support valuable resources for fish and wildlife. The BSNP has largely separated the river from its floodplain in the channelized reach; it appears that the woodland community on this site receives little to no overbank flooding and appears to be entirely upland. Impacts to woodlands on the site are anticipated to be long-term, but minor. The Eastern riparian woodland community is relatively common in and around the project site and the development alternatives would impact 10.6%-16.5% of this community in the project area. Wildlife with life requisites dependant on this community type are anticipated to find refuge in the remaining woodlands. To compensate for losses of trees on site, the IDNR plans to plant a 15 acre portion of the site that is currently utilized for row-crop agriculture to native hardwood species.

Without construction of a shallow water habitat project, Deer Island GMA would continue to be managed by the Iowa DNR as a game management area. Activities to develop habitat that would benefit the endangered pallid sturgeon and other native fish species would not be undertaken. The existing riparian woodland community would develop through natural succession, likely transforming from a predominance of mature cottonwoods to green ash, mulberry, and dogwoods. Low-lying accreted soils adjacent to the channel would likely continue to be dominated by a monotypic stand of reed canarygrass as new sediment is deposited through occasional flooding.

5.1.3 Wildlife

Some animals may be temporarily disturbed or displaced during construction. After construction is complete, the SWH produced would attract and provide food and cover for a diversity of waterfowl and other wildlife – especially for those species that rely on aquatic ecosystems for part of their life cycle. Amphibians, reptiles, and other wetland species may be disturbed or displaced resulting from the loss of 24 acres of reed canarygrass dominated wetlands. Monotypic stands of reed canarygrass are thought to have little value to wildlife; however some species of amphibians and reptiles may utilize the reed canarygrass monoculture for breeding, foraging, and cover. It is anticipated that impacts to amphibians and reptiles would be minimized by providing gradual slopes in selected areas along the new bankline to encourage wetland development.

Due to the temporary nature of the construction activity and the availability of similar habitat surrounding the project area, long-term impacts are not expected. The proposed project would convert a relatively small portion (approximately 100 acres) of the 773 acre site to aquatic habitat. All required grubbing and clearing of trees and shrubs prior to dredging would occur outside of the migratory bird nesting season. Impacts to riparian wildlife are anticipated to be minor and short-term due to the availability of similarly structured vegetative communities and habitat in the project area.

In general, without construction and operation of the proposed Lower Little Sioux Project, the site would continue to provide suitable habitat for some terrestrial species. The IDNR would continue to manage the property as a game management area.

The absence of flood effects due to upstream impoundments and hard bank stabilization has reduced shallow water habitat in the channel and wetlands within the floodplain for which aquatic species depend on for reproduction, hibernation, and food. By taking No Action, aquatic species would continue to be adversely affected by operation of the BSNP.

5.1.4 Threatened and Endangered Species

The creation of SWH less than 1.5 meters deep (less than approximately 5 feet) with velocities less than 1.5 meters per second (less than approximately 2 feet per second) would be expected to benefit the pallid sturgeon (USFWS 2000, 2003a, 2009). Adult pallid sturgeon have been found at depths of 3 feet in the Missouri River by the Nebraska Game and Parks Commission (Mestl 2004), and at depths of 1 to 3 feet in the Platte River (Snook and Peters 2000). The SWH is expected to be suitable for use by the pallid sturgeon, even if its depth is shallower than that generally preferred by adult pallid sturgeon. This project would provide habitat needed to support components of the ecosystem that are thought to be very important to pallid sturgeon. For example, the primary food eaten by the pallid sturgeon includes mostly aquatic invertebrates (principally early life stages of insects) but also some fish (USFWS 1993). Because pallid sturgeon are adapted to areas of high turbidity, the short-term discharge of dredged material into the entrained bed load of the Missouri River would not be expected to adversely affect the pallid sturgeon. The amount of material that would be discharged into the river as part of the proposed project is minor in comparison to the sediment transport capacity of the river. Siltation of natural backwaters, chutes, and /or canals would therefore not be expected to occur as a result of proposed project activities.

The LWD structures in the SWH would provide cover for small or young fish (including the small minnow species preyed upon by pallid sturgeon), substrate for periphyton, and organic materials that would increase production of aquatic invertebrates. The SWH would constitute a good foraging area for various life history stages of Missouri River fish and their predators, including pallid sturgeon. The SWH is also thought to provide a suitable nursery and rearing habitat, where free swimming and drifting fish larvae (including larval pallid sturgeon) and juvenile fish can find refuge from high water velocities, accumulations of organic materials, and good foraging, facilitating their recruitment into later developmental stages.

Short-term and minor impacts such as disturbance or displacement of pallid sturgeon may occur during construction. There is also the slight possibility that incidental take of pallid sturgeon could occur as a result of dredging and habitat creation activities. In the 2003 amendment to the U.S. Fish and Wildlife Service's Biological Opinion, the Service determined that this level of disturbance and take is not likely to result in jeopardy to the species and the effect would largely be offset by implementation of the Reasonable and Prudent Alternative, and Reasonable and Prudent Measures (including SWH creation). The proposed SWH project at Lower Little Sioux Bend is anticipated to improve habitat found along the Missouri River for pallid sturgeon, and this action, along with other

activities currently being planned to create SWH would be expected to have a long-term beneficial cumulative impact on pallid sturgeon populations (see USFWS correspondence in Appendix A).

Without a project, habitat for pallid sturgeon and other native aquatic species would continue to be rare in this stretch of River. Pallid sturgeon and other native aquatic species would continue to be adversely affected by operation of the BSNP.

The USFWS lists western prairie fringed orchid (*Platanthera praeclara*) and prairie bush clover (*Lespedeza leptostachya*) as threatened in Harrison County. Both of these species are associated with high quality prairies or wet meadows. Grasslands on the project site are dominated almost entirely by invasive reed canarygrass. No prairie or wet meadow habitat was detected in the project area; therefore, neither of these species is expected to be affected by the proposed project.

An IDNR letter dated March 22, 2010 (see Agency correspondence in Appendix A) indicates that rare species and/or significant natural communities are not likely to be adversely impacted by the proposed project. In accordance with the IDNR letter, additional studies would be conducted if listed species or rare communities are found during the planning and construction phases.

5.1.5 Migratory Birds

Although the provisions of MBTA are applicable year-round, most migratory bird nesting activity in the project area occurs during the period of April 1 to July 15. However, some migratory birds are known to nest outside of the aforementioned primary nesting period. Clearing and grubbing would be scheduled to occur outside the primary nesting period. A qualified biologist would conduct a field survey of the affected habitats to determine the absence or presence of nesting bald eagles or other migratory birds prior to construction activities. The USFWS's Iowa Ecological Services Field Office would be contacted immediately for further guidance and assistance in project modification if a field survey identifies the existence of one or more active bird nests.

Under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712: Ch. 128 as amended), construction activities in rivers, wetlands, streams, riparian forest, woodland, and grassland habitats that would otherwise result in the taking of migratory birds, eggs, young, and/or active nests should be avoided and completed outside the primary nesting season. Construction activities involved with this restoration project would have the potential to result in disturbing migratory birds; however, impacts will be minimized by scheduling clearing and grubbing activities to occur outside of the primary nesting season and surveying the site for nesting bald eagles and other migratory birds prior to construction. Either of the build alternatives would disturb a relatively small portion of the available habitat to bald eagles; preferred bald eagle nesting and roosting trees would continue to exist on the site after the project has been constructed. As mentioned in the Affected Environment Section, surveys conducted by the IDNR in February 2010 and January 2011 did not reveal any bald eagle nests in the project

area. Impacts to migratory birds, including bald eagles, are expected to be short-term and minor.

Minimal disturbance to migratory birds would be expected under the No Action Alternative. The site would continue to provide habitat for raptors and migratory songbirds. In the future, the site would likely provide less suitable nesting habitat for bald eagles and other raptors that utilize large cottonwoods as the tree canopy transitions from large mature cottonwoods to green ash, elms, mulberry, and dogwoods.

5.2 PRIME FARMLAND

Soil conservationists with the Logan Service Center, Iowa offices of the Natural Resources Conservation Service (NRCS), were contacted regarding prime or unique farmland within the project site (see Appendix A). Farmland of statewide importance within the project area includes Albaton and Sarpy series soils; prime farmland within the project area includes Blake series soils. Approximately 19 acres of soils mapped as prime farmland and approximately 76 acres of soils mapped as farmland of statewide importance are located within the proposed dredging zone. Considering the minimal acreage that would be affected and that Harrison County has 130,243 acres of prime farmland (Iowa Field Technical Guide 2006), this project would affect a small proportion of the county's prime farmland. The soils in the proposed dredging area are mapped as prime farmland and farmland of statewide importance; however, this area consists of accreted land that has no history of being planted to crops. Impacted soils would not likely be utilized for agriculture in the future given that they exist in a flood prone area in a Game Management Area.

Under the No Action alternative, the project site would continue to be managed as a wildlife management area; therefore, it is not likely the project site would be converted to agriculture in the absence of the proposed project.

5.3 WATER QUALITY

Up to approximately 3 million cubic yards of silty sand would be directly discharged into the Missouri River by hydraulic dredge over a period of 3-5 construction seasons. Missouri River sediment and nutrient loads were historically much higher than today and native fish including the pallid sturgeon and other native species have adapted and evolved to the high turbidity and sediment loads that were historically in the Missouri River. An increase in turbidity would be considered a beneficial impact to native riverine species (National Academy of Sciences 2002, 2010; USFWS 2000, 2003).

The recent Federal Position Paper on Sediment Management, Missouri River Recovery, Shallow Water Habitat Creation Downstream of Gavins Point Dam (USACE, EPA, USFWS, NPS, January, 2011) reiterates that Federal agencies recognize the importance of receiving-water characteristics (i.e., the natural, chemical and physical condition of each specific waterbody and the associated water quality requirements of its resident aquatic life) in relation to the Clean Water Act. It also supports the SWH

creation methods (dredging, side-cast, etc.) that favor restoration of natural processes to support endangered native species, with regard for pre-project site characterization through soil, water, and elutriate tests, while also maintaining all authorized purposes and compliance with the Clean Water Act.

Section 401 of the CWA allows states to grant or deny water quality certification for any activity that results in a discharge to waters of the United States. Certification requires a finding by the state that the activities permitted will comply with all water quality standards individually or cumulatively over the term of the permit. There were no elevated levels of contaminants, including Dieldrin or PCBs in the elutriate samples taken at the Lower Little Sioux Bend project site (see Appendix C for elutriate sampling results).

General Conditions outlined in the Section 401 water quality certification require dredging to occur only when Missouri River discharges are greater than 25,000 c.f.s., which corresponds to a Blair, Nebraska gage reading of 12.85 feet. Discharges are typically greater than 25,000 c.f.s. from April 1 to November 30. Sediment would be discharged outside of the navigation channel among the LWD and riprap structures until the design elevation is reached. Remaining sediment would be discharged into the thalweg of the river. The end of the discharge pipe would be submerged at a location in the water column where mixing and integration into the bed load would occur quickly. Studies and construction experience from other projects (California Bend, Nebraska and Hidden Lake/Great Marsh, Nebraska) indicate that suspending the discharge pipe 4 to 6-feet off the bottom of the river will provide for adequate entrainment of the dredge material. The dredge discharge schedule would be proportional to the river discharge as shown in Table 4. This would minimize the potential for sediment build-up near the discharge pipe

Table 5-2. Relationship of Dredge Discharge to Missouri River Discharge.

Dredge Discharge (cfs) (water and sediment)	Missouri River at Blair, Nebraska	
	Discharge (cfs)	Stage (feet)
17.8	22,300	11.4
26.73	33,450	15.6
35.64	44,600	17.9
44.56	55,750	19.9
53.47	66,850	21.5

Discharge of dredged material from the project site is not expected to significantly impact existing water quality or exceed any standard set by the IDNR or the NDEQ for the Missouri River. At any given stage in the above table the dredge discharge is roughly .0008 percent of the total discharge as measured at Blair, Nebraska. The discharge would likely be spread over two to five years of construction which equates to roughly 1,500,000 to 600,000 cubic yards per year. This amount is similar to that discharged by completed SWH projects such as Tyson Bend, Plattsmouth Bend Chute, and Boyer Chute.

Without a project, turbidity and sediment loads in the Lower Little Sioux reach would remain much lower than historic levels. Native species that are adapted to high turbidity would continue to be adversely impacted.

5.4 AIR QUALITY

Minor increases in dust and equipment exhaust are expected during construction of either of the build alternatives. These increases would be temporary and would not be expected to be high enough to result in Harrison County or Washington County becoming a non-attainment area for any NAAQS parameters. Therefore, the proposed project would have no significant impacts on air quality.

The project site would remain in attainment under the No Action alternative.

5.5 NOISE

Increases in noise from construction equipment are expected at the project site during construction. The expected increases in noise would be minor, temporary, and similar to those already occurring in the area at certain times of the year from farm machinery and boat activity. Therefore, the expected increases in noise levels from project construction would be minor and short-term.

Long-term noise levels under the No Action Alternative would be similar to those expected for either of the build alternatives. Under the No Action Alternative, no short term noise increases would be expected.

5.6 HISTORIC PROPERTIES and CULTURAL RESOURCES

The likelihood of significant adverse impacts to any historic or archaeological resources resulting from construction of the mitigation project is minimal. All construction activities are expected to occur on lands that have previously been disturbed by historic shifting of the Missouri River channel across the flood plain and where the land consists of relatively recently accreted sediment. In a letter dated June 11, 2010 the State Historical Society (SHSI) of Iowa indicated that there are not likely to be historic properties affected by the proposed project (see Agency Correspondence, Appendix A).

If a discovery is made during construction, all activity would be halted around the discovery site and a USACE archaeologist would inform the SHSI of the discovery. The USACE archaeologist would examine the discovery area as soon as possible and then consult with the SHSI about the nature and National Register of Historic Places eligibility of the area prior to resumption of any activity near the site. Construction would resume at the discovery site only if all parties agree it is appropriate. For these reasons, the proposed project is not likely to impact cultural resources.

5.7 SOCIOECONOMIC RESOURCES

Construction is proposed for an area owned by the State of Iowa, and no jurisdiction would experience a decrease in property tax revenues. The SWH would not be expected to result in a change in the agricultural use of the privately owned land south of the Lower Little Sioux Bend dredging area. Because the project would provide no increase in permanent employment, no impacts to the local population would be expected. The project would have no disproportionate impact on minority or socio-economically disadvantaged populations because 99 percent of Harrison County residents are white, median incomes are high, and only a few farmers live near the project area.

5.8 RECREATION

Both of the build alternatives would likely have minor short-term impacts to recreation. Construction activities may interrupt outdoor recreational activities in areas where active construction is taking place. Construction activities are projected to take place in increments over a two to five year period. Either of the build alternatives would be expected to provide additional recreational opportunities in, and increased visitation to, the Deer Island GMA in the long-term. The dredging project would increase the amount of SWH in the area, attracting more fish and waterfowl, which would in turn result in an increase in hunters and fishermen. An increase in the number of days spent hunting or fishing would likely be accompanied by an increase in the number of nights spent camping by hunters and boat fishermen (Weiner 2004). As a greater variety of wildlife, especially birds used the shallow water habitat, wildlife viewing would be expected to increase, but the number of "birdwatchers" would likely remain small compared to the number of hunters and fishermen.

Either of the build alternatives will impact the existing boat ramp at Deer Island GMA. Both alternatives include replacing the existing boat ramp with a new boat ramp at Deer Island GMA just north of the proposed dredging area before impacts to the existing boat ramp occur. All of the large woody debris and stone riprap structures would be placed in areas outside of the maintained navigation channel.

Under the No Action Alternative, the Deer Island GMA would continue to provide outdoor recreational opportunities. No short term impacts from construction would occur; however, the long term benefits gained from SWH restoration would not be realized.

5.9 NAVIGATION and SEDIMENTATION

Modeling indicates that no adverse impacts to navigation or access to the Harbor 671 channel are expected from construction and operation of the SWH for any of the alternatives. The U.S. Congress requires the USACE to maintain a 9 feet deep by 300 feet wide navigation channel. The navigation channel will be monitored during and after construction by USACE to ensure the 9 foot deep 300 foot wide dimensions are being

maintained. Depth will also be monitored in the nearby Harbor 671 side-channel to ensure excess sedimentation is not occurring. Areas outside of the navigation channel are not maintained by the USACE for boat traffic. The Corps recommends using extreme caution when boating outside of the navigation channel. All of the proposed structures would be located outside of the area maintained for barge navigation and other boat traffic.

5.10 TOPOGRAPHY

The development alternatives would remove a relatively small portion of the 773 acre Deer Island GMA, the majority of the property would remain at its existing elevation. A more natural topographic profile would result from the creation of natural shallow water riverine habitat; therefore the project would have long-term beneficial impacts.

5.11 CUMULATIVE IMPACTS

Cumulative effects were previously addressed in the SEIS for the Mitigation Project completed in 2003. This PIR is tiered from the 2003 SEIS. Cumulative effects are those that result from the incremental effects of the action when added to past, present, and reasonably foreseeable future actions within a region. The following discussion covers resource topics not directly addressed in the 2003 SEIS.

As discussed previously, significant cumulative effects have already occurred throughout the Missouri River, which have caused or contributed to the decline of listed species known to occur in the project area. Anthropogenic alteration of river hydrographs and dynamic processes has resulted in dramatic changes and the loss of proper riverine ecosystem functioning.

The implementation of this project, in conjunction with other SWH projects constructed along the Missouri River, is expected to have a major long-term beneficial effect on native Missouri River aquatic species that rely on SWH. SWH is particularly important for larval and juvenile pallid sturgeon habitat, slowing larval pallid sturgeon drift, and adding to the forage base of the river.

While providing positive biological benefits, the design of this project is intended to maintain the integrity of the navigation channel by preventing thalweg meander. SWH projects are designed to avoid conflicts with other authorized purposes of the system (e.g. navigation and flood risk management); therefore, negative cumulative impacts to navigation and other authorized purposes are not anticipated. The total capacity of the channel will also not be negatively altered. The sediment deposits dredged to create the SWH will be discharged to the river to once again become part of the entrained bed load. Long-term and cumulative impacts to wildlife resources are expected to be beneficial because of an increase in valued habitat types and the relative abundance of these habitats.

Typically, SWH projects such as channel widening, chute construction, or backwater development involve a minor amount of timber clearing and alluvial soil disturbance. Many MRRP projects incorporate wetland, deciduous forest, and native grassland areas to offset impacts to terrestrial vegetation from the BSNP. The Missouri River Recovery Program (MRRP) is actively purchasing approximately 3,500 acres of Missouri River floodplain land per year for restoration of wetlands, woodlands, riverine, and other floodplain habitats. Cumulative impacts to terrestrial riparian habitat favored by bald eagles and other riparian dependant species are offset by the beneficial effects of SWH construction and the net beneficial effects of other habitat development that occurs as part of the MRRP such as restoration of cottonwood forests under the MRRP Cottonwood Restoration Program.

According to the recent National Academy of Sciences Report, *Missouri River Planning: Recognizing and Incorporating Sediment Management* (NAS, 2011), a comparison of potential phosphorus loads from SWH projects, with load increments required to produce measurable changes in the areas extent of Gulf Hypoxia, shows that SWH projects would neither individually or cumulatively significantly change the extent of the hypoxic area in the Gulf.

5.12 IRREVERSABLE and IRRETRIVABLE COMMITMENT of RESOURCES

Irreversible and irretrievable resource commitments due to planning, constructing, and operating Lower Little Sioux Bend would include expenditure of Federal funds, labor, energy, and construction materials used to plan, design, construct, and monitor the project. Changes to the project site resulting from the preferred alternative would be reversible, but would require extensive labor and budget.

5.13 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The natural ecosystem benefits offered by the proposed project are considered as a significant beneficial impact that would provide a long-term enhancement to the fish and wildlife resources of the Lower Missouri River ecosystem. Short-term impacts from construction activities are not anticipated to be significant.

5.14 ADVERSE EFFECTS that CANNOT be AVOIDED

If the recommended alternative is implemented (Alternative 3), adverse effects that cannot be avoided include: the minor long-term loss of terrestrial riparian habitat and minor long-term loss of reed canarygrass wetlands; minor short-term loss of recreational opportunities in the project area due to construction activity and noise; and minor short-term disturbance to terrestrial wildlife species from construction activity and noise.

TABLE 5.3: Environmental Consequences Summary

Resource Category	Alternative 1 (No Action)	Alternative 2 (Medium Width Shallow Bench)	Alternative 3 (Wide Shallow Bench)
Aquatic Species	major long-term impact to native fish species from maintaining a narrow, fixed navigation channel with very little SWH	minor short-term impacts from construction operations; long-term beneficial impacts to pallid sturgeon and other native fish species from creation of 77-110 acres of new SHW	minor short-term impacts from construction operations; long-term beneficial impacts to pallid sturgeon and other native fish species from creation of 132-182 acres of new SWH
Wetlands and other Riparian Habitat	No Impacts	minor long-term impacts to reed canarygrass wetlands, minor long-term impacts to Riparian woodlands, and minor long-term impacts to willow shrublands from clearing and dredging	minor long-term impacts to reed canarygrass wetlands, minor long-term impacts to Riparian woodlands, and minor long-term impacts to willow shrublands from clearing and dredging
Wildlife	Adverse impacts to wildlife species dependent on natural riverine habitat such as SWH.	Short-term minor impacts from Construction activity; short-term minor impacts to terrestrial wildlife species from tree, shrub, and other terrestrial habitat removal; Long-term beneficial impacts to wildlife species dependent on natural riverine habitat through creation of 77-110 acres of SWH	Short-term minor impacts from Construction activity; short-term minor impacts to terrestrial wildlife species from tree, shrub, and other terrestrial habitat removal; Long-term beneficial impacts to wildlife species dependent on natural riverine habitat through creation of 132-182 acres of SWH

Federally Threatened or Endangered Species	Adverse impact to pallid sturgeon from maintaining a narrow, fixed navigation channel with very little SWH	long-term beneficial impacts to pallid sturgeon from creating 77-110 acres of new SWH	long-term beneficial impacts to pallid sturgeon from creating 132-182 acres of new SWH
State Threatened or Endangered Species	No Impacts	No Impacts	No Impacts
Migratory Birds	No Impacts	Minor short-term impacts to terrestrially oriented species from tree and shrub removal – long-term beneficial impacts to aquatic species from restoration of natural riverine habitat	Minor short-term impacts to terrestrially oriented species from tree and shrub removal – long-term beneficial impacts to aquatic species from restoration of natural riverine habitat
Prime Farmland	No Impacts	minor long-term impacts from re-introducing 77 acres of accreted land (mapped as Prime Farmland) back into the river	minor long-term impacts from re-introducing 132 acres of accreted land (mapped as Prime Farmland) back into the river
Water Quality	No Impacts	Negligible impacts - moderate beneficial effects from re-introducing sediment and turbidity into Lower Little Sioux Reach	Negligible impacts - Beneficial effects from re-introducing sediment and turbidity into Lower Little Sioux Reach

Air Quality	No impacts	negligible impacts from construction equipment emissions	negligible impacts from construction equipment emissions
Noise	No impacts	Minor short-term impacts due to construction noise	Minor short-term impacts due to construction noise
Historic Properties and Cultural Resources	No impacts	No impacts	No impacts
Socioeconomic Resources	No impacts	No Impacts	No impacts
Recreation	No impacts	minor short-term impacts from construction activity – long-term beneficial effects from improved fish and wildlife habitat and new boat ramp	minor short-term impacts from construction activity – long term beneficial effects from improved fish and wildlife habitat and new boat ramp
Site Topography	No impacts	No adverse effects – beneficial effects from returning a more natural topography to the river bottom	No adverse effects – beneficial effects from returning a more natural topography to the river bottom

6.0 ENVIRONMENTAL COMPLIANCE

This section summarizes the statutory and regulatory environmental compliance requirements and discusses the major Federal and state permits and clearances that would be required for the approval and implementation process for Lower Little Sioux Bend. The applicability and status of these environmental requirements is presented in Table 6.1 and a discussion of the most important follows.

6.1 Environmental Policy

The USACE is preparing a Project Implementation Report (PIR) consistent with USACE planning policy and guidance for each mitigation site. The PIR would document the planning for the mitigation site and would provide the information needed to ensure compliance with respect to environmental considerations.

Federal agencies use NEPA [42 USC 4321 et seq.] to evaluate the environmental impacts of a proposed project. Through the NEPA process, public officials and citizens are given opportunity to be involved in the environmental review and receive information about environmental impacts before any decisions are made on Federal actions regarding the proposed projects. This PIR is intended to serve as the documentation necessary to incorporate the NEPA process into the Mitigation Program planning and implementation. If no significant impacts are determined, a Finding of No Significant Impact (FONSI) would be prepared and NEPA compliance would be fulfilled.

6.2 Water Resources

Federal limits on the amounts of specific pollutants that could be discharged to surface waters in order to restore and maintain the chemical, physical, and biological integrity of the water are governed by CWA [33 USC 1251 et seq., as amended], National Pollutant Discharge Elimination System (NPDES).

Discharge of stormwater resulting from construction activities that would disturb more than one acre of surface area requires an NPDES permit under Section 402 of the CWA. The IDNR and NDEQ authorize NPDES permits in the state of Iowa and Nebraska. A Stormwater Pollution Prevention Plan (SWPPP) would be prepared prior to commencement of construction activities. The plan would address practices and measures required to control and reduce the amount of pollutants in stormwater runoff.

