Appendix A

Public and Agency Coordination

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Public and Agency Coordination

Coordination among the Kansas City and Omaha Districts of the Corps, USFWS, and MDC has been ongoing throughout the approval and implementation process for Barney Bend. In August 2006, the USFWS and MDC were contacted to solicit comments regarding Barney Bend. Correspondence with the NRCS was initiated in December 2006. The request for comment letters and the letters received from the agencies in response to the request are included in this appendix. Table A-1 provides a brief summary of the agencies' responses.

On August 1, 2006 the Corps held a site visit with representatives from MDC, Omaha District Corps, local levee district, and private landowners. During the meeting, the group reviewed the preliminary chute alignment for Barney Bend and the Corps received input from all representatives present. This input was used to evaluate the chute alternatives developed and to assist in selecting a recommended alternative.

TABLE A-1. AGENCY COMMENTS

Agency	Response
MDC	Records show that sensitive species are known to exist in the Missouri River north of Kansas City but are not known within ½ mile of the boundaries of Barney Bend nor in close proximity to the proposed chute. A list of species of conservation concern and information from the Heritage Database was provided; recommended actions to minimize potential impacts to sensitive biological resources.

NRCS	Farmland of Statewide Importance is located in the project area. Complete Form AD-1006.
USFWS	Records show that the following species may occur in the project area: Bald eagle (*Haliaeetus leucocephalus*), Indiana bat (*Myotis sodalis*), and Pallid sturgeon (*Scaphirhynchus albus*).

A description of the proposed project was circulated to the public and resource agencies through a Public Notice, No. **To Be Determined (TBD)**, dated **TBD**, with a thirty-day comment period ending on **TBD**. This notice contained a project description, along with information on the Corps' preliminary determination to prepare a Finding of No Significant Impact for the project and a draft Section 404(b)(1) Evaluation. The notice was mailed to individuals, agencies, and businesses listed on the NWK-Regulatory Branch's General, State of Missouri and Atchison county mailing lists. The Public Notice was also available for public and agency review and comment on the NWK-Regulatory Branch's website and the Mitigation Program's website (http://www.nwk.usace.army.mil/projects/mitigation/).

August 30, 2006

Mr. Shannon Cave
Missouri Department of Conservation
2901 West Truman Boulevard
P.O. Box 180
Jefferson City, MO 65102-0180

Re: Request for Threatened and Endangered Species Information
Barney Bend Chute at the Lower Hamburg Mitigation Site

Dear Mr. Cave:

HDR Engineering, Inc. is under contract to the U.S. Army Corps of Engineers (Corps), Kansas City District, to complete a Project Implementation Report (PIR) for the construction of a flow through chute at Barney Bend located within the Lower Hamburg Mitigation Site (Lower Hamburg) as part of the Missouri River Fish and Wildlife Mitigation Program (Mitigation Program). The objectives of the Mitigation Program are to restore Missouri River ecosystem habitat in the floodplain adjacent to the main channel of the Missouri River. Historically, chutes, wetlands, backwater areas, and sandbars contributed to the river ecosystem. The following provides a brief description of Barney Bend.

Barney Bend is generally located between River Mile (RM) 546.5 and RM 550 on the left descending bank of the Missouri River in Atchison County, Missouri. Lower Hamburg contains approximately 2,665 acres of land owned by the Corps and managed by the Missouri Department of Conservation (MDC). The following are enclosed for your information and assistance reviewing the project:

- A project location map showing the project boundary on a USGS topographic map,
- An aerial photograph of the site showing the preferred alignment for the Barney Bend chute,
- A real estate tract map for the Lower Hamburg Mitigation Site; including the tracts that comprise Barney Bend.

Under current Corps program management guidelines, a PIR is required for each mitigation site to ensure compliance with the National Environmental Policy Act (NEPA) and Corps policy. The focus of the PIR will be conducting an alternatives analysis and Environmental Assessment (EA) for the proposed chute at Barney Bend.

At this time, we are requesting information regarding rare, threatened and endangered species or ecologically sensitive areas within the project area. Please address all correspondence to my attention at HDR at the address provided on this letter. If you have any questions regarding this request, please contact me at (816) 360-2700.

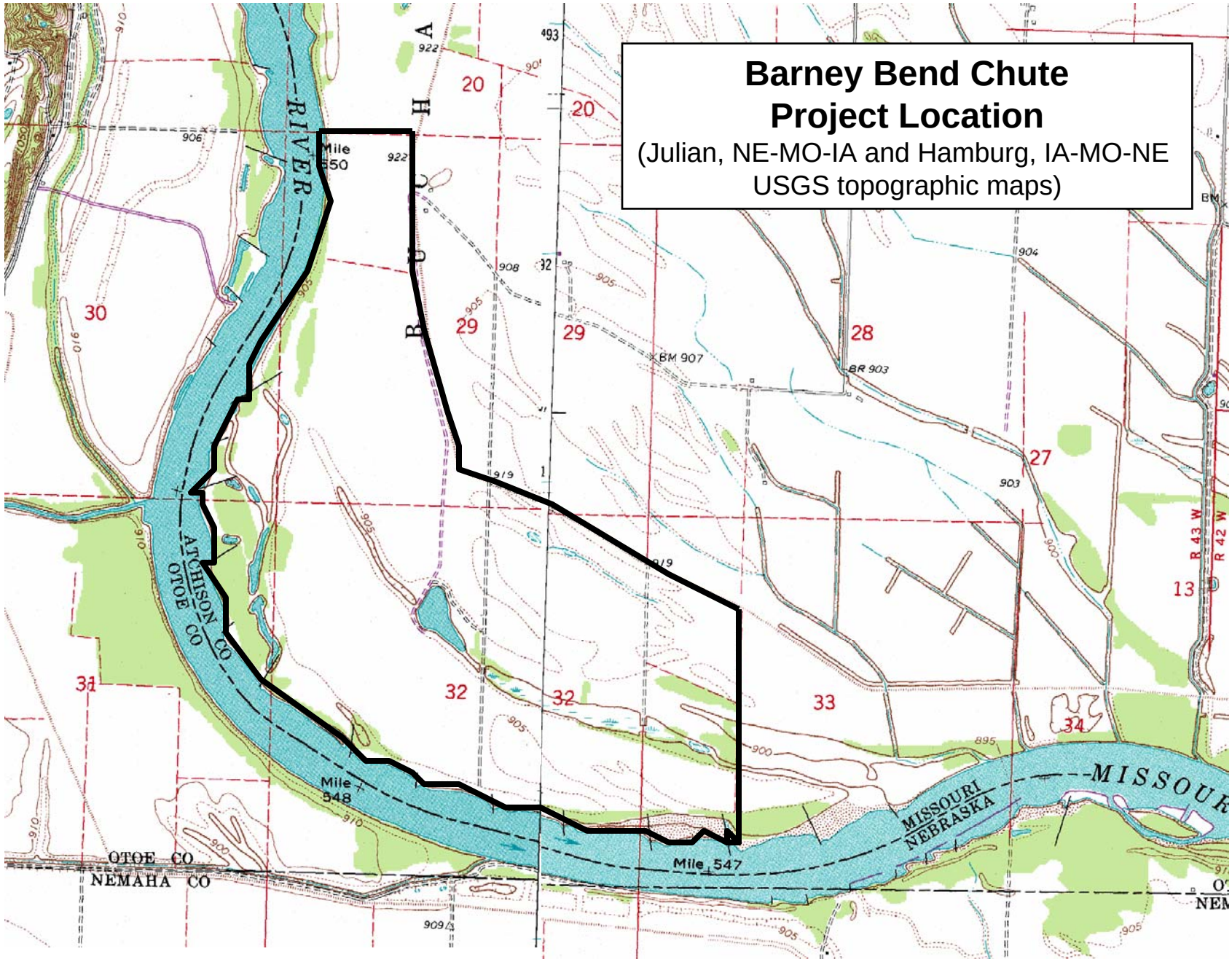
Sincerely,

HDR ENGINEERING, INC.

Michael V. Snyder
Environmental Scientist

Enclosure

cc: David Hibbs, Corps
File


Barney Bend Chute
Project Location
(Julian, NE-MO-IA and Hamburg, IA-MO-NE
USGS topographic maps)
RIVER
ATCHISON CO
OTOE CO
Mile 550
Mile 548
Mile 547
MISSOURI
NEBRASKA
OTOE CO
NEMAHA CO
MISSOURI
20
29
30
28
27
13
31
32
33
34
R 43 W
R 42 W
BM 907
BR 903

NOTE:

1. SEE SHEET NO. _____ FOR BORING LOCATIONS

2. ALL ROCK CONTROL STRUCTURES SHALL BE CONSTRUCTED PRIOR TO OPENING THE CHUTE TO THE MISSOURI RIVER.

US Army Corps of Engineers
Kansas City District

Symbol	Description	Date	Appr.

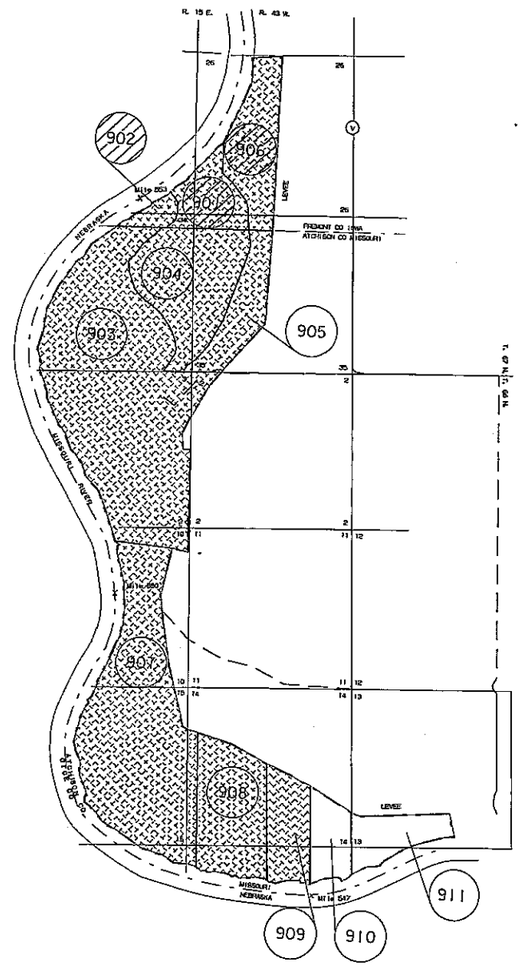
Designed by:
Drawn by:
Checked by:
Submitted by:
Date: AUGUST 2006
File no.
Plot scale:
CADD File Name:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

MISSOURI RIVER
BARGE CHUTE
LOWER HAMBURG MITIGATION SITE

OVERALL PLANVIEW

Sheet reference number:
C1.2



321.10 ACRES, FEE, (TRACTS 901,902,&906) TRANSFERRED TO CENWO BY DD FORM 1354 DATED 4 FEBRUARY 2000, ACCEPTED.

TRACT REGISTER

TRACT NO.	LAND OWNER	ACREAGE FEE	ACREAGE EASM'T		REMARKS
900	NOT USED				
901	FRED A. WALKER, ET AL	103.70			DEED DTD 25 JUL 97
902	LUCIAN SMITH, ET UX	31.66			DEED DTD 01 JUL 98
903	LUCIAN M. SMITH, TRUSTEE	940.84			DEED DTD 01 JUL 98
904	WOLTEMATH FARM, INC.	240.00			DEED DTD 09 OCT 98
905	DOROTHY WOLTEMATH, TRUSTEE	130.37			DEED DTD 09 OCT 98
906	STATE LINE FARM COMPANY	185.74			DEED DTD 22 DEC 95
907	ARTHUR VOGEL, ET UX	613.00			DEED DTD 29 AUG 96
908	ARTHUR M. VOGEL, ET UX	230.00			DEED DTD 29 AUG 96
909	MICHAEL K. BINDER, ET UX	111.00			DEED DTD 29 FEB 96
* 910	DENNIS HENDRICKSON AND	84.53			
	PATRICIA HENDRICKSON, TR.				
* 911	E. B. NENNEMANN, INC.	96.51			

* NOT INCLUDED IN STATISTICS

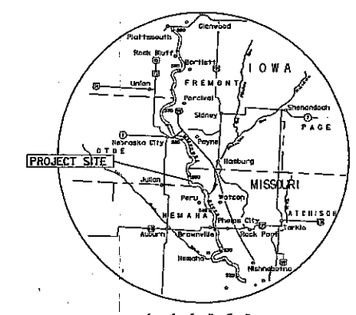
ACREAGE SUMMARY

ATCHINSON COUNTY

FEE ---------- 2,265.21 ACRES
LESS. INT'S ---------- 0 ACRES

FREEMONT COUNTY

FEE ---------- 321.10 ACRES
LESS. INT'S ---------- 0 ACRES



VICINITY MAP

STATE INDEX

FINAL PROJECT MAP

DEPT. OF THE ARMY

USING SERVICE U.S.A.C.E.

LOCATION OF PROJECT

STATE IOWA, MISSOURI
COUNTY FREMONT CO. IA/ATCHISON CO. MO
DIVISION NORTHWEST
DISTRICT KANSAS CITY
ARMY AREA FIFTH

TRANSPORTATION FACILITIES

RAILROADS
STATE ROADS ROUTE "V"
FEDERAL ROADS
AIR LINES

ACQUISITION

TOTAL ACRES ACQUIRED 2,586.31
FEE 2,586.31
PUBLIC DOMAIN { WITHDRAWAL / USE PERMIT
USE PERMIT (OTHER THAN P.D.)
TRANSFER {
LEASE
LESSER INTERESTS {

DISPOSAL

TOTAL ACRES DISPOSED OF 321.10
SOLD
PUBLIC DOMAIN { WITHDRAWAL / USE PERMIT
USE PERMIT (OTHER THAN P.D.)
TRANSFERRED { FEE 321.10
LEASE TERMINATED
LESSER INTERESTS TERM. {
REASSIGNED
OTHER

LEGEND

EXCEPT FOR THE SPECIAL SYMBOLS SHOWN BELOW MAP SYMBOLS ARE STANDARD IN ARMY MAP SERVICE TECHNICAL MANUAL NO. 20.

RESERVATION LINE
TRACT BOUNDARY LINE
TRACT NUMBER 900
CONTOUR LINE 914
DISPOSAL
EXTENDED OWNERSHIP LINE

1st End MRK-RE to MRK-DE--- DTD 01-29-96
1st End MRK-RE to MRK-GE-- DTD 07-14-95
PL99-662 ---------- DTD 11-17-86

ACQUISITION AUTHORIZATION

SEGMENT "9"

DEPARTMENT OF THE ARMY
OFFICE OF THE KANSAS CITY DISTRICT ENGINEER
NORTHWESTERN DIVISION

DRAWN BY: P.L.R.
TRACED BY: K.R.W.
CHECKED BY: W.K.M.

REAL ESTATE
MISSOURI RIVER BANK
STABILIZATION & NAVIGATION,
FISH & WILDLIFE MITIGATION PROJECT

LOWER HAMBURG BEND
IOWA-MISSOURI

RECOMMENDED BY:
CHIEF, PLANNING AND CONTROL BRANCH

APPROVED BY:
CHIEF, REAL ESTATE DIVISION
DATE

OFFICE, CHIEF OF ENGINEERS, WASHINGTON, D.C. 20314

AUDITED

INSTALLATION OR PROJECT NO. KC-2-0028

SCALE IN FEET 2000 0 2000 4000

SHEET 1 OF 1 DRAWING NO. MO. 56

DATE AUDIT APPROVED	DATE	REVISIONS	BY
08-03-2000	2-10-2000	DUE TO FINAL AUDIT	JW

FILE: k:\projects\civil\mo\lo-hamburg\cadfiles\relocation.dgn

August 30, 2006

Mr. Charles Scott
U.S. Fish and Wildlife Service
101 Park DeVille Drive, Suite A
Columbia, MO 65203-0007

Re: Request for Threatened and Endangered Species Information
Barney Bend Chute at the Lower Hamburg Mitigation Site

Dear Mr. Scott:

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HDR Engineering, Inc.

4435 Main Street
Suite 1000
Kansas City, MO 64111-1856

Phone: (816) 360-2700
Fax: (816) 360-2777
www.hdrinc.com

At this time, we are requesting information regarding rare, threatened and endangered species or ecologically sensitive areas within the project area. Please address all correspondence to my attention at HDR at the address provided on this letter. If you have any questions regarding this request, please contact me at (816) 360-2700.

Sincerely,

HDR ENGINEERING, INC.