Regulatory requirements for a permit system governing the placement of dredged or fill material into waters of the United States are also mandated by CWA under Section 404. The USACE authorizes this permit. The proposed project requires a Section 404 Individual permit and a Section 404(b)(1) evaluation. Section 401 of the CWA requires state agencies to certify that a project requiring a Federal permit to discharge complies

with specific provision of the CWA. Section 401 water quality certification would be obtained from the IDNR and the NDEQ.

Table 6-1: Compliance of Recommended Alternative with Environmental Protection Statutes and Other Environmental Requirements

Federal Environmental Requirements	Applicability	Status
Archeological Resources Protection Act, 16 U.S.C. 470, et. seq.	Applicable	Full Compliance
Clean Air Act, as amended, 42 U.S.C. 7401-7671g, and et. seq.	Applicable	Full Compliance
Clean Water Act (Federal Water Pollution Control Act),	Applicable	Full Compliance
Endangered Species Act, 16 U.S.C. 1531, et. seq.	Applicable	Full Compliance
Federal Water Project Recreation Act, 16 U.S.C. 4601-12, et. seq.	Applicable	Full Compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 661, et. seq.	Applicable	Full Compliance
Land and Water Conservation Fund Act, 16 U.S.C. 4601-4, et. seq.	Not Applicable	Not Applicable
National Environmental Policy Act, 42 U.S.C. 4321, et. seq.	Applicable	Full Compliance
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470a, et. seq.	Applicable	Full Compliance
Rivers and Harbors Act, 33 U.S.C. 403, et. seq.	Applicable	Full Compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et. seq.	Not Applicable	Not Applicable
Wild and Scenic River Act, 16 U.S.C. 1271, et. seq.	Not Applicable	Not Applicable
Farmland Protection Policy Act, 7 U.S.C. 4201, et. seq.	Applicable	Full Compliance
Protection & Enhancement of the Cultural Environment (Executive Order 11593)	Applicable	Full Compliance
Floodplain Management (Executive Order 11988)	Applicable	Full Compliance
Protection of Wetlands (Executive Order 11990)	Applicable	Full Compliance
Environmental Justice (Executive Order 12898)	Applicable	Full Compliance
Migratory Bird Conservation (Executive Order 13186)	Applicable	Full Compliance

6.3 Threatened and Endangered Species

Federal agencies are required to determine the effects of their actions on federally listed endangered or threatened species and their critical habitats under ESA [16 USC 1531 et seq.]. Steps must be taken by the Federal agency to conserve and protect these species and their habitat, and to avoid or mitigate any potentially adverse impacts resulting from the implementation of the proposed project.

The USACE requested information on fish, wildlife, and federally listed species in the vicinity of the proposed project area in a letter dated February 2, 2010. Formal consultation would not be required for the proposed project as adverse impacts to listed species or their habitats are not anticipated. Further, the proposed action is a component of a Reasonable and Prudent Alternative (RPA) element under the existing 2003 Biological Opinion.

6.4 Fish and Wildlife

The Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.) provides the basic authority for USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It also requires that Federal agencies that construct, license or permit water resource development projects must first consult with USFWS (and the National Marine Fisheries Service in some instances) and state fish and wildlife agency regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. In order to streamline coordination the USFWS and USACE have a programmatic FWCA agreement in place for the MRRP. Full consideration is to be given to USFWS recommendations.

The USACE requested input from the USFWS regarding the Lower Little Sioux Bend project in a letter dated February 2, 2010. The USFWS responded in support of the proposed project.

6.5 Prime Farmlands

The Farmland Protection Act [7 CFR 658] minimizes the extent to which Federal actions contribute to the unnecessary conversion of prime farmlands to nonagricultural use. The NRCS takes steps to ensure that prime farmlands lost to development are documented and provided to congress in a yearly report. In full compliance with the Farmland Protection Act, Form AD-1006 Farmland Conversion Impact Rating form was submitted to the NRCS (Appendix A).

6.6 Air Quality

The Federal policy to protect and enhance the quality of the air to protect human health and the environment is established under the Clean Air Act [42 USC 7401

et seq., as amended]. Impacts to air quality from the proposed project are considered insignificant. Therefore, no additional actions would be required for full compliance.

6.7 Cultural Resources

Section 106 of NHPA of 1966 (amended June 17, 1999) requires Federal agencies to take into account the effects of their undertakings on historic properties. By definition, historic properties are properties eligible for or listed on the National Register of Historic Places (NRHP). Federal undertakings refer to any Federal involvement including funding, permitting, licensing, or approval. Federal agencies are required to define and document the Area of Potential Effects (APE) for undertakings. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.

The Advisory Council on Historic Preservation (ACHP) issues regulations that implement Section 106 of NHPA at 36 CFR Part 800, Protection of the Historic Properties. Section 106 sets up the review process whereby a Federal agency consults with the SHPO, Native American tribes, and other interested parties including the public to identify, evaluate, assess effects, and mitigate adverse impacts on any historic properties affected by their undertaking. The PIR will be provided to the Iowa State Historic Preservation Officer and appropriate federally recognized Native American Tribes for comment in accordance with Section 106 of the NHPA during the public comment period.

In a letter dated June 11, 2010 the Iowa SHPO indicated that it is not likely to be historic properties affected by the proposed project.

6.8 Invasive Species

Executive Order (E.O.) 13112 specifies that federal agencies not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species. The proposed project would be in compliance with E.O. 13112 because it is designed to restore habitat that favors native aquatic species; and therefore would be expected to increase the occurrence of native species and not be expected to promote the spread of invasive species.

6.9 Relationship of the Proposed Project to Other Planning Efforts

The proposed project should have no effect on land use in the area. The proposed plan would be in general agreement with habitat planning efforts of the Iowa Department of Natural Resources and the Nebraska Game and Parks Commission. Other MRRP SWH projects in the vicinity of the proposed project include Fawn Island, Three Rivers, Little Sioux Bend and Louisville Bend.

7.0 OTHER CONSIDERATIONS

7.1 INTRODUCTION

The recommended alternative for Lower Little Sioux Bend includes various activities, primarily construction of a shallow bench, multiple integrated chutes, and riprap and LWD structures to develop SWH. This section describes the monitoring and evaluation plan, operations and maintenance plan, real estate considerations, implementation responsibilities and views, cost estimate, schedule, and conclusions and recommendations for Lower Little Sioux Bend's recommended alternative.

7.2 MONITORING AND ADAPTIVE MANAGEMENT

In order to ensure project success, an Adaptive Management (AM) plan will be implemented which addresses project uncertainties through monitoring of physical and biological responses to management actions, assessment of progress towards project objectives and implementation of potential subsequent actions to improve project performance. A sub-program level AM strategy is currently under development that will address the objectives, uncertainties, metrics, monitoring, assessment and potential management actions for SWH projects. As such, this project will be covered under the overall SWH AM Strategy, including monitoring for success in meeting stated objectives, once it is developed and implemented. Under the SWH AM Strategy, it is likely that a representative sample of SWH projects will be monitored. Given the uniqueness of the proposed project among all other SWH projects constructed to date, it is recommended that the proposed project be monitored for success during the implementation of the forthcoming SWH AM strategy. The following discussion references the potential site specific AM activities and the objectives described in the BiOp and subsequent correspondence, existing metrics, ongoing monitoring and potential future actions relevant to this project. Working draft Objectives and Metrics from the SWH AM Strategy are also referenced. This AM plan assumes that adequate funding will be available to implement recommendations although funding from year to year for monitoring and management is uncertain.

7.2.1 Objectives

The central objective of the SWH program is to provide the necessary quantity and quality of SWH to benefit pallid sturgeon and other native fish species. This would involve the restoration of 20-30 acres per river mile of aquatic habitat that is generally < 1.5m (approximately 5 feet) in depth and < 0.6 m/s (approximately 2 feet per second) of water velocity including "side channels, backwaters, depositional sandbars detached from the bank, and low-lying depositional areas adjacent to shorelines." (FWS, 2009) The proposed project at Lower Little Sioux

Bend is anticipated to contribute 132-182 acres of SWH to the system. The project would initially produce approximately 132 acres of SWH. Over time, the adjacent channel section will be enhanced through the constructed riprap/large wood debris structures with a future estimate of 182 acres as natural sedimentation occurs and the habitat matures.

In addition to the quantity of habitat to be restored, habitat quality is also an objective of the program. In their 2009 letter, FWS describes physical habitat quality parameters of SWH as follows: "Key physical components of SWHs are their dynamic nature with depositional and erosive areas, predominance of shallow depths intermixed with deeper holes and secondary side channels, lower velocities and higher water temperatures than main-channel habitats." In addition, the letter describes the anticipated biological responses as follows: "Shallow water habitat provides areas for increased primary productivity, invertebrate production, and larval/young-of-year nursery habitat." To address these habitat quality parameters, a number of draft Objectives and Performance Metrics have been developed for the SWH AM Strategy that would be applicable to the proposed project including:

- Increase physical habitat complexity
 - Emulate depth and velocity profiles of naturally-occurring habitats
 - Emulate substrate size composition found in naturally-occurring habitats
 - Emulate the entrainment/retention of large woody debris found in naturally-occurring habitats
 - Increase lateral connection of created habitat
- Achieve project-scale biological responses
 - Increase primary productivity (chlorophyll A, phytoplankton biomass, etc.)
 - Increase secondary productivity (benthic macroinvertebrate biomass, zooplankton abundance, etc.)
 - Increase local abundance and diversity of young-of-year fish

This project incorporates a large shallow water bench, multiple chutes at varying depths located in the shallow bench excavation zone, riprap and LWD structures, and an anticipated depositional zone among the riprap/LWD structures. These features are intended to improve habitat quality for pallid sturgeon and other native aquatic species by providing a far greater variety of depths, velocities, and habitat structure than currently exists in this river reach and address many of the draft Objectives described above. Furthermore, while many other SWH projects are intended to develop physical complexity over time as projects are shaped through natural processes, the proposed site was designed as a management experiment to create a site with the desired physical habitat complexity in place immediately following construction to test the following:

- 1) If this is achievable through construction
- 2) If the desired project-scale biological responses are triggered by this increased habitat complexity
- 3) If this habitat is sustainable

In order to comply with congressional mandates and the current Master Manual on the Missouri River Mainstem System, an additional objective involves maintaining other congressionally authorized purposes of the system, including navigation. This project was designed with this objective in mind with the length, width and configuration of the features placed in a manner that is anticipated to preserve navigation depth in the adjacent main channel.

7.2.2 Monitoring

The proposed project at Lower Little Sioux Bend is intended to help address program level uncertainties surrounding the eventual biological responses and sustainability of top-width widening projects constructed with passive measures that rely on the river's erosive forces. In order to address these uncertainties it will be crucial for ongoing SWH monitoring efforts to include collection of site specific data at Lower Little Sioux Bend. The goal for monitoring at Lower Little Sioux Bend will be to evaluate physical and biological responses to the SWH creation and to provide the information necessary for adaptive management of the project. Success will be determined by how well the completed project meets the project objectives. Monitoring should consist of both physical and biological components including, but not necessarily limited to, measuring depth and flow velocity distributions, measuring primary and secondary productivity, monitoring water quality, and monitoring fish community composition to address the draft SWH AM Strategy Objectives.

Pre-project monitoring of the main-channel fish community was conducted in from 2007-2009 under previous Habitat Assessment and Monitoring Program (HAMP) efforts. Also, main-channel bathymetry and water velocity data were collected in 2007-2009. Immediately prior to (2011) and following construction, additional monitoring would focus on water depths and velocities, substrate size distributions, large woody debris counts, and floodplain elevations (lateral connectivity). These data would be collected about once every 3 years depending on flows. In addition, biological responses would be measured prior to and following construction at the restored site and adjacent main channel including measures of primary productivity, secondary productivity and young-of-year fish abundance. These data would be collected approximately monthly during summer every other year following construction for up to 10 years depending on physical conditions of the site. The cost of HAMP monitoring would be approximately \$30,000 per year.

Depth will also be monitored in the navigation channel and the nearby Harbor 671 side-channel to ensure excess sedimentation is not occurring. As the main

channel of the Missouri River is self-sustaining, meaning it does not require annual dredging to maintain depth, there are no annual efforts to survey channel depth. However, a survey of main channel depth profiles may be initiated for the proposed project if problems are reported by navigators or others on the system.

7.2.3 Assessment

The quantity of habitat constructed annually is used to measure progress towards the overall BiOp SWH goal as part of the annual MRRP Performance Assessment. This data is tracked over time and is reported in the BiOp Annual Report. Data from the Pallid Sturgeon Population Assessment, HAMP, and the Water Quality monitoring program is typically captured in annual monitoring reports and analyzed semi-annually in multi-year reports. In the event that reports of navigation problems in the vicinity of the chute are received, existing and newly collected data would be analyzed to assess whether or not a depth problem existed and if the project was responsible.

To measure success, the constructed site will be compared to the best examples of naturally-occurring shallow water habitats and the main channel and similarity indices will be developed to measure progress over time as both the constructed and natural sites continue to develop through natural processes. If physical habitat complexity is not achieved or degrades over time, adjustments to the site may be necessary to achieve the objectives. The broader SWH AM Strategy will address uncertainties associated with whether or not physical habitat complexity results in the desired biological responses through the assessment of multiple SWH sites (including the proposed projects) and the use of investigations targeted at reducing uncertainties associated with biological responses to both management actions and other external factors.

7.2.4 Adaptive Management

Data from physical and biological responses will be used to determine whether site specific adjustments are needed to achieve the desired habitat quality. While potential adaptive management actions will be identified as part of the forthcoming sub-program level AM strategy, several potential site-specific actions are currently known. If depths in the main channel are found to be insufficient to meet navigation flows and an assessment is made that the project is responsible, a management action such as, but not limited to, a modification of riprap/large wood debris structures may be recommended to direct additional flow into the navigation channel. Modification of the riprap/large woody debris structures may also be necessary to achieve the desired level of depth and flow diversity in the main channel adjacent to the shallow bench excavation zone. It is very difficult to determine the best placement of structures through modeling; therefore, some adjustment of structure placement will be necessary. Rough estimates for future

structure modification work include an average of \$100,000 per year, likely to occur in \$300,000 to \$500,000 blocks over the next 6 years.

7.2.5 Adaptive Management Implementation

The Executive Steering Committee (ESC), as informed by the Integrated Science Program Management team, would be responsible for deciding which monitoring efforts are funded within a given year. Data analysis and assessment would be conducted by the Adaptive Management Work Group, in conjunction with the Aquatic Habitat Work Group and SWH Project Delivery Teams. The decision to implement a subsequent adaptive management action at this site would be made by the SWH program manager and approved by the ESC.

7.3 OPERATIONS AND MAINTENANCE PLAN

O&M activities would include the maintenance of developed habitats and additional management activities at the site. Because the IDNR already owns and manages the land, the IDNR will continue to manage the land portion of the site. The USACE will have responsibility for O&M of the river structures constructed as part of the project. The USACE will prepare an O&M Manual for Lower Little Sioux Bend. It is anticipated that the IDNR will conduct certain aspects of O&M as part of its normal management activities at the Deer Island Game Management Area. These final arrangements would be outlined in the O&M Manual.

7.4 REAL ESTATE CONSIDERATIONS

All lands required for the proposed project at Lower Little Sioux Bend are owned by the State of Iowa and managed by the IDNR. A construction staging area would be established on site by the contractor subject to approval of the contracting officer. The USACE would obtain an easement from the IDNR to construct the project and maintain river structures. Aside from clearing and grubbing the shallow bench excavation zone, it is anticipated that most of the construction activities would occur from the river.

7.5 IMPLEMENTATION RESPONSIBILITIES

The USACE is responsible for study management and coordination with USFWS, and other affected/interested agencies. The USACE will prepare and submit the subject PIR and complete all environmental review and coordination requirements. The USACE will then prepare any design plans that may be required, finalize any plans and specifications, prepare and implement a monitoring and evaluation plan, advertise and award a construction contract, perform construction contract supervision and administration, develop an O&M manual, and ensure O&M is carried out in accordance with the O&M manual. The USACE will maintain the SWH habitat site for all project purposes including fisheries and navigation. In the event of flood damages to the project, the

USACE will evaluate and complete the work necessary to reestablish project features.

The USACE is ultimately responsible for all O&M activities related to the constructed habitat at Lower Little Sioux Bend. The ACT meets quarterly to discuss the status of the MRRP. As part of the meetings, an O&M update is given at which time the ACT ensures that site O&M is appropriate and reasonable.

7.6 COST ESTIMATE

The total estimated construction cost of Lower Little Sioux Bend is anticipated to be \$22 million. This estimate includes clearing and grubbing, shallow bench excavation with hydraulic dredging, rock fill for structures, placement of large woody debris/riprap structures, seeding and mulching, and excavation and transport of rock. Adaptive management is expected to cost approximately \$600,000 spread over approximately six years. Supervisory and Administration (S&A) costs are estimated to be 6% of project construction costs. The project is anticipated to be constructed in phases; each phase with a 30% contingency to account for uncertainties in flow levels. The Engineering and Design Cost (EDC) estimate would be finalized along with the government estimate.

The Lower Little Sioux Bend project would be federally funded in its entirety. If Federal funds are not available to accomplish general operations, management and maintenance at the site, such work could be deferred or not accomplished. Additionally, the dynamics of the Missouri River adjacent to the site could deem a deferment or "no action" decision about operations, management and maintenance at the site. Annual O&M costs will be estimated as part of the USACE' MCACES estimate. The cost estimate would be updated throughout the life of the project.

7.7 ESTIMATED SCHEDULE

Table 7-1 Estimated Schedule

Milestone	Scheduled
Draft PIR	March 18, 2011
Final PIR	June 24, 2011
Plans & Specifications Started	July 2011
Plans & Specifications Reviewed	September 2, 2011
Plans & Specifications Approved	September 16, 2011
Construction Contract Advertised	September 26, 2011
Construction Contract Awarded	Fall 2011
Construction Contract Completed	Not Scheduled

7.8 CONCLUSIONS AND RECOMMENDATIONS

Alternative 3, the development of 132-182 acres of SWH in the form of a shallow bench, integrated chutes, and riprap/large woody debris structures at Lower Little Sioux Bend at an estimated construction cost of \$22 million has been identified as the preferred plan and a priority project for inclusion into the Missouri River Recovery Program. The proposed project is anticipated to help address uncertainties surrounding the eventual biological productivity and sustainability of numerous top-width widening SWH projects that have been constructed by utilizing, primarily, the erosive force of the river. By aggressively widening the top-width of the river by mechanical means, a SWH area that closely resembles the desired end-state can be created relatively quickly at Lower Little Sioux Bend. The SWH area can then be monitored to help gauge the eventual biological productivity and physical sustainability of SWH projects constructed with more-passive means. This information is critical because it could help to forecast the future success of many in-channel SWH projects as they are currently being implemented.

8.0 REFERENCES

- Berner, L. M. 1951. Limnology of the lower Missouri River. *Ecology* 32: 1-12.
- Brinson, M.M. 1990. Pages 87-141 in Lugo, A. E., Brinson, M., and Brown, S., editors. *Ecosystems of the World*. Elsevier Science, New York, New York. 527 pp.
- Carlson, D.M. and W.L. Pflieger. 1981. Abundance and life history of the lake, pallid, and shovelnose sturgeons in Missouri. Final Report Endangered Species Project SE-1-6. Missouri Department of Conservation. 40 pp.
- U. S. Army USACE of Engineers, 1981. Missouri River Fish and Wildlife Mitigation Iowa, Nebraska, Kansas, and Missouri Final Feasibility Report and Final Environmental Impact Statement. Missouri River Division, Omaha District, Omaha, Nebraska.
- U.S. Army USACE of Engineers, 1990a. Missouri River Bank Stabilization and Navigation Fish and Wildlife Mitigation Project Reaffirmation Report. Missouri River Division, Omaha, Nebraska.
- U.S. Army USACE of Engineers, 1990b. Missouri River Bank Stabilization and Navigation, Fish and Wildlife Mitigation Project, Real Estate Design Memorandum #1. Missouri River Division.
- U.S. Army USACE of Engineers, 1992. Missouri River Fish and Wildlife Mitigation Project, Project Management Plan. Missouri River Division.
- U.S. Army USACE of Engineers, 1994. Missouri River Master Water Control Manual Review and Update, Volume 3A: Low Flow Studies, Gavins Point Dam to St. Louis, Missouri. Missouri River Division.
- U.S. Army USACE of Engineers, 2001. Main Report Revised Draft Environmental Impact Statement. Volume 1: Missouri River Master Water Control Manual Review and Update Study. Northwestern Division, Omaha, Nebraska.
- U.S. Army USACE of Engineers, 2003a. Missouri River Fish and Wildlife Mitigation Project, Final Supplemental Environmental Impact Statement. Kansas City and Omaha Districts.
- U.S. Army USACE of Engineers, 2005. Missouri River Fish and Wildlife Mitigation Program, Draft Program Management Plan. Kansas City and Omaha Districts.
- Dahl, A.R. 1961. Missouri River studies: alluvial morphology and quaternary history. PhD Dissertation, Iowa State University, Ames, Iowa.
- Duffy, W.G., C.R. Berry, and K.D. Keenlyne. 1996. Biology of the pallid sturgeon with an annotated bibliography through 1994. Cooperative Fish and Wildlife research Unit, Technical Bulletin 5. South Dakota State University, Brookings, South Dakota.
- U.S. Army USACE of Engineers, U.S. Fish and Wildlife Service, Environmental Protection Agency, National Park Service, 2011. Federal Position on Sediment Management Missouri River Recovery, Shallow Water Habitat Creation Downstream of Gavins Point Dam.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds*. Simon and Schuster/Fireside Books.

Environmental Protection Agency (EPA). 2007. Introduction to TMDLs. <http://www.epa.gov/owow/tmdl/intro.html>. Accessed July 12, 2007.

Funk, J.L., and J.W. Robinson. 1974. Changes in the channel of the lower Missouri River and effects on fish and wildlife. Aquatic Series No. 11, , Jefferson City, Missouri.

Galat, D.L., Berry, W.M. Gardner, J.C. Hendrickson, G.E. Mestl, G.J. Power, C. Stone, and M.R. Winston. 2004. Spatiotemporal patterns and changes in Missouri River fishes. Historical changes in fish assemblages of large American Rivers. American Fisheries Society Symposium.

Hesse, L.W., Mestl, G.E., and Robinson, J.W., 1993. Status of Selected Fishes in the Missouri River in Nebraska with Recommendations for Their Recovery. Nebraska Game and Parks Commission Research Publication

Hesse, L.W. 1996. Floral and faunal trends in the middle Missouri River. Pages 73-90 in D. L. Galat and A. G. Frazier, editors. Overview of river-floodplain ecology in the upper Mississippi River basin. Vol. 3 of J. A. Kelmelis, editor. Science for floodplain management into the 21st century. U.S. Government Printing Office, Washington, D.C.

IDNR (Iowa Department of Natural Resources). 2004. Iowa's final 2004 integrated report, category 5: water impaired and in need of a TMDL (the 303(d) list of impaired waters). Iowa Department of Natural Resources, Des Moines, Iowa. [http://wqm.igsb.uiowa.edu/WQA/303d/2004/2004%20Final%20EPA-approved%20Category%205%20-%20303\(d\)%20list.pdf](http://wqm.igsb.uiowa.edu/WQA/303d/2004/2004%20Final%20EPA-approved%20Category%205%20-%20303(d)%20list.pdf) Accessed July 13, 2007.

IDNR (Iowa Department of Natural Resources). 2006. Draft category 5 of Iowa's 2006 integrated report: the list of impaired waters. Iowa Department of Natural Resources, Des Moines, Iowa. <http://wqm.igsb.uiowa.edu/WQA/303d/2006/303dFO4.htm>. Accessed July 13, 2007.

Mayhew, J. (editor). 1987. *Iowa Fish and Fishing*. Iowa Department of Natural Resources.

Mestl, Gerald. 2004. Personal communication to Eric Laux, USACE. Nebraska Game and Parks Commission, Lincoln, NE.

NDEQ (Nebraska Department of Environmental Quality). 2004. Surface Water Quality Integrated Report. Nebraska Department of Environmental Quality, Water Quality Division. Lincoln, NE. <http://www.ndeq.state.ne.us>

U.S. Army USACE of Engineers, 2001. US Army USACE of Engineers Mitigation Lands Area Plan (Northwest Missouri Region). , Jefferson City, Missouri.

NASS (National Agricultural Statistics Service). 2002. 2002 Census of Agriculture. U.S. Department of Agriculture, Washington, D.C. http://www.nass.usda.gov/Census/Pull_Data_Census Accessed July 13, 2007.

National Research Council. 2002. The Missouri River ecosystem: exploring the prospects of recovery. National Academy Press, Washington, D.C.

National Research Council. 2010. Missouri River Planning: Recognizing and Incorporating Sediment Management. National Academy Press, Washington D.C.

Sheehan, R.J., R.C. Heidinger, K. Hurley, P.S. Wills, M.A. Schmidt. 2000. Middle Mississippi River pallid sturgeon habitat use project: Year 5 Annual Progress Report, December 1998. Fisheries Research Laboratory and Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois.

Snook, Vaughn A. and E. J. Peters. 2000. Movements and habitat of pallid sturgeon in the lower Platte River. American Fisheries Society meeting abstracts, IA-NE Chapters, January 18-20, 2000.

Steinauer, Gerry. 2003. Terrestrial Natural Communities of Nebraska. Version III. Nebraska Natural Heritage Program, Nebraska Game and Parks Commission, Lincoln, Nebraska

U.S. Census Bureau. 2006a. State and county quick facts, Harrison County, Iowa. US Census Bureau, Washington, D.C.
<http://quickfacts.census.gov/qfd/states/19/19085.html> Accessed July 13, 2007.

U.S. Census Bureau. 2006b. Population finder, Modale, Iowa. US Census Bureau, Washington, D.C.
http://factfinder.census.gov/servlet/SAFFPopulation?_event=Search&_name=modale&_state=04000US19&_county=modale&_cityTown=modale&_zip=&_sse=on&_lang=en&_pc.txt=fph Accessed July 13, 2007.

U.S. Fish and Wildlife Service. 1980. Missouri River Stabilization and Navigation Project, Sioux City, Iowa to Mouth detailed Fish and Wildlife Coordination Act Report. Division of Ecological Services, Kansas City Area Office, North Kansas City, Missouri.

U.S. Fish and Wildlife Service, 1993. Pallid sturgeon recovery plan. USFWS, Bismarck, North Dakota.

U.S. Fish and Wildlife Service, 1996. *Platanthera praeclara* (western prairie fringed orchid) recovery plan. U.S. Fish and Wildlife Service, Ft. Snelling, MN.

U.S. Fish and Wildlife Service, 2000. Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System. Denver, Colorado and Fort Snelling, Minnesota.

U.S. Fish and Wildlife Service, 2003a. 2003 Amendment to the 2000 Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System. Denver, Colorado and Fort Snelling, Minnesota.

U.S. Fish and Wildlife Service, 2003b. 2002 Annual Report, Lower Mississippi River Pallid Sturgeon Monitoring and Population Assessment Report, prepared for the U.S. Army USACE of Engineers Northwest Division, Wyatt Doyle and Andrew Starostka, U.S. Fish and Wildlife Service, Columbia Missouri Fishery Resources Office.
USGS. 2003. Physiographic Regions. <http://tapestry.usgs.gov/> (April 17, 200)

APPENDIX A

AGENCY AND PUBLIC CORRESPONDENCE

Quinn, Aaron T NWO

From: McMichael, Julie - Chariton, IA [REDACTED]
Sent: Monday, March 29, 2010 1:54 PM
To: Lawson, Robert - Harlan, IA; Quinn, Aaron T NWO
Cc: Miller, Paul - Ankeny, IA
Subject: RE: Lower Little Sioux Bend (Deer Island) Shallow Water Habitat project - Farmland Conversion

Attachments: Lower Little Sioux (Deer Island) Impact Rating.pdf



Lower Little Sioux
(Deer Island...)

Aaron and Rob,

Attached in the Farmland Conversion Rating Sheet. If you have any questions about it please let me know.

Thanks,

Julie

From: Lawson, Robert - Harlan, IA
Sent: Tuesday, March 23, 2010 4:09 PM
To: McMichael, Julie - Chariton, IA
Cc: Miller, Paul - Ankeny, IA
Subject: FW: Lower Little Sioux Bend (Deer Island) Shallow Water Habitat project - Farmland Conversion

Hello Julie,

We received a Farmland Conversion Impact Rating that needs to be completed for a project in Harrison County. Is this something you can help me fill out or should I be asking someone else?

Thanks,
Rob

From: Koenig, Kelly - Logan, IA
Sent: Tuesday, March 23, 2010 3:35 PM
To: Lawson, Robert - Harlan, IA
Subject: FW: Lower Little Sioux Bend (Deer Island) Shallow Water Habitat project - Farmland Conversion

From: Quinn, Aaron T NWO [REDACTED]
Sent: Tuesday, March 23, 2010 2:22 PM
To: Koenig, Kelly - Logan, IA
Subject: Lower Little Sioux Bend (Deer Island) Shallow Water Habitat project - Farmland Conversion

Kelly,

We are estimating that 76 acres of farmland of statewide importance and 19 acres of prime farmland would be converted to aquatic habitat by our proposed project (none of the areas are currently farmed though). The attached map shows our estimated area of dredging limits. Also attached is the Farmland Impact Rating form with Parts I and III filled out per the instructions. The proposed project is located on the Deer Island State Game management area just west of Little Sioux, IA. The project entails widening the topwidth of the river to create an estimated 80 acres of Shallow Water Habitat. As part of the NEPA process we are coordinating with resource agencies about the project. <<Lower Little Sioux (Deer Island) Impact Rating.pdf>> <<Prime Farmland.pdf>>

It looks like the attached form instructions indicate that the NRCS is to fill out Parts II, IV, and V of the form in cases where FPPA covered farmlands would be converted.

Thanks for you help,

Aaron Quinn
Natural Resource Specialist, CENWO-PM-AC USACE, Omaha District Environmental Recovery and MRRP Plan Formulation Section
Phone: [REDACTED] [REDACTED]

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)		Date Of Land Evaluation Request 3/30/10			
Name Of Project Lower Little Sioux Bend (Deer Island)		Federal Agency Involved U.S. Army Corps of Engineers			
Proposed Land Use Aquatic Habitat Creation		County And State Harrison County, IA			
PART II (To be completed by NRCS)		Date Request Received By NRCS 3/23/10			
Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply -- do not complete additional parts of this form).		Yes ☐	No ☐	Acres Irrigated 0.0	Average Farm Size 519
Major Crop(s) Corn	Farmable Land In Govt. Jurisdiction Acres: 337,825 % 75	Amount Of Farmland As Defined in FPPA Acres: 122,701 % 27			
Name Of Land Evaluation System Used Harrison County, Iowa	Name Of Local Site Assessment System N/A - FPPA	Date Land Evaluation Returned By NRCS 3/29/10			
PART III (To be completed by Federal Agency)		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		128.0			
B. Total Acres To Be Converted Indirectly		0.0			
C. Total Acres In Site		128.0	0.0	0.0	0.0
PART IV (To be completed by NRCS) Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		19.0			
B. Total Acres Statewide And Local Important Farmland		76.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		88.0			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)		27	0	0	0
PART VI (To be completed by Federal Agency) Site Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))		Maximum Points			
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS		160	0	0	0
PART VII (To be completed by Federal Agency)					
Relative Value Of Farmland (From Part V)		100	27	0	0
Total Site Assessment (From Part VI above or a local site assessment)		160	0	0	0
TOTAL POINTS (Total of above 2 lines)		260	27	0	0
Site Selected:		Date Of Selection		Was A Local Site Assessment Used? Yes ☐ No ☐	
Reason For Selection:					

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C together with maps indicating locations of site(s), to the Natural Resources Conservation Service (NRCS) local field office and retain copy D for their files. (Note: NRCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field office locations are available from the NRCS State Conservationist in each state).

Step 3 – NRCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

Step 4 – In cases where farmland covered by the FPPA will be converted by the proposed project, NRCS field offices will complete Parts II, IV and V of the form.

Step 5 – NRCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for NRCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal policies.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as shown in § 658.5 (b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood control, criteria #5 and #6 will not apply and will be weighed zero, however, criterion #8 will be weighed a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 12 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned relative adjustments must be made to maintain the maximum total weight points at 160.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points, and alternative Site "A" is rated 180 points:

Total points assigned Site A = $\frac{180}{200} \times 160 = 144$ points for Site "A."

Maximum points possible 200

Site Assessment Scoring for the Twelve Factors Used in FPPA

The Site Assessment criteria used in the Farmland Protection Policy Act (FPPA) rule are designed to assess important factors other than the agricultural value of the land when determining which alternative sites should receive the highest level of protection from conversion to non agricultural uses.

Twelve factors are used for Site Assessment and ten factors for corridor-type sites. Each factor is listed in an outline form, without detailed definitions or guidelines to follow in the rating process. The purpose of this document is to expand the definitions of use of each of the twelve Site Assessment factors so that all persons can have a clear understanding as to what each factor is intended to evaluate and how points are assigned for given conditions.

In each of the 12 factors a number rating system is used to determine which sites deserve the most protection from conversion to non-farm uses. The higher the number value given to a proposed site, the more protection it will receive. The maximum scores are 10, 15 and 20 points, depending upon the relative importance of each particular question. If a question significantly relates to why a parcel of land should not be converted, the question has a maximum possible protection value of 20, whereas a question which does not have such a significant impact upon whether a site would be converted, would have fewer maximum points possible, for example 10.

The following guidelines should be used in rating the twelve Site Assessment criteria:

1. How much land is in non-urban use within a radius of 1.0 mile from where the project is intended?

More than 90 percent:	15 points
90-20 percent:	14 to 1 points
Less than 20 percent:	0 points

This factor is designed to evaluate the extent to which the area within one mile of the proposed site is non-urban area. For purposes of this rule, "non-urban" should include:

- Agricultural land (crop-fruit trees, nuts, oilseed)
- Range land
- Forest land
- Golf Courses
- Non paved parks and recreational areas
- Mining sites
- Farm Storage
- Lakes, ponds and other water bodies
- Rural roads, and through roads without houses or buildings
- Open space
- Wetlands
- Fish production
- Pasture or hayland

Urban uses include:

- Houses (other than farm houses)
- Apartment buildings
- Commercial buildings
- Industrial buildings
- Paved recreational areas (i.e. tennis courts)
- Streets in areas with 30 structures per 40 acres
- Gas stations

- Equipment, supply stores
- Off-farm storage
- Processing plants
- Shopping malls
- Utilities/Services
- Medical buildings

In rating this factor, an area one-mile from the outer edge of the proposed site should be outlined on a current photo; the areas that are urban should be outlined. For rural houses and other buildings with unknown sizes, use 1 and 1/3 acres per structure. For roads with houses on only one side, use one half of road for urban and one half for non-urban.

The purpose of this rating process is to insure that the most valuable and viable farmlands are protected from development projects sponsored by the Federal Government. With this goal in mind, factor S1 suggests that the more agricultural lands surrounding the parcel boundary in question, the more protection from development this site should receive. Accordingly, a site with a large quantity of non-urban land surrounding it will receive a greater number of points for protection from development. Thus, where more than 90 percent of the area around the proposed site (do not include the proposed site in this assessment) is non-urban, assign 15 points. Where 20 percent or less is non-urban, assign 0 points. Where the area lies between 20 and 90 percent non-urban, assign appropriate points from 14 to 1, as noted below.

Percent Non-Urban Land within 1 mile	Points
90 percent or greater	15
85 to 89 percent	14
80 to 84 percent	13
75 to 79 percent	12
70 to 74 percent	11
65 to 69 percent	10
60 to 64 percent	9
55 to 59 percent	8
50 to 54 percent	7
45 to 49 percent	6
40 to 44 percent	5
35 to 39 percent	4
30 to 34 percent	3
25 to 29 percent	2
21 to 24 percent	1
20 percent or less	0

2. How much of the perimeter of the site borders on land in non-urban use?

More than 90 percent:	10 points
90 to 20 percent:	9 to 1 point(s)
Less than 20 percent:	0 points

This factor is designed to evaluate the extent to which the land adjacent to the proposed site is non-urban use. Where factor #1 evaluates the general location of the proposed site, this factor evaluates the immediate perimeter of the site. The definition of urban and non-urban uses in factor #1 should be used for this factor.

In rating the second factor, measure the perimeter of the site that is in non-urban and urban use. Where more than 90 percent of the perimeter is in non-urban use, score this factor 10 points. Where less than 20 percent, assign 0 points. If a road is next to the perimeter, class the area according to the

use on the other side of the road for that area. Use 1 and 1/3 acre per structure if not otherwise known. Where 20 to 90 percent of the perimeter is non-urban, assign points as noted below:

Percentage of Perimeter Bordering Land	Points
90 percent or greater	10
82 to 89 percent	9
74 to 81 percent	8
65 to 73 percent	7
58 to 65 percent	6
50 to 57 percent	5
42 to 49 percent	4
34 to 41 percent	3
27 to 33 percent	2
21 to 26 percent	1
20 percent or Less	0

3. How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last ten years?

More than 90 percent:	20 points
90 to 20 percent:	19 to 1 point(s)
Less than 20 percent:	0 points

This factor is designed to evaluate the extent to which the proposed conversion site has been used or managed for agricultural purposes in the past 10 years.

Land is being farmed when it is used or managed for food or fiber, to include timber products, fruit, nuts, grapes, grain, forage, oil seed, fish and meat, poultry and dairy products.

Land that has been left to grow up to native vegetation without management or harvest will be considered as abandoned and therefore not farmed. The proposed conversion site should be evaluated and rated according to the percent, of the site farmed.

If more than 90 percent of the site has been farmed 5 of the last 10 years score the site as follows:

Percentage of Site Farmed	Points
90 percent or greater	20
86 to 89 percent	19
82 to 85 percent	18
78 to 81 percent	17
74 to 77 percent	16
70 to 73 percent	15
66 to 69 percent	14
62 to 65 percent	13
58 to 61 percent	12
54 to 57 percent	11
50 to 53 percent	10
46 to 49 percent	9
42 to 45 percent	8
38 to 41 percent	7
35 to 37 percent	6
32 to 34 percent	5
29 to 31 percent	4
26 to 28 percent	3

23 to 25 percent	2
20 to 22 percent percent or Less	1
Less than 20 percent	0

4. Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?

Site is protected:	20 points
Site is not protected:	0 points

This factor is designed to evaluate the extent to which state and local government and private programs have made efforts to protect this site from conversion.

State and local policies and programs to protect farmland include:

State Policies and Programs to Protect Farmland

1. Tax Relief:

A. Differential Assessment: Agricultural lands are taxed on their agricultural use value, rather than at market value. As a result, farmers pay fewer taxes on their land, which helps keep them in business, and therefore helps to insure that the farmland will not be converted to nonagricultural uses.

1. Preferential Assessment for Property Tax: Landowners with parcels of land used for agriculture are given the privilege of differential assessment.
2. Deferred Taxation for Property Tax: Landowners are deterred from converting their land to nonfarm uses, because if they do so, they must pay back taxes at market value.
3. Restrictive Agreement for Property Tax: Landowners who want to receive Differential Assessment must agree to keep their land in - eligible use.

B. Income Tax Credits

Circuit Breaker Tax Credits: Authorize an eligible owner of farmland to apply some or all of the property taxes on his or her farmland and farm structures as a tax credit against the owner's state income tax.

C. Estate and Inheritance Tax Benefits

Farm Use Valuation for Death Tax: Exemption of state tax liability to eligible farm estates.

2. "Right to farm" laws:

Prohibits local governments from enacting laws which will place restrictions upon normally accepted farming practices, for example, the generation of noise, odor or dust.

3. Agricultural Districting:

Wherein farmers voluntarily organize districts of agricultural land to be legally recognized geographic areas. These farmers receive benefits, such as protection from annexation, in exchange for keeping land within the district for a given number of years.

4. Land Use Controls: Agricultural Zoning.

Types of Agricultural Zoning Ordinances include:

- A. Exclusive: In which the agricultural zone is restricted to only farm-related dwellings, with, for example, a minimum of 40 acres per dwelling unit.
- B. Non-Exclusive: In which non-farm dwellings are allowed, but the density remains low, such as 20 acres per dwelling unit.

Additional Zoning techniques include:

- A. Sliding Scale: This method looks at zoning according to the total size of the parcel owned. For example, the number of dwelling units per a given number of acres may change from county to county according to the existing land acreage to dwelling unit ratio of surrounding parcels of land within the specific area.
- B. Point System or Numerical Approach: Approaches land use permits on a case by case basis.

LESA: The LESA system (Land Evaluation-Site Assessment) is used as a tool to help assess options for land use on an evaluation of productivity weighed against commitment to urban development.
- C. Conditional Use: Based upon the evaluation on a case by case basis by the Board of Zoning Adjustment. Also may include the method of using special land use permits.

5. Development Rights:

- A. Purchase of Development Rights (PDR): Where development rights are purchased by Government action.

Buffer Zoning Districts: Buffer Zoning Districts are an example of land purchased by Government action. This land is included in zoning ordinances in order to preserve and protect agricultural lands from non-farm land uses encroaching upon them.

- B. Transfer of Development Rights (TDR): Development rights are transferable for use in other locations designated as receiving areas. TDR is considered a locally based action (not state), because it requires a voluntary decision on the part of the individual landowners.

6. Governor's Executive Order: Policy made by the Governor, stating the importance of agriculture, and the preservation of agricultural lands. The Governor orders the state agencies to avoid the unnecessary conversion of important farmland to nonagricultural uses.

7. Voluntary State Programs:

- A. California's Program of Restrictive Agreements and Differential Assessments: The California Land Conservation Act of 1965, commonly known as the Williamson Act, allows cities, counties and individual landowners to form agricultural preserves and enter into contracts for 10 or more years to insure that these parcels of land remain strictly for agricultural use. Since 1972 the Act has extended eligibility to recreational and open space lands such as scenic highway corridors, salt ponds and wildlife preserves. These contractually restricted lands may be taxed differentially for their real value. One hundred-acre districts constitute the minimum land size eligible.

Suggestion: An improved version of the Act would state that if the land is converted after the contract expires, the landowner must pay the difference in the taxes between market value for the land and the agricultural tax value which he or she had been

paying under the Act. This measure would help to insure that farmland would not be converted after the 10 year period ends.

- B. Maryland Agricultural Land Preservation Program: Agricultural landowners within agricultural districts have the opportunity to sell their development rights to the Maryland Land Preservation Foundation under the agreement that these landowners will not subdivide or develop their land for an initial period of five years. After five years the landowner may terminate the agreement with one year notice.

As is stated above under the California Williamson Act, the landowner should pay the back taxes on the property if he or she decides to convert the land after the contract expires, in order to discourage such conversions.

- C. Wisconsin Income Tax Incentive Program: The Wisconsin Farmland Preservation Program of December 1977 encourages local jurisdictions in Wisconsin to adopt agricultural preservation plans or exclusive agricultural district zoning ordinances in exchange for credit against state income tax and exemption from special utility assessment. Eligible candidates include local governments and landowners with at least 35 acres of land per dwelling unit in agricultural use and gross farm profits of at least \$6,000 per year, or \$18,000 over three years.

8. Mandatory State Programs:

- A. The Environmental Control Act in the state of Vermont was adopted in 1970 by the Vermont State Legislature. The Act established an environmental board with 9 members (appointed by the Governor) to implement a planning process and a permit system to screen most subdivisions and development proposals according to specific criteria stated in the law. The planning process consists of an interim and a final Land Capability and Development Plan, the latter of which acts as a policy plan to control development. The policies are written in order to:

- prevent air and water pollution;
- protect scenic or natural beauty, historic sites and rare and irreplaceable natural areas; and
- consider the impacts of growth and reduction of development on areas of primary agricultural soils.

- B. The California State Coastal Commission: In 1976 the Coastal Act was passed to establish a permanent Coastal Commission with permit and planning authority. The purpose of the Coastal Commission was and is to protect the sensitive coastal zone environment and its resources, while accommodating the social and economic needs of the state. The Commission has the power to regulate development in the coastal zones by issuing permits on a case by case basis until local agencies can develop their own coastal plans, which must be certified by the Coastal Commission.

- C. Hawaii's Program of State Zoning: In 1961, the Hawaii State Legislature established Act 187, the Land Use Law, to protect the farmland and the welfare of the local people of Hawaii by planning to avoid "unnecessary urbanization". The Law made all state lands into four districts: agricultural, conservation, rural and urban. The Governor appointed members to a State Land Use Commission, whose duties were to uphold the Law and form the boundaries of the four districts. In addition to state zoning, the Land Use Law introduced a program of Differential Assessment, wherein agricultural landowners paid taxes on their land for its agricultural use value, rather than its market value.

- D. The Oregon Land Use Act of 1973: This act established the Land Conservation and Development Commission (LCDC) to provide statewide planning goals and guidelines.

Under this Act, Oregon cities and counties are each required to draw up a comprehensive plan, consistent with statewide planning goals. Agricultural land preservation is high on the list of state goals to be followed locally.

If the proposed site is subject to or has used one or more of the above farmland protection programs or policies, score the site 20 points. If none of the above policies or programs apply to this site, score 0 points.

5. How close is the site to an urban built-up area?

The site is 2 miles or more from an urban built-up area	15 points
The site is more than 1 mile but less than 2 miles from an urban built-up area	10 points
The site is less than 1 mile from, but is not adjacent to an urban built-up area	5 points
The site is adjacent to an urban built-up area	0 points

This factor is designed to evaluate the extent to which the proposed site is located next to an existing urban area. The urban built-up area must be 2500 population. The measurement from the built-up area should be made from the point at which the density is 30 structures per 40 acres and with no open or non-urban land existing between the major built-up areas and this point. Suburbs adjacent to cities or urban built-up areas should be considered as part of that urban area.

For greater accuracy, use the following chart to determine how much protection the site should receive according to its distance from an urban area. See chart below:

Distance From Perimeter of Site to Urban Area	Points
More than 10,560 feet	15
9,860 to 10,559 feet	14
9,160 to 9,859 feet	13
8,460 to 9,159 feet	12
7,760 to 8,459 feet	11
7,060 to 7,759 feet	10
6,360 to 7,059 feet	9
5,660 to 6,359 feet	8
4,960 to 5,659 feet	7
4,260 to 4,959 feet	6
3,560 to 4,259 feet	5
2,860 to 3,559 feet	4
2,160 to 2,859 feet	3
1,460 to 2,159 feet	2
760 to 1,459 feet	1
Less than 760 feet (adjacent)	0

6. How close is the site to water lines, sewer lines and/or other local facilities and services whose capacities and design would promote nonagricultural use?

None of the services exist nearer than 3 miles from the site	15 points
Some of the services exist more than one but less than 3 miles from the site	10 points
All of the services exist within 1/2 mile of the site	0 points

This question determines how much infrastructure (water, sewer, etc.) is in place which could facilitate nonagricultural development. The fewer facilities in place, the more difficult it is to develop an area. Thus, if a proposed site is further away from these services (more than 3 miles distance away), the site should be awarded the highest number of points (15). As the distance of the parcel of land to services decreases, the number of points awarded declines as well. So, when the site is equal to or further than 1 mile but less than 3 miles away from services, it should be given 10 points. Accordingly, if this distance is 1/2 mile to less than 1 mile, award 5 points; and if the distance from land to services is less than 1/2 mile, award 0 points.

Distance to public facilities should be measured from the perimeter of the parcel in question to the nearest site(s) where necessary facilities are located. If there is more than one distance (i.e. from site to water and from site to sewer), use the average distance (add all distances and then divide by the number of different distances to get the average).

Facilities which could promote nonagricultural use include:

- Water lines
- Sewer lines
- Power lines
- Gas lines
- Circulation (roads)
- Fire and police protection
- Schools

7. Is the farm unit(s) containing the site (before the project) as large as the average-size farming unit in the county? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage of Farm Units in Operation with \$1,000 or more in sales.)

As large or larger:	10 points
Below average: Deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more is below average	9 to 0 points

This factor is designed to determine how much protection the site should receive, according to its size in relation to the average size of farming units within the county. The larger the parcel of land, the more agricultural use value the land possesses, and vice versa. Thus, if the farm unit is as large or larger than the county average, it receives the maximum number of points (10). The smaller the parcel of land compared to the county average, the fewer number of points given. Please see below:

Parcel Size in Relation to Average County Size	Points
Same size or larger than average (100 percent)	10
95 percent of average	9
90 percent of average	8
85 percent of average	7
80 percent of average	6
75 percent of average	5
70 percent of average	4
65 percent of average	3
60 percent of average	2
55 percent of average	1
50 percent or below county average	0

State and local Natural Resources Conservation Service offices will have the average farm size information, provided by the latest available Census of Agriculture data

8. If this site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?

Acreage equal to more than 25 percent of acres directly converted by the project	10 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project	9 to 1 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project	0 points

This factor tackles the question of how the proposed development will affect the rest of the land on the farm. The site which deserves the most protection from conversion will receive the greatest number of points, and vice versa. For example, if the project is small, such as an extension on a house, the rest of the agricultural land would remain farmable, and thus a lower number of points is given to the site. Whereas if a large-scale highway is planned, a greater portion of the land (not including the site) will become non-farmable, since access to the farmland will be blocked; and thus, the site should receive the highest number of points (10) as protection from conversion.

Conversion uses of the Site Which Would Make the Rest of the Land Non-Farmable by Interfering with Land Patterns

Conversions which make the rest of the property nonfarmable include any development which blocks accessibility to the rest of the site. Examples are highways, railroads, dams or development along the front of a site restricting access to the rest of the property.

The point scoring is as follows:

Amount of Land Not Including the Site Which Will Become Non-Farmable	Points
25 percent or greater	10
23 - 24 percent	9
21 - 22 percent	8
19 - 20 percent	7
17 - 18 percent	6
15 - 16 percent	5
13 - 14 percent	4
11 - 12 percent	3
9 - 11 percent	2
6 - 8 percent	1
5 percent or less	0

9. Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?

All required services are available	5 points
Some required services are available	4 to 1 point(s)
No required services are available	0 points

This factor is used to assess whether there are adequate support facilities, activities and industry to keep the farming business in business. The more support facilities available to the agricultural

landowner, the more feasible it is for him or her to stay in production. In addition, agricultural support facilities are compatible with farmland. This fact is important, because some land uses are not compatible; for example, development next to farmland can be dangerous to the welfare of the agricultural land, as a result of pressure from the neighbors who often do not appreciate the noise, smells and dust intrinsic to farmland. Thus, when all required agricultural support services are available, the maximum number of points (5) are awarded. When some services are available, 4 to 1 point(s) are awarded; and consequently, when no services are available, no points are given. See below:

Percent of Services Available	Points
100 percent	5
75 to 99 percent	4
50 to 74 percent	3
25 to 49 percent	2
1 to 24 percent	1
No services	0

10. Does the site have substantial and well-maintained on farm investments such as barns, other storage buildings, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?