Michael V. Snyder
Environmental Scientist

Enclosures

cc: David Hibbs, Corps
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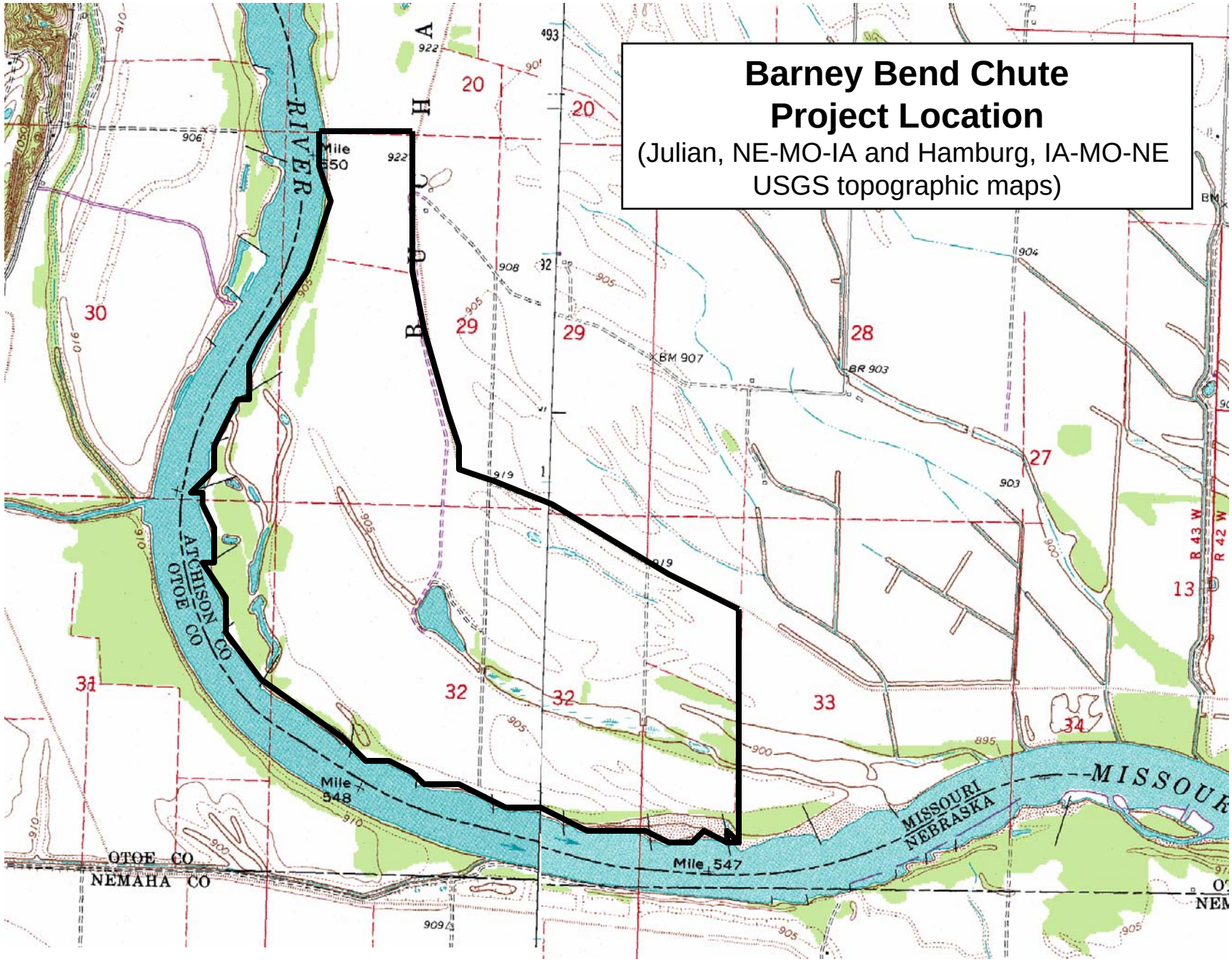
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US Army Corps of Engineers
Kansas City District

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Drawn by:
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Submitted by:
Date: AUGUST 2006
File no.
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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
KANSAS CITY, MISSOURI

MISSOURI RIVER
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LOWER HAMBURG MITIGATION SITE

OVERALL PLANVIEW

Sheet reference number:
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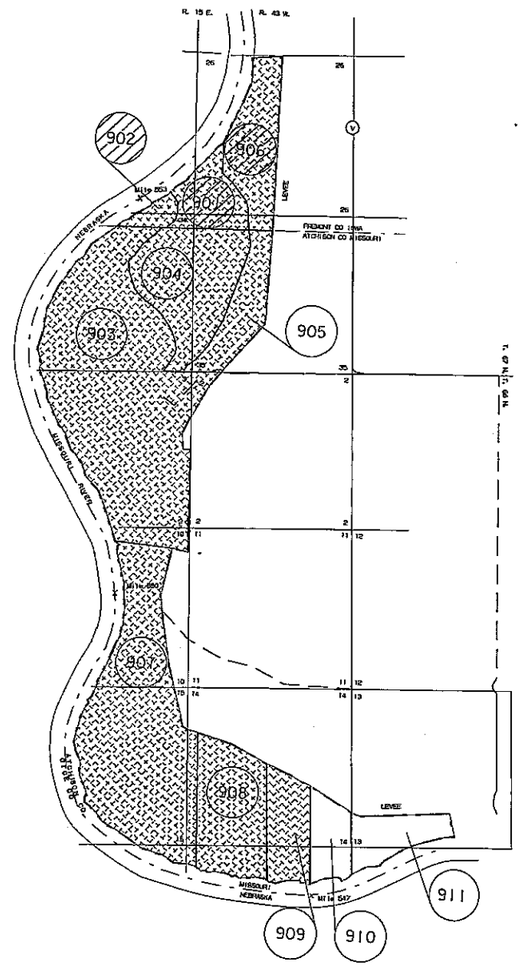

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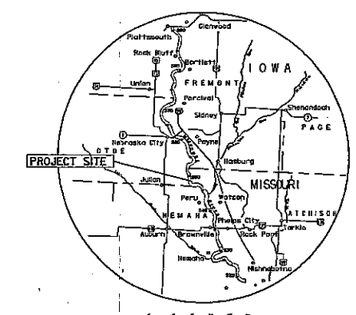

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AIR LINES

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USE PERMIT (OTHER THAN P.D.)
TRANSFER {
LEASE
LESSER INTERESTS {

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EXCEPT FOR THE SPECIAL SYMBOLS SHOWN BELOW MAP SYMBOLS ARE STANDARD IN ARMY MAP SERVICE TECHNICAL MANUAL NO. 20.

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PL99-662 ---------- DTD 11-17-86

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DEPARTMENT OF THE ARMY
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DRAWN BY: P.L.R.
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REAL ESTATE
MISSOURI RIVER BANK
STABILIZATION & NAVIGATION,
FISH & WILDLIFE MITIGATION PROJECT

LOWER HAMBURG BEND
IOWA-MISSOURI

RECOMMENDED BY:
CHIEF, PLANNING AND CONTROL BRANCH

APPROVED BY:
CHIEF, REAL ESTATE DIVISION
DATE

OFFICE, CHIEF OF ENGINEERS, WASHINGTON, D.C. 20314

AUDITED

INSTALLATION OR PROJECT NO. KC-2-0028

SCALE IN FEET 2000 0 2000 4000

SHEET 1 OF 1 DRAWING NO. MO. 56

DATE AUDIT APPROVED	DATE	REVISIONS	BY
08-03-2000	2-10-2000	DUE TO FINAL AUDIT	JW

FILE: k:\projects\civil\mo\lo-hamburg\cadfiles\relocation.dgn

Missouri Department of Conservation
Policy Coordination Unit
P. O. Box 180
Jefferson City, MO 65102
573-522-4115 X 3250 -- Shannon.Cave@mdc.mo.gov

Heritage Review Report

Mr. Michael V. Snyder
HDR
4435 Main Street, Suite 1000
Kansas City, MO 64111-1856
Copy: Stuart Miller (MDC)

Project type: Chute Restoration
Location: 664329, 30 & 32
County: Atchison
Described in query as: Barney Bend Chute, USACE
Date query received: September 1, 2006

This is not a site clearance letter, but a report of Missouri Department of Conservation records concerning public lands and sensitive resources known to be near and possibly affected by the proposed project. Stuart Miller is MDC's policy coordinator for compliance issues in this part of the state, and will provide continuing liaison if needed (573-522-4115 X 3378, Stuart.Miller@mdc.mo.gov).

Prepared by:
September 5, 2006

Records Found of Species/habitats with Federal and State concerns: The Missouri River and its floodplain are home to a number of species of state and federal concern, including pallid sturgeon, gray bats, Indiana bats, bald eagles, lake sturgeon, flathead chubs and others. There are no records within ½ mile of the boundaries of the Conservation Area, nor in close proximity to the proposed chute. Species recorded in the river may have records many miles upstream or down, and important species like the following must be assumed to be present in appropriate habitats in this part of the Missouri River and its floodplain. The following records are known in the Missouri River north of Kansas City

Species	Common name	Federal Status	State Status	State Rank
Haliaeetus leucocephalus	Bald Eagle	T	E	S3
Scaphirhynchus albus	Pallid Sturgeon	E	E	S1
Falco peregrinus	Peregrine Falcon	none	E	S1
Rallus elegans	King Rail	none	E	S1
Platygobio gracilis	Flathead Chub	none	E	S1
Botaurus lentiginosus	American Bittern	none	E	S1

STATUS CODES- Federal status derives from the federal Endangered Species Act, administered by the U.S. Fish and Wildlife Service. The ESA provides protection for plants and animals listed as: E = Endangered, T = Threatened, C = Candidate, PE = Proposed Endangered for Federal listing. ***Consult with U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132) if your project affects a listed species.***
"State Status" is either E, for "endangered," or blank.
"State Rank" codes are S1 = Critically Imperiled, S2 = Imperiled, or S3 = Rare and uncommon in the state.

Records Found of Species/habitats with State concerns: There is a record of *rana pipiens*, the northern leopard frog, about one mile northeast of the start of the chute. Rana pipiens is not federally-listed or state-endangered. It is tracked as an S2 species (imperiled)

Concerns & management recommendations based on site or project details, not related to specific heritage records:

Indiana bats (*myotis sodalis,* Federally endangered, State endangered) roost and raise young under the bark of trees in riparian forests and upland forests near perennial streams in north Missouri. This project seems likely to impact trees that, in summer, might be use by Indiana bats. Please coordinate with the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) about managing this project for Indiana bats. Additional information to incorporate in planning documents is available at http://www.mdc.mo.gov/documents/nathis/endangered/indianabat.pdf.

Streams in the area should be protected from soil erosion, water pollution and in-stream activities that modify or diminish aquatic habitats. Best management recommendations relating to streams and rivers may be found at http://www.mdc.mo.gov/documents/nathis/endangered/streams.pdf

A HERITAGE REVIEW provides information about species and habitats of concern that could be affected by the project. Heritage records note things that were positively identified at some date and time, marked at a location that may be more or less precise. Animals move quickly but plant communities can move also. To say "there is a record" does not mean the species/habitat is still there. To say that "there is no record" does not mean the project may not encounter something. Because of this, reports include information about records near but not necessarily on the project site. Three different kinds of information are provided.

- *FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.*
- *STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and protected under the Wildlife Code of Missouri (RSMo 3 CSR 10). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR10-4.111. "State Rank" is numeric rank of relative rarity, protected under general provisions of the Wildlife Code but not endangered.*
- *"Concerns & management recommendations" are things for which one might prudently look. There is no specific heritage record, but our knowledge of the surrounding landscape suggests consideration. 93% of Missouri's land is in private ownership, so most sites have never been carefully inspected by conservation professionals*

This report is not a site clearance letter. Rather, it provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from our Heritage Database into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive natural resources. However, the Heritage Database is only one reference that should be used to evaluate potential adverse impacts. Other types of information, such as wetland and soils maps and on-site inspections or surveys, should be considered. Reviewing current landscape and habitat information and species biological characteristics would additionally ensure that species of conservation concern are appropriately identified and addressed.

Additional information on rare, endangered and watched species may be found at http://www.mdc.mo.gov/nathis/endangered/.. If you would like printed copies of best management practices cited as internet URLs, please contact us.

Snyder, Michael

From: Jane_Ledwin@fws.gov
Sent: Friday, September 29, 2006 1:19 PM
To: Snyder, Michael
Cc: David.r.hibbs@usace.army.mil; Stuart Miller
Subject: Barney Bend Chute information - listed species

Mike:

Please refer to your August 30, 2006, letter requesting information on federally listed species that may occur near Barney Bend, on the Missouri River (RM 545-550) in Atchison County, Missouri. I'm emailing our response to expedite your preparation of the Project Implementation Report for the Barney Bend Chute as part of the BSNP Fish and Wildlife Mitigation Project.

Based on the location and the information in your letter and enclosed documents, we've determine the following species may occur in the project area:

Indiana bat (Myotis sodalis), Endangered – From late fall through winter Indiana bats in Missouri hibernate in caves in the Ozarks and Ozark Border Natural Divisions. During the spring and summer, Indiana bats utilize living, injured (e.g. split trunks and broken limbs from lightening strikes or wind), dead or dying trees for roosting throughout the state. Indiana bat roost trees tend to be greater than 9 inches diameter at breast height (dbh) (optimally greater than 20 inches dbh) with loose or exfoliating bark. Most important are structural characteristics that provide adequate space for bats to roost.

Preferred roost sites are located in forest openings, at the forest edge, or where the overstory canopy allows some sunlight exposure to the roost tree, which is usually within 1 km (0.6 mi.) of water. Indiana bats forage for flying insects (particularly moths) in and around the tree canopy of floodplain, riparian, and upland forests.

If trees suitable for use by Indiana bats are to be removed for the proposed project the Service recommends a survey be conducted by a qualified biologist to determine the presence or absence of Indiana bats and avoid the potential injury or death to roosting individuals and maternity colonies. Survey efforts should include using a combination of mist nets and bat detection devices [e.g., “Anabat” (© Titley Electronics, Ballina, New South Wales, Australia)]. If it is determined that a survey for Indiana bats is needed, please contact the Missouri Ecological Services Field Office to obtain specific information regarding survey protocol. If surveys indicate that Indiana bats are using trees proposed to be removed during their breeding season (April 1 to September 30) further consultation with the Service under section 7 of the Act will be required.

Pallid Sturgeon (Scaphirhynchus albus), Endangered - The pallid sturgeon is found primarily in the Missouri River and the Mississippi River downstream of its, confluence with the Missouri RIver. Limited data is available concerning preferred habitats in the Missouri, but adults of the species has been captured across many river habitats, including tributary mouths, sandbars, along main channel borders, deep holes (winter) and along revetments. Small sturgeon have been captured in areas with shoals, island tips, and secondary channels.

Bald eagle (Haliaeetus leucocephalus), Threatened – Bald eagles are common migrants and winter residents throughout the state and are uncommon breeders along some of the major rivers and larger reservoirs in the state.
During winter, they congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. Wintering eagles usually occupy river habitats between November 15 and March 1, and use large diameter riparian tree species as daytime perches

and night roosts. They usually perch within a riparian corridor or along lake shores and prefer areas with limited human activity. At night, wintering bald eagles may congregate at communal roosts and will travel as much as 20 kilometers (12 miles) from feeding areas to a roost site. The period January 1 to March 1 is important for initiating nesting activity; March 1 to May 15 is the most critical time for incubation and rearing of young.

Bald eagles are known to prefer trees greater than 11 inches dbh and within 100 to 600 feet of water for perching sites. Eagles also tend to roost on the tallest trees (greater than 63 feet above ground level). Cottonwood (Populus deltoides) and sycamore (Platanus occidentalis) are often selected over other trees for perching and roosting. We recommend the project be designed to avoid the loss of trees matching these criteria.

Please give me a call if you have questions regarding these comments or need additional information. Thanks for the opportunity to comments.

Jane Ledwin

****
Jane Ledwin
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
101 Park DeVille Drive
Columbia, Missouri 65203
Phone 573/234-2132, extension 109
email jane_ledwin@fws.gov
****

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December 11, 2006

Mr. David Kacirek
Natural Resources Conservation Service
3915 Oakland Avenue
St. Joseph, MO 64506-4920

Re: Barney Bend Chute Project

Dear Mr. Kacirek:

HDR Engineering, Inc. is under contract to the U.S. Army Corps of Engineers (Corps) Kansas City District to complete a Project Implementation Report and Plans and Specifications for planning and design of a flow-through chute at Barney Bend, an area of the Lower Hamburg Missouri River Mitigation Site. Barney Bend is located in Atchison County, Missouri and is generally located between RM 546.5 and 550 on the left descending bank of the Missouri River. The site is located in Sections 29, 32, and 33 of T66N, R43W.

The soils on-site include the Haynie silt loam, sandy substratum, frequently flooded and Sarpy loamy fine sand, frequently flooded. The Haynie silt loam, sandy substratum, frequently flooded is classified as a prime farmland if protected from flooding or not frequently flooded during the growing season. The area of Barney Bend lies riverward of Federal levee L-575 and is not protected from flooding; therefore, it was assumed that this soil is not a prime farmland in this case. The Sarpy loamy fine sand, frequently flooded is classified as a farmland of statewide importance.

In compliance with the Farmland Protection Policy Act, HDR is submitting the enclosed Form AD-1006 on behalf of the Corps to report the planned conversion of a farmland of statewide importance. Direct impacts were considered those resulting from the loss of soils to chute excavation. Indirect impacts were considered those acres of soil

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that would have restricted access following construction of the chute as they would become an island. These impacts are reported in Part III of Form AD-1006. A map of the project area, identifying the project boundary, chute alignment, and impacted areas of farmlands of statewide importance is enclosed. It is our understanding that NRCS shall complete Parts II, IV, and V of Form AD-1006, and then return to HDR for completion of Part VI and VII. Please contact me at (816) 360-2779 or at michael.snyder@hdrinc.com if you have any questions regarding this evaluation. We look forward to working with you to complete the reporting requirements.

Sincerely,

Michael V. Snyder
Environmental Scientist

Enclosures

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 12/11/06
Name Of Project Barney Bend	Federal Agency Involved U.S. Army Corps of Engineers
Proposed Land Use Fish & Wildlife Habitat Mitigation	County And State Atchison County, Missouri
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

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	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS	

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	16.7			
B. Total Acres To Be Converted Indirectly	142.3			
C. Total Acres In Site	159.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	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	Site A	Site B	Site C	Site D
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	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

Form AD-1006 (10-83)

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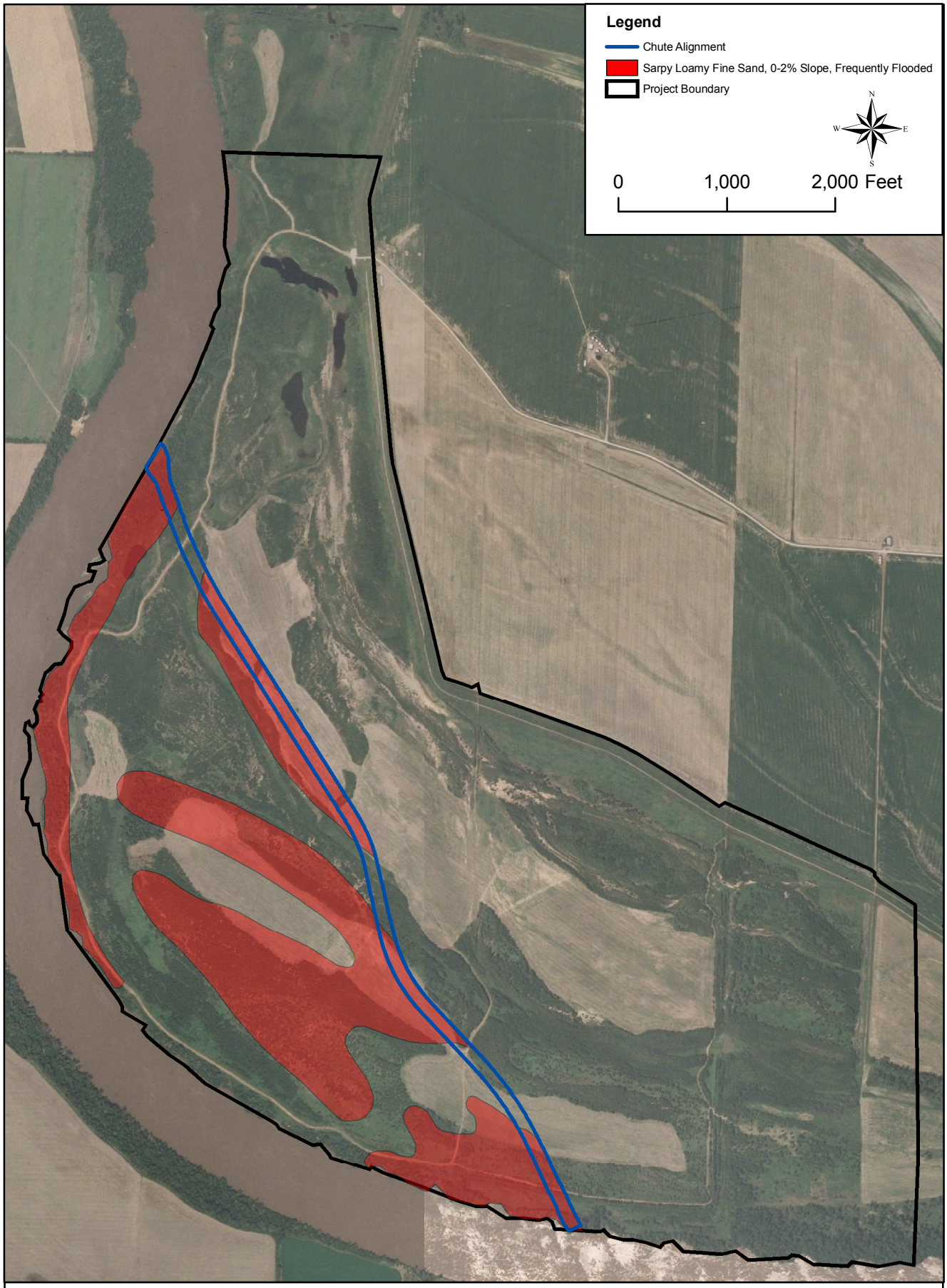

HDR

Barney Bend Chute

Farmland of State Wide Importance

US Army Corps of Engineers
Kansas City District

United States Department of Agriculture

USDA

NRCS Natural Resources Conservation Service

3915 Oakland Avenue, Suite 103, St. Joseph, MO. 64506

December 18, 2006

Mr. Michael V. Snyder
HDR Engineering, Inc.
4435 Main Street
Suite 1000
Kansas City, MO 64111-1856

Dear Mr. Snyder,

Enclosed is the Farmland Conversion Impact Rating (Form AD-1006) for the habitat mitigation project in Atchison County, Missouri. The designated area does contain farmland of statewide importance. After you, or the funding agency, have completed parts VI and VII, please send one copy to my office.