High amount of on-farm investment	20 points
Moderate amount of non-farm investment	19 to 1 point(s)
No on-farm investments	0 points

This factor assesses the quantity of agricultural facilities in place on the proposed site. If a significant agricultural infrastructure exists, the site should continue to be used for farming, and thus the parcel will receive the highest amount of points towards protection from conversion or development. If there is little on farm investment, the site will receive comparatively less protection. See-below:

Amount of On-farm Investment	Points
As much or more than necessary to maintain production (100 percent)	20
95 to 99 percent	19
90 to 94 percent	18
85 to 89 percent	17
80 to 84 percent	16
75 to 79 percent	15
70 to 74 percent	14
65 to 69 percent	13
60 to 64 percent	12
55 to 59 percent	11
50 to 54 percent	10
45 to 49 percent	9
40 to 44 percent	8
35 to 39 percent	7
30 to 34 percent	6
25 to 29 percent	5
20 to 24 percent	4
15 to 19 percent	3
10 to 14 percent	2
5 to 9 percent	1
0 to 4 percent	0

11. Would the project at this site, by converting farmland to nonagricultural use, reduce the support for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?

Substantial reduction in demand for support services if the site is converted	10 points
Some reduction in demand for support services if the site is converted	9 to 1 point(s)
No significant reduction in demand for support services if the site is converted	0 points

This factor determines whether there are other agriculturally related activities, businesses or jobs dependent upon the working of the pre-converted site in order for the others to remain in production. The more people and farming activities relying upon this land, the more protection it should receive from conversion. Thus, if a substantial reduction in demand for support services were to occur as a result of conversions, the proposed site would receive a high score of 10; some reduction in demand would receive 9 to 1 point(s), and no significant reduction in demand would receive no points.

Specific points are outlined as follows:

Amount of Reduction in Support Services if Site is Converted to Nonagricultural Use	Points
Substantial reduction (100 percent)	10
90 to 99 percent	9
80 to 89 percent	8
70 to 79 percent	7
60 to 69 percent	6
50 to 59 percent	5
40 to 49 percent	4
30 to 39 percent	3
20 to 29 percent	2
10 to 19 percent	1
No significant reduction (0 to 9 percent)	0

12. Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of the surrounding farmland to nonagricultural use?

Proposed project is incompatible with existing agricultural use of surrounding farmland	10 points
Proposed project is tolerable of existing agricultural use of surrounding farmland	9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland	0 points

Factor 12 determines whether conversion of the proposed agricultural site will eventually cause the conversion of neighboring farmland as a result of incompatibility of use of the first with the latter. The more incompatible the proposed conversion is with agriculture, the more protection this site receives from conversion. Therefore, if the proposed conversion is incompatible with agriculture, the site receives 10 points. If the project is tolerable with agriculture, it receives 9 to 1 points; and if the proposed conversion is compatible with agriculture, it receives 0 points.

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor-type site or design alternative for protection as farmland along with the land evaluation information.

For Water and Waste Programs, corridor analyses are not applicable for distribution or collection networks. Analyses are applicable for transmission or trunk lines where placement of the lines are flexible.

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?

- | | |
|--------------------------|-----------------------|
| (2) More than 90 percent | (3) 15 points |
| (4) 90 to 20 percent | (5) 14 to 1 point(s). |
| (6) Less than 20 percent | (7) 0 points |

(2) How much of the perimeter of the site borders on land in nonurban use?

- | | |
|--------------------------|-------------------|
| (3) More than 90 percent | (4) 10 point(s) |
| (5) 90 to 20 percent | (6) 9 to 1 points |
| (7) less than 20 percent | (8) 0 points |

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?

- | | |
|--------------------------|----------------------|
| (4) More than 90 percent | (5) 20 points |
| (6) 90 to 20 percent | (7) 19 to 1 point(s) |
| (8) Less than 20 percent | (9) 0 points |

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?

- | | |
|-----------------------|-----------|
| Site is protected | 20 points |
| Site is not protected | 0 points |

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage of Farm Units in Operation with \$1,000 or more in sales.)

- | | |
|---|---------------|
| As large or larger | 10 points |
| Below average deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average | 9 to 0 points |

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?

- | | |
|--|------------------|
| Acreage equal to more than 25 percent of acres directly converted by the project | 25 points |
| Acreage equal to between 25 and 5 percent of the acres directly converted by the project | 1 to 24 point(s) |
| Acreage equal to less than 5 percent of the acres directly converted by the project | 0 points |

- (7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?

All required services are available	5 points
Some required services are available	4 to 1 point(s)
No required services are available	0 points

- (8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?

High amount of on-farm investment	20 points
Moderate amount of on-farm investment	19 to 1 point(s)
No on-farm investment	0 points

- (9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?

Substantial reduction in demand for support services if the site is converted	25 points
Some reduction in demand for support services if the site is converted	1 to 24 point(s)
No significant reduction in demand for support services if the site is converted	0 points

- (10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?

Proposed project is incompatible to existing agricultural use of surrounding farmland	10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland	9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland	0 points



STATE OF IOWA

CHESTER J. CULVER, GOVERNOR
PATTY JUDGE, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
RICHARD A. LEOPOLD, DIRECTOR

March 22, 2010

Brad Thompson
Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, Nebraska 68102-4901

RE: Environmental Review for Natural Resources
Deer Island/Little Sioux Bend Shallow Water Habitat Project
Harrison County
Section 17, Township 81N, Range 45W

Dear Mr. Thompson:

Thank you for inviting Department comment on the impact of this project. The Department has searched for records of rare species and significant natural communities in the project area and found no site-specific records that would be impacted by this project. However, these records and data are not the result of thorough field surveys. If listed species or rare communities are found during the planning or construction phases, additional studies and/or mitigation may be required.

This letter is a record of review for protected species, rare natural communities, state lands and waters in the project area, including review by personnel representing state parks, preserves, recreation areas, fisheries and wildlife but does not include comment from the Environmental Services Division of this Department. This letter does not constitute a permit. Other permits may be required from the Department or other state or federal agencies before work begins on this project.

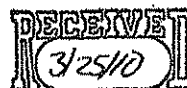
Any construction activity that bares the soil of an area greater than or equal to one acre including clearing, grading or excavation may require a storm water discharge permit from the Department. Construction activities may include the temporary or permanent storage of dredge material. For more information regarding this matter, please contact Ruth Rosdail at (515) 281-6782.

The Department administers regulations that pertain to fugitive dust IAW Iowa Administrative Code 567-23.3(2)"c." All persons shall take reasonable precautions to prevent the discharge of visible emissions of fugitive dusts beyond the lot line of property during construction, alteration, repairing or demolishing of buildings, bridges or other vertical structures or haul roads. All questions regarding fugitive dust regulations should be directed to Jim McGraw at (515) 242-5167.

If you have questions about this letter or require further information, please contact me at (515) 281-8524.

Sincerely,

Daryl Howell
Environmental Specialist
Conservation and Recreation Division



FILE COPY: D. Howell
Tracking Number: 4591



A Division of the Iowa Department of Cultural Affairs

June 11, 2010

In reference to R & C#: 100543151

Ms. Rebecca J. Shipman
U.S. Army Corps of Engineers – Omaha District
1616 Capitol Avenue
Omaha, NE 68102-4901

RE: COE – HARRISON COUNTY – CITY OF LITTLE SIOUX – SHALLOW WATER HABITAT PROJECT ON
LOWER LITTLE SIOUX REACH OF MISSOURI RIVER – RM 670.7 TO 672.8 – ADDITIONAL
INFORMATION.

Dear Ms. Shipman,

We have received the Corps' June 7, 2010 letter and supplemental information regarding the above-referenced federal undertaking. We make the following comments and recommendations based upon the results of this investigation and in accordance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470 *et seq.*) and its implementing regulations 36 CFR Part 800 (revised, effective August 5, 2004).

Considering the scope, location, and nature and extent of natural disturbances within the project area of potential effects, it is our consulting opinion that there are not likely to be historic properties affected by the proposed action. Therefore we are able to concur with your determination of 'no historic properties affected.'

If design changes are made for this project which would involve undisturbed new rights-of-way or easements, please forward additional information to our office for further comment along with the Agency Official's determination of effect. If project activities uncover an item(s) that might be of archeological, historical or architectural interest, or if important new archeological, historical or architectural data should be encountered in the project APE, the applicant should make reasonable efforts to avoid further impacts to the property until an assessment can be made by a qualified archaeologist.

I can be reached at [REDACTED] or by email at [REDACTED] if you have any questions or require further assistance in this matter.

Sincerely,

A handwritten signature in cursive script, reading "Dan Higginbottom".

Daniel K. Higginbottom, Archaeologist
Iowa State Historic Preservation Office

Quinn, Aaron T NWO

From: Wallace, A Luke NWO
Sent: Monday, April 12, 2010 7:58 AM
To: Quinn, Aaron T NWO
Subject: FW: Deer Island/Little Sioux Bend SWH Project

-----Original Message-----

From: Jane Ledwin [REDACTED] v [REDACTED]
Sent: Friday, April 09, 2010 3:56 PM
To: Wallace, A Luke NWO
Subject: Deer Island/Little Sioux Bend SWH Project

Hi Luke -

In an effort to streamline correspondence, I'm providing this email in lieu of a letter as a response to the Corps February 2, 2010, letter, requesting Service input regarding information on fish, wildlife, and federally listed species in the area of the proposed Deer Island/Little Sioux Bend SWH project, RM 670.7 to 672.8, Harrison, County, Iowa. The Service supports river restoration projects, particularly in reach of the river that has lost so much off-channel aquatic habitat. It appears the project is trying to incorporate multiple depths and structure to increase habitat diversity. Good! According to the information in the letter, the proposed bottom width is 75 feet which should reduce the chance of clogging up with debris. We appreciate the Corps efforts to continue to vary their approach towards river restoration projects. This project will include an ambitious removal of deposited alluvial sediments. Much of the area to be excavated appears to be riparian habitat preferred by bald eagle for nesting areas. We recommend you survey the project site for bald eagles which have become increasingly common along the river. While no longer federally listed, bald eagles are protected, and should you find a nest at the project site, please contact this office for additional coordination.

The Service also support river discharge of the dredged material. At the same time, I think it would be wise to consider potential effects to sturgeon that may be migrating or spawning in the area of the outfall. More information on the expected timing, duration, and materials discharged would provide background to better assess potential effects. Perhaps it is possible to opportunistically monitor radio-tagged sturgeon during project construction to determine what response, if any, pallids may have to the discharge. If necessary, we may want to consider a "window" within which there would be not disposal if that could be accommodated into project construction. The long-term effects of spoil disposal in the river are likely insignificant, or beneficial in remobilizing a modest amount of previously deposited bed load of the river.

Thanks for your coordination. If you have any questions, please don't hesitate to contact me.

Jane Ledwin

Jane Ledwin
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
101 Park DeVille Drive
Columbia, Missouri 65203
Phone [REDACTED]
email [REDACTED]



U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT

Meeting Attendance List

Date: October 14, 2010
Time: 6pm

Location: Little Sioux, Iowa

Meeting Topic: Lower Little Sioux (Deer Island) Shallow Water Habitat Project

Name	Organization	Phone
Aaron Quinn	USACE	
Don Ship Meisner	SIMPCC	
Martin & Wanda McElroy		
Scott Corrie	Congressman King	
Roger & Grace Wipf		
Ken Humphrey		
Gardena Wallis		
Walter F. Sudzynski		
Ed Weimer		
BILL SPITZNAGLE		
Ben Spitznagle		
Red Sloan		
Frank & Holly Raymond		



U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT

Meeting Attendance List

Date: October 14, 2010

Time: 6pm

Location: Little Sioux, Iowa

Meeting Topic: Lower Little Sioux (Deer Island) Shallow Water Habitat Project

Name	Organization	Phone
<i>Jessie Shelton</i>	[REDACTED]	—
<i>Brian Smith</i>	[REDACTED]	
<i>Vonna Jean Johnson</i>	[REDACTED]	
<i>Jessie Van Beck</i>		
<i>Dave & Kathy Brainerd</i>	[REDACTED]	
<i>Luke Wallace</i>	USACE	
<i>Dan Pridel</i>	USACE	
<i>Angi Bruce</i>	IDNR	
<i>Van Sterner</i>	IDNR	
<i>Doug Chafa</i>	IDNR	
<i>Chris Larsen</i>	IDNR	

June 28,2011

Corps of Engineers,

I have received a letter about a potential project involving land that I own from Matthew T. Wray. I would like to say that I feel you guys do not have the ability to handle another project when you are not able to control the project of the flooding of the Missouri river. In the past we've had a lot of fish around our stretch of Missouri river. When the Corps came and cut the rock pilings on our side of the river to create more habitat, it actually took away from the habitat we already had. So I am not sure your proposed plan for creating habitat will even work.

I have spoken with many people around my area that will also be affected by this project and they agree that this is not a good plan. This will be taking away land from us as well as not a guaranteeing that the fish habitat will increase in these areas. We all agree that we would like to have a hearing to get more information on the project and be able to speak our opinions on this matter before any final decisions are made. We would also like to see a potential picture of what the finished project would look like. Also, we would like you to explain to us how this project will be better than the last project you did for the habitat.

Sincerely,

Bret L. Pettit

U.S. Army Corps of Engineers.

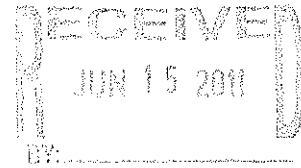
Wehrspann Regulatory Field Office

8901 South 154th Street, Suite 1

Omaha, Nebraska 68138-3635

Public Notice application No. 2011-00794-WEH

June 14, 2011



Project Location: sections 6,7,8 township 21 north, range 12 east and the southeast ¼ of section 31 township 22 north, range 12 east Harrison County, Iowa. River miles 670.7 to 672.8 left side.

Cc: Matt Wray, Michelle Bandur KETV Channel 7, Flo Stevenson, Bret Pettit

This Letter is to inform you of my opposition and request of public Hearing for the following reasons...

- #1 Present Flood devastation clearly proves that flood control has fallen from number one priority.
- #2 The millions of dollars allocated for this project and others like it will be needed and better used for flood relief.
- #3 The siltation and destruction of natural backwater chutes and canals that still exists could be destroyed.
- #4 Additional rock barricades out in the river are an extreme danger to boaters.

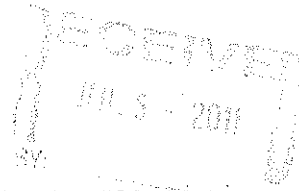
I am a person that strongly supports Habitat and have participated in many Government Programs such as CRP, WRP, and WREP. But in my opinion along with many others we need to step back and reevaluate the priorities of the functions of Missouri River to benefit society. At what price are we willing to provide habitat for the Pallid Sturgeon and Piping Pluber. The price we are paying now is unbearable. Our whole family now farms on the River bottom and I have for almost 30 years. To watch your property being destroyed is devastating especially when the flood control Dams already in place could have been better managed to prevent this flood!! Thanks for your consideration in this matter. I will be looking forward to hearing from you.

Sincerely.

L. Bret Brodersen.

A handwritten signature in black ink, appearing to read "L. Bret Brodersen". The signature is fluid and cursive, with a long horizontal stroke at the end.

June 29, 2011



U.S. Army Corps of Engineers

Public Notice application #2011-00794-WEH

Nebraska Regulatory Office – Wehrspann

8901 South 154th Street, Suite 1

Omaha, Nebraska 68138-3621

Project Location – Sections 6, 7 and 8 in Township 21 North, Range 12 East, and the Southeast ¼ of Section 31 in Township 22 North, Range 12 East, Harrison County, Iowa. River miles 670.7-672.8, left side.

This letter is to inform you of our opposition and request of public hearing for the following reasons:

- #1 Current flood devastation shows that flood control is no longer the top priority.
- #2 The money allocated for the proposed projects could be better used for flood relief for the victims of this unnecessary flood.
- #3 The siltation of our backwater chute/canal will more than likely destroy it.
- #4 How much will the project change the river? Will it totally finish off the communities up and down the river?
- #5 Any additional rock barricades in the river could cause major damages to boats and boaters.

We have lost our home due to the flood and quite possibly our land. To watch this happen has put quite a toll on our lives. We believe it is time for everyone to stop and look at all the devastation and figure out what the priorities are. We will be looking forward to hearing from you.

Sincerely,

Robert E Paul

Jane Paul

From: Quinn, Aaron T NWO
To: Thompson, Bradley F NWO; Wallace, A Luke NWO
Subject: FW: Lower Little Sioux (Deer Island) Shallow Water Habitat Project -- Draft PIR/EA posted for public review (UNCLASSIFIED)
Date: Wednesday, June 01, 2011 9:05:42 AM

Classification: UNCLASSIFIED
Caveats: NONE

FWS comments on the draft

-----Original Message-----

From: [REDACTED]
Sent: Wednesday, June 01, 2011 9:03 AM
To: Quinn, Aaron T NWO
Cc: [REDACTED]
Subject: Re: Lower Little Sioux (Deer Island) Shallow Water Habitat Project -- Draft PIR/EA posted for public review (UNCLASSIFIED)

Hi Aaron -

Thank you for passing along the information and link for the PIR. The U.S. Fish and Wildlife Service (Service) has reviewed that document and offers the following comments pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347), and the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544).

The Service strongly supports the proposed project. It will restore a portion of the diverse aquatic habitats of the Missouri River before channelization changed them to terrestrial habitats. The innovative project design will help us refine our restoration techniques and explore more alternatives for habitat enhancement. The project will make an important contribution to the native fish communities of the Missouri River, and benefit the federally endangered pallid sturgeon. The monitoring program will ensure we can track project performance over the long-term.

We offer the following comments to clarify specific items in the text.

Page 12, third paragraph - There is no critical habitat designated for the pallid sturgeon or least tern. There is no critical habitat designated for the piping plover below Sioux City. We recommend the text be revised (e.g., essential or important habitat) to avoid confusion with Critical Habitat, which has regulatory meaning under the ESA.

Page 50, fifth paragraph - There is no Ecological Services Office in Iowa. The Service's Columbia, Missouri, Ecological Services Office should be listed as the point of contact for Missouri River project coordination. Contact information below.

Thank you for the opportunity to review the proposed project. If you have any questions regarding our comments or need additional information, please contact me at the address below.

Best Regards -

Jane Ledwin

Jane Ledwin
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
101 Park DeVille Drive
Columbia, Missouri 65203
Phone [REDACTED]

email [REDACTED]

"Quinn, Aaron T NWO" [REDACTED]

05/18/2011 10:10 AM To

[REDACTED] > [REDACTED] > [REDACTED] >
> "Albrecht, Frank" > "Eder, Brandon"
[REDACTED] > "Larson, Chris J [DNR]" >

cc

"Wallace, A Luke NWO" [REDACTED] "Wray, Matt, T NWO"

[REDACTED] > "Krajewski, Matthew S NWO"

[REDACTED] "Bentley, Laura A NWO" [REDACTED]

"Pridal, Daniel B NWO" [REDACTED]

Subject

Lower Little Sioux (Deer Island) Shallow Water Habitat Project -- Draft PIR/EA posted for public review
(UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

The Lower Little Sioux Bend SWH Draft PIR is posted for public comment on the MRRP website (link below). We'll be taking comments until June 16th. My contact info is provided on the cover sheet of the PIR for receiving any comments. Please forward this email to anyone else you feel may want to review this document.

<http://www.moriverrecovery.org/mrrp/f?p=136:6:2742838865728307::NO>
<<http://www.moriverrecovery.org/mrrp/f?p=136:6:2742838865728307::NO>>

It's the first document under "Recent Articles/Reports"

Thanks,

Aaron

Aaron Quinn
Environmental Resources Specialist
USACE, Omaha District, CENWO-PM-AC
Phone: [REDACTED]

Classification: UNCLASSIFIED

Caveats: NONE

Classification: UNCLASSIFIED

Caveats: NONE



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
1616 CAPITOL AVENUE
OMAHA NE 68102-4901

May 18, 2011

Planning Branch

Gary Robinette, Director of Cultural Affairs
Culture Department
P.O. Box 288
Niobrara, Nebraska 68760

Dear Mr. Robinette:

The U.S. Army Corps of Engineers, Omaha District (Corps) is planning to construct a shallow water habitat (SWH) project on the Lower Little Sioux Reach of the Missouri River near the town of Little Sioux, Iowa between river miles 670.7 and 672.8. The proposed project site is located in portions of Sections 6, 7, and 8 in Township 21 North, Range 12 East, and the Southeast ¼ of Section 31 in Township 22 North, Range 12 East, Harrison County, Iowa (Vicinity Map provided as sheet C0.01 of the attached plans). The project would be constructed entirely on the Deer Island State Game Management area owned by the Iowa Department of Natural Resources. The project site is located on lands that have accreted through river sediment deposit resulting from the Bank Stabilization and Navigation Project (BSNP) since the 1930s.

In 2003, the U.S. Fish and Wildlife Service issued an amended Biological Opinion (BiOp) for the Operation of the Missouri River Mainstem and Bank Stabilization and Navigation Project. Part of this BiOp included the creation of SWH to benefit the endangered pallid sturgeon. In general, SWH includes sidechannels, backwaters, depositional sandbars detached from the bank, and low-lying depositional areas adjacent to shorelines (USFWS, letter dated June 29, 2009).

This project entails significant topwidth widening of the Missouri River channel near Little Sioux, Iowa. The proposed project would be approximately 2 miles long and 300-700 feet wide (width will vary depending on location) and would create an estimated 80 acres of SWH. Large woody debris (LWD) and stone riprap structures would be placed in the channel to provide aquatic habitat, create a diversity of flow, and maintain depths in the created habitat and the existing navigation channel. Trees and brush cleared from lowering of the bank line would be salvaged for use as LWD structures in the channel. The remainder would be placed in piles selectively located throughout the project to serve as habitat for birds and small mammals.

Approximately 3,081,727 cubic yards of the bank would be excavated using hydraulic dredges. The material would be distributed in the main channel among the various stone riprap structures (potentially creating additional SWH) until the design grade is reached. The remaining material would be discharged into the thalweg of the Missouri River where it would become entrained into the bedload of the river.



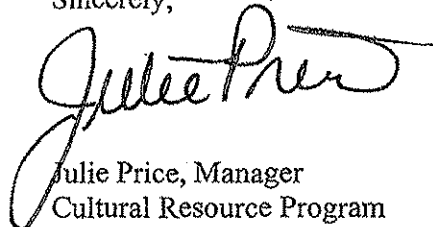
To further identify historic properties, Section 106 of the NHPA of 1966, as amended (36 CFR 800.4[a][3]), requires Federal agencies to seek information from tribes likely to have knowledge of, or concerns with, historic properties within the project's APE. We are specifically seeking assistance in identifying properties that may be of religious or cultural significance and may be eligible for listing in the NRHP, including Traditional Cultural Properties (TCP). Specific guidance concerning the Corps' obligation to contact your tribe regarding this issue is found at 36 CFR 800.4(a)(4), which states that the agency official shall:

(4) Gather information from any Indian tribe or Native Hawaiian organization identified pursuant to Sec. 800.3(f) to assist in identifying properties, including those located off tribal lands, which may be of religious and cultural significance to them and may be eligible for the National Register, recognizing that an Indian tribe or Native Hawaiian organization may be reluctant to divulge specific information regarding the location, nature, and activities associated with such sites. The agency official should address concerns raised about confidentiality pursuant to Sec. 800.11(c).

We appreciate any assistance you can provide us in our efforts to comply with Section 106 of the National Historic Preservation Act. Please be assured that the Corps will treat any information you decide to share with us with the degree of confidentiality that is required in Section 800.11(c) of the Act, or with any other special restrictions you may require. In order to fulfill these obligations we request that you provide comments at your earliest convenience.

If you have any questions, please feel free to contact Becky Shipman at [REDACTED] or by e-mail. My e-mail address is [REDACTED]

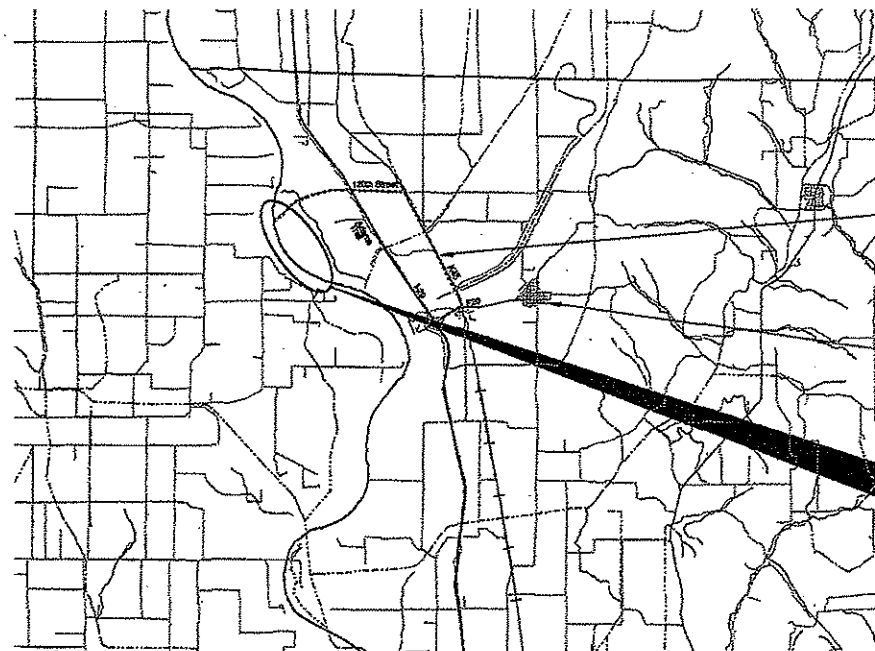
Sincerely,


Julie Price, Manager
Cultural Resource Program
Planning Branch

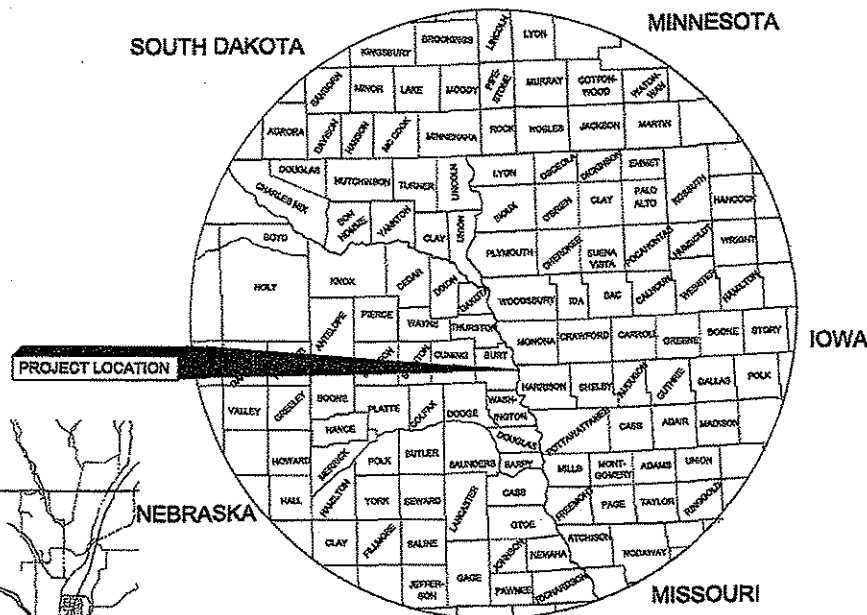
Enclosures

FILENAME	SHEET NO.	DESCRIPTION
MRA08901.DGN	-	COVER
MRA0C001.DGN	C0.01	LOCATION MAP, VICINITY MAP & INDEX
MRA0C101.DGN	C1.01	GENERAL PLAN VIEW AND RIGHT-OF-WAY MAP
MRA0C102.DGN	C1.02	SHEET LAYOUT PLAN
MRA0C201.DGN	C2.01	CLEARING AND GRUBBING
MRA0C202.DGN	C2.02	CLEARING AND GRUBBING
MRA0C203.DGN	C2.03	CLEARING AND GRUBBING
MRA0C204.DGN	C2.04	CLEARING AND GRUBBING
MRA0C301.DGN	C3.01	SITE LAYOUT PLAN
MRA0C302.DGN	C3.02	SITE LAYOUT PLAN
MRA0C303.DGN	C3.03	SITE LAYOUT PLAN
MRA0C304.DGN	C3.04	SITE LAYOUT PLAN
MRA0C601.DGN	C6.01	CROSS SECTIONS
MRA0H701.DGN	C7.01	LARGE WOODY DEBRIS DETAILS
MRA0H702.DGN	C7.02	TYPICAL SECTIONS AND MISCELLANEOUS DETAILS
MRA0H801.DGN	C8.01	MISSOURI RIVER RECENT RIVER FLOW & ELEV DATA

NOTE:
CONSTRUCTION REPRESENTATIVE OFFICER MUST APPROVE THE LOCATION OF
ANY STAGING AREAS PRIOR TO ARRIVAL ON SITE.



VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

LEGEND

- PILE ORGE
- STONE FILL Dike OR REVEINMENT
- PILE REVEINMENT
- PILE REVEINMENT, STONE FILL
- TOE TRENCH OR STANDARD REVEINMENT OR REINFORCED STD. REVEIN. OR ACCRETION FAYING
- ASPHALT REVEINMENT
- DESIGNED STABILIZED CHANNEL LINE
- BLUFF LINE
- 1000 CHANNEL MILEAGE
- BEND CHANGE
- 615.8 STRUCTURE NUMBERS ARE BASED ON 1000 MILEAGE
- CRP THIS IS THE CONSTRUCTION REFERENCE PLANE WHICH REPRESENTS A SYNTHESIZED WATER SURFACE PROFILE OF A STADY DISCHARGE THAT IS EQUALLED OR EXCEEDED 1% OF THE TIME DURING THE NAVIGATION SEASON (APRIL - NOVEMBER).



DATE	DESIGNED BY	INCHES	SCALE
APPROVED BY	DATE	DESIGNED BY	DATE

PROJECT NO.	DATE

PROJECT NO.	DATE

PROJECT NO.	DATE

SHEET REFERENCE NUMBER
C0.01

ED ARMY CORPS
OF ENGINEERS
CHINA DISTRICT

DATE	BY	REVISION

APPROVED BY:
[Signature]
[Name]
[Title]

DATE	BY	REVISION

WITHOUT FURTHER
NOTICE, THE
FIRM & WILLING INTENTION
OF THE UNITED STATES
GENERAL & AN NEW
RIGHT-OF-WAY

SHEET
REFERENCE
NUMBER:
C1.01

- NOTES:
1. FOR CROSS-SECTIONS OF THE EXCAVATION SEE THE SHEET C1.02 FOR GRADE CONTROL STRUCTURE REMOVAL, SEE SHEET C1.03
 2. ALL AREAS OUTSIDE OF THE EXCAVATION LIMITS THAT ARE DISTURBED BY CONSTRUCTION AND NOT OTHERWISE SURFACED SHALL BE SEEDED (PER SPEC 02235).
 3. THE SURVEY COORDINATE SYSTEM OF THE DATA IS:
HORIZONTAL: UTM ZONE 15NAD 83
VERTICAL: NGVD 29 (ALSO REFERENCED AS "MEAN SEA LEVEL" DATUM)
 4. THE ACQUISITION OR ADDITIONAL RIGHT-OF-WAY, AS MAY BE NECESSARY FOR THE CONDUCT OF WORK, SHALL BE ARRANGED BY THE CONTRACTOR WITHOUT COST TO THE GOVERNMENT.
 5. CONSTRUCTION REPRESENTATIVE OFFICER MUST APPROVE THE LOCATION OF ANY STAGING AREAS PRIOR TO CONTRACTORS ARRIVAL ON SITE.

- LEGEND -



PLACE A ROOTLESS VANE WITH LARGE WOODY DEBRIS FEATURES (2 TREES). FOR DETAILS SEE SHEET C7.01.



TREED AREA

--- RIGHT OF WAY BOUNDARY

--- SLOPE LINES

--- EXCAVATION LIMITS

--- NEW TOE OF SLOPE

SCALE: 1 INCH = 400 FEET
400'

ROW 19
N 15 232.734
E 722.000

ROW 20
N 15 232.734
E 722.000

ROW 21
N 15 232.734
E 722.000

ROW 22
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ROW 23
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ROW 25
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ROW 26
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ROW 27
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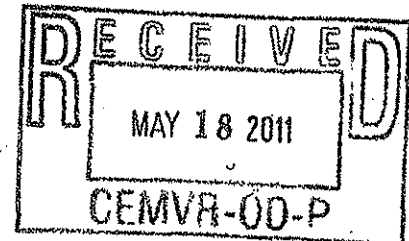
STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
ROGER L. LANDE, DIRECTOR

April 28, 2011

Mr. Luke A. Wallace, CENWO-PM-AE-Wallace
c/o Tony D. Krause, CENWO-ED-HB-Krause
Omaha District
U.S. Army Corps of Engineers
1616 Capitol Avenue
Omaha, NE 68102-1618



RE: Proposed Revetment Lowering and Excavation to Establish Shallow Water Habitat – Deer Island Project (Missouri River)
Sections 17, 20 and 21, T81N, R45W; Harrison County, Iowa

Dear Mr. Krause:

Your application on behalf of Luke Wallace of the Omaha District, U.S. Army Corps of Engineers, for a Flood Plain Development Permit for the above referenced project has been approved. Enclosed is Flood Plain Development Permit Number FP 2011-99 and an approved copy of the plan sheet. The permit is issued subject to various conditions, which you should review carefully. Please pay particular attention to Permit Conditions 7 and 8 which outline spoil disposal and no-rise certification requirements, respectively. If you don't agree with any of these conditions, you have 30 days from the date of mailing of the permit to appeal. If you wish to appeal, it is suggested that you contact our Legal Services Section within 15 days to determine the correct procedure and format. Also, you should be aware of the fact that any person can appeal the issuance of this permit within the same 30-day period.

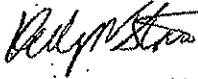
Also enclosed is a DNR Form 37, Notification of Completion of Construction. The Form 37 must be completed and returned within 30 days of the completion of construction.

The owner is responsible for complying with all other requirements applicable to the construction, operation and maintenance of the approved project. The project may require a Section 404 Permit from the U.S. Army Corps of Engineers. The project will require a local permit. If you have not yet done so, please contact the Harrison County Flood Plain Manager (Matt Pitt at 712-644-2302) regarding the local permit.

Please note that the project requires a Sovereign Land Construction Permit (Construction Permit) from the Department. It is my understanding that the Construction Permit has been completed and will be mailed to you in the same packet as this flood plain response. The Construction Permit contains conditions and instructions that the applicant is required to follow. You should be aware that construction may not begin until all necessary permits are obtained.

Thank you for your patience and cooperation. If you have any questions, please contact Rich Wirtz of our office at 515-281-6906.

Sincerely,



Kelly M. Stone, P.E.
Environmental Engineer Senior
Flood Plain Management Program
Water Resources Section

Enclosures
Copies:

- IDNR FO #4
- Matt Wray, USACE Omaha District; Nebraska State Regulatory Office;
8901 South 154th St., Suite 1; Omaha, NE 68138-3621
- Matt Pitt, Harrison County Zoning & Environmental Health; 301 N. 6th Ave.; Logan, IA
51546

**IOWA DEPARTMENT OF NATURAL RESOURCES
FLOOD PLAIN DEVELOPMENT PERMIT**

PERMIT NUMBER: FP 2011-99

PERMIT ISSUED TO: Luke A. Wallace, CENWO-PM-AE-Wallace
Omaha District
U.S. Army Corps of Engineers
1616 Capitol Avenue
Omaha, NE 68102-1618

PERMIT ISSUED BY:


Kelly M. Stone, P.E.

DATE: 5-3-11

Environmental Engineer Senior, Water Resources Section

PROJECT LOCATION: Sections 17, 20 and 21, T81N, R45W; Harrison County, Iowa

PERMITTED ACTIVITY: In accordance with the approved plan sheet and subject to the following permit conditions, permittee is authorized to lower an existing revetment in conjunction with excavation along 2.4 miles of stream corridor to establish an area of shallow water habitat on the flood plain of the Missouri River at the above-described location.

BASIS FOR ISSUANCE: The decision to issue this permit was based on a staff review of the project with respect to relevant approval criteria contained in Chapter 72 of the Department's administrative rules (Agency 567, Iowa Administrative Code) and applicable provisions of Iowa Code Sections 455B.262, .264, .275 and .277.

PERMIT CONDITIONS:

1. **Disclaimer.** No legal or financial responsibility arising from the construction, operation or maintenance of the approved works shall attach to the State of Iowa or the Department due to issuance of this permit.
2. **Maintenance.** The permittee and any successor in real estate on which the permitted activity is located shall be responsible for proper maintenance.
3. **Other Permits, Licenses and Regulations.** The permittee shall be responsible for complying with all other local, state and federal statutes, ordinances, rules and permit requirements applicable to the construction, operation and maintenance of the approved works.
4. **Revocation.** This permit may be revoked by the Department if construction is not completed within 5 years of the date of issue.

5. **Change in Plans.** This permit only authorizes construction in accordance with the approved plan sheet. No changes shall be made without prior authorization from the Department.
6. **Lands, Easements and Rights-of-Way.** The permittee shall be responsible for obtaining all lands, easements or rights-of-way necessary for the construction and maintenance of the approved works.
7. **Spoil Disposal.** Excess spoil material resulting from the project shall not be placed in any floodway delineated in a Flood Insurance Study without prior authorization from this Department.
9. **No-Rise Certification.** The permittee shall be responsible for obtaining a No-Rise Certification (i.e., no more than a 0.00 ft. increase to the 100-year encroached profile for the proposed project condition) prepared by a professional engineer licensed in Iowa and forwarding a copy of the certification to the Harrison County Flood Plain Manager for local flood plain permit program documentation purposes.

CERTIFICATION OF MAILING

I hereby certify that I have this 13th day of May, 2011 mailed Flood Plain Development Permit No. FP 2011-99 to the permittee.

By N. F. [Signature]



STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
ROGER L. LANDE, DIRECTOR

May 11, 2011

Omaha District Corps of Engineers
Attn: Tony Krause
1616 Capitol Ave
Omaha, NE 68102-4901

Subject: Sovereign Lands Construction Permit 11-079
Shallow water habitat restoration
Missouri River (Deer Island)
Harrison County
Section 17/20/21, Township 81N, Range 45W

Dear Mr. Krause:

As provided under Chapter 461A of the Code of Iowa, the Department of Natural Resources hereby grants permission to do the following work subject to stipulations stated herein and in the documents submitted in application for this permit which are now on file in the central office of the Department of Natural Resources. Any special conditions and stipulations contained in this permit shall take precedence over plans or specifications provided by the applicant.

Work shall not begin in advance of contact with the Wildlife Biologist in charge of the area. You may contact Doug Chafa at [REDACTED].

You are required to complete and return the enclosed "Report of Completion" postcard upon conclusion of the project in accordance with 571 IAC—13.18.

The permittee is authorized to establish an area of shallow water habitat for a stretch of 2.4 miles of the Missouri River.

The Deer Island Wildlife Management Area shall remain open for public use for the duration of the construction project.

The permittee shall maintain and gravel the public access road for the duration of the construction project.

The permittee is authorized to utilize trees from the project site for habitat structures of the project.

The permittee shall have a copy of this permit on-site during construction.

Although this permit authorizes you to construct this project on state lands and/or waters, you must acquire other applicable federal, state and local permits before you begin construction. This project may also require a permit from the U.S. Army Corps of Engineers. If you have not already done so, you should contact Mr. Dan Johnson of the U.S. Army Corps of Engineers in writing or by telephone at [REDACTED] to determine if a Corps permit is required for this project.

Any construction activity that bares the soil of an area greater than or equal to one acre including clearing, grading or excavation may require a storm water discharge permit from the Department. Construction activities may include the temporary or permanent storage of dredge material. For more information regarding this matter, please contact Ms. Ruth Rosdail at [REDACTED].

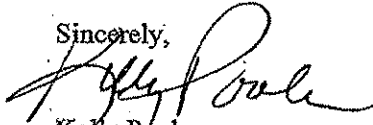
This permit is also a record of review for protected species, rare natural communities, state lands and waters in the project area, including review by personnel representing state parks, preserves, recreation areas, fisheries and wildlife. The Department has searched Natural Areas Inventory records for the project area and found no site-specific records of rare species or significant natural communities that would be impacted by this project. However, Department data are not the result of thorough field surveys. If listed species or rare communities are found during the planning or construction phases, additional studies and/or mitigation may be required.

The permittee is presumed to be familiar with all laws, ordinances, and regulations that may affect employees, materials, or equipment used in or upon the work. The permittee shall indemnify and save harmless the State of Iowa, the Department of Natural Resources, and all its officers and agents from claims or liability of any character arising out of any acts or damages that might result from the installation or construction of the project described in this permit.

This permit expires December 31, 2013.

Please direct questions to me by telephone at [REDACTED] or email at [REDACTED].

Sincerely,



Kelly Poole
Environmental Specialist
Conservation and Recreation Division

CC: US Army Corps of Engineers, Attn: CENWO-PM-AE (Wallace), Omaha District, 1616 Capitol Ave, Omaha, NE 68102-4901
Doug Chafa, Iowa DNR (email)
Todd Rozendaal, Iowa DNR (email)
Chris Schwake, Iowa DNR (email)



STATE OF NEBRASKA

Dave Heineman
Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

Michael J. Linder

Director

Suite 400, The Atrium

1200 'N' Street

P.O. Box 98922

Lincoln, Nebraska 68509-8922

Phone (402) 471-2186

FAX (402) 471-2909

Website: www.deq.state.ne.us

JUN 23 2011



Aaron Quinn
Omaha District, Corps of Engineers
1616 Capitol Ave.
Omaha, NE 68102

RE: State Water Quality Certification for Section 404 Application
2011-00794-WEH, Shallow water habitat project, Missouri River,
Harrison County, IA.

Dear Mr. Quinn:

We have reviewed the information received regarding the above-referenced application and feel the activity will comply with Section 401 of the Clean Water Act of 1977, as amended by the Water Quality Act of 1987, subject to meeting the following conditions:

Construction activities should employ controls to prevent the erosion of land adjacent to the water body. This includes revegetating disturbed areas and maintaining the controls.

If the area of disturbance will be greater than 1.0 acre, we remind the applicant that a National Pollution Discharge Elimination System construction stormwater permit may be required under § 402 of the Clean Water Act.

We therefore, by this letter, provide Section 401 Water Quality Certification. This certification does not constitute authorization to conduct your project. It is a statement of compliance with Surface Water Quality Standards only, which is one requirement to gain authorization from the U.S. Army Corps of Engineers in the form of a Section 404 permit. If you have any questions, please feel free to call Terry Hickman on my staff, at

Sincerely,

Patricia W. Rice

for

Marty Link

Associate Director,

Water Quality Division

cc: Matt Wray, US Army Corps of Engineers
John Cochran, US Fish & Wildlife Service
Lourdes Mena, US Fish & Wildlife Service
Carey Grell, Nebraska Game & Parks Commission
Eliodora Chamberlain, US Environmental Protection Agency



STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
ROGER L. LANDE, DIRECTOR

TRANSMITTAL FORM

TO: Mr. Aaron Quinn
U.S. Army Corps of Engineers
1616 Capitol Avenue
Omaha, NE 68102

FROM: Christine Schwake
Water Resources Section

PHONE: [REDACTED]
DATE: May 24, 2011

Enclosed or attached is the following:

No.	Description
1	Department of Natural Resources Public Notice

☒ For your information and use

REMARKS: This public notice will be printed one time in the Missouri Valley Times-News. State Section 401 Certification is required for the issuance of the Department of the Army Corps of Engineers (DA) Section 404 permit. Section 401 certification is the Department's concurrence that a project is consistent with Iowa's Water Quality Standards.

All projects requiring 401-certification are put out on public notice in a local newspaper close to the proposed project; there are no costs to the applicant associated with the review or the public notice. The public notice allows the public to comment on the water quality aspects of the project that is affecting a water of the state. The public comment period will expire on June 9, 2011.

The Department can waive, certify, certify with conditions or deny projects depending on the extent of the water quality impacts of the project. Some projects that have minimal impacts can be approved if mitigation to replace the affected wetland habitat or water of the state is provided. Mitigation is considered and developed for projects based on the Department's Antidegradation Policy, set forth in Chapter 61, Iowa Administrative Code.

PUBLIC NOTICE OF INTENT TO CONSIDER ISSUANCE OF SECTION 401 WATER QUALITY CERTIFICATION

The Iowa Department of Natural Resources (IDNR) proposes to evaluate Section 401 Certification for the following project. The Section 401 Certification is the statement that a project will not cause a violation of Iowa's Water Quality Standards.

PROJECT DESCRIPTION: The U.S. Army Corps of Engineers Omaha District, Corps #2011-00794-WEH, proposes to create shallow water habitat as part of the Missouri River Recovery Program from Missouri River Miles 670.7 to 672.8, Harrison County. A shallow water zone with 3 separate chutes and 50-60 structures consisting of riprap and/or large woody debris will be installed along the left descending bank. Hydraulic dredging will be performed. Project application material is available for review at <http://www.nwo.usace.army.mil/html/od-rne/pn/pn.html> or copies of this information may be requested by calling Chris Schwake at (515) 281-6615.

Anyone wishing to comment on the intent to proceed with Section 401 Certification review must do so in writing by June 9, 2011. All relevant comments will be considered in the review process. Written requests for the IDNR to hold a public hearing must cite specific reasons, including a proposed list of topics to be covered, and must be submitted to the IDNR, Chris Schwake, Wallace State Office Building, Des Moines, IA 50319-0034 by June 9, 2011. A request may be denied if substantive reasons for holding a hearing are not provided. If a public hearing is warranted, interested parties will be notified of the time, date, and location.



STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
ROGER L. LANDE, DIRECTOR

July 12, 2011

Mr. Tony Krause
U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, NE 68102-1618



Dear Mr. Krause:

After reviewing your request for State 401 Water Quality Certification, the Iowa Department of Natural Resources has issued the enclosed Certification. Please read the attached conditions carefully before beginning work on the project.

If you have any questions or comments about the certification or any conditions contained therein, please contact me at the address shown below or call [REDACTED].

Sincerely,

Christine M. Schwake

Christine M. Schwake
Environmental Specialist

cc: ✓ Mr. Matt Wray, Nebraska Regulatory Office – Wehrspann, 8901 South 154th Street, Suite 1, Omaha,
NE 68138-3621

IOWA DEPARTMENT OF NATURAL RESOURCES

SECTION 401 WATER QUALITY CERTIFICATION

Certification issued to:

Effective: July 12, 2011

U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, NE 68102-1618

Project certified: US Army Corps of Engineers, Joint Public Notice No. 2011-00794-WEH
State 401 Water Quality Certification, Application Log No.: 11-W-085-05-03-S

Project Description: As part of the Missouri River Recovery Program (MRRP), the Corps of Engineers (Corps) will create shallow water habitat (SWH) in S17, 20 & 21, T81N, R45W, Harrison County, Iowa (Missouri River miles 670.7 to 672.8 left descending bank). The project consists of a wide excavated zone along the inside of the river bend for a length of approximately 2 miles. The shallow bench excavation zone will include 3 separate 75-100-foot-wide integrated chutes designed to provide depth diversity and also to facilitate construction access. The chutes will be constructed at a depth of 4 to 6 feet below construction reference plane (CRP). The remainder of the wide bench will be excavated from 2 to 5.5 feet below CRP.

The project will also include 50 to 60 structures consisting of riprap and/or large woody debris (LWD). About half of the structures will be located within the existing river section with the remainder located within the excavated bank portion of the channel. Structure location is designed to optimize benefits to aquatic species and maintain the navigation channel.

Approximately 2.5 to 3.0 million cubic yards of material will be excavated using hydraulic dredges over a two to five year construction period. The discharge will likely be spread over two to five years of construction which equates to roughly 600,000 to 1,500,000 cubic yards per year.

Discharge will occur during and throughout the navigation season. The material will be distributed in the main channel among the various stone riprap and LWD structures (to create additional SWH) until the design grade is reached. The remaining material will be discharged into the thalweg of the Missouri River where it will become entrained into the bedload of the river. Monitoring during construction will be included to prohibit elevated amounts of material deposition within the navigation channel and within the Harbor 671 channel (a private access channel located across the river from Deer Island GMA). Sedimentation of these channels occurs naturally and will be expected even in the absence of the project.

Approximately 24 acres of PEMA/C riverine floodplain wetlands dominated by Reed Canary Grass (*Phalaris arundinacea*) and 1 acre of PSSA riverine floodplains wetlands dominated by willows (*Salix* spp.) will be excavated by this project. These wetlands are situated on former river sediment that has accreted to the bank due to the Bank Stabilization Navigation Project. This project will initially produce approximately 132 acres of SWH. An additional amount of SWH up to 50 acres is anticipated to form in the adjacent channel as sediment settles from the water column among the riprap and LWD structures. Riprap and LWD structures placed in the adjacent channel will slow the river's current allowing sediment to settle out of the water column, creating more SWH in the adjacent channel.

The project purpose is to replace SWH lost by construction and operation of the Bank Stabilization and Navigation Project; improving aquatic habitat quality and diversity for pallid sturgeon and other native aquatic species; and maximizing the amount of biologically productive and physically sustainable SWH while maintaining a properly functioning navigation channel. The project will contribute to the number of acres necessary for the Corps to comply with the U.S. Fish and Wildlife's 2000 Biological Opinion and 2003 Amended Biological Opinion pursuant to Section 7 of the Endangered Species Act.

Water quality use designation:

This reach of the Missouri River is designated as Class A1 Primary contact recreational use. These are waters in which recreational or other uses may result in prolonged and direct contact with the water, involving considerable risk of ingesting water in quantities sufficient to pose a health hazard. This reach of the Missouri River is also designated as Class B(WW-1) which are waters in which temperature, flow and other habitat characteristics are suitable to maintain warm water game fish populations along with a resident aquatic community that includes a variety of native nongame fish and invertebrate species. This reach of the Missouri River is also designated as Class HH, human health, which are waters in which fish are routinely harvested for human consumption or waters both designated as a drinking water supply and in which fish are routinely harvested for human consumption. All surface waters in Iowa, including wetlands and those designated for Class "A", "B", and/or "C" are classified for the following general uses: livestock and wildlife watering, noncontact recreation, crop irrigation, and industrial, agricultural, domestic, and other incidental withdrawal uses.

The Iowa Department of Natural Resources (IDNR) has issued this State 401 Water Quality Certification pursuant to Section 401 of the Clean Water Act. The Army Corps of Engineers (Corps) requires state Certification before a Section 404 permit can be issued. Section 401 Certification represents the IDNR's concurrence that the project certified is consistent with the Water Quality Standards of the state of Iowa as set forth in Chapter 61, Iowa Administrative Code.

Subject to the attached conditions, incorporated by reference herein, the IDNR has determined that there is reasonable assurance the proposed activities will be conducted in a manner that will not violate water quality standards of the state of Iowa.