If you have any questions, please call me at 816-232-6555 ext. 138.

Sincerely,

David K. Kacirek
Area Resource Soil Scientist

Enclosure:

cc: Christina L. Rader, District Conservationist, Rock Port, MO

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 12/11/06
Name Of Project Barney Bend	Federal Agency Involved U.S. Army Corps of Engineers
Proposed Land Use Fish & Wildlife Habitat Mitigation	County And State Atchison County, Missouri
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 12-13-06

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 –	Average Farm Size 625
Major Crop(s) Corn - Soybean	Farmable Land In Govt. Jurisdiction Acres: 328,498 % 94.1	Amount Of Farmland As Defined in FPPA Acres: 324278 92.8	
Name Of Land Evaluation System Used LESA	Name Of Local Site Assessment System –	Date Land Evaluation Returned By NRCS 12-18-06 D.K.K.	

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	16.7			
B. Total Acres To Be Converted Indirectly	142.3			
C. Total Acres In Site	159.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	-0-			
B. Total Acres Statewide And Local Important Farmland	159.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	.05%			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	94.1%			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	43		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	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

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January 16, 2007

Mr. David Kacirek
Natural Resources Conservation Service
3915 Oakland Avenue, Suite 103
St. Joseph, MO 64506-4920

Re: Barney Bend Chute Project

Dear Mr. Kacirek:

Enclosed please find the Farmland Conversion Impact Rating (Form AD-1006) for the Barney Bend chute project with completed parts VI and VII. I transferred the information you provided in your December 18, 2006 letter to the electronic Form AD-1006 for this submittal. Please note that some of the values you provided may have been automatically rounded as a result of the formatting in the electronic Form AD-1006. If you have any questions or require additional information please contact me at (816) 360-2779 or michael.snyder@hdrinc.com.

Sincerely,

Michael V. Snyder
Environmental Scientist

Enclosures

HDR Engineering, Inc.
4435 Main Street
Suite 1000
Kansas City, MO 64111-1856
Phone: (816) 360-2700
Fax: (816) 360-2777
www.hdrinc.com

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 12/11/06
Name Of Project Barney Bend Chute	Federal Agency Involved U.S. Army Corps of Engineers
Proposed Land Use Fish & Wildlife Habitat Mitigation	County And State Atchison County, Missouri
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 12/13/06

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 -- / Average Farm Size 625
Major Crop(s) Corn - Soybean	Farmable Land In Govt. Jurisdiction Acres: 328,498 % 94		Amount Of Farmland As Defined in FPPA Acres: 324,278 % 93
Name Of Land Evaluation System Used LESA	Name Of Local Site Assessment System --		Date Land Evaluation Returned By NRCS 12/18/06

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	16.7			
B. Total Acres To Be Converted Indirectly	142.3			
C. Total Acres In Site	159.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	0.0			
B. Total Acres Statewide And Local Important Farmland	159.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.1			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	94.1			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	43	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		15			
2. Perimeter In Nonurban Use		10			
3. Percent Of Site Being Farmed		3			
4. Protection Provided By State And Local Government		0			
5. Distance From Urban Builtup Area		15			
6. Distance To Urban Support Services		10			
7. Size Of Present Farm Unit Compared To Average		10			
8. Creation Of Nonfarmable Farmland		10			
9. Availability Of Farm Support Services		5			
10. On-Farm Investments		3			
11. Effects Of Conversion On Farm Support Services		0			
12. Compatibility With Existing Agricultural Use		1			
TOTAL SITE ASSESSMENT POINTS	160	82	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	43	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	82	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	125	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

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Appendix B

Engineering Report

Barney Bend Chute Construction Project
Missouri River Mitigation Program

A Shallow Water Habitat Project to be constructed on

Lower Hamburg Bend Mitigation Site

Atchison County, Missouri
Missouri River Miles 546.5 to 550.0

Evaluation of Chute Configurations

Final Report
January 2007

US Army Corps of Engineers
Kansas City District

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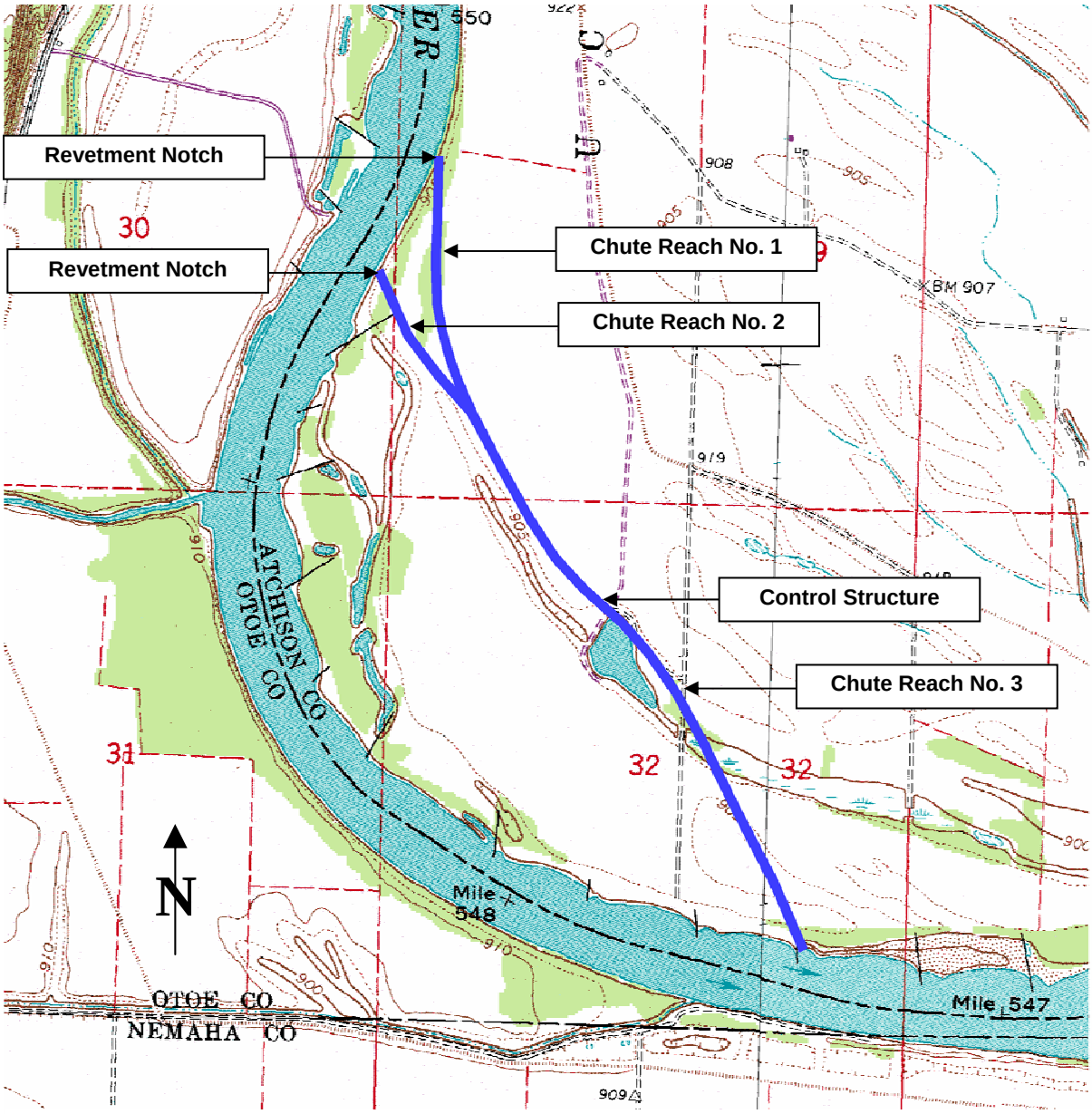
MISSOURI RIVER MITIGATION
BARNEY BEND CHUTE
LOWER HAMBURG BEND MITIGATION SITE

1.0 Overview

The Lower Hamburg Bend Mitigation Site is located in Atchison County, Missouri on the left descending bank of the Missouri River between river miles 547 and 554. The site contains approximately 2586 acres of land owned by the Corps of Engineers and managed by the Missouri Department of Conservation (MDC). The Lower Hamburg Bend Mitigation Site is comprised of two large parcels generally defined by a constriction at River Mile 550 where the Federal Levee L-575 comes to within approximately ¼ mile of the channel at Upper Barney Bend.

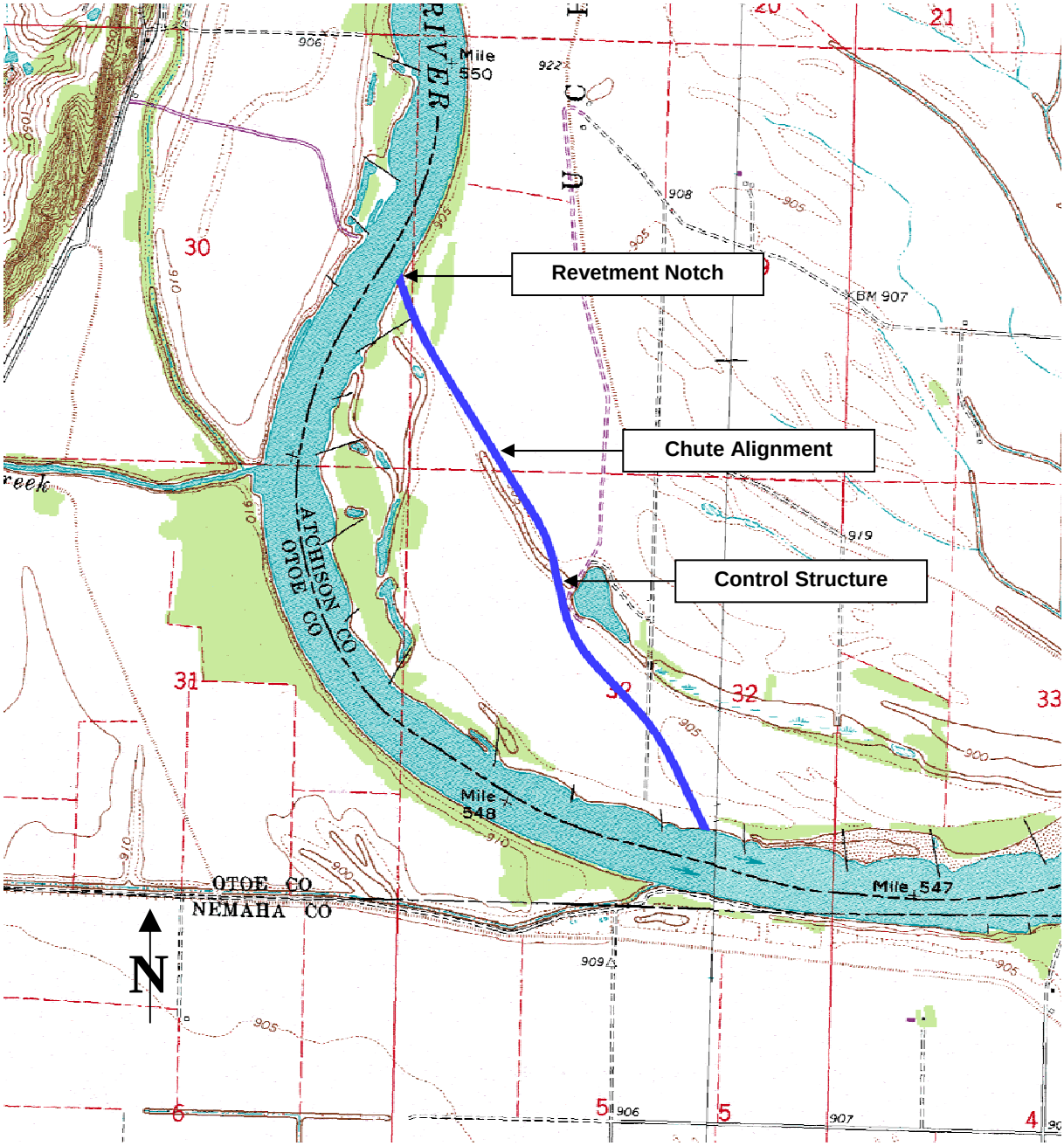
The northern parcel of the mitigation site has experienced significant habitat development including construction of a chute to reopen a historic channel and enhancement of a backwater slough. Construction of the chute and backwater slough was completed in 2004. Other habitat development activities have occurred on the site including shallow water habitat development, tree planting, warm season grass plantings, food plots and active management by the MDC. The southern parcel is largely undeveloped and experiencing agricultural leasing and natural succession of terrestrial habitat.

This report provides an evaluation of various chute configurations along two alternative chute alignments (see Figures 1 and 2) on the southern parcel of the Lower Hamburg Mitigation Site, generally located between river miles 546.5 and 550. Chute configurations are based on varied chute geometrics such as bottom width and depth. Each configuration has been evaluated in consideration of recommended design criteria, hydraulic performance, geotechnical issues, preliminary construction costs, and other factors. The recommended chute configuration is provided to best maximize aquatic and terrestrial habitat while optimizing cost and minimizing environmental impacts.



Source: USGS Topographic Mapping, 1:24,000 / Hamburg, IA–MO-NE photorevised 1984 / Julian, NE-MO-IA photorevised 1984

Figure 1
Barney Bend Chute Alignment No. 1



Source: USGS Topographic Mapping, 1:24,000 / Hamburg, IA–MO-NE photorevised 1984 / Julian, NE-MO-IA photorevised 1984

Figure 2
Barney Bend Chute Alignment No. 2

2.0 Constraints

The project should not affect other congressionally authorized projects such as flood control or commercial navigation, nor should the project adversely affect existing infrastructure or private property.

The Lower Hamburg Mitigation Site is owned by the Corps and managed by the MDC.

Flood control is provided at the Lower Hamburg Mitigation Site by Federal levee L-575. The proposed chute alignment is greater than 1300 feet away from the levee toe.

A non-federal agricultural levee begins near river mile 550 and continues south, generally following the left bank of the Missouri River to approximately river mile 547. The levee height varies considerably, with the majority being approximately five feet high. The levee is heavily vegetated, including many small trees. In the vicinity of river mile 550, the levee is considerably higher, and in some locations actually higher than the L-575. According to discussions with local landowners and levee district representatives, this higher segment of agricultural levee (referred to as a levee "plug") was constructed following the 1993 flood event to minimize the impacts of Missouri River flood flows on L-575. The 1993 flood event formed several deep scour holes just riverward of L-575. A local landowner constructed the plug to minimize direct scour effects and to deflect overbank flow velocities away from L-575 and the remnant scour holes. According to a local landowner, the plug is comprised primarily of sand. Similar to the lower areas of agricultural levee, the plug is heavily vegetated, including many small trees. Although the plug embankment is not directly connected to L-575, it does appear to be effective in minimizing overbank flow velocities. During a site visit in August 2006, an alternative chute alignment (Alignment No. 2) was identified to minimize impacts to the levee plug, while also bisecting the existing dike structure and minimizing impacts to existing vegetation.

Private property will not be directly affected by the chute excavation, as the closest point between the chute and private property is approximately 2500 feet. However, private property does exist east of the site in the Missouri River floodplain. During the site visit, local landowners expressed concern that chute construction could direct flows into low-lying swales that eventually run onto local property. Landowners were supportive of a chute design that would not increase the frequency and magnitude of flow onto local property. To achieve this condition, the chute development project will evaluate the possibility of using excavated materials to construct low-lying berm(s) across the existing swales. Such berm structure(s) may also provide opportunities for shallow wetland areas and habitat development.

According to discussions with local landowners, there are no known utilities on the site. The contractor shall be responsible for coordinating utility locates. If utilities are encountered during construction, the contractor shall promptly notify the Contracting Officer's Representative (COR) and stop work in the immediate area until the issue is resolved.

Impacts to commercial navigation will be minimized by designing the chute to divert less than 10% of the Missouri River flow through the chute at construction reference plane (CRP) stage. CRP is defined as the water surface elevation equaled or exceeded 75% of the time during navigation season, corresponding to a discharge of 37,500 cfs at Nebraska City, Nebraska. Additionally, the main channel will be monitored during construction to ensure no build up of spoil material is occurring in the navigation channel. The 10% diversion threshold has been selected by the Corps as an exploratory amount to be validated through channel monitoring. In the future, more or less water may be diverted depending on channel maintenance needs.

3.0 Construction Details

As shown in Figure 1, Alignment No. 1 includes three reaches (two chute entrance reaches and one chute exit reach). The constructed base width of the two chute entrance reaches is a minimum of 70 feet. The constructed base width of the chute exit reach, downstream of the entrance reach junction, is a minimum of 85 feet.