Prepared By: Christine M. Schwake Date Executed: July 12, 2011
Christine M. Schwake, IDNR, Wallace State Office Building, Des Moines, IA 50319-0034 [REDACTED]

GENERAL CONDITIONS

1. Prior to construction, the permittee is responsible for securing and for compliance with such other permits or approvals as may be required by the IDNR, federal, state, or local governmental agencies for the project activities described.
2. ~~Clearing of vegetation, including trees located in or immediately adjacent to waters of the state, shall be limited to that which is absolutely necessary for construction of the project. All vegetative clearing material shall be removed to an upland, non-wetland disposal site.~~
3. All construction debris shall be disposed of on land in such a manner that it cannot enter a waterway or wetland. Construction equipment, activities, and materials shall be kept out of the water to the maximum extent possible. Equipment for handling and conveying materials during construction shall be operated to prevent dumping or spilling the material into waterbodies, streams or wetlands except as approved herein. Care shall be taken to prevent any petroleum products, chemicals, or other deleterious materials from entering waterbodies, streams or wetlands.
4. Erosion control features (i.e., silt fences, silt ditches, silt dikes, silt basins, etc.) must be installed to provide continuous erosion control throughout the construction and post construction period as well as the revegetation of all disturbed areas upon project completion. Where siltation control features have been reduced in capacity by 50% or more, the features shall be restored to their original condition with a minimum of delay.

5. All disturbed areas not covered with riprap shall be seeded with native grasses, excluding Reed Canary grass (*Phalaris arundinacea*) or any aggressive or invasive species, during an optimal seeding period. If excavation and construction are completed outside an optimal seeding period, temporary erosion control protection shall be implemented immediately upon completion of excavation and construction and shall be maintained until such time as seeding can be completed during an optimal period. The applicant shall monitor revegetated areas continuously to assure success of revegetation. If rye is initially planted to stabilize the soil then native warm season grasses shall be planted during the following growing season.
6. Riprap shall consist of clean native fieldstone, clean quarry run rock or clean broken concrete. If broken concrete is used all reinforcement material shall be completely removed from it; if removal is not possible, said reinforcement material shall be cut flush with the flat surface of the concrete. It shall be the applicant's responsibility to maintain the riprap such that any reinforcement material that becomes exposed in the future is removed. The concrete pieces shall be appropriately graded and no piece shall be larger than 3 feet across the longest flat surface. No asphalt or petroleum based material shall be used as or included in riprap material.
7. The hydraulic dredging shall occur during elevated river flows, preferable at 24,000 cubic feet per second or greater. The hydraulic dredge discharge pipe should be submerged at least 3' below the surface of the water and shall be at least 20' into the free flowing portion of the river. When discharging spoils to the river, the sediment capacity of the river shall not be exceeded.
8. It is the goal of the Water Quality Standards that all uses of the river be maintained and protected. The instream disposal of the dredged material will cease if the water quality standards of either the State of Iowa or the State of Nebraska are violated.
9. The operation and maintenance of this shallow water habitat area will be the responsibility of the U.S. Army Corps of Engineers (Corps).
10. The Deer Island Wildlife Management Area shall remain open for public use for the duration of the construction project.
11. The Corps shall maintain and gravel the public access road for the duration of the construction project.
12. The Corps is authorized to utilize trees from the project site for the habitat structures.

APPENDIX B

CONSTRUCTION PLANS



US Army Corps
of Engineers
Omaha District

MISSOURI RIVER RECOVERY DEER ISLAND/ LITTLE SIOUX BEND REVTMENT LOWERING PROJECT CONTRACT NO. W9128F-08-R-0024 (TASK ORDER 000X)

MISSOURI RIVER IOWA

OCTOBER 2009
30% DESIGN - VALUE ENGINEERING SET



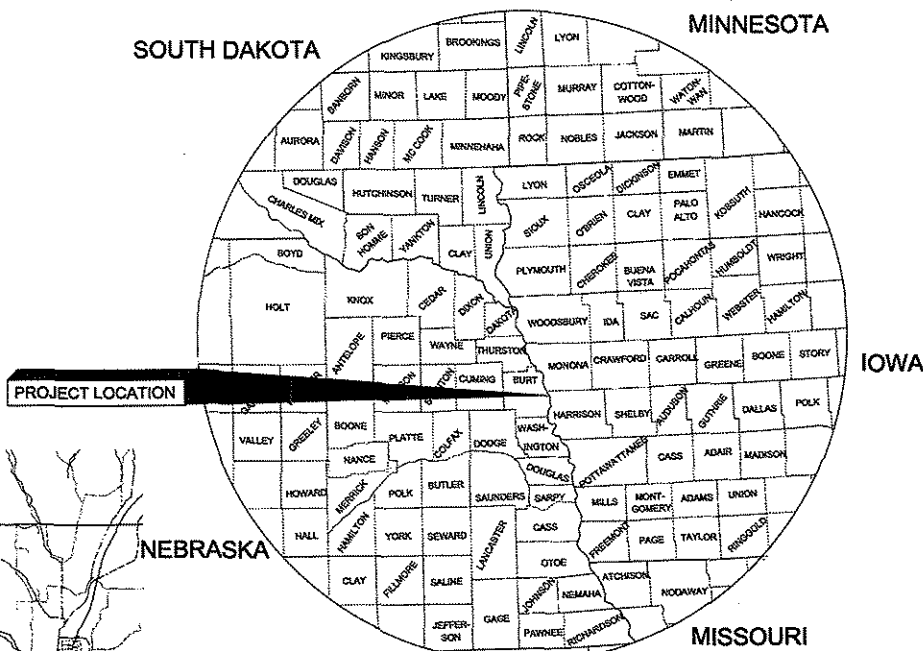
US Army Corps
of Engineers
Omaha District

5 4 3 2 1

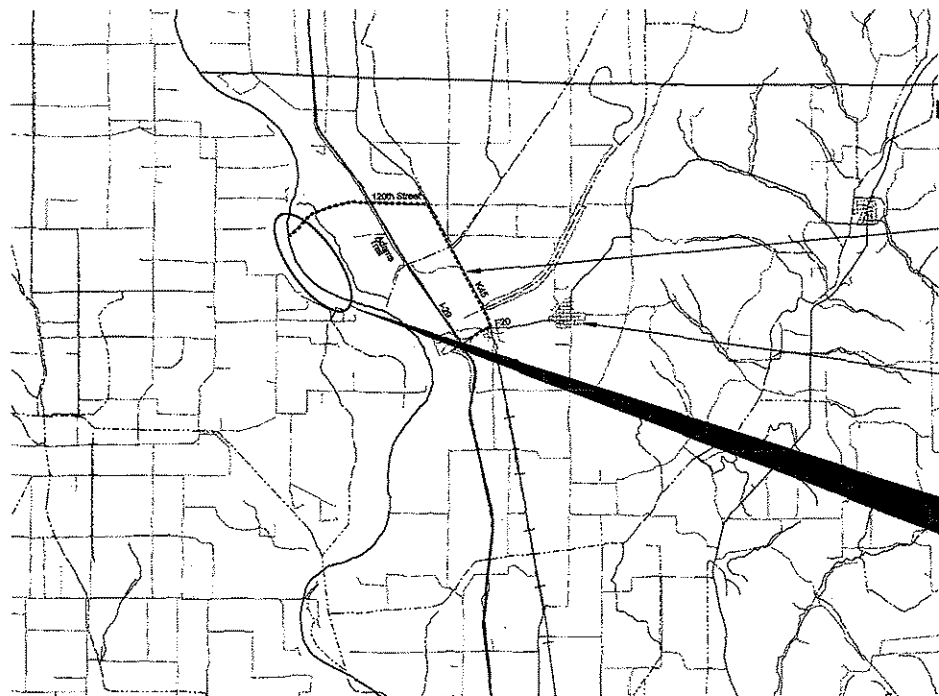
INDEX

FILENAME	SHEET NO.	DESCRIPTION
MRA0B001.DGN	-	COVER
MRA0C001.DGN	C0.01	LOCATION MAP, VICINITY MAP & INDEX
MRA0C101.DGN	C1.01	GENERAL PLAN VIEW AND RIGHT-OF-WAY MAP
MRA0C102.DGN	C1.02	SHEET LAYOUT PLAN
MRA0C201.DGN	C2.01	CLEARING AND GRUBBING
MRA0C202.DGN	C2.02	CLEARING AND GRUBBING
MRA0C203.DGN	C2.03	CLEARING AND GRUBBING
MRA0C204.DGN	C2.04	CLEARING AND GRUBBING
MRA0C301.DGN	C3.01	SITE LAYOUT PLAN
MRA0C302.DGN	C3.02	SITE LAYOUT PLAN
MRA0C303.DGN	C3.03	SITE LAYOUT PLAN
MRA0C304.DGN	C3.04	SITE LAYOUT PLAN
MRA0C601.DGN	C6.01	CROSS SECTIONS
MRA0H701.DGN	C7.01	LARGE WOODY DEBRIS DETAILS
MRA0H702.DGN	C7.02	TYPICAL SECTIONS AND MISCELLANEOUS DETAILS
MRA0H901.DGN	C8.01	MISSOURI RIVER RECENT RIVER FLOW & ELEV DATA

NOTE:
CONSTRUCTION REPRESENTATIVE OFFICER MUST APPROVE THE LOCATION OF
ANY STAGING AREAS PRIOR TO ARRIVAL ON SITE.



LOCATION MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

BURT
COUNTY

LEGEND

- PILE DIKE
- STONE FILL DIKE OR REVETMENT
- PILE REVETMENT
- PILE REVETMENT, STONE FILL
- TOE TRENCH OR STANDARD REVETMENT OR REINFORCED STD. REVET. OR ACCRETION PAVING
- ASPHALT REVETMENT
- DESIGNED STABILIZED CHANNEL LINE
- BLUFF LINE
- 1890 CHANNEL MILEAGE
- BEND CHANGE

615.8 STRUCTURE NUMBERS ARE BASED ON 1890 MILEAGE

CRP THIS IS THE CONSTRUCTION REFERENCE PLANE WHICH REPRESENTS A SYNTHESIZED WATER SURFACE PROFILE OF A STEADY DISCHARGE THAT IS EQUALLED OR EXCEEDED 75% OF THE TIME DURING THE NAVIGATION SEASON (APRIL - NOVEMBER).



APPROVED BY:	DATE:
DESIGNED BY:	DATE:
CHECKED BY:	DATE:
IN CHARGE:	DATE:

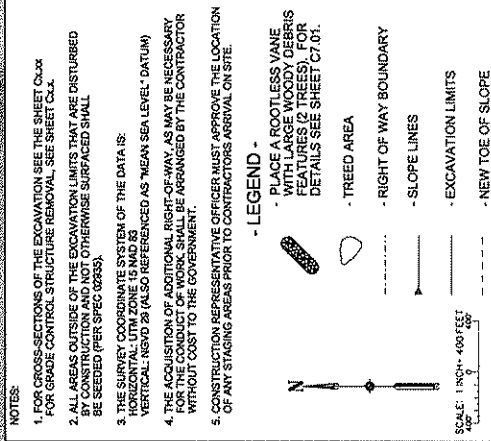
APPROVED BY:	DATE:
DESIGNED BY:	DATE:
CHECKED BY:	DATE:
IN CHARGE:	DATE:

DATE:	10/02/2009
DESIGNED BY:	W. J. H. H.
CHECKED BY:	W. J. H. H.
IN CHARGE:	W. J. H. H.
PROJECT NO.:	615.8
PROJECT NAME:	MISSOURI RIVER
PROJECT LOCATION:	MISSOURI RIVER
PROJECT SCALE:	1:1
PROJECT DATE:	10/02/2009
PROJECT TIME:	10:00 AM

DATE:	10/02/2009
DESIGNED BY:	W. J. H. H.
CHECKED BY:	W. J. H. H.
IN CHARGE:	W. J. H. H.
PROJECT NO.:	615.8
PROJECT NAME:	MISSOURI RIVER
PROJECT LOCATION:	MISSOURI RIVER
PROJECT SCALE:	1:1
PROJECT DATE:	10/02/2009
PROJECT TIME:	10:00 AM

DATE:	10/02/2009
DESIGNED BY:	W. J. H. H.
CHECKED BY:	W. J. H. H.
IN CHARGE:	W. J. H. H.
PROJECT NO.:	615.8
PROJECT NAME:	MISSOURI RIVER
PROJECT LOCATION:	MISSOURI RIVER
PROJECT SCALE:	1:1
PROJECT DATE:	10/02/2009
PROJECT TIME:	10:00 AM

SHEET
REFERENCE
NUMBER:
C0.01



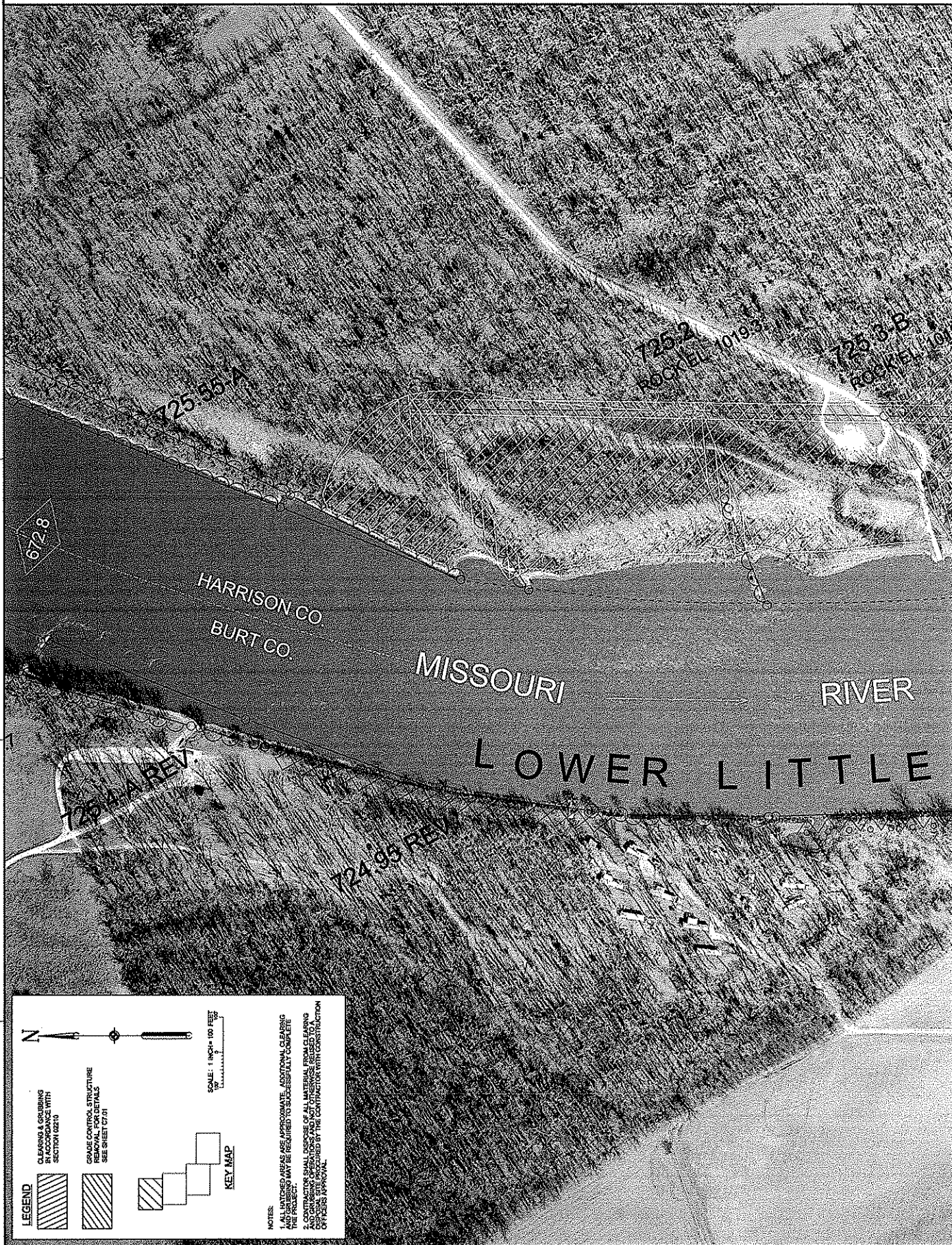
DATE	APPROVED BY	DESCRIPTION	DATE	APPROVED BY

DATE: _____
 APPROVED BY: _____
 PROJECT NO. _____
 SHEET NO. _____

DESIGNED BY: _____	DATE: _____
CHECKED BY: _____	DATE: _____
APPROVED BY: _____	DATE: _____
PROJECT NO. _____	SHEET NO. _____
CONTRACT NO. _____	CONTRACTOR: _____
CONTRACT DATE: _____	CONTRACT VALUE: _____
CONTRACT TYPE: _____	CONTRACT STATUS: _____
CONTRACT LOCATION: _____	CONTRACT DESCRIPTION: _____
CONTRACT OWNER: _____	CONTRACT CONTACT: _____
CONTRACT ADDRESS: _____	CONTRACT PHONE: _____
CONTRACT FAX: _____	CONTRACT EMAIL: _____
CONTRACT WEBSITE: _____	CONTRACT SOCIAL MEDIA: _____

CLEARING AND GRUBBING
 MISSOURI RIVER
 FISH & WILDLIFE REHABILITATION
 DEER ISLAND PROJECT

SHEET
 REFERENCE
 NUMBER
C2.01



LEGEND

- CLEARING & GRUBBING (Hatched pattern)
- GRADE CONTROL STRUCTURE REMOVAL FOR DETAILS (Dashed pattern)
- SEE SHEET C2.01

KEY MAP

NOTES:

1. ALL LATTICED AREAS ARE APPROXIMATE. ADDITIONAL CLEARING MAY BE REQUIRED TO ACCURATELY LAYOUT THE PROJECT.
2. CONTRACTOR SHALL REMOVE ALL MATERIAL FROM CLEARING SITE AND SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL MATERIAL FROM THE PROJECT SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL MATERIAL FROM THE PROJECT SITE.

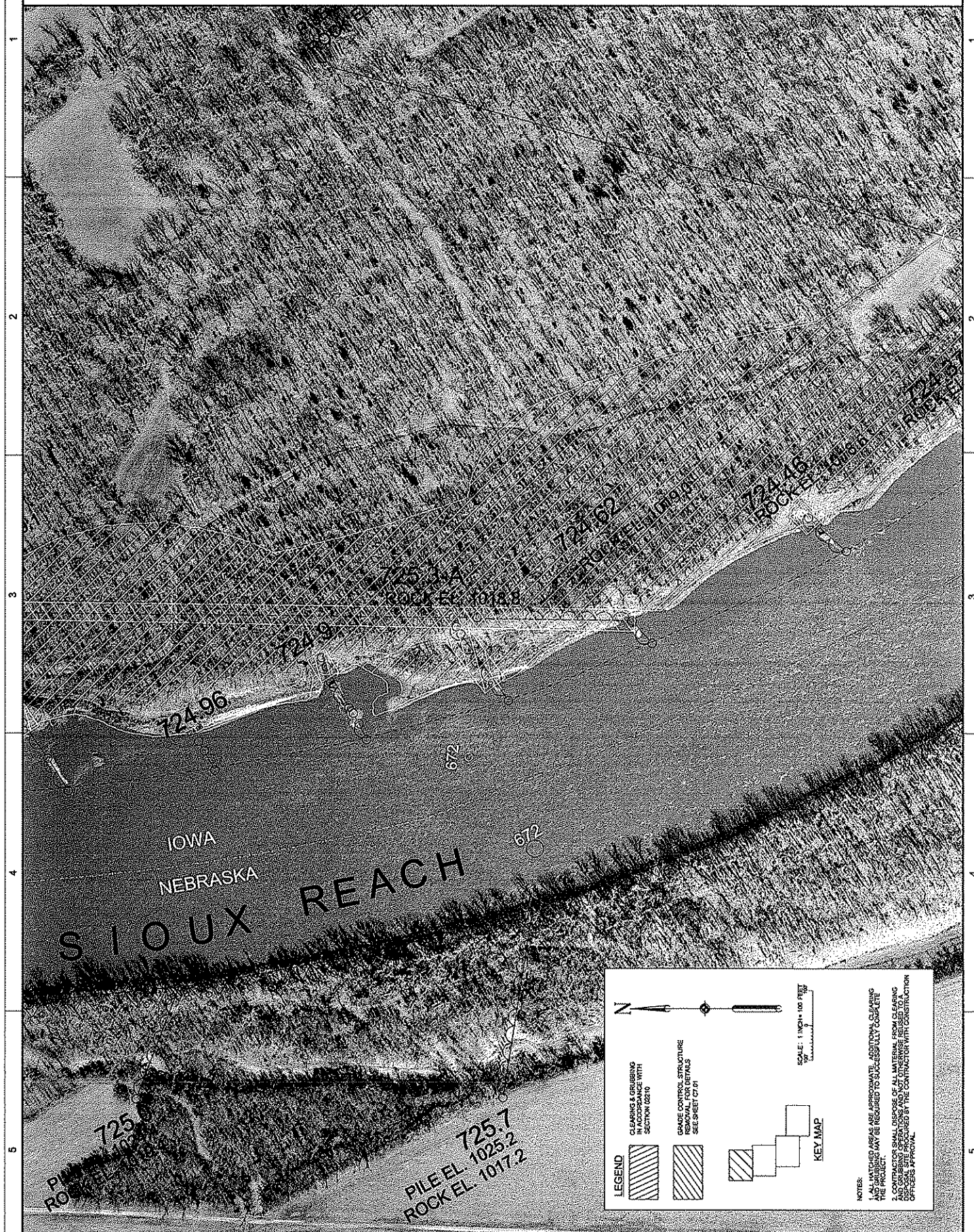
DATE	APPROVED	DESCRIPTION	STATION

DATE: _____
 ENGINEER: _____
 APPROVED BY: _____

DATE: OCTOBER 2009	SCALE: 1"=100'	PROJECT NO. 021-170	CONTRACT NO. 021-170
DESIGNED BY: _____	CONTRACT NO. 021-170	CONTRACT NO. 021-170	CONTRACT NO. 021-170
DESIGNED BY: _____	CONTRACT NO. 021-170	CONTRACT NO. 021-170	CONTRACT NO. 021-170
DESIGNED BY: _____	CONTRACT NO. 021-170	CONTRACT NO. 021-170	CONTRACT NO. 021-170
DESIGNED BY: _____	CONTRACT NO. 021-170	CONTRACT NO. 021-170	CONTRACT NO. 021-170

MISSOURI RIVER
 NEBRASKA AND IOWA
 FISH & WILDLIFE MITIGATION
 BEAR ISLAND PROJECT
 CLEARING AND
 GRUBBING

SHEET
 REFERENCE
 NUMBER
C2.02



LEGEND

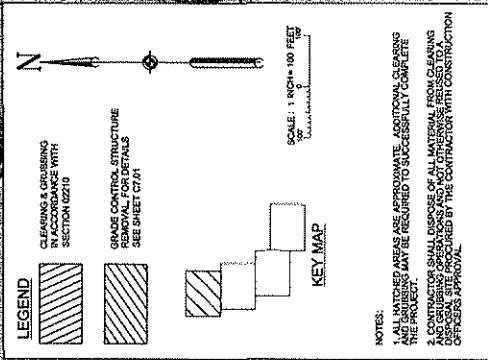
- CLEARING & GRUBBING
REMOVAL FOR DETAILS
SECTION 021.10
- GRADE CONTROL STRUCTURE
REMOVAL FOR DETAILS
SEE SHEET 07.01

KEY MAP

NOTES:

- ALL LATERAL AREAS ARE APPROXIMATE. ADDITIONAL CLEARING MAY BE REQUIRED TO SUCCESSFULLY COMPLETE THE PROJECT.
- CONTRACTOR SHALL DISPOSE OF ALL MATERIAL FROM CLEARING AND GRUBBING OPERATIONS IN ACCORDANCE WITH THE DISposal SITE PROCEDURE BY THE CONTRACTOR WITH CONSTRUCTION OFFICIALS APPROVAL.