As shown in Figure 2, Alignment No. 2 consists of a single reach with a minimum constructed base width of 85 feet.

Chute side slopes will be determined by the contractor. The contractor may choose to excavate the cross section wider than specified to obtain the minimum base width following slumping of the banks within the natural angle of repose of the soil. The project is to be constructed either by hydraulic dredge, land-based equipment, or a combination of each based on the lowest bid through free and open competition.

For all chute configurations evaluated, the elevation of the chute invert is set at a constant slope between the endpoints five feet below the CRP. The contractor shall be allowed to excavate the chute deeper than the specified depth at no additional cost to the government. One rock grade control structure will be placed at five feet below the CRP. Existing stone revetment at the chute entrance(s) will be notched to a depth of five feet below the CRP. Under Alignment No. 1, an existing dike structure would be removed at the chute exit. Under Alignment No. 2, the chute exit is located between two existing dike structures, to remain in place. Details of the inlet revetment notch and grade control structure will be provided in the construction drawings.

Spoil material from the chute excavation will be discharged into the river channel in the spoil areas shown on the construction drawings. Spoil area for land-based operations will be provided to accommodate spoil material less than 3” diameter. The contractor shall assume that the spoil material will erode at a rate sufficient to allow 100% of the spoil material to be placed in the designated spoil areas. Sufficient spoil area will be provided for 100% of the material greater than 3” diameter. The discharge pipe from a dredge should be placed 4-6 feet from the channel bottom in at least 11 feet of flowing water to ensure sediments will be immediately washed downstream. Pumping lanes and haul routes will be allowed only along the chute alignment. A total of approximately 355,100 cubic yards of material will be excavated and placed into the river. Cleared trees and

underbrush will be placed in mounds approximately 15 to 30 feet from the edge of excavation, allowing the cleared trees and underbrush to fall into the chute and diversify the aquatic habitat after the chute erodes to design width. A total of 5600 tons of quarry-run rock will be placed in the grade control structure, and roughly 1400 tons of rock riprap will be removed from the existing revetments at the chute entrances as shown in the construction drawings.

While the chute construction will produce an immediate measurable amount of aquatic habitat following construction, by no means does the "as-built" chute represent the final habitat product. The project is designed to develop over time, and should not be considered complete at least until the chute erodes to channel design width, i.e. the width of the control structure. Additionally, after the chute erodes to channel design width, the chute may be adjusted by modifying the control structure geometry, adding woody debris, or adding new structures to create desired micro-habitats identified by the Corps biological monitoring programs.

4.0 Construction Schedule

Funding for the chute is expected to be available in Fiscal Year 2007, and construction is expected to begin in Quarter 2. Construction duration should be approximately eight months following the award date. River level information from Nebraska City, Nebraska will be included in the plans to allow a bidder to estimate delays in schedule, select the proper equipment, etc. Land-based equipment will experience the greatest delays during high water, while dredging operations will experience minor delays due to any required over-excavation during low water periods. Flows during 2007 are expected to be minimum service targets at Rulo, and navigation targets are provided in Tables 1 and 2 below. For more information, the 2006-2007 Missouri River Annual Operating Plan, including planned spring pulses, is posted on the Northwestern Division Missouri River Water Management website: http://www.nwd-mr.usace.army.mil/rcc/, or is available in hard copy by writing to: Water Management Division, U.S. Army Corps of Engineers, 12565 West Center Road, Omaha, NE 68144.

Table 1
Normal Navigation Season Opening/Closing Dates

Location	River Mile	Opening	Closing
Sioux City, IA	732.3	23 March	22 November
Omaha, NE	615.9	25 March	24 November
Nebraska City, NE	562.6	26 March	25 November
Kansas City, MO	366.1	28 March	27 November
Mouth near St. Louis	0	1 April	1 December

*Note: Table from USACE RCC (2000) "Releases Needed to Support Navigation"

Table 2
Missouri River Navigation Flow Targets

Location	River Mile	Full Service Target Flows in cfs	Minimum Service Target Flows in cfs
Sioux City, IA	732.3	31,000	25,000
Omaha, NE	615.9	31,000	25,000
Nebraska City, NE	562.6	37,000	31,000
Kansas City, MO	366.1	41,000	35,000

*Note: Table from USACE RCC (2000) "Releases Needed to Support Navigation"

5.0 Hydraulic Analysis

Hydraulic analysis has been conducted to support the evaluation of alternative chute configurations and alignments at Barney Bend of the Lower Hamburg Mitigation Site. The objective of the chute evaluation and development is to maximize habitat value while optimizing cost and minimizing environmental, social, and economic impacts.

Hydraulic parameters such as flow rates, velocities, sediment capacity, and others have been determined along the various chute configurations. The potential affects of various chute configurations on the Missouri River, the adjacent floodplain, navigation, and flood control have also been analyzed.

5.1 Missouri River Hydraulic Model

An HEC-RAS model for the Missouri River was obtained from the Omaha District in May 2006. The model extends from River Mile 494.83 to 562.74 (approximately Rulo to Nebraska City) and had been calibrated to 2003 gage data within about 0.5 foot accuracy at most locations. The HEC-RAS model files were named as follows:

Project file:	upper_barney.prj
Plan file:	upper_barney.p01
Steady flow file:	upper_barney.f02
Geometry file:	upper_barney.g03

The HEC-RAS model was comprised of approximately 180 cross sections of the Missouri River and adjacent floodplain. The cross sections were spaced approximately 2000 feet apart.

Manning's roughness coefficients in the Missouri River main channel ranged from 0.024 to 0.029. Floodplain overbank roughness coefficients ranged from 0.024 to 0.050. The blocked obstructions option within HEC-RAS was used at many cross sections to represent portions of the cross sectional area that do not contribute to hydraulic conveyance.

The steady flow data contained in the Omaha District model is presented in Table 3 below.

Table 3
HEC-RAS Flow Data from Omaha District Model

River Mile	Missouri River Flow Data (cfs) for Various Dates								
	9-23-97	5-5-98	9-22-98	9-14-99	7-19-00	9-18-01	6-11-02	9-17-02	9-15-03
562.74	73,300	47,200	40,100	54,100	41,500	40,100	33,600	33,600	36,000
542.11	74,601	50,791	42,496	56,496	42,767	41,304	34,041	34,051	36,239
527.80	74,896	51,429	43,072	56,974	43,387	41,659	34,004	34,178	36,276
522.29	75,173	51,872	43,593	57,513	43,510	41,976	33,848	34,303	36,297
507.50	76,363	53,780	45,841	59,833	44,039	43,343	33,177	34,838	36,389
498.04	76,500	54,000	46,100	60,100	44,100	43,500	33,100	34,900	36,400
495.70	76,500	54,000	46,100	60,100	44,100	43,500	33,100	34,900	36,400
494.83	76,611	54,220	46,348	59,879	44,043	44,182	33,347	34,996	36,563

For the purposes of the Barney Bend chute hydraulic analysis, a range of flows have been evaluated. Specifically, the CRP discharge has been a focus of the hydraulic analysis. The CRP discharge and other discharges evaluated for this hydraulic analysis are shown in Table 4.

Table 4
Missouri River Flow Rates

Flow Description	Discharge (cfs)
Low Flow (95% exceedance)	19,000
Minimum Service Navigation	31,000
CRP Discharge	37,500
Median August Discharge	40,150
High Water (10% exceedance)	63,900
Bankfull (approximate)	75,000

5.2 Split Flow Analysis

In order to evaluate the hydraulic performance of the Barney Bend chute, the HEC-RAS model as obtained from the Omaha District was modified between River Mile 547 and 550. The chute connection to the Missouri River was evaluated using split flow analysis, where a portion of the upstream flow enters the chute(s), and the remainder of the flow is conveyed further downstream in the Missouri River. At the downstream exit of the chute, the chute flows and Missouri River flows were combined again. Several river reaches and junctions were added to the geometric data to represent a proposed chute alignment in the left overbank of the Missouri River floodplain. Hydraulic computations through the junctions were performed using the energy equation. The two alternative alignments for the Barney Bend chute are shown in Figures 1 and 2.

The alignments and geometric configurations of the chute (cross-sectional shape, dimensions, sinuosity, depth below CRP, bed slope, etc.) have been based on hydraulic design criteria developed from previously constructed chutes along the Missouri River. The design criteria are presented in Table 5 below.

Table 5
Hydraulic Design Criteria

Hydraulic Parameter	Design Criteria
Chute Invert	4 to 6 ft below CRP
Chute Bottom Width	+75 ft preferred
Side Slopes	1.5H to 1V or vertical if dredged
Bend Radius of Curvature / Design Width	> 2.5
Minimum Radius of Curvature	90% > 600 ft, 2000 ft typical
Chute/River Length Ratio	< 1.0
Constructed Sinuosity	1.0 to 1.2
Flow capture	No more than 10% of CRP discharge

Alternative chute configurations have been developed for the purposes of maximizing hydraulic performance and habitat values, while optimizing cost and minimizing environmental, social, and economic impacts. The potential effects of these various chute configurations on the Missouri River, the adjacent floodplain, navigation, and flood control have also been evaluated. The alternative configurations involve variations to the basic design criteria outlined in Table 5. The alternative chute configurations are summarized in Table 6 below.

Table 6
Alternative Chute Configurations

Scenario No.	Alignment No.	Chute Bottom Width	Side Slope (H:V)	Chute Invert	Min. Radius of Curvature	Sinuosity	Chute/River Length Ratio
1	1	Reach 1: 70 ft. Reach 2: 70 ft. Reach 3: 85 ft.	1.5:1	5 ft. below CRP	3000 ft.	1.03	0.73
2	1	Reach 1: 70 ft. Reach 2: 70 ft. Reach 3: 120 ft.	1.5:1	5 ft. below CRP	3000 ft.	1.03	0.73
3	1	Reach 1: 70 ft. Reach 2: 70 ft. Reach 3: 150 ft.	1.5:1	5 ft. below CRP	3000 ft.	1.03	0.73
4	2	85 ft.	1.5:1	5 ft. below CRP	1500 ft.	1.01	0.74
5	2	200 ft.	1.5:1	5 ft. below CRP	1500 ft.	1.01	0.74

For each alternative chute configuration, an iterative flow balancing process was conducted to determine the flow captured by the chute. At the Barney Bend chute, the upstream flow in the Missouri River was split into chute flows and downstream Missouri River flows. Where the chute reconnects with the Missouri River, the flows were added back together. Through iterative hydraulic analysis, the flows in the chute and in the river were adjusted until the energy grade line (EGL) at the chute entrances and exit converged with the EGLs on the Missouri River. The iterative solutions were continued until the EGLs were within an allowable tolerance of 0.1 foot. Table 7 displays the flow rates in the Missouri River and the various chute reaches. Hydraulic analysis results for each chute configuration scenario are shown in Table 8.

Table 7
Barney Bend Chute Split Flow Analysis

Description	Missouri River Flow (cfs)	Barney Bend Chute Flow (cfs)
Low Flow (95% exceedance)	19,000	50
Minimum Service Navigation	31,000	670
CRP Discharge	37,500	1200
Median August Discharge	40,150	1400
High Water (10% exceedance)	63,900	3800
Bankfull (approximate)	75,000	5000

Note: Flow values reported above pertain to Scenario No. 4

Table 8
Hydraulic Analysis Results

Scenario No.	Alignment No.	Chute No.	Bottom Width	Invert Below CRP	Chute Flow at CRP	Flow Capture at CRP	Average Chute Velocity
1	1	1	70 ft.	5 ft.	600 cfs	1.6%	1.7 ft/s
		2	70 ft.	5 ft.	500 cfs	1.3%	1.4 ft/s
		3	85 ft.	5 ft.	1100 cfs	2.9%	2.4 ft/s
2	1	1	70 ft.	5 ft.	670 cfs	1.8%	2.1 ft/s
		2	70 ft.	5 ft.	600 cfs	1.6%	2.0 ft/s
		3	120 ft.	5 ft.	1270 cfs	3.4%	2.4 ft/s
3	1	1	70 ft.	5 ft.	720 cfs	1.9%	2.4 ft/s
		2	70 ft.	5 ft.	700 cfs	1.9%	2.3 ft/s
		3	150 ft.	5 ft.	1420 cfs	3.8%	2.2 ft/s
4	2	n/a	85 ft.	5 ft.	1200 cfs	3.2%	2.6 ft/s
5	2	n/a	200 ft.	5 ft.	2600 cfs	6.9%	2.6 ft/s

5.3 Sediment Capacity Analysis

For each of the chute configurations, the sediment carrying capacity of the chute has been evaluated to determine if the chute will be aggradational or degradational in nature. Copeland's Method within HEC-RAS was used to develop stability curves for each chute configuration. Input data for the Copeland's Method computations included the following:

- Chute discharge
- Specific gravity
- Bed material gradation (d_{84}, d_{50}, d_{16})
- Temperature
- Median channel width
- Side slope
- Roughness coefficient
- Inflow sediment concentration

Bed material gradations were obtained from MRR Sediment Series Report No. 39c dated January 2001. Appendix A of Report No. 39C includes bed material and suspended sediment samples on the Missouri River at Nebraska City as collected between October 1976 and September 1991 through a cooperative stream gaging program with the U.S. Geological Survey and the U.S. Army Corps of Engineers, Omaha District. Point-integrated sediment data were then processed using the ODSET program, an Omaha District Sediment Transport Package developed to analyze Missouri River sedimentation data. The inflow sediment concentration was determined by curve-fitting the ODSET data and computing the sediment concentration given the Missouri River discharge. Missouri River sediment loads and gradation curves from the ODSET data are shown in Figures 3 and 4, respectively.

Figure 3

Sediment Loads from ODSET 1976-1991
Missouri River Suspended Sediment Data Assessment
Nebraska City

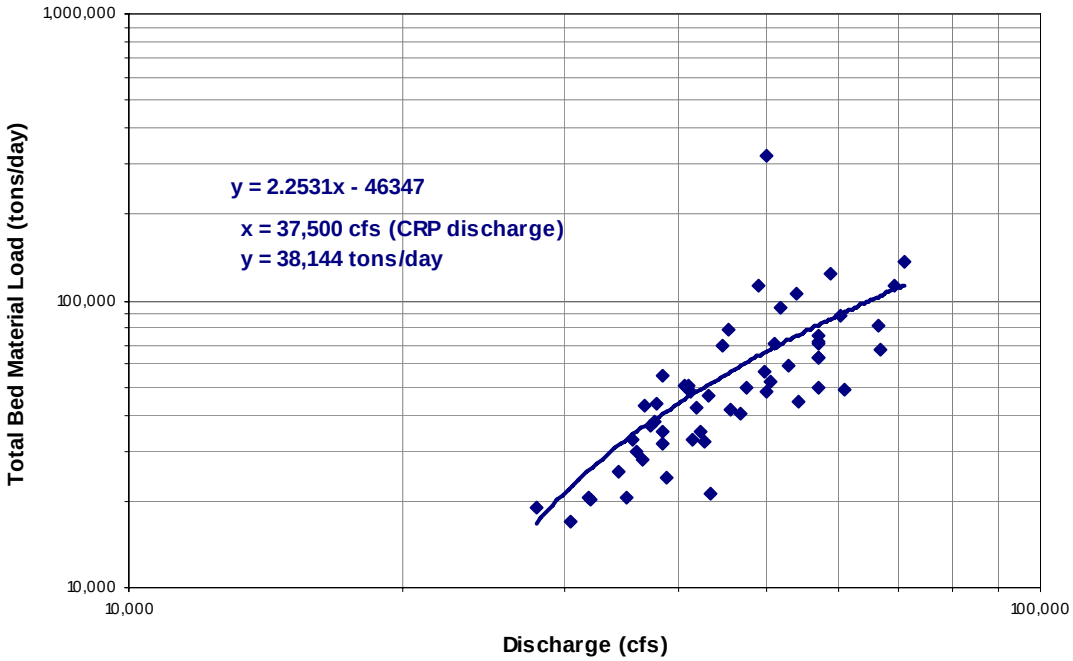
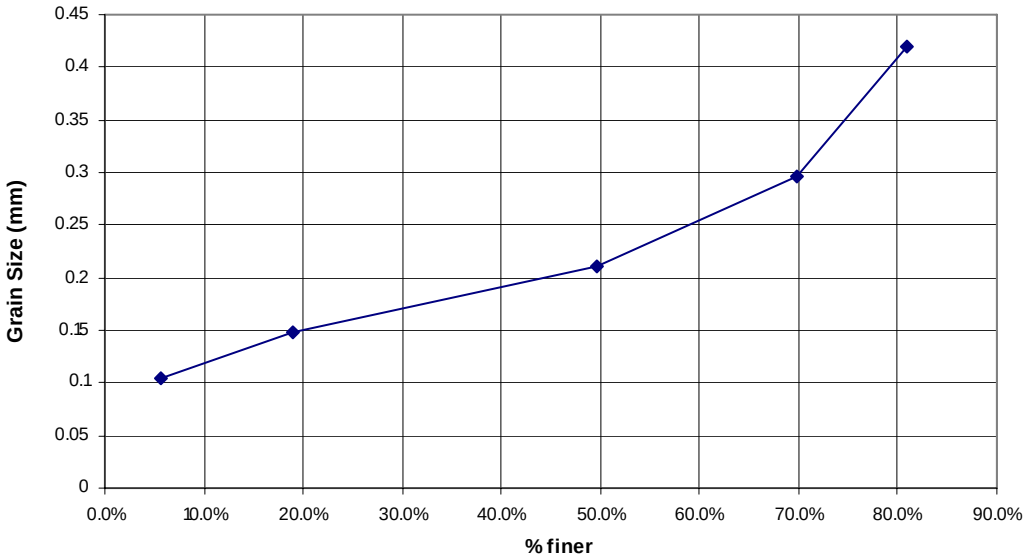


Figure 4

Grain Size Distribution of Total Bed Material Load
(from ODSET 1976-1991)
Missouri River Suspended Sediment Data Assessment
Nebraska City



Through the use of Copeland's Method within HEC-RAS, channel stability curves were developed for the various chute configurations. Figure 5 is a plot of the stability curve showing energy slope versus chute width. Figure 6 is a plot of the stability curve showing energy slope versus chute depth. These curves, developed for Alignment No. 2, provide graphical representations of the aggradational or degradational nature of the chutes for given slope, width, and depth combinations.

Output data from the Copeland's Method computations are shown in Table 9 below. Scenario 1 was based on an initial configuration with a 70 foot bottom width in chutes 1 and 2, an 85 foot bottom width in chute 3, and a depth below CRP of 5 feet. Hydraulic analysis indicated that the flow through chutes 1 and 2 was limited by the conveyance capacity of chute 3, as shown by the differing chute velocities for Scenario No. 1. In attempts to achieve more uniform chute velocities and maximize the sediment carrying capacity through all chute reaches, Scenarios 2 and 3 were developed with an increased bottom width through chute 3.

For all scenarios evaluated, the chute velocity was determined to be lower than the stable channel velocity from Copeland's Method, suggesting that the chute may be aggradational in nature. However, the chute velocities for Scenarios 3, 4, and 5 are similar to previously successful Missouri River chute projects; sustained aggradation is not anticipated for these scenarios. Also, the Copeland's Method parameters used in the computations are expected to be conservative (skewed towards aggradation). Both the sediment concentration and grain size distribution parameters were based on available sediment data for the entire Missouri River cross section. Depth-integrated sediment concentrations and grain size distributions were not available. It is expected that the upper portion of the water column, which would be diverted into the chute, would consist of lower concentrations and finer grain sizes. Thus, the actual stable channel velocity for the chute is expected to be lower than the 2.9 ft/s reported from Copeland's Method. For these reasons, the chute is expected to remain open and may tend towards degradation.

Table 9
Copeland's Method Computations

Scenario No.	Alignment No.	Chute No.	Bottom Width	Invert Below CRP	Chute Velocity	Stable Channel Velocity	Aggradation or Degradation
1	1	1	70 ft.	5 ft.	1.7 ft/s	2.6 ft/s	Aggradation
		2	70 ft.	5 ft.	1.4 ft/s	2.5 ft/s	Aggradation
		3	85 ft.	5 ft.	2.4 ft/s	2.8 ft/s	Aggradation
2	1	1	70 ft.	5 ft.	2.1 ft/s	2.7 ft/s	Aggradation
		2	70 ft.	5 ft.	2.0 ft/s	2.6 ft/s	Aggradation
		3	120 ft.	5 ft.	2.4 ft/s	2.8 ft/s	Aggradation
3	1	1	70 ft.	5 ft.	2.4 ft/s	2.7 ft/s	Aggradation
		2	70 ft.	5 ft.	2.3 ft/s	2.7 ft/s	Aggradation
		3	150 ft.	5 ft.	2.2 ft/s	2.7 ft/s	Aggradation
4	2	n/a	85 ft.	5 ft.	2.6 ft/s	2.9 ft/s	Aggradation
5	2	n/a	200 ft.	5 ft.	2.6 ft/s	2.9 ft/s	Aggradation

Figure 5

Copeland's Method Stability Curve
Q = 1200 cfs, Total Sediment Concentration = 377 ppm

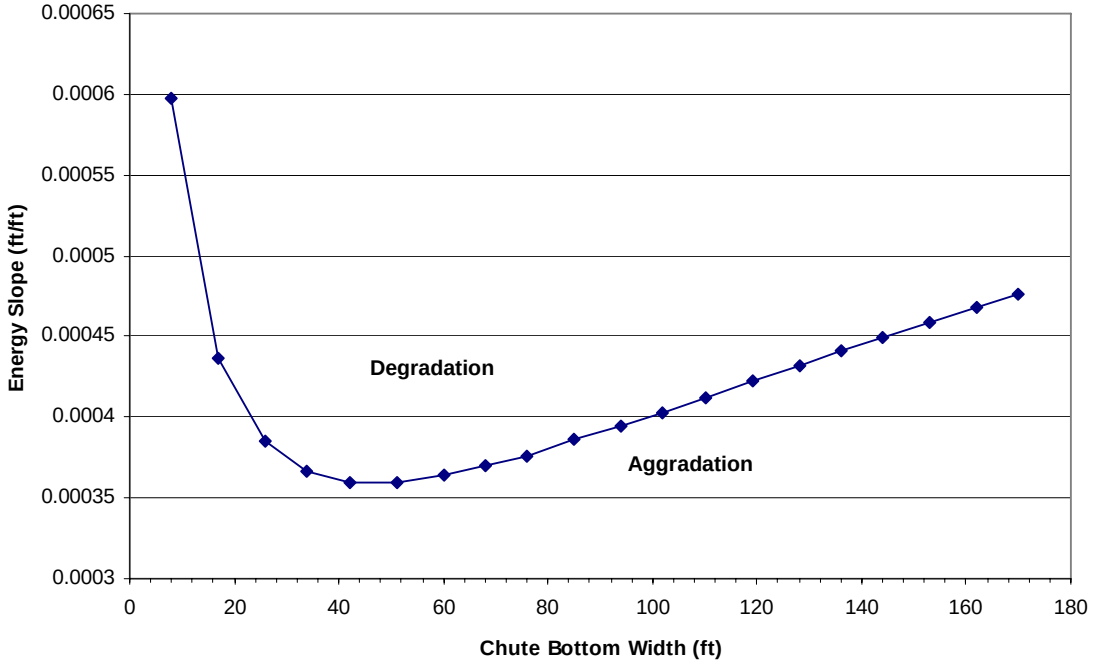
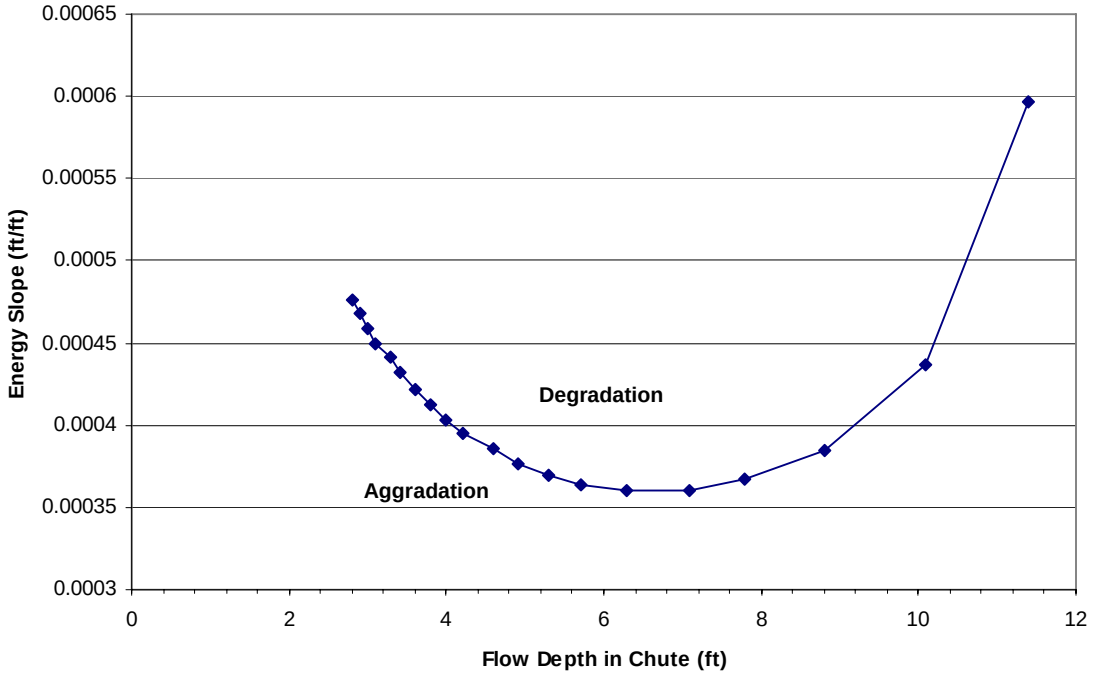


Figure 6

Copeland's Method Stability Curve
Q = 1200 cfs, Total Sediment Concentration = 377 ppm



5.4 Meander Geometry

In the future, the length of a chute may increase or decrease slightly due to erosion and natural meander migration. A summary table of geometric configurations for various natural and fully developed constructed chutes along the Missouri River is presented in Table 10. As shown, the sinuosity (or chute length / valley length) ranges between 1.0 and 1.4, with a median value of 1.15. For comparison, the proposed sinuosity for the Barney Bend chute is approximately 1.01. The largest meander wavelength at the Barney Bend chute is approximately 3000 feet, representing the 11% percentile compared to other Missouri River chutes. Therefore, the length and meander geometry of the chute is not expected to change significantly over time. However, given the dynamics of the Missouri River system, the final planform of the chute is unknown.

Table 10
Existing Chute Geometrics Summary

Percentile (%)	Min. Radius of Curvature (feet)	Chute Sinuosity (ft/ft)	Meander Wavelength (feet)
max	12,940	1.45	30,600
75%	2,900	1.20	11,500
50%	1,730	1.15	6,450
25%	930	1.05	3,670
10%	380	1.02	2,950
min	160	1.01	2,200

Alignment No. 2 has four bends of various curvature radii (R_c). From upstream to downstream, the bend R_c's are 4000, 1500, 1500, and 3000 feet. Compared to the minimum R_c measurements from natural and fully developed constructed chutes along the Missouri River summarized in Table 10, the chute curvature radii correspond to the 78%, 43%, 43%, and 75% percentiles as compared to the other chutes. Meander migration rates are greatest for R_c/width values in the range of 2.3 to 3.5, and begin to reduce from 4 to 5 (Nanson and Hickin 1983, Williams 1986). Following construction, Rc/width values will be 47, 18, 18, and 35 in the four bends, respectively. At design width, Rc/width values will be approximately 20, 7.5, 7.5, and 15 from upstream to downstream, respectively. As a result, meander migration can be expected to be rather gradual, but should create highly diverse aquatic habitat with point bars, pools, riffles, and undercut banks. Additionally, as meander erosion persists, trees and other debris should fall into the chute to further diversify and enhance aquatic habitat.

5.5 Grade Control Structure Stability

The number, spacing, and dimensions of grade control structures have varied over time since the inception of chute construction through the various habitat programs on the Missouri River. Structure placement usually depends on a number of factors, including the location of buried dikes along the chute alignment, distance to private land, distance to infrastructure, distance to levees, etc. Many projects have a series of structures maintaining a more uniform depth throughout the project. Examples include Boyer Chute and other recently constructed chutes near Federal Levees such as Deroin Bend,

Lower Hamburg, and Worthwine Island. Other projects, such as Lisbon and Hamburg have only minimal control near the upstream end. Lisbon and Hamburg chutes have a considerable variation in depth, width, velocity, and substrates. Pallid sturgeon have been sampled in both chutes.

The proposed Barney Bend Chute alignment bisects one buried dike structure approximately midway along the chute length. The chute alignment includes a tangent section in the vicinity of the buried dike structure to minimize risk of meander migration threatening the structure stability. The use of this single grade control structure maximizes diversity in the chute and encourages future chute development. With only one structure, a high energy environment could be created with rapidly varied flow through a grade change across the structure, especially after the chute erodes to design width. To prevent failure of the structure, a scour analysis has been conducted. Figure 7 presents a conceptual sketch showing local scour versus bed degradation.

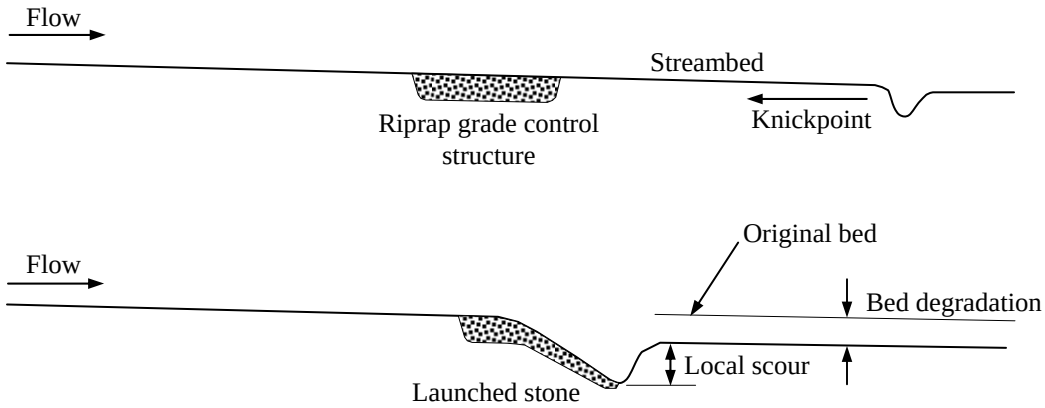


Figure 7
Knickpoint Migration Onto a Bed Control Structure

Local scour may be addressed utilizing existing relationships. Little and Murphy (1982) found that scour depth downstream of low drop structures is approximately equal to the structure drop height plus critical depth. A low drop is defined as a structure which has critical depth per unit drop height > 1.0, creating a relatively submerged grade change as opposed to a waterfall or cascade scenario. To evaluate the structure stability, bankfull flow with all of the energy loss occurring at the grade control structure was selected for analysis as overbank areas will convey a large portion of the flow at greater than bankfull conditions, and velocities are not expected to significantly increase in the channel at stages above bankfull. Additionally, with all of the energy loss occurring at the control structure, a conservative energy loss scenario is examined. For bankfull flow conditions at Barney Bend, critical depth is approximately equal to 4.0 feet. Drop height across the structure was assumed to be equal to energy loss through the chute, or 2.5 feet.

Accordingly, local scour may reach approximately 6.5 feet below the chute invert downstream of the grade control structure.

To address bed degradation, system stability and downstream elevation control must be evaluated. The lower 735 miles of the Missouri River as a whole is relatively stable, with minor degradation occurring in most places, other than in the vicinity of Kansas City where considerable degradation has occurred. Assuming the river bottom is approximately stable in the area surrounding Barney Bend, the maximum depth the chute could degrade to would be the elevation of the Missouri River bottom near the chute exit. The chute invert elevation is set 5 feet below CRP. Near the chute exit, the elevation of the river bed is approximately 18 feet below CRP. Accordingly, channel degradation could reach 13 feet in the chute, a value nearly twice the local scour estimate.

Recent grade control structures constructed in series have been five feet thick and 30 feet long. Excavation below the water table and accurate rock placement can be quite difficult. However, structures at Lower Hamburg were constructed ten feet thick with success. Therefore, to address scour estimates, a 13 foot thick structure was selected. Structure length can also be adjusted to allow the rock blanket to self-launch if degradation reaches the structure. Average stone weight specified in the structure is 150 lbs, corresponding to a stone size of 1.2 feet (366 mm), with a maximum size of 700 lbs and a stone size of approximately 2 feet (612 mm). At bankfull flow, the unit discharge will be approximately 45 cfs/ft (4.2 cms/m). Robinson et al. (1998) found that rock size and channel slopes are directly related such that steeper slopes require larger rock to remain stable. A two-part prediction equation was developed by Robinson et al. (1998) to determine the highest stable discharge as a function of the median rock size and channel slope. Equations 1 and 2 present the regression equations created for SI units:

$$q = 9.76 \times 10^{-7} D_{50}^{1.89} S_o^{-1.50} \text{ for } S_o < 0.10 \qquad \text{Equation 1}$$

$$q = 8.07 \times 10^{-6} D_{50}^{1.89} S_o^{-0.58} \text{ for } 0.10 < S_o < 0.4 \qquad \text{Equation 2}$$

where q = unit discharge ($m^3/s/m$), S_o = slope (m/m), and D_{50} = median stone size (mm). Equations 1 and 2 where developed using data from Abt 1988 and the Agricultural Research Station 1998, representing the most extensive database for rock size on sloped channels available. From Equation 1, stable slope at bankfull flow (roughly a 10-year flood event) is approximately 1 on 16 for D_{50}, or 1 on 8 for D_{100}. Based on energy grade line, the maximum drop height equals approximately 2.5 feet, and with 1 on 16 bed slope, a minimum 40-foot long structure would be required. The proposed structure is 13 feet thick, and with the natural angle of repose of rock being roughly 1 on 1.5, a 60-foot top width and 20-foot bottom width as shown in Figure 8.

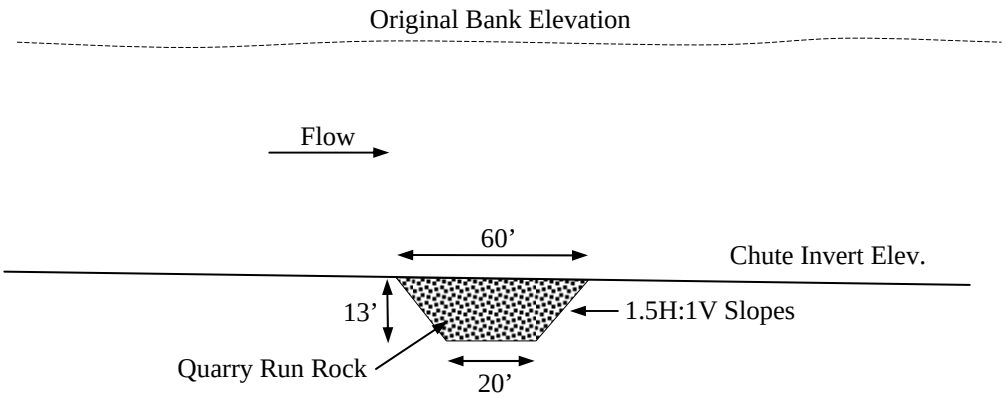


Figure 8
Chute Centerline Profile Sketch of Grade Control Structure

The grade control structure will be 200 feet wide measured perpendicular to the chute alignment. Structure side slopes are typically constructed at a 2H:1V slope, with a 5-foot minimum rock thickness, extending in elevation from the chute invert elevation up to the top of bank. New quarry-run rock will be used to build the grade control structure. Since the new structure is located at an existing buried dike structure, portions of the existing rock will need to be removed to allow for full-width chute development. Existing rock riprap that is not necessary to be removed for the new grade control structure will remain in place.

6.0 Geotechnical Considerations

6.1 Available Geotechnical Data

Available information at this site was limited to the SCS Soil Survey for Atchison County and boring logs from the design of the federal levee L-575.

The available soil borings from the L-575 design were obtained and reviewed. These borings indicate that the typical surficial silts and clays over deep sands are present along the levee alignment. The thickness of the blanket is relatively thin, which resulted in the implementation of relief wells along the toe of the levee to control underseepage pressures. These borings are over 1000 feet away from the proposed Barney Bend Chute alignment.

The soil survey maps indicate that the proposed alignment of the Barney Bend Chute will traverse the Haynie and Sarpy soil series. The Haynie series consists of silty loam, whereas the Sarpy series consists of fine sand. Both are underlain by coarser sands. This profile is consistent with the boring data contained in the documents from L-575. No fine-grained and highly plastic clays were noted.

6.2 Geotechnical Investigations

Geotechnical investigations on the site include classifying subsurface information for the contract documents and determining the design of the excavated cross sections. Cone penetrometer tests (CPT) are being performed by CENWK in the proposed areas to be excavated to determine the general soil stratigraphy. This testing is being performed to provide information in the contract documents that will assist the contractor in determining the most effective method of excavation. CPT borings will be performed to 30 feet below existing grade near the centerline of the proposed chute. The soil stratigraphy will be derived from the raw CPT data and provided in the contract drawings. Additional sampling and testing is not anticipated to be performed as the additional information is not expected to be beneficial to designers or contractors.