SHEET
REFERENCE
NUMBER
C2.03



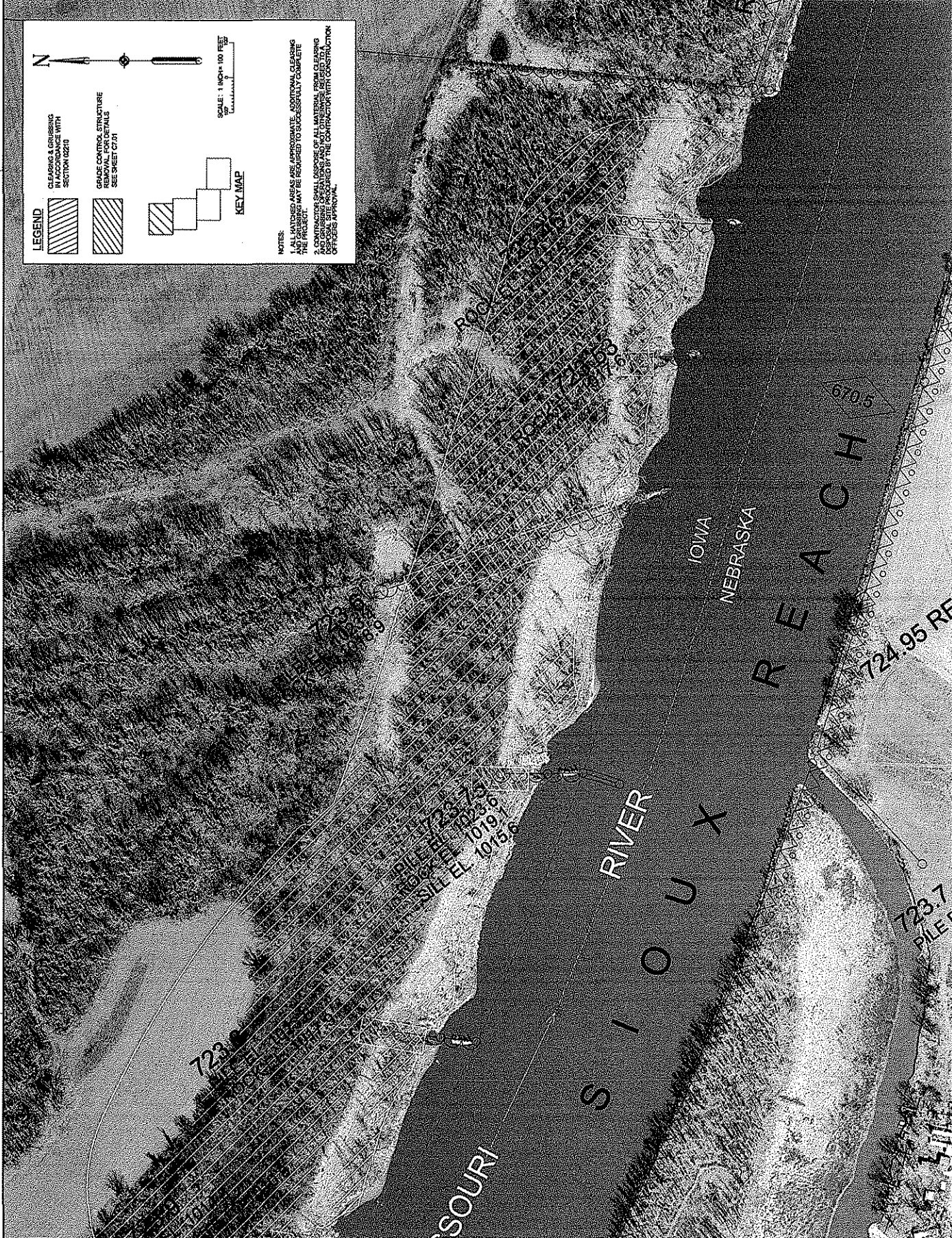
SHEET
REFERENCE
NUMBER
C2.04

MISSOURI RIVER
NEBRASKA AND IOWA
FISH & WILDLIFE MITIGATION
DEER ISLAND PROJECT
**CLEANING
AND
GRUBBING**

CLIENT: IOWA & NEB.
SUBMITTED BY: JRS
CONTRACT NO.: MR10-170
DRAWING CODE: 1-1
PROJECT NAME: MISSOURI RIVER
FISH & WILDLIFE MITIGATION
DEER ISLAND PROJECT
DATE: OCTOBER 2009

APPROVED BY: _____
ENGINEERING DIVISION, CIVIL

DATE	APPROVED



LEGEND

- CLEANING & GRUBBING IN ACCORDANCE WITH SECTION 02210
- GRADE CONTROL STRUCTURE REMOVAL FOR DETAILS SEE SHEET C7.01

KEY MAP

SCALE: 1 INCH = 100 FEET

NOTES:

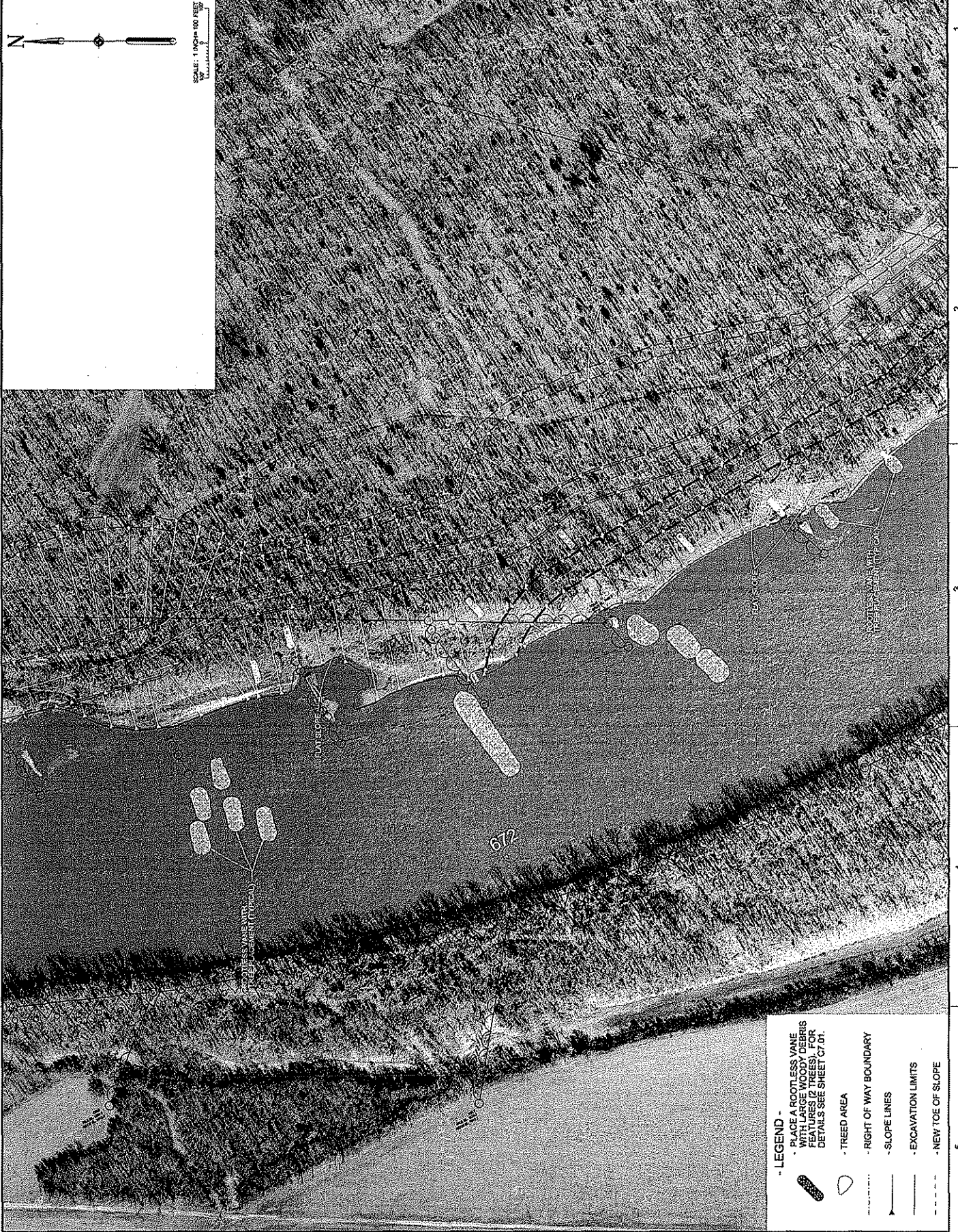
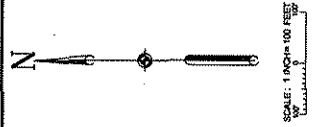
1. MATERIALS ARE TO BE REMOVED FROM THE PROJECT SITE AND NOT REUSED.
2. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FROM THE MISSOURI RIVER COMMISSION AND THE IOWA DEPARTMENT OF NATURAL RESOURCES.
3. DISPOSAL SITE TO BE DETERMINED BY THE CONTRACTOR WITH CONSTRUCTION OFFICER'S APPROVAL.

SHEET
NO. 3
C3.02

MISSOURI RIVER
FISH & WILDLIFE RECOVERY
DEER ISLAND PROJECT
SITE LAYOUT PLAN

DATE: OCTOBER 2009	BY: [Signature]
APPROVED BY: [Signature]	DATE: [Blank]
PROJECT NO. MR-10-170	CONTRACT NO. [Blank]
PROJECT NAME: MISSOURI RIVER FISH & WILDLIFE RECOVERY DEER ISLAND PROJECT	PROJECT LOCATION: [Blank]
PROJECT DESCRIPTION: [Blank]	PROJECT STATUS: [Blank]

NO.	DATE	REVISION
1	10/20/09	ISSUED FOR PERMIT
2	11/10/09	REVISED TO ADD EXCAVATION LIMITS
3	12/15/09	REVISED TO ADD SLOPE LIMITS
4	01/15/10	REVISED TO ADD TIE-IN TO SHEET C3.01
5	02/15/10	REVISED TO ADD TIE-IN TO SHEET C3.03
6	03/15/10	REVISED TO ADD TIE-IN TO SHEET C3.04
7	04/15/10	REVISED TO ADD TIE-IN TO SHEET C3.05
8	05/15/10	REVISED TO ADD TIE-IN TO SHEET C3.06
9	06/15/10	REVISED TO ADD TIE-IN TO SHEET C3.07
10	07/15/10	REVISED TO ADD TIE-IN TO SHEET C3.08



- LEGEND -
- PLACE A ROOTLESS VANE WITH LARGE WOODY DEBRIS (SEE SHEET C3.01 FOR DETAILS)
 - TREED AREA
 - RIGHT OF WAY BOUNDARY
 - SLOPE LIMITS
 - EXCAVATION LIMITS
 - NEW TOE OF SLOPE

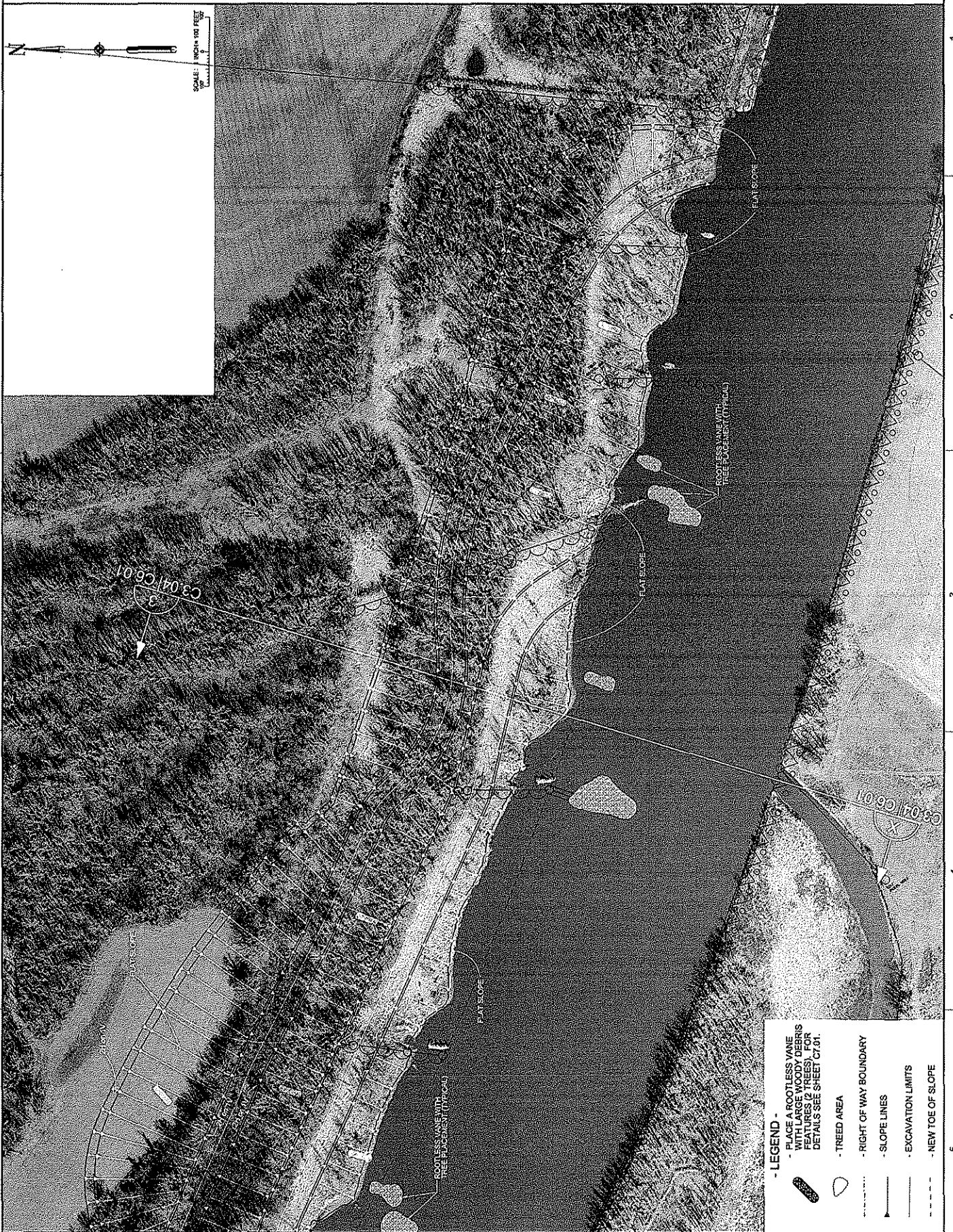
SHEET
REFERENCE
NUMBER
C3.04

MISSISSIPPI RIVER
DEER ISLAND PROJECT
SITE LAYOUT PLAN

DESIGNED BY: RSP
CHECKED BY: JSP
DATE: OCTOBER 2008
PROJECT NO.: 100900100
DRAWING NO.: 100900100-001
CONTRACT NO.: 100900100-001
SCALE: 1" = 100'

APPROVED BY: _____
ENGINEERING DIVISION CHIEF: _____
DATE: _____

REVISION	DATE	APPROVED

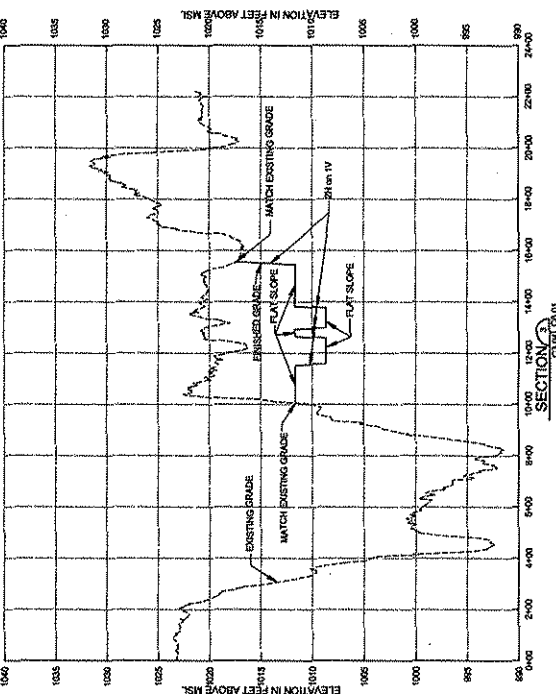
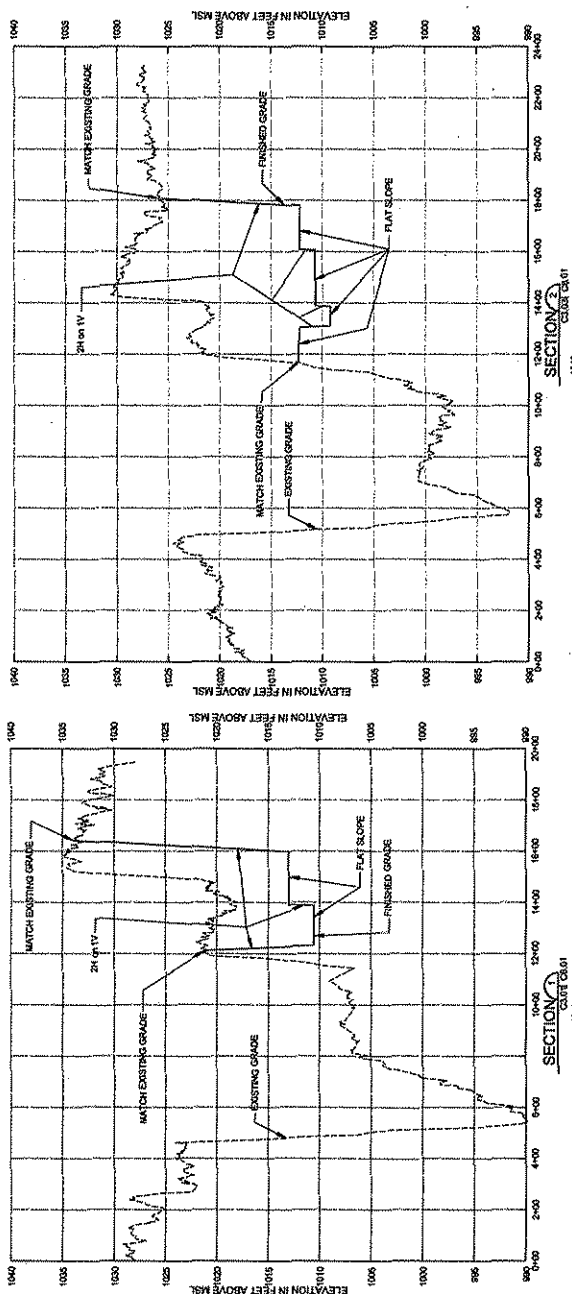


- LEGEND**
- PLACE A ROOTLESS VANE WITH LARGE WOODY DEBRIS DETAILS SEE SHEET C7.01.
 - TREED AREA
 - RIGHT OF WAY BOUNDARY
 - SLOPE LINES
 - EXCAVATION LIMITS
 - NEW TOE OF SLOPE

MISSOURI RIVER
NEBRASKA AND IOWA
FISH & WILDLIFE MITIGATION
DEER ISLAND PROJECT
CROSS SECTIONS

[illegible][illegible]

THE CHAIRMAN



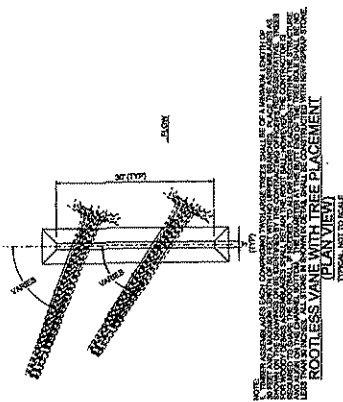
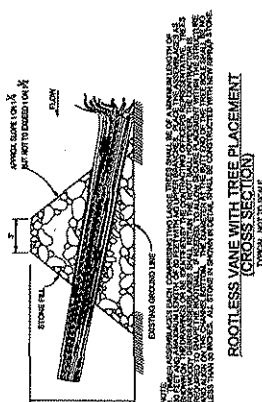
SHEET
REFERENCE
NUMBER
C7.01

LARGE WOODY DEBRIS DETAILS
DEER ISLAND PROJECT
FISH & WILDLIFE REHABILITATION
NEBRASKA AND IOWA

DESIGNED BY:	DATE:	PROJECT NO.:
CHIEF ENGINEER:	10/08/08	111
PROJECT NO.:	DATE:	PROJECT NO.:
111	10/08/08	111
PROJECT NO.:	DATE:	PROJECT NO.:
111	10/08/08	111

APPROVED BY:	DATE:
ENGINEERING DIVISION, CIV.	

DATE	APPROVED



SHEET
REFERENCE
NUMBER
C7.02

TYPICAL SECTIONS A
MISSOURI RIVER
FISH & WILDLIFE MITIGATION
NEBRASKA AND KANSAS
DEBRIS ISLAND PROJECT

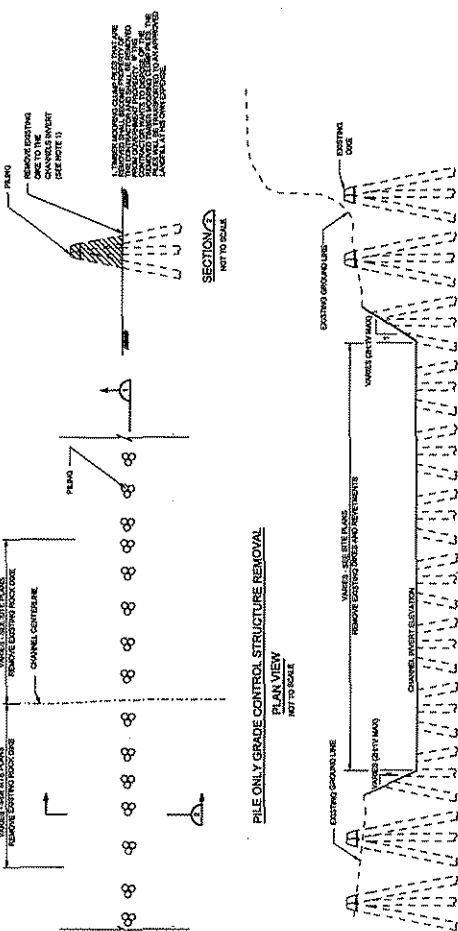
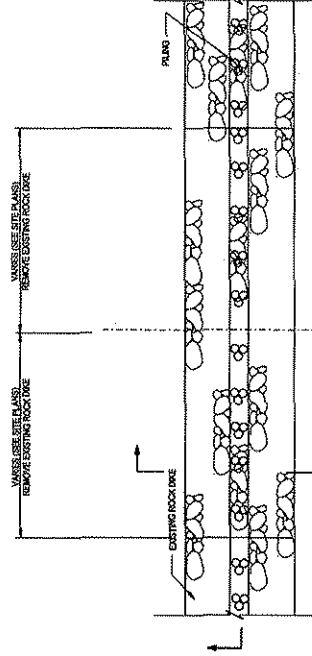
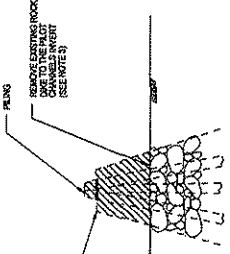
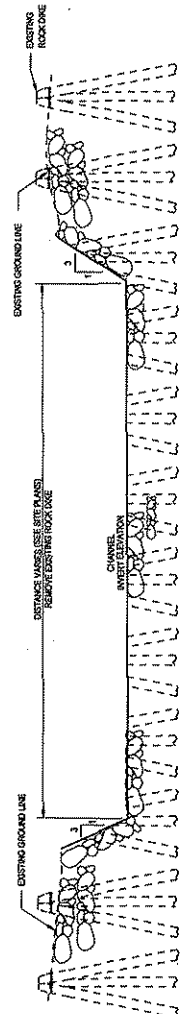
DATE	OCTOBER 2009
DESIGNED BY	MRP
CHECKED BY	MRP
IN CHARGE	MRP
PROJECT NO.	MR-10-170
CONTRACT NO.	300-00-0000
STATE	KANSAS
COUNTY	DEKALB

DATE	OCTOBER 2009
DESIGNED BY	MRP
CHECKED BY	MRP
IN CHARGE	MRP
PROJECT NO.	MR-10-170
CONTRACT NO.	300-00-0000
STATE	KANSAS
COUNTY	DEKALB

DATE	OCTOBER 2009
DESIGNED BY	MRP
CHECKED BY	MRP
IN CHARGE	MRP
PROJECT NO.	MR-10-170
CONTRACT NO.	300-00-0000
STATE	KANSAS
COUNTY	DEKALB

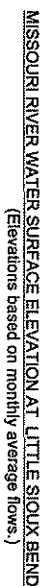


- NOTES:
1. TIMBER MOORING CLUMP PILES THAT ARE REMOVED SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE PROJECT AREA. THE CONTRACTOR WANTS TO DISPOSE OF THE REMOVED TIMBER MOORING CLUMP PILES. THE REMOVED TIMBER MOORING CLUMP PILES SHALL BE REMOVED FROM THE PROJECT AREA AT HIS OWN EXPENSE.
 2. STONE REMOVED FROM THE ROCKFILL DIKE CAN BE USED AS SALVAGED STONE AS NEEDED.
 3. PILING SHALL BE REMOVED TO AT LEAST THE NEW CHANNEL INVERT ELEVATION.