6.3 Chute Cross Section Design

The cross section below was determined to be the most appropriate to use to allow both land based and dredging excavation equipment, while also considering maximizing cost efficiency and safety. This cross section allows the contractor maximum flexibility on how to construct the project in a safe manner while potentially reducing construction costs. This cross section may be used for both land based and dredged excavations. The contractor will be required to meet the minimum width shown. It is anticipated that if dreding occurs, the contractor will need to overexcavate several feet on each side to allow for sloughing following dreding a vertical slope. Depending on the method of excavation and survey method(s) chosen by the contractor, additional excavation may be required in order for the survey and general working methods to meet EM 385-1-1.

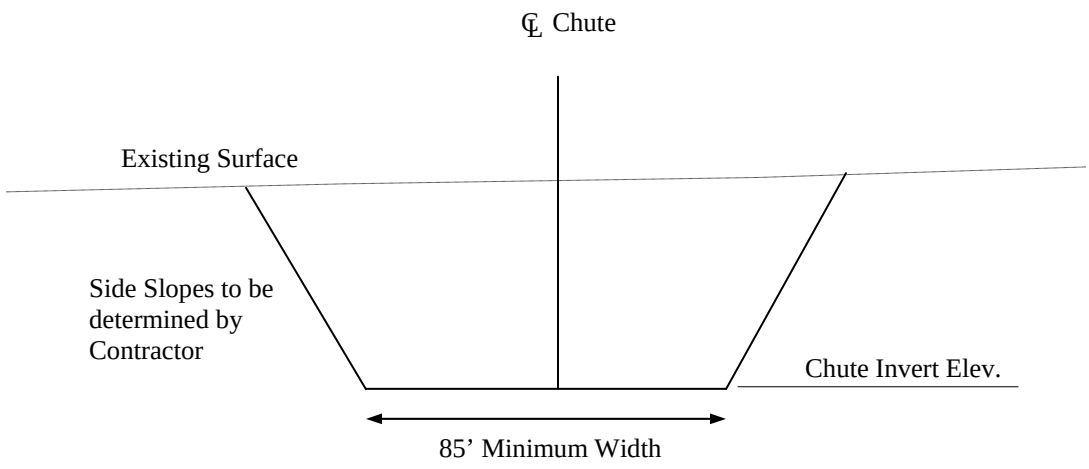


Figure 9
Typical Excavation Cross Section

7.0 Civil Engineering

7.1 Preliminary Construction Quantities and Costs

Preliminary construction quantities have been developed for each of the five alternative chute configurations. Such quantities are based on limited topographic mapping (four-foot contour interval) and will be further developed based on field surveying along the preferred chute alignment.

Preliminary opinions of construction cost have been developed for comparison purposes, and have considered both dredged excavation and mechanical excavation methods. Depending on the selected scenario and construction methods, the preliminary opinion of construction cost is expected to range from approximately $2 million to $5 million.

Habitat enhancement areas will be created by in-river disposal of the chute excavation materials, resulting in approximately 9.8 acres of additional habitat enhancements.

7.2 Operations and Maintenance (O&M)

The constructed features and habitat areas will need to be operated and maintained to assure that maximum habitat value is achieved. Long term O&M requirements will need to be documented in an O&M manual that will define the entity responsible for performing maintenance, the degree of Corps responsibility, funding, and schedule and procedure requirements.

Limited monitoring and evaluation activities (M&E) may also occur on the site to determine if the mitigation site is performing as expected. Periodic inspections and data collection may be performed to assess the degree of success of habitat development.

8.0 Habitat and Environmental Considerations

8.1 Qualitative Evaluations

Qualitatively, the constructed chute should introduce a greater amount of habitat diversity than currently exists at the site and restore habitat features that would have naturally occurred within the Missouri River floodplain. This objective would be accomplished by each of the chute scenarios previously presented.

8.2 Aquatic Habitat

The amount of aquatic habitat that would be created is the main factor differentiating the chute scenarios. Alignment 1 (Scenarios 1-3) would create more aquatic habitat than Alignment 2 (Scenarios 4 and 5). Research has shown that juvenile sturgeon and pallid sturgeon were collected on sand bars, island tips and notched L-dikes and it has been suggested that pallid sturgeon show a preference for habitat created by dike modifications or islands (USFWS 2003). Alignment 1 would create an additional island tip compared to Alignment 2 due to its split entrance design. Therefore, it can be speculated that Alignment 1 may provide additional benefits to the Federally endangered pallid sturgeon over Alignment 2. However, due to the lack of shallow water aquatic habitat currently at Barney Bend, either alignment or scenarios thereof would result in an important increase in the amount of this resource. All scenarios would benefit Missouri River fisheries in the vicinity of Barney Bend. All five scenarios would also provide the opportunity for additional scour and bank erosion that could introduce trees into the chute, which would beneficially increase habitat complexity within the chute.

8.3 Terrestrial Habitat

Construction of a chute at Barney Bend would result in the conversion of some terrestrial habitat to aquatic habitat. Although, a majority of the terrestrial area that would be lost is currently in soy bean production, some area of floodplain forest would be impacted by construction and subsequent erosion of the chute banks. Loss of mature trees could have implications for species such as the bald eagle and Indiana bat. Although the construction of a chute would reduce terrestrial habitat acres at the site, terrestrial habitat throughout the rest of Barney Bend would be developed so that there would be a net beneficial effect to terrestrial habitat on Barney Bend.

Excavation and construction of a chute at Barney Bend would restrict land-based access to personnel to the area that would become island(s). Habitat development activities (e.g., warm season grass plantings) in those areas would need to be completed prior to excavation of the chute.

8.4 Environmental Impacts

Environmental impacts associated with chute construction would be similar for each alignment and all scenarios. There would likely be a short-term increase in turbidity due to the discharge of sediment into the Missouri River, however this would be considered a beneficial effect as the Missouri River naturally carried a high sediment load. Bald eagles may experience short-term effects due to noise disturbance from construction activities. It is possible that trees with potential to be bald eagle roost sites or Indiana bat maternity roost trees could be lost during excavation; however the overall increase in habitat quality at Barney Bend from chute construction and other habitat development activities would offset these potential impacts. There would be a loss of farmland of statewide importance as a result of chute construction.

9.0 Recommendations

As previously stated, the objective of this chute evaluation and development is to maximize habitat value while optimizing cost and minimizing environmental, social, and economic impacts. Alignment 1 would maximize the creation of aquatic habitat through chute construction at Barney Bend. However, adjacent property owners expressed significant concerns regarding the potential for Alignment 1 to impact adjacent private properties. Therefore, Alignment 2 is recommended because it would provide a balance between maximizing aquatic habitat and potential social and economic impacts. Alignment 2 would also result in less impact to existing vegetation (i.e. floodplain forest). Of the Alignment 2 scenarios evaluated, Scenario 4 is recommended for implementation because it would maximize aquatic habitat, minimize environmental, social, and economic impacts while also minimizing construction cost.

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Appendix C

Cultural Resources Report

Appendix C
Cultural Resources

The following documents are included within this appendix: Barney Bend Cultural Resources Assessment.

BARNEY BEND MITIGATION SITE CULTURAL RESOURCES[1]

Historic properties records review and accretion analysis of a proposed ±917.0 ac (±371.1 ha) fish and wildlife habitat mitigation site along the Missouri River from approximately RM 546.5 – RM 550.0 in the Missouri 5/Nishnabotna Study Unit, Atchison County, Missouri

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INTRODUCTION

This report documents Historic Preservation Associates, LLC (HPA) investigations of the Barney Bend Mitigation Site (Barney Bend) located just north of Rulo, Nebraska in Atchison County, Missouri[2]. The investigations reported here were oriented toward determining whether the proposed habitat mitigation project would affect any National Register-eligible or culturally significant sites in the Area of Potential Effects (APE). This report follows the guidelines contained in the *Management of Archeological Resources: The Airlie House Report* (McGimsey and Davis 1977) and the guidelines listed in the Missouri *Master Plan* (Weston and Weichman 1987).

The APE is located adjacent to the left descending bank of the Missouri River between approximately RM 546.5 – RM 550.0, and lies in portions of sections 20, 29, 30, 31, 32, and 33 in T7N R15E of the 6th Principal Meridian. The APE is in the Nishnabotna Watershed of the Missouri 5/Nishnabotna Study Unit (Figure 1) identified in the Missouri *Master Plan* (Wright

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[2] All of the Barney Bend Mitigation Site is location in Atchison County, Missouri. This was not the case, however, until 12 November 1999 when Public Law 106-101 (H.J. Res. 54) known as the *Missouri-Nebraska Boundary Compact* (*Compact*), was enacted by a Joint Resolution of the 106th Congress.

Among other matters, the *Compact* observed "…that there are actual and potential disputes [and] controversies…arising or which may arise out of the location of the boundary line between the states of Missouri and Nebraska; that the Missouri River constituting the boundary between the states has changed its course from time to time, and that the United States Army Corps of Engineers has established a main channel of such river for navigation and other purposes, which main channel is identified on maps jointly certified by the state surveyors of Missouri and Nebraska and identified as the 'Missouri-Nebraska Boundary Maps'" [Article I(a):113 Stat. 1333].

The *Compact* also found that "…the principal purpose of the states of Missouri and Nebraska in executing the compact to establish an identifiable compromise boundary between the state of Missouri and the state of Nebraska for the entire distance thereof as of the effective date of the compact [12 November 1999] without interfering with or otherwise affecting private rights or titles to property…" [Article I(b):113 Stat. 1333].

Of particular substance in the *Compact* was the establishment of the boundary by finding that "The permanent compromise boundary line between the states of Missouri and Nebraska shall be fixed at the center line of the main channel of the Missouri River…except for that land known as McKissick's Island as determined by the Supreme Court of the United States to be within the state of Nebraska in the case of Missouri v. Nebraska, 196 U.S. 23, and 197 U.S. 577, all of which is identified on maps jointly prepared and certified by the state surveyors of Missouri and Nebraska and identified as the 'Missouri-Nebraska Boundary Compact Maps,'…This center line of the main channel of the Missouri River as described on such maps shall be referred to as the 'compromise boundary'" [Article II:113 Stat. 1334].

In addition, the *Compact* provides for relinquishment of sovereignty where in "The state of Missouri hereby relinquishes to the state of Nebraska all sovereignty over all lands lying on the Nebraska side of such compromise boundary and the state of Nebraska hereby relinquishes to the state of Missouri all sovereignty over all lands lying on the Missouri side of such compromise boundary [except for McKissick's Island] which is identified on the 'Missouri-Nebraska Boundary Compact Maps'" [Article III:113 Stat. 1334].

Prior to the adoption of the *Compact*, parts of the Barney Bend Mitigation Site were located in Otoe County, Nebraska (and KCD-COE real estate records reflect Nebraska deeds for these partials). It was because of this situation that cultural resource records from both Nebraska and Missouri repositories were consulted during this review and documentation.

1987:B-15-1 – B-15-5) and is part of the Missouri River Watershed. HPA conducted the cultural resources investigations in the first through third quarters of 2006.

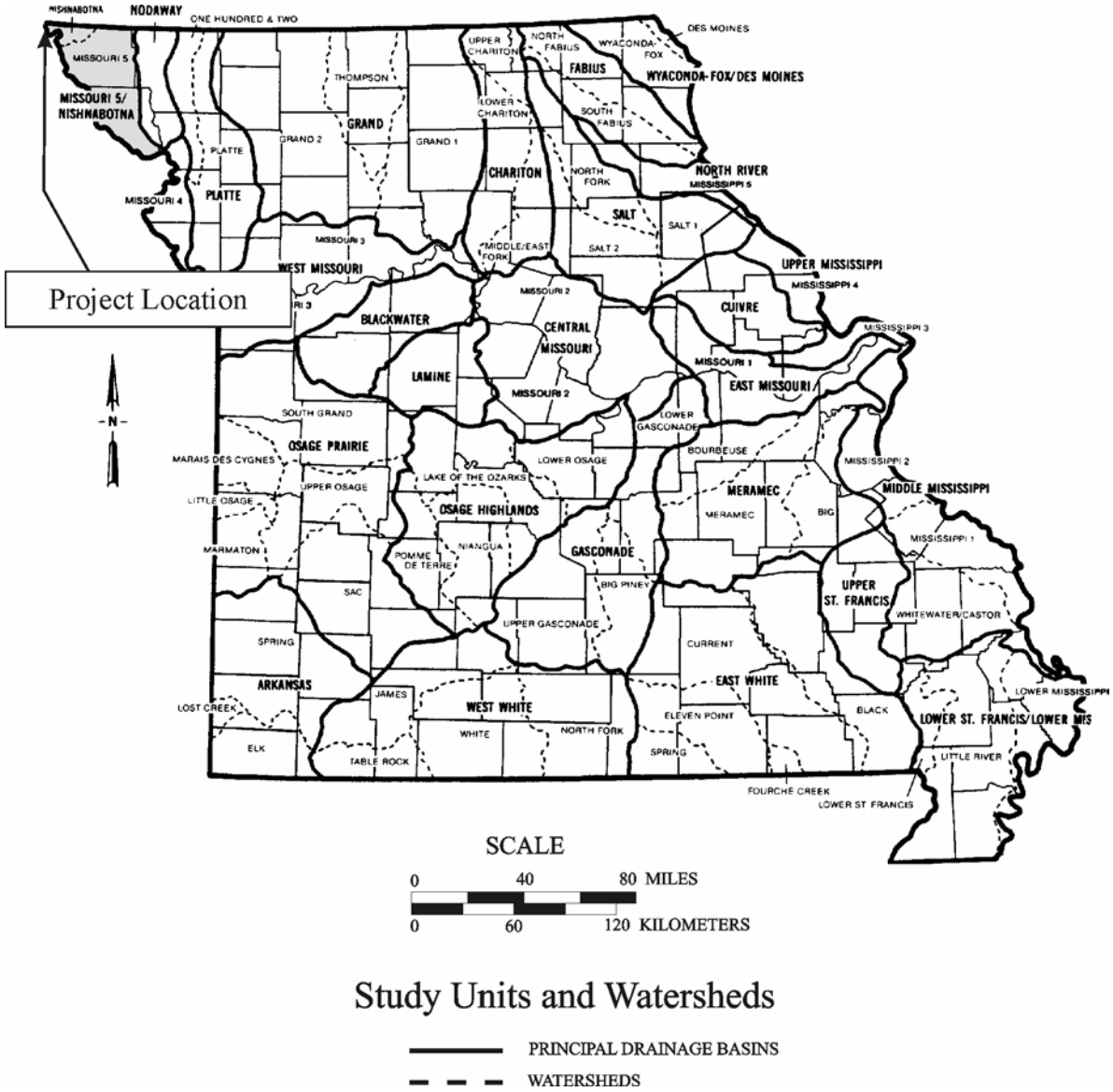

Figure 1. General location of the Barney Bend Mitigation Site.

HABITAT RESTORATION PLAN

(*See main text for additional information*)

Barney Bend currently consists of land owned by the Corps of Engineers (COE). The existing area consists of timbered areas, wetlands, and cropped lands with approximately 3.5 mi (5.6 km) of river frontage. In July 2000, a Cooperative Agreement was entered into between the COE and the Missouri Department of Conservation (MDC). The MDC controls the water and vegetation on the site with a system of water control structures, levees, and land management practices to maintain the area for bottomland habitats and associated resident wildlife.

AREA OF POTENTIAL EFFECT

The APE for the project includes a single ±917.0 ac (±371.1 ha) tract [36 C.F.R. § 800.2(c)]. This APE was documented for previously recorded archeological and historic resources including standing architectural resources to assist the planning team (Table 1 and Table 2).

Table 1. Specific characteristics of the APE.
(all Omaha District – Corps of Engineers)

Area	Total Area
Barney Bend Mitigation Site	±917.0 ac (±371.1 ha)
Total APE	±917.0 ac (±371.1 ha)

Table 2. USGS quadrangles included in and near the APE.

No.	Quadrangle	Relationship to Project
1	Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984	APE quadrangle
2	Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984	APE quadrangle

NATURAL ENVIRONMENT AND FIELD CONDITIONS

A comprehensive review of the natural environment for this part of the Northwest Missouri Region is beyond the scope of the current investigation.

Early soil surveys of Atchison County, Missouri were conducted in 1910 by the U. S. Department of Agriculture with the University of Missouri Agricultural Experiment Station (Mann and Krusekopf 1910). The 1910 survey categorized the soils in the proposed Barney Bend APE as "Riverwash," described as:

> Riverwash includes the areas along the Missouri River which are composed of alternating sand bars and sand flats and narrow depressions covered with a silty clay. These areas can not be considered as final soils, as they are but the basis for further depositions in times of overflow. They will in time probably give rise to soils such as are now found over the main bottoms.
>
> Very rarely a small part of these areas is cultivated, but the returns seldom are remunerative and as overflows are frequent the can not be utilized to any considerable extent for agriculture. They are usually covered with a growth of willow.

More recently, Soil Conservation Service scientists have mapped 46 soil units in Atchison County, Missouri. The project APE crosses 2 soil types in Atchison County, Missouri (Table 3) (Young and Kowalewycz 1994). All of the APE soils are found on floodplains and include the moderately drained and frequently flooded Haynie silt loam with 0% - 2% slopes (18) and the excessively drained and frequently flooded Sarpy loamy fine sand, gently undulating (39) that is found on levees and floodplains[3].

Table 3. Soils mapped in the APE.
(Young and Kowalewycz 1994)

Symbol	Soil Name	Drainage	Flooding	Local Setting
18	Haynie silt loam, 0% - 2% slopes	moderate	frequent	floodplains
39	Sarpy loamy fine sand, gently undulating	excessive	frequent	levees and floodplains

[3] Relative ages of the APE soils are not known and the relationship of these surfaces to prehistoric and historic uses of the project area is unknown.

PREVIOUSLY RECORDED RESOURCES

REVIEW OF THE GLO RECORDS

Instructions given to the surveyors of public lands by the Surveyor General of the United States and the General Land Office (GLO) concerned their responsibilities while mapping the states and territories (Tiffin 1815 in Minnick n.d.:1-10). These instructions were to clarify and standardize the routines of the surveyors of public land and are valuable in reconstructing the footsteps of the original surveyors and in interpreting the meanings of the original notes and plats.

Specific instructions were issued to cover the state of Missouri in 1834 (U.S. Surveyor General 1834 in Minnick n.d.:79-98). This set of information was known as the "General Instructions (1834) to Deputy Surveyors in Illinois and Missouri." Described in these notes are all land characteristics necessary in interpreting the GLO plats of the project townships and ranges from the Office of the Surveyor General for Illinois and Missouri on 30 December 1852. These plats contain notes and drawings, including the current APE. The relevant characteristics to be noted by all surveyors are described in the instructions from a letter in 1834:

> All rivers, creeks, springs and smaller streams of water, with their width and the course they run in crossing the lines of surveys, and whether navigable, rapid or otherwise; also, all swamps, ponds, stone quarries, coal beds, peat or turf grounds, mounds, precipices, caves, rapids, cascades or falls of water, minerals, ores, salt springs, salt licks and fossils, prairies, hills and mountains, towns, villages and settlements, forges, factories and cotton gins; also, all uncommon, natural or artificial productions, which may come to your knowledge, are to be particularly regarded and noted in your Field Book. You will likewise note when the lines enter and when they leave creek or river bottom.

The current APE includes parts of T7N R15E in Atchison County, Missouri (Figure 2).

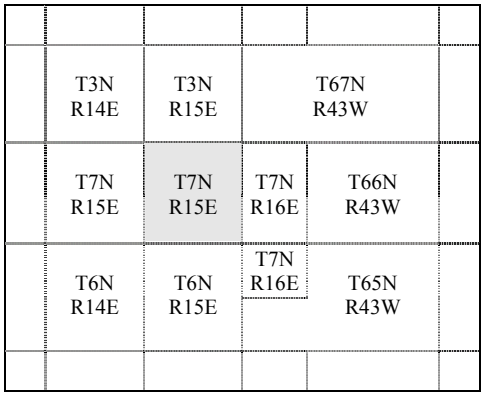

Figure 2. GLO plats included in the APE.

T7N R15E of the 6th Principal Meridian (February 15, 1856)

The dominant feature on the 1856 plat of T7N R15E (Figure 3) is the *Missouri River*[4] that defines the eastern boundary of this plat and the boundary between the state of Missouri and the state of Nebraska. The plat includes the fractional eastern sections of sections 7, 18, 19, 20, 21, 28, 27 and 34. The only additional natural feature noted on this plat is a bluff line along the eastern border of the township located in portions of sections 18, 19 and 30. There are no cultural improvements noted on this plat.

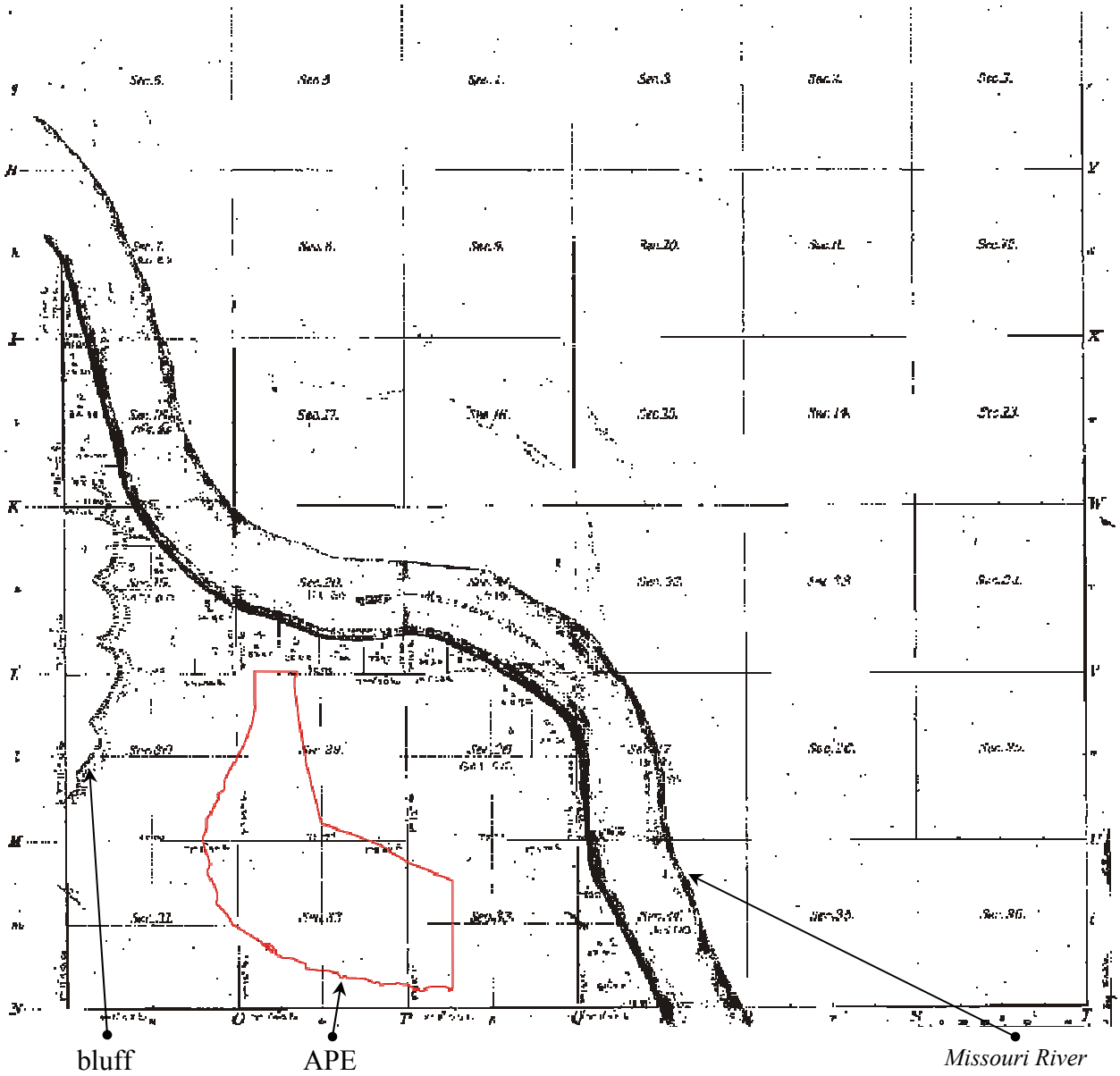

Figure 3. GLO plat of T7N R15E (February 15, 1856).
(select call-outs in T7N R15E)

[4] Note that italicized words and phrases in this discussion of GLO records indicate words and phrases as written on the GLO plates themselves. Capitalization, abbreviations, punctuation and spelling accurately reflect information recorded on the GLO.

T7N R15E of the 6th Principal Meridian (June 7, 1858)

The dominant feature on the 1858 plat of T7N R15E is the *Missouri River* (Figure 4) that defines the eastern boundary of this plat and the boundary between the state of Missouri and the state of Nebraska. The plat notes the fractional eastern sections in T7N R15E. A *slough* is noted emanating from the *Missouri River* in Section 26 flowing to the southeast through sections 35, 25, and 36, exiting the township through the eastern border of Section 36. This plat shows the vicinity now known as McKissick Island. No cultural improvements were noted on this plat.

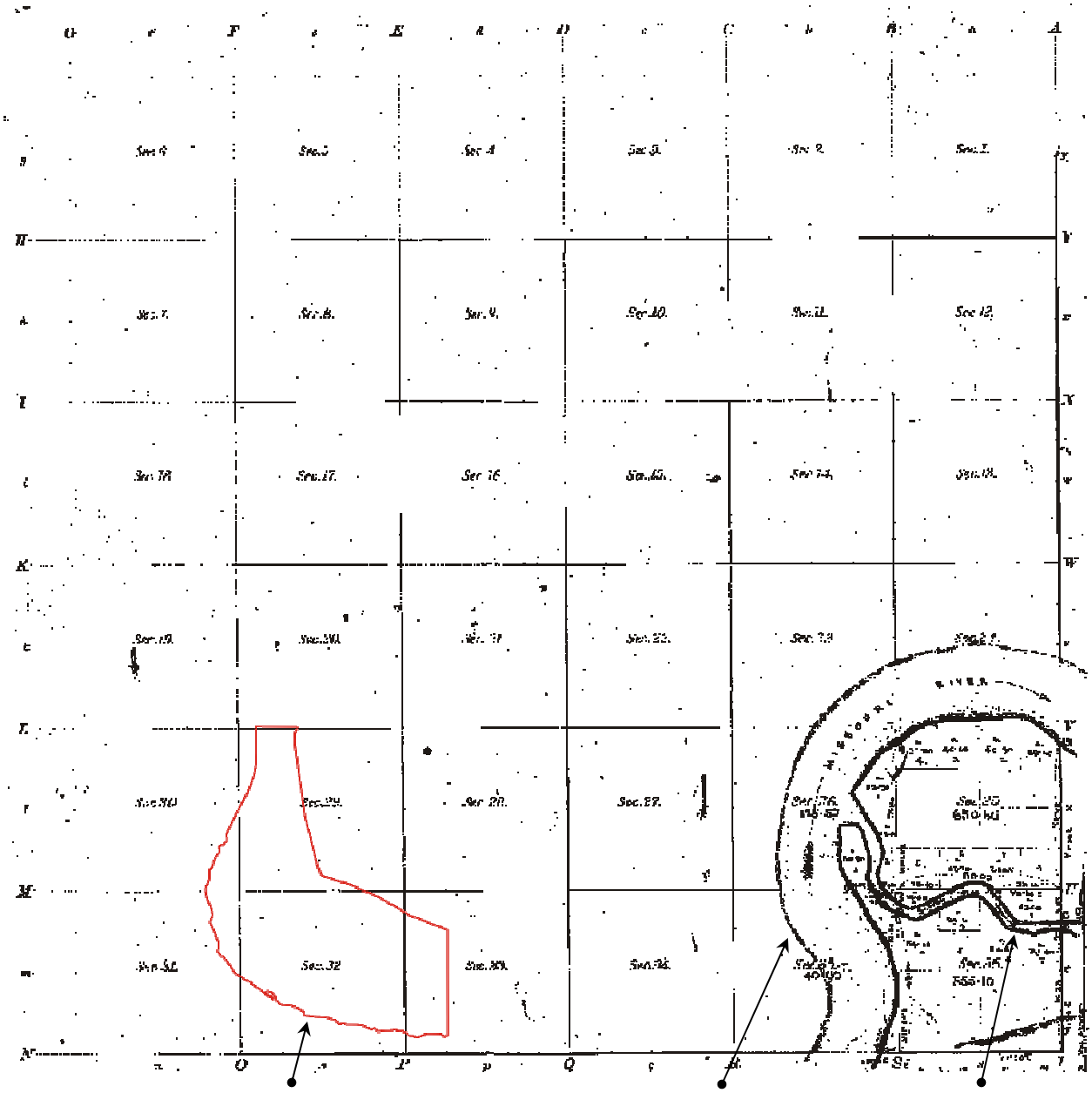

Figure 4. GLO plat of T7N R15E (June 7, 1858).
(call-outs limited to APE and vicinity)

RECORDS REVIEW

The project team requested the Archaeological Survey of Missouri (ASM) (Appendix 1) and the Nebraska State Historical Society (NSHS) Archeology Division (Appendix 3) to conduct a file search for information regarding recorded archeological and historic sites that may be located in or adjacent to the APE. No previously recorded sites are on record in the APE (see attached file search results in Appendix 2 and Appendix 4) (Table 4)[5].

Table 4. Previously recorded sites.
(in or adjacent to the APE sections based on
ASM records search dated 17 August 2006 and NSHS records search dated 17 August 2006)

Township	Section	Results
ASM Response		
T66N R43W	20	no previously recorded sites[6]
	29	no previously recorded sites
	32	no previously recorded sites
	33	no previously recorded sites
NSHS Response		
T6N R15E	3	no previously recorded sites [7]
	4	no previously recorded sites
	5	no previously recorded sites
	6	no previously recorded sites
T7N R14E	24	25OT129[8]
	36	25OT12[9]
T7N R15E	19	no previously recorded sites
	30	no previously recorded sites
	31	no previously recorded sites
	32	no previously recorded sites
	33	no previously recorded sites
	34	no previously recorded sites

[5] In addition to the ASM and Nebraska SHPO records reviews, Missouri DNR-HPP Section 106 reviewer Judith Deel was contacted for cultural resources information in connection with the referenced project (specifically about previously surveyed areas, recorded site locations, and steamboat wrecks). A review of the records consulted was discussed and Ms. Deel was satisfied with the scope and completeness of the documentation effort.

[6] Data are based on a records search conducted by the Archaeological Survey of Missouri (see appendix).

[7] Data are based on a records search conducted by the Nebraska Archeological Collections Manager and Curator of Anthropology (see appendix).

[8] Previously recorded site 25OT129 is located west of the Missouri River, and well west of the Barney Bend APE.

[9] Previously recorded site 25OT12 is located west of the Missouri River, and well west of the Barney Bend APE.

STEAMBOAT WRECKS

A review of information regarding steamboat wrecks along this area of the Missouri River indicated that there were no wrecks located in the Barney Bend APE, though three wrecks were located in the vicinity of Kansas Bend, the adjacent bend downriver. Capt. H.M. Chittenden's *List of Steamboat Wrecks on the Missouri River* (1897) indicates that the *Bishop*[10] was lost on July 15, 1867 while entering the new river channel from the "Old River" and was capsized by a strong current. A ships mate, Andy Gouff was lost. The final resting place of the *Bishop* is reported to be at the head of the Peru Cut-off. The *Kansas*[11] hit a snag on April 25, 1853, both boat and cargo were a total loss. The final resting place of the *Kansas* is on Kansas Bend, above Linden Landing according to Chittenden's report. The *Ontario*[12], piloted by Capt. Joe Fecto[13], was lost as a result of a snag at Kansas Bend on September 22, 1866. According to Captain Chittenden's report the *Ontario* was loaded with rails bound for Omaha, Nebraska and that the vessel had a reported value of $20,000. While it has been documented that all three ships were lost in the vicinity of Kansas Bend, their final locations remain undetermined.

Due to the extensive movement of the Missouri River channel from the 1800s to the present, the remains of the *Bishop*, *Kansas*, and the *Ontario* are documented to be located well east of the APE (Figure 5) and will not be affected by the proposed undertaking. No other steamboat wrecks were noted in the vicinity of the APE.

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[10] The *Bishop* was reported as a stern-wheeled small steamer engaged in Missouri River trade.
[11] The *Kansas* was reported as a side-wheeled steamer engaged by St. Louis and Weston.
[12] The *Ontario* was reported as a stern-wheeled steamer engaged in Mountain trade.
[13] Captain Joe Fecto was the pilot on three additional ill-fated vessels, the *Excel*, the *Kate Howard*, and the *Kate Sweeney*.

ACCRETED LANDS

A review of the 1803 – 1804 Lewis and Clark Missouri River map, the 1856 GLO plat of T7N R15E, 1879 and 1893 Missouri River channel maps [Missouri River Commission (MRC) 1891-1895], 1910 USDA soil survey map for Atchison County, Missouri, 1940 COE topographic survey map of the Missouri River, 1940 COE alluvial plain map, 1947 USGS topographic map of the Missouri River, 1968 COE hydrographic survey map, 1974 COE Missouri River channel map, and aerial photographs from 1993 and 2000 was performed to assess the extent of accretion occurring in the limits of the Barney Bend APE. River channel maps and the aerial photographs were digitized and overlaid onto the base map (comprised of the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles) to show areas where erosion and deposition has occurred due to natural meandering by, and man induced changes to, the Missouri River.

Channels of the Missouri River passed though roughly 5% (46.2 ac; 18.7 ha) of the Barney Bend APE based on the 1803 – 1804 Missouri River map assembled during the Lewis and Clark Expedition (http://lewisclark.geog.missouri.edu/website/lewisclark1/viewer.htm; Curator of the University of Missouri 2002a). One large island is shown to form an east and west channel, with a portion of the western channel covering a small area at the northern end of the Barney Bend APE. Though none of the Lewis and Clark campsites were located in the immediate vicinity of the Barney Bend APE, one was reported approximately 4.5 mi (7.3 km) east "Starboard Opposite Bald Island ('Isle Chauvin'), July 16-17, 1804" (Curator of the University of Missouri 2002b; http://lewisclark.geog.missouri.edu/campsites/1804/july16camp.shtml) (Figure 5).

The Missouri River channel did not pass through the Barney Bend APE based on the Missouri GLO plat of T7N R15E of the 6th Principal Meridian dated February 15, 1856. This map was incorporated in the accretion study because it shows both the eastern and the western bank of the Missouri River. The 1856 GLO plat suggests that Missouri River channel passed north and east of the Barney Bend APE. It also shows the western channel illustrated on the 1803 – 1804 Lewis and Clark map (Figure 5) no longer existed. The GLO plat also shows that at the southern portion of the Barney Bend APE the Missouri River channel noted on the Lewis and Clark map migrated farther south before bending to the east (Figure 6).

Channels of the Missouri River did not pass though the Barney Bend APE based on the 1879 MRC maps. The MRC maps illustrate the same change in the Missouri River channel illustrated by the 1856 GLO plat (Figure 6). A major change shown on the MRC map is that the river channel documentation was vastly more detailed than the earlier maps. The course of the river, though generally the same that depicted on the 1856 GLO, is far wider, with multiple channels and islands. It is also shown to have a far more acute bend to the south, east of the Barney Bend APE. This depiction of the Missouri River channel also shows that the plotted shipwrecks of the *Bishop*, *Kansas*, and the *Ontario* occur in plausible locations (Figure 7).

Channels of the Missouri River crossed roughly <1% (8.3 ac; 3.4 ha) of the Barney Bend APE based on the 1893 MRC maps. The most obvious change from the previous maps is that the Missouri River channel had now divided into three channels, with the western channel shifting southward and crossing through the northern portion of the Barney Bend APE to join the middle channel. The middle channel is shown to follow the channel depicted on the 1879 MRC maps (Figure 7), but shifting slightly more to the south, more or less parallel to the eastern border of the Barney Bend APE. The eastern channel shifted only slightly to the northeast, then angling southeast to join the middle channel. The sharp southward bend shown on previous maps has now been replaced by a gentle angle to the southeast (Figure 8).

Channels of the Missouri River did not pass though the Barney Bend APE based on the 1910 USDA soil survey map (Mann and Krusekopf 1910). This map illustrates prominent changes from the earlier 1893 MRC map (Figure 8), in that the Missouri River is shown to have been restricted to a single channel (the former middle channel). The former middle channel is also shown to have shifted slightly eastward, with a much more pronounced bend east of the Barney Bend APE. East of the Barney Bend APE, the Missouri River channel crosses the location of the modern river channel in the vicinity of Kansas Bend (Figure 9).

Channels of the Missouri River crossed roughly 28% (255.3 ac; 103.3 ha) of the Barney Bend APE based on the 1940 COE topographic survey of the Missouri River maps (sheets 41 and 42, though Sheet 40 covering the southeast portion of the Barney Bend APE could not be located, thus more accretion occurred, but can not be documented)[14]. These maps show that the Missouri River channel had pushed westward to the bluff line west of the modern river channel. The channel as shown appears as a wide, braided course with islands. These maps also show that the Missouri River channel parallels the modern channel to the north within the Barney Bend APE (Figure 10).