PILE ONLY GRADE CONTROL STRUCTURE REMOVAL
PLAN VIEW
NOT TO SCALE

ROCK DIKE REMOVAL
PLAN VIEW
NOT TO SCALE



APPROXIMATE STAGE - FLOW RATING
MISSOURI RIVER AT PROJECT SITE

THE TWO TUBES ABOVE AND "BROADEN" ONLY FOR FLOWS AT "THE ABOVE RATED REND
FOR KNOCKMAY FLOWS LIMITS OF OVERSEPH DRESSING REFER TO PARAGRAPHS 1, 2 AND 3 OF 0242
CONVERTING ASIDE PRE-SELECTION

[illegible]

SHEET
REFERENCE
NUMBER
C8.01

APPENDIX C

WATER QUALITY (ELUTRIATE) SAMPLING

FIELD MEASUREMENTS FOR ELUTRIATE SAMPLING
Conducted at Deer Island Project Site on the Missouri River April 14, 2010

Project Name: Deer Island Elutriate Monitoring

Project Number: SPS-DEERID-001

Trip Number: EDXDEJ041310

Date Sampled: 14-Apr-2010

Site Location: Missouri River, RM670 – RM673 (Iowa Side)

Collectors: Jensen, Otto

Site Numbers: DR-S1, DR-S2, DR-S3, DR-W1

GPS MEASUREMENTS (NAD27 CONUS)

GPS Device Used for Determining Actual Locations: Garmin GPS Map 765

Site DR-S1:

Targeted Location: Latitude: 41° 49' 45.3", Longitude: 96° 06' 31.1"

Actual Location: Latitude: 41° 48' 49.3", Longitude: 96° 05' 21.6"

Site DR-S2:

Targeted Location: Latitude: 41° 49' 08.3", Longitude: 96° 06' 07.4"

Actual Location: Latitude: 41° 49' 10.4", Longitude: 96° 06' 11.1"

Site DR-S3:

Targeted Location: Latitude: 41° 48' 49.1", Longitude: 96° 05' 21.9"

Actual Location: Latitude: 41° 49' 47.1", Longitude: 96° 06' 31.8"

Site DR-W1:

Targeted Location: Latitude: 41° 48' 46.5", Longitude: 96° 05' 22.0"

Actual Location: Latitude: 41° 48' 45.0", Longitude: 96° 05' 15.3"

SAMPLES COLLECTED

Sample Type	Sample ID	Sampled Depth	Collection Time	Sampling Method
Water Sample	DR-W1	Surface	14:30	Grab
Soil Sample	DR-S1	4 ft	14:10	Composite Core
Soil Sample	DR-S2	4 ft	13:40	Composite Core
Soil Sample	DR-S3	4 ft	13:00	Composite Core

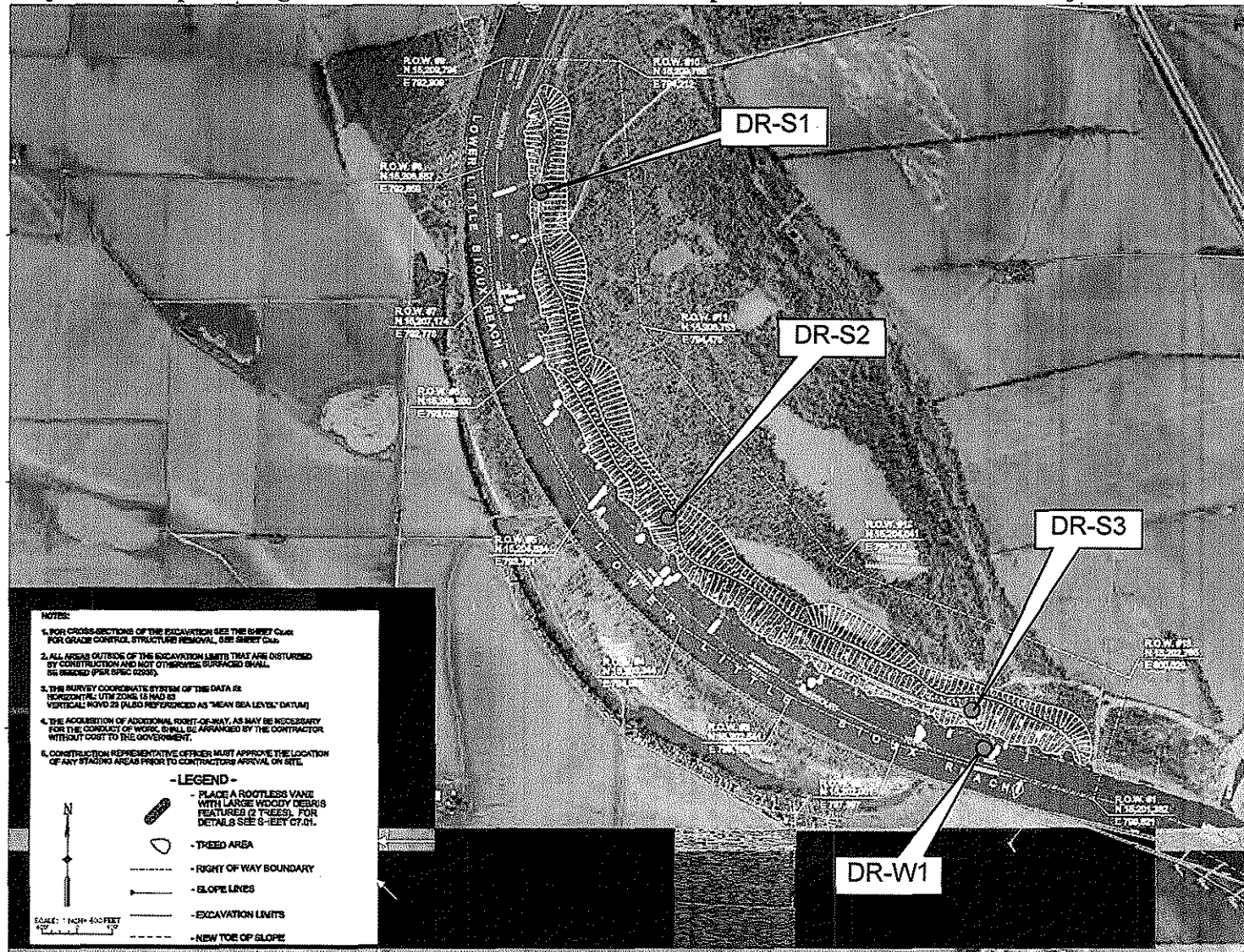
WATER QUALITY FIELD MEASUREMENTS

Temp (°C)	pH (S.U.)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	D.O. (% Sat.)	Turbidity (NTU)
15.4	8.4	837	9.3	96.2	77

Comments:

Samples were delivered to Midwest Laboratories, Inc. (Omaha, NE) for analyses.

Project Site Map Showing Locations Where Soil and Water Samples Collected at Deer Island Project Area.



NOTE: Interpretation of Elutriate Results

Under the column Elutriate Water on the Midwest Laboratory analytical results reports are values reported for the following:

- Ammonia as N, Total
- Chromium, Total
- Copper, Total
- Iron - Total
- Kjeldahl Nitrogen - Total
- Lead, Total
- Mercury, Total
- Nitrate/Nitrite Nitrogen - Total
- Total Organic Carbon – TOC
- Total Phosphorus
- Total Suspended Solids
- Turbidity, Total
- Zinc, Total

These values are for analyses of the "elutriate" supernatant prior to complete settling and filtration.

The other reported values under the column Elutriate Water are the results for analyses of the standard elutriate water after settling and filtration.



Midwest Laboratories, Inc.[®]

13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

Particle Size Distribution Report

Project: DEER ISLAND ELUTRIATE SPS-DEERID-001 TRIP EDXWAO 041310

Report No.: 10-113-2206

Client: US ARMY CORPS OF ENGINEERS

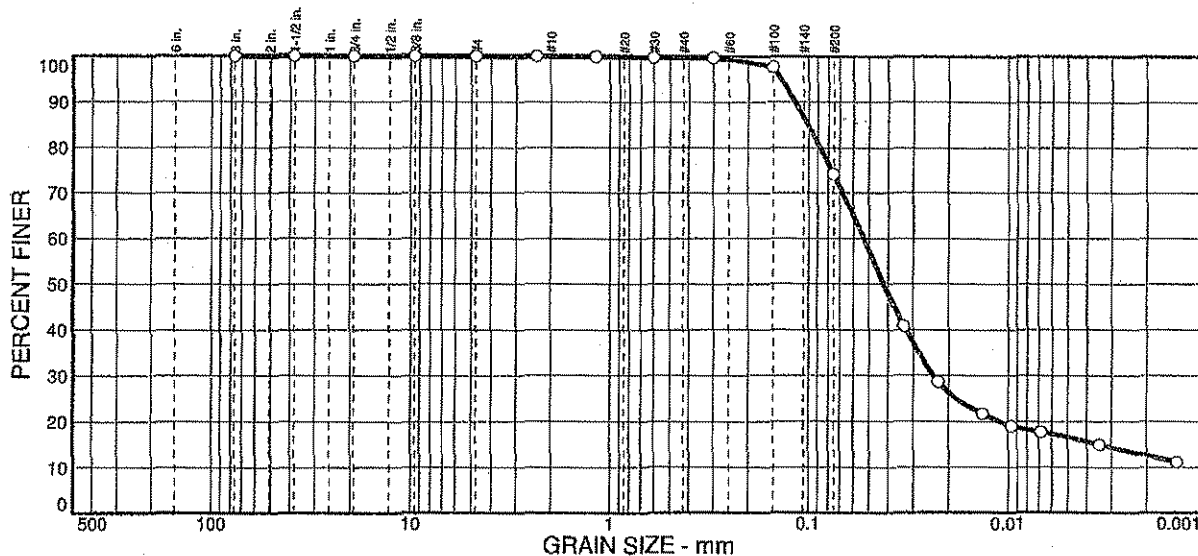
Sample No: 1701371

Source of Sample:

Date: 04/13/2010

Location: DR-S1

Elev./Depth:



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	25.6	57.6	16.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.9		
#30	99.7		
#50	99.6		
#100	97.7		
#200	74.1		

Soil Description

PL= **Atterberg Limits** LL= PI=

Coefficients

D₈₅= 0.101 D₆₀= 0.0534 D₅₀= 0.0422

D₃₀= 0.0239 D₁₅= 0.0035 D₁₀=

C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

Figure



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Report #: 10-187-2093
10-182-2197
10-187-2096

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name:
Project #:
Trip Number:

DEER ISLAND ELUTRIATE MONITORING
SPS-DEERID-001
EDXWAO 041310

Lab Number:						1701374	1701370	1701377
Sample ID:						DR-S1	DR-W1 MO R	Elutriate
Parameter	Method	Method Detection Limit		Laboratory Reporting Limit		Units	Receiving Water	Elutriate Water
		soil	water	soil	water			
Ammonia as N, - Dissolved	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	---	0.12
Ammonia as N, - Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	46.5	0.11
Alfrazine	EPA 200.8	0.25	0.05	2.5	0.15	mg/kg µg/L	n.d.	n.d.
CBOD	SM 5210B	-	2	-	5	mg/kg µg/L	---	3
Chemical Oxygen Demand-COD	ASTM 1252	-	2	-	5	mg/L	---	25
Chromium, Dissolved	EPA 200.7	0.2	10	1	30	mg/kg µg/L	---	n.d.
Chromium, Total	EPA 200.7	0.2	10	1	30	mg/kg µg/L	19.5	n.d.
Copper, Dissolved	EPA 200.7	0.2	2	1.0	5	mg/kg µg/L	---	n.d.
Copper, Total	EPA 200.7	0.2	2	1.0	5	mg/kg µg/L	19.4	n.d.
Iron - Dissolved	EPA 200.7	4	7	10	20	mg/kg µg/L	---	58
Iron - Total	EPA 200.7	4	7	10	20	mg/kg µg/L	20,940	2886
Kjeldahl Nitrogen - Dissolved	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	---	1.1
Kjeldahl Nitrogen - Total	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	900	1.25
Lead, Dissolved	EPA 200.7	1	0.5	5	2	mg/kg µg/L	---	n.d.
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	14.6	n.d.
Mercury, Dissolved	EPA 245.1	0.2	0.02	1	0.04	mg/kg µg/L	---	n.d.
Mercury, Total	EPA 245.1	0.2	0.02	1	0.04	mg/kg µg/L	n.d.	n.d.
Nitrate/Nitrite Nitrogen - Dissolved	EPA 353.2	0.2	0.02	1	0.10	mg/kg mg/L	---	1.2
Nitrate/Nitrite Nitrogen - Total	EPA 353.2	0.2	0.02	1	0.10	mg/kg mg/L	1.2	1.2
Dieldrin	EPA 8081	10	0.001	50	0.003	µg/kg µg/L	n.d.	n.d.
Polychlorinated Biphenyls (PCB's)	EPA 8082	10	0.001	50	0.003	µg/kg µg/L	n.d.	n.d.
Particle Size	Sieve	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1	---	0.2	---	7.7	8.3	7.83
Dissolved Organic Carbon - DOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	---	7.6
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	10,300	7.5
Dissolved Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	---	0.11
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	597	0.39
Percent Solids	SM 2540 G	0.05	---	1.0	---	mg/kg mg/L	61.46	---
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	103
Turbidity, Dissolved	EPA 180.1	-	1	-	3	APHA	---	n.d.
Turbidity, Total	EPA 180.1	-	1	-	3	NTU	---	56
Zinc, Dissolved	EPA 200.7	1	10	5	30	mg/kg µg/L	---	n.d.
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	69.6	14.5

n.d. = Not Detected

--- Test not requested/Applicable

J = Estimated concentration below laboratory reporting limit

PCBS - Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260

Prem N. Arora
Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.



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Particle Size Distribution Report

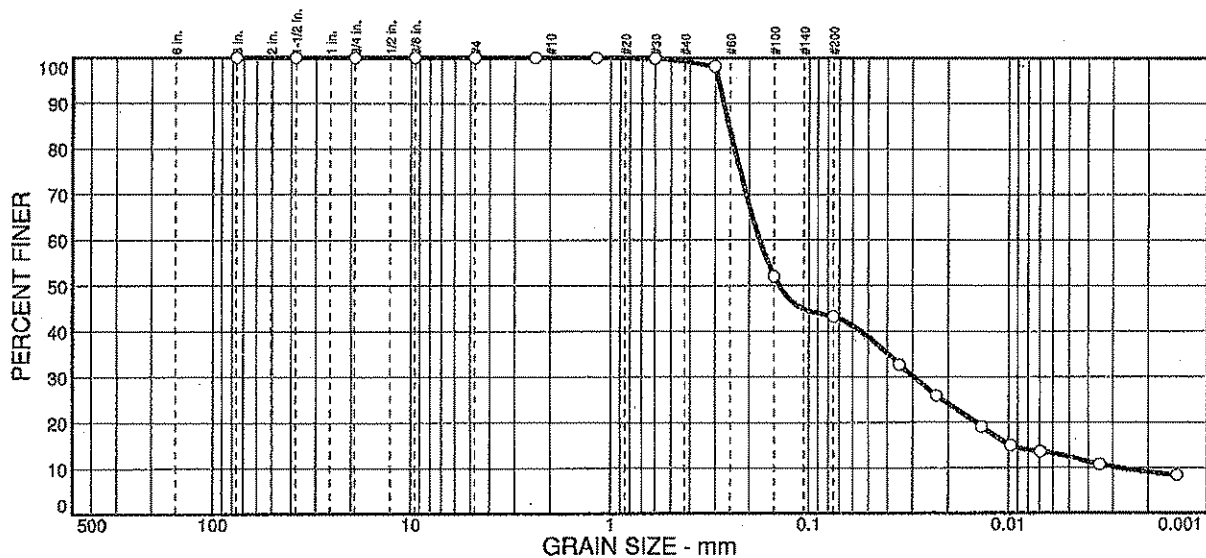
Project: DEER ISLAND ELUTRIATE SPS-DEERID-001 TRIP EDXWAO 041310
Client: US ARMY CORPS OF ENGINEERS

Report No.: 10-113-2207

Sample No: 1701372
Location: DR-S2

Source of Sample:

Date: 04/13/2010
Elev./Depth:





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Report #: 10-187-2094
10-182-2197
10-187-2097

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name:
Project #:
Trip Number:

DEER ISLAND ELUTRIATE MONITORING
SPS-DEERID-001
EDXWAO 041310

Lab Number:						1701375	1701370	1701378	
Sample ID:						DR-S2	DR-W1 MO R	Elutriate	
Parameter	Method	Method Detection Limit		Laboratory Reporting Limit		Units	Soil	Receiving Water	Elutriate Water
		soil	water	soil	water				
Ammonia as N, - Dissolved	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	---	0.12	0.16
Ammonia as N, - Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	49.4	0.11	0.14
Atrazine	EPA 200.8	0.25	0.05	2.5	0.15	mg/kg µg/L	n.d.	n.d.	n.d.
CBOD	SM 5210B	-	2	-	5	mg/kg µg/L	---	3	3
Chemical Oxygen Demand-COD	ASTM 1252	-	2	-	5	mg/L	---	25	40
Chromium, Dissolved	EPA 200.7	0.2	10	1	30	mg/kg µg/L	---	n.d.	n.d.
Chromium, Total	EPA 200.7	0.2	10	1	30	mg/kg µg/L	15.1	n.d.	n.d.
Copper, Dissolved	EPA 200.7	0.2	2	1.0	5	mg/kg µg/L	---	n.d.	3 J
Copper, Total	EPA 200.7	0.2	2	1.0	5	mg/kg µg/L	15.3	n.d.	8
Iron - Dissolved	EPA 200.7	4	7	10	20	mg/kg µg/L	---	58	32
Iron - Total	EPA 200.7	4	7	10	20	mg/kg µg/L	17,412	2886	4,583
Kjeldahl Nitrogen - Dissolved	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	---	1.1	0.90
Kjeldahl Nitrogen - Total	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	745	1.25	1.65
Lead, Dissolved	EPA 200.7	1	0.5	5	2	mg/kg µg/L	---	n.d.	n.d.
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg mg/L	11.7	n.d.	2.3
Mercury, Dissolved	EPA 245.1	0.2	0.02	1	0.04	mg/kg µg/L	---	n.d.	n.d.
Mercury, Total	EPA 245.1	0.2	0.02	1	0.04	mg/kg µg/L	n.d.	n.d.	n.d.
Nitrate/Nitrite Nitrogen - Dissolved	EPA 353.2	0.2	0.02	1	0.10	mg/kg mg/L	---	1.2	1.2
Nitrate/Nitrite Nitrogen - Total	EPA 353.2	0.2	0.02	1	0.10	mg/kg mg/L	1.8	1.2	1.2
Dieldrin	EPA 8081	10	0.001	50	0.003	µg/kg µg/L	n.d.	n.d.	n.d.
Polychlorinated Biphenyls (PCB's)	EPA 8082	10	0.001	50	0.003	µg/kg µg/L	n.d.	n.d.	n.d.
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.1	8.3	7.91
Dissolved Organic Carbon - DOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	---	7.6	9.1
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	12,100	7.5	10
Dissolved Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	---	0.11	0.22
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	642	0.39	0.4
Percent Solids	SM 2540 G	0.05	---	1.0	---	mg/kg mg/L	63.22	---	---
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	103	60
Turbidity, Dissolved	EPA 180.1	-	1	-	3	APHA	---	n.d.	n.d.
Turbidity, Total	EPA 180.1	-	1	-	3	NTU	---	58	243
Zinc, Dissolved	EPA 200.7	1	10	5	30	mg/kg µg/L	---	n.d.	11 J
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	58.4	14.5	32.8

n.d. = Not Detected

--- Test not requested/Applicable

J = Estimated concentration below laboratory reporting limit.

PCBS - Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260

Prem N. Arora
Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.



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Particle Size Distribution Report

Project: DEER ISLAND ELUTRIATE SPS-DEERID-001 TRIP EDXWAO 041310

Report No.: 10-113-2208

Client: US ARMY CORPS OF ENGINEERS

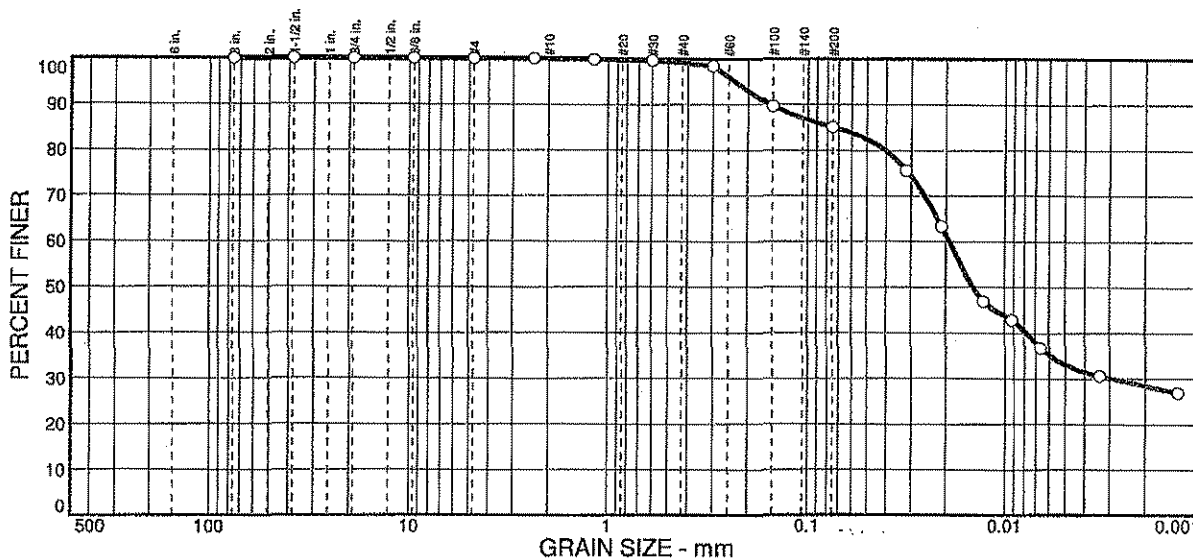
Sample No: 1701373

Source of Sample:

Date: 04/13/2010

Location: DR-S3

Elev./Depth:



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.8	14.2	52.0	33.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.8		
#30	99.6		
#50	98.4		
#100	89.6		
#200	85.0		

Soil Description

PL= Atterberg Limits LL= PI=

Coefficients
D₈₅= 0.0750 D₆₀= 0.0192 D₅₀= 0.0145
D₃₀= 0.0029 D₁₅= D₁₀=
C_u= C_c=

USCS= Classification AASHTO=

Remarks

* (no specification provided)

Figure



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Report #: 10-187-2095
10-182-2197
10-182-2206

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: DEER ISLAND ELUTRIATE MONITORING
Project #: SPS-DEERID-001
Trip Number: EDXWAO 041310

Lab Number:							1701376	1701370	1701379
Sample ID:							DR-S3	DR-W1 MOR	Elutriate
Parameter	Method	Method Detection Limit	Laboratory Reporting Limit	Units	Soil	Receiving Water	Elutriate Water		
		soil water	soil water						
Ammonia as N, - Dissolved	EPA 350.2	0.2	0.02	1 0.1	mg/kg mg/L	---	0.12	n.d.	
Ammonia as N, - Total	EPA 350.2	0.2	0.02	1 0.1	mg/kg mg/L	72.1	0.11	0.05 J	
Atrazine	EPA 200.8	0.25	0.05	2.5 0.15	mg/kg µg/L	n.d.	n.d.	n.d.	
CBOD	SM 5210B	-	2	- 5	mg/kg µg/L	---	3	5	
Chemical Oxygen Demand-COD	ASTM 1252	-	2	- 5	mg/L	---	25	34	
Chromium, Dissolved	EPA 200.7	0.2	10	1 30	mg/kg µg/L	---	n.d.	n.d.	
Chromium, Total	EPA 200.7	0.2	10	1 30	mg/kg µg/L	13.4	n.d.	10 J	
Copper, Dissolved	EPA 200.7	0.2	2	1.0 5	mg/kg µg/L	---	n.d.	n.d.	
Copper, Total	EPA 200.7	0.2	2	1.0 5	mg/kg µg/L	13.2	n.d.	8.0	
Iron - Dissolved	EPA 200.7	4	7	10 20	mg/kg µg/L	---	58	77	
Iron - Total	EPA 200.7	4	7	10 20	mg/kg µg/L	15,482	2886	7,975	
Kjeldahl Nitrogen - Dissolved	EPA 351.3	2	0.2	10 0.5	mg/kg mg/L	---	1.1	0.90	
Kjeldahl Nitrogen - Total	EPA 351.3	2	0.2	10 0.5	mg/kg mg/L	1322	1.25	1.17	
Lead, Dissolved	EPA 200.7	1	0.5	5 2	mg/kg µg/L	---	n.d.	n.d.	
Lead, Total	EPA 200.7	1	0.5	5 2	mg/kg mg/L	10.4	n.d.	n.d.	
Mercury, Dissolved	EPA 245.1	0.2	0.02	1 0.04	mg/kg µg/L	---	n.d.	n.d.	
Mercury, Total	EPA 245.1	0.2	0.02	1 0.04	mg/kg µg/L	n.d.	n.d.	n.d.	
Nitrate/Nitrite Nitrogen - Dissolved	EPA 353.2	0.2	0.02	1 0.10	mg/kg mg/L	---	1.2	1.2	
Nitrate/Nitrite Nitrogen - Total	EPA 353.2	0.2	0.02	1 0.10	mg/kg mg/L	2	1.2	1.2	
Dieldrin	EPA 8081	10	0.001	50 0.003	µg/kg µg/L	n.d.	n.d.	n.d.	
Polychlorinated Biphenyls (PCB's)	EPA 8082	10	0.001	50 0.003	µg/kg µg/L	n.d.	n.d.	n.d.	
Particle Size	Sieve	---	---	---	---	See Attached	---	---	
pH	SM 4500-H	0.1	0.2	---	---	7.7	8.3	7.88	
Dissolved Organic Carbon - DOC	EPA 415.1	2	0.2	10.0 1	mg/kg mg/L	---	7.6	7.4	
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0 1	mg/kg mg/L	12,400	7.5	7.6	
Dissolved Phosphorus	SM 4500 P-F	0.2	0.02	1 0.05	mg/kg mg/L	---	0.11	0.09	
Total Phosphorus	SM 4500 P-F	0.2	0.02	1 0.05	mg/kg mg/L	618	0.39	0.34	
Percent Solids	SM 2540 G	0.05	---	1.0	---	62.95	---	---	
Total Suspended Solids	SM 2540D	-	4	- 10	mg/L	---	103	96	
Turbidity, Dissolved	EPA 180.1	-	1	- 3	APHA	---	n.d.	n.d.	
Turbidity, Total	EPA 180.1	-	1	- 3	NTU	---	56	1178	
Zinc, Dissolved	EPA 200.7	1	10	5 30	mg/kg µg/L	---	n.d.	14	
Zinc, Total	EPA 200.7	1	10	5 30	mg/kg µg/L	52.3	14.5	42.0	

n.d. = Not Detected

--- Test not requested/Applicable

J = Estimated concentration below laboratory reporting limit.

PCBS - Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260

Prem N. Arora
Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.