Channels of the Missouri River crossed roughly 25% (231.7 ac; 93.8 ha) of the Barney Bend APE based on the 1940 COE alluvial plain map (sheet 10). This map illustrates that the river had undergone drastic changes [due to the Bank Stabilization and Navigation Project (BSNP)] as its course now generally follows the modern channel of the Missouri River shown on the Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles. The river's new alignment still shows two channels of the river north, but parallel to the modern channel in sections 32 and 33 T17N R15E of the 6th Principal Meridian as shown in the 1940 COE topographic survey of the Missouri River (Figure 10 and Figure 11).

[14] Sheet 40 of the COE topographic survey of the Missouri River could not be located by either the Omaha or Kansas City Districts, though efforts were made by both parties.

Channels of the Missouri River crossed roughly 11% (103.7 ac; 42.0 ha) of the Barney Bend APE based on the 1947 USGS Missouri River topographic map. This map illustrates that the Missouri River had generally shifted to the current channel shown on the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles. The two channels noted on the 1940 COE alluvial plain map (Figure 11), and 1940 COE topographic survey of the Missouri River maps (Figure 10), still remain, though the northern channel runs through the middle of the Barney Bend APE, while the southern, main channel is shown as following the modern Missouri River channel (Figure 12).

The Missouri River channel did not pass through the Barney Bend APE based on the 1968 COE (Omaha District) hydrographic survey of the Missouri River map (sheets 16 – 17). By this time, the Missouri River had been fully channelized and followed the course shown on the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles. This map illustrates the impact of the BSNP along this portion of the river. The river channel as illustrated on the 1968 COE (Omaha District) hydrographic survey of the Missouri River map runs adjacent to and west of the Barney Bend APE (Figure 13).

The Missouri River channel did not pass through the Barney Bend APE based on the 1974 COE (Omaha District) Missouri River map (sheets 16 – 17). This map illustrates the impacts of the BSNP projects along this portion of the river. The Missouri River channel is shown to follow the course shown on the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles. The river channel as illustrated on the 1974 COE (Omaha District) Missouri River map runs adjacent to and west of the Barney Bend APE (Figure 14).

The Missouri River channel did not pass through the Barney Bend APE based on the 1993 COE aerial photograph. This photograph illustrates that the river occupies the present course shown by the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles. The river channel as illustrated on the 1993 aerial photograph runs adjacent to and west of the Barney Bend APE (Figure 15).

The Missouri River channel did not pass through the Barney Bend APE based on the 2000 COE aerial photograph. This photograph illustrates that the river occupies the present course shown by the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles. The river channel as illustrated on the 2000 aerial photograph runs adjacent to and west of the Barney Bend APE (Figure 16).

A composite image was created by showing each of the previously described map layers over the base map comprised of the modern Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984 USGS quadrangles (Figure 17). Areas in the Barney Bend APE that are covered by former river channels or bank revetments and dike fields are considered to be accreted lands, and those areas not covered by the superimposed river channels or bank revetments and dike fields are considered to be non-accreted lands. The composite river mapping data indicates that approximately 47.1% (432.2 ac; 174.9 ha) of the Barney Bend APE has been accreted since the early 19th Century. Approximately 52.9% (484.8 ac; 196.2 ha) of the Barney Bend APE is non-accreted (Figure 18).

LIKELIHOOD OF UNRECORDED SITES

Approximately 52.9% of the APE has not been accreted since the early 19th Century. These non-accreted areas have been relatively stable for some time during the prehistoric past as well. Because of this condition, it is possible that evidence of historic and perhaps prehistoric activities may occur in portions of the APE. Based on this possibility (and the fact that this area has never been reviewed by a professional archeologist), it is recommended that a Phase I cultural resources survey be conducted prior to project implementation (with monitoring as may be required during project implementation) on those areas of non-accreted land that would be affected by major land disturbing activities.

UNANTICIPATED DISCOVERY PLAN

If any cultural and/or human remains are uncovered during construction, the work in the site area will be halted until the site area can be evaluated for National Register of Historic Places significance. The Kansas City District, District Archeologist will be notified of the discovery and will be responsible for determining site significance. The Corps will coordinate the site findings with the appropriate State Historic Preservation Officer and/or Indian Tribe(s).

CONCLUSIONS AND RECOMMENDATIONS

In accordance with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* and standard protocol for the investigation of potential effects to cultural resources those previously recorded resources that may be affected by the proposed project have been identified [36 C.F.R. § 800.4(b)]. The APE for the project includes a single tract adjacent to the left descending bank of the Missouri River. The entire project results in a total APE of ±917.0 ac (±371.1 ha) [36 C.F.R. § 800.2(c)]. This APE was documented for previously recorded archeological and historic resources including standing architectural resources to assist the planning team.

The intensity and scope of the investigations in connection with the APE were sufficient to determine whether historic or prehistoric properties were previously recorded that either are on or may be eligible for inclusion on the National Register of Historic Places, or whether additional investigations are necessary to make such a determination. No architectural resources are currently known to be located in or near the APE. It is possible that the remains of the *Bishop*, *Kansas*, and the *Ontario* are in the vicinity, but are located well east of the APE. In addition to this possibility, approximately 52.9% (484.8 ac; 196.2 ha) of the APE has not been accreted since the 1803 – 1804 mapping and should be the focus of Phase I documentation (Table 5, Table 6, and Table 7) in any areas where ground disturbance is planned or may occur.

Table 5. Summary of investigations in the Barney Bend Mitigation Site.

Area	County	Waterway Name	Type of Study Conducted	Results/Recommendation
Barney Bend Mitigation Site	Atchison County, MO	Missouri River	Records Only and Accretion Analysis	Phase I documentation of non-accreted lands in any areas where ground disturbance is planned or may occur

Table 6. Summary of resources in the Barney Bend Mitigation Site.

Resources	Relationship to APE	Recommendations
Non-accreted lands	In APE	Phase I documentation of non-accreted lands in any areas where ground disturbance is planned or may occur

Table 7. Summary of results in the Barney Bend Mitigation Site.

Area	Resources	Recommendations
Barney Bend Mitigation Site	Non-accreted lands	Phase I documentation of non-accreted lands in any areas where ground disturbance is planned or may occur

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1897 *List of Steamboat Wrecks on the Missouri River from the Beginning to the Present*. In Annual Report of the Chief of Engineers for 1897, pp. 3869 – 3892. Government Printing Office, Washington, D.C.

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2002b Lewis and Clark Across Missouri. http://lewisclark.geog.missouri.edu/campsites/1804/july16camp.shtml. University of Missouri-Columbia.

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Young, Fred J. and Patricia Kowalewycz
1994 *Soil Survey of Atchison County, Missouri*. United States Department of Agriculture, Soil Conservation Service. Washington, D.C.

PROJECT PARTICIPANTS

JOHN L. GRAY IV produced the report graphics, assisted in archival research, and authored various sections of the report. Mr. Gray received a B.A. in Anthropology from the University of Arkansas in 1991 and has extensive experience in archeology throughout the Midwest.

TIMOTHY C. KLINGER served as principal investigator and authored various sections of the report. Mr. Klinger received an M.A. in Anthropology from the University of Arkansas in 1977 and a J.D. from the University of Arkansas, School of Law in 1982. He is a member of the Registry of Professional Archeologists and is an attorney at law licensed by the State of Arkansas.

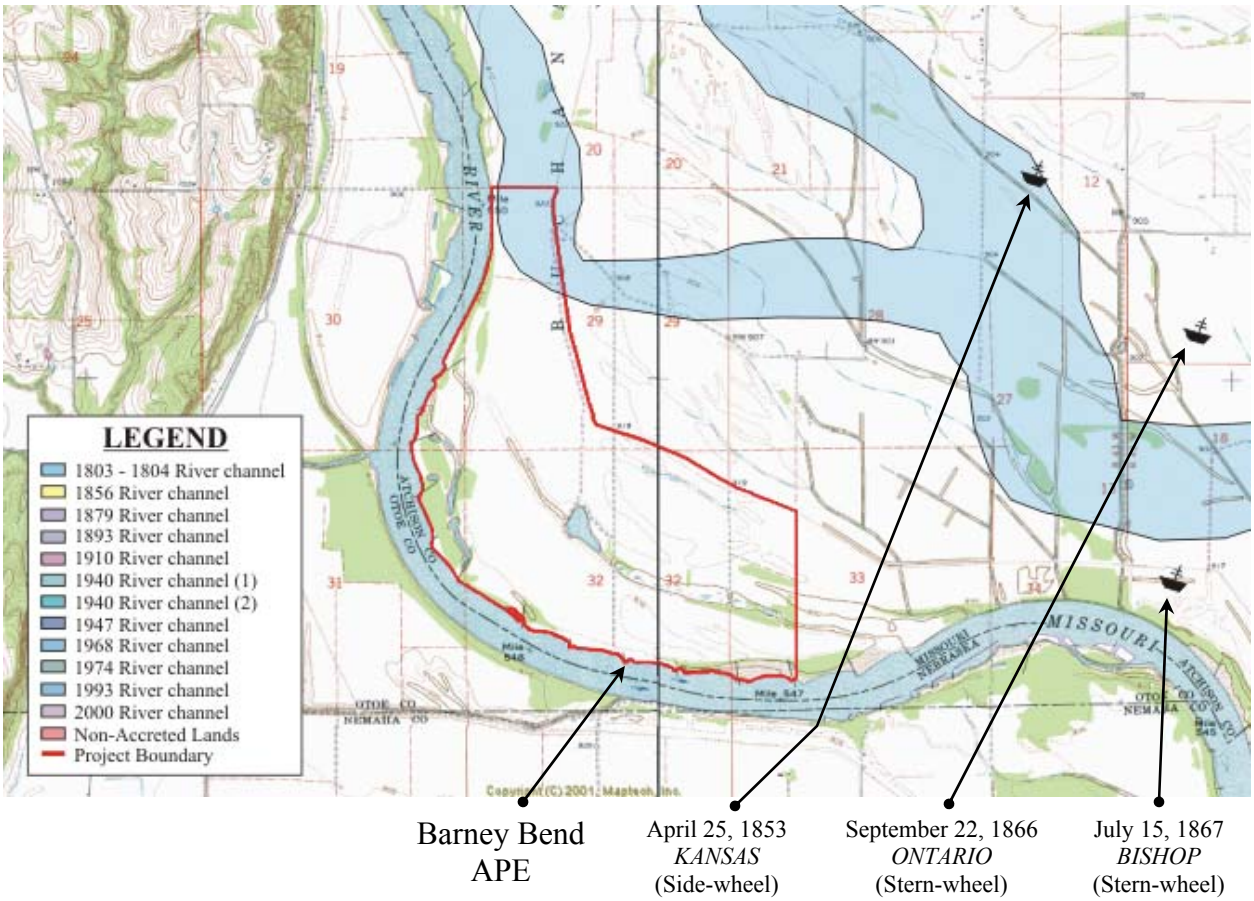

Figure 5. Course of the Missouri River based on the 1803 - 1804 Lewis and Clark map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from http://lewisclark.geog.missouri.edu/website/lewisclark1/viewer.htm; Curators of the University of Missouri 2002a; wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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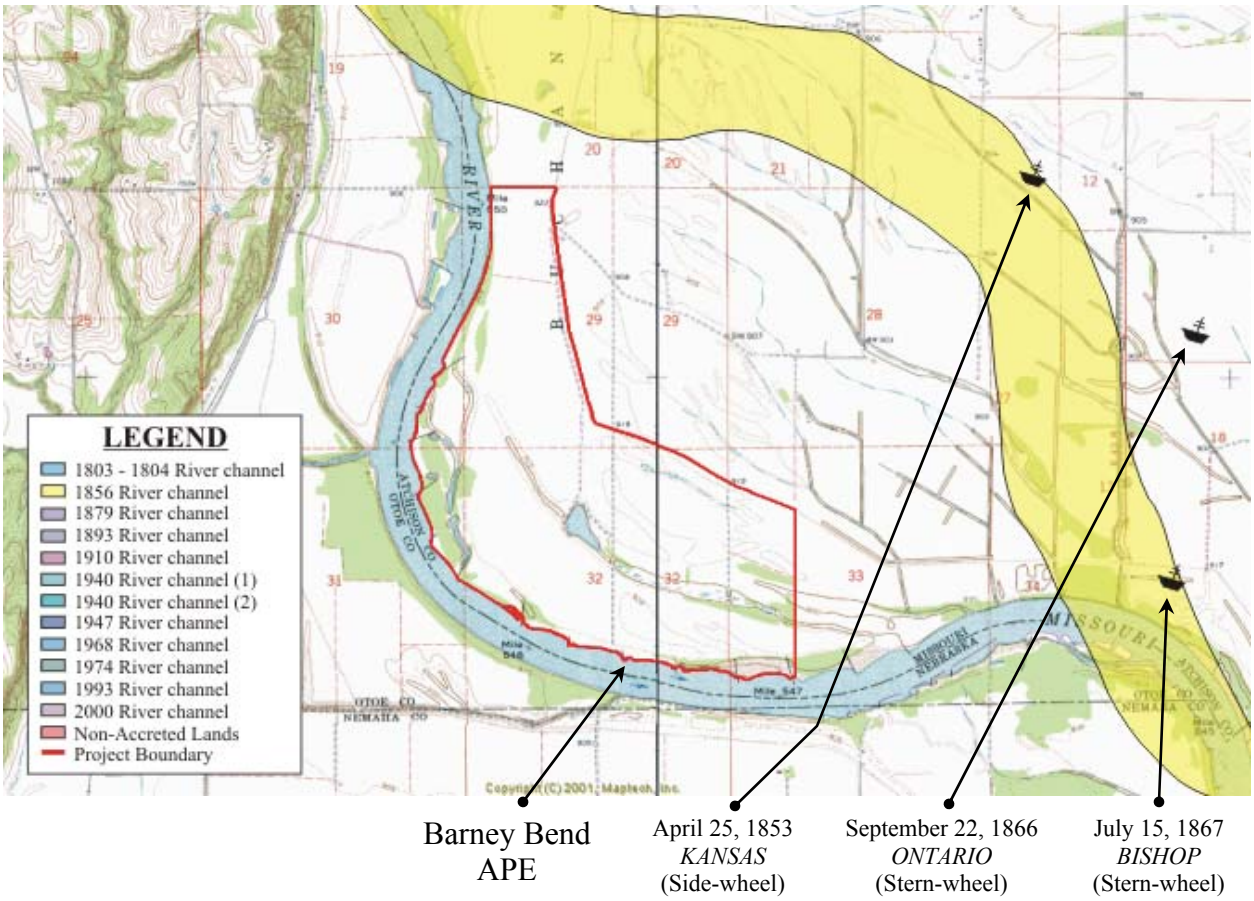

Figure 6. Course of the Missouri River based on the 1856 GLO Plat of 7N R15E.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from GLO plat T7N R15E dated February 15, 1856; wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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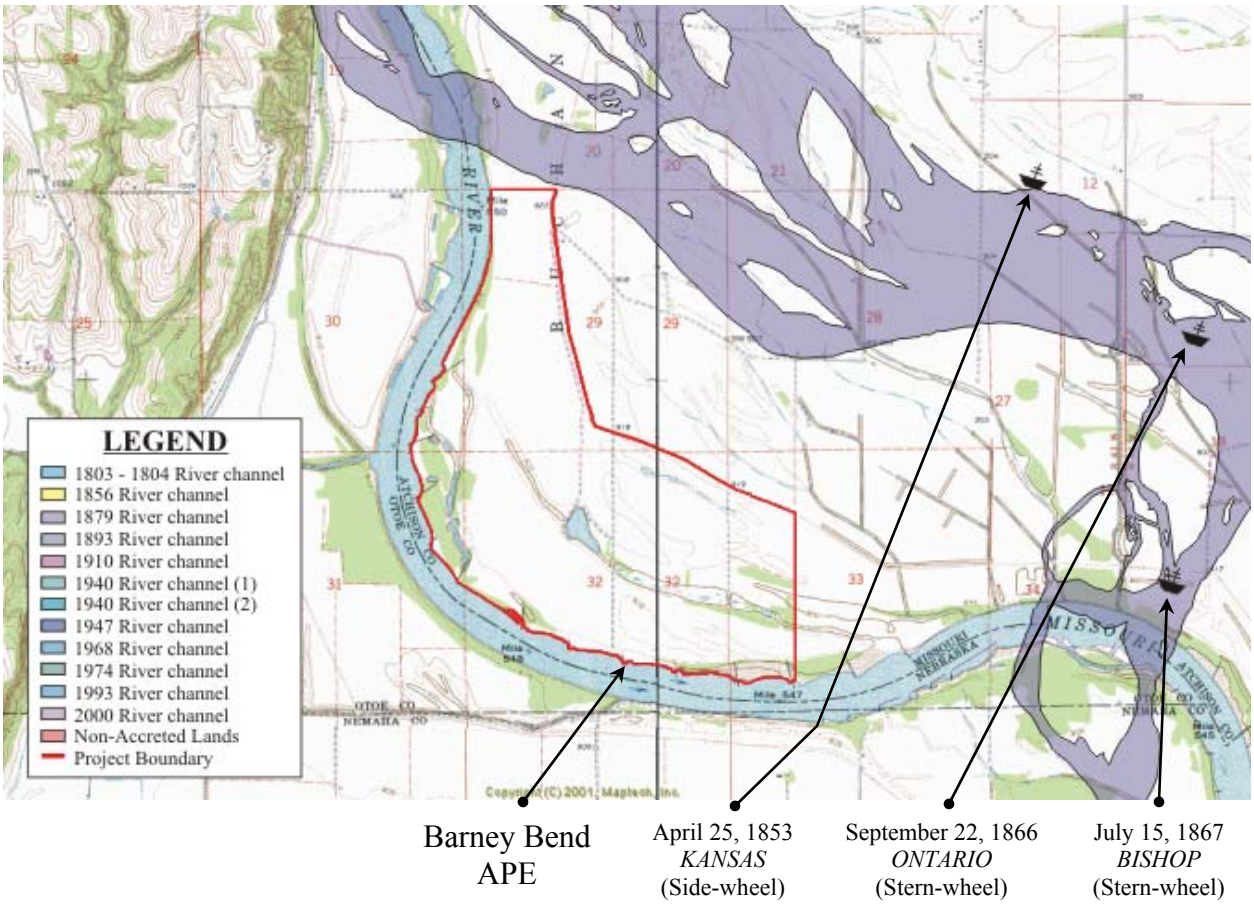

Figure 7. Course of the Missouri River based on the 1879 MRC map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Missouri River Commission 1879: Plate XXI; wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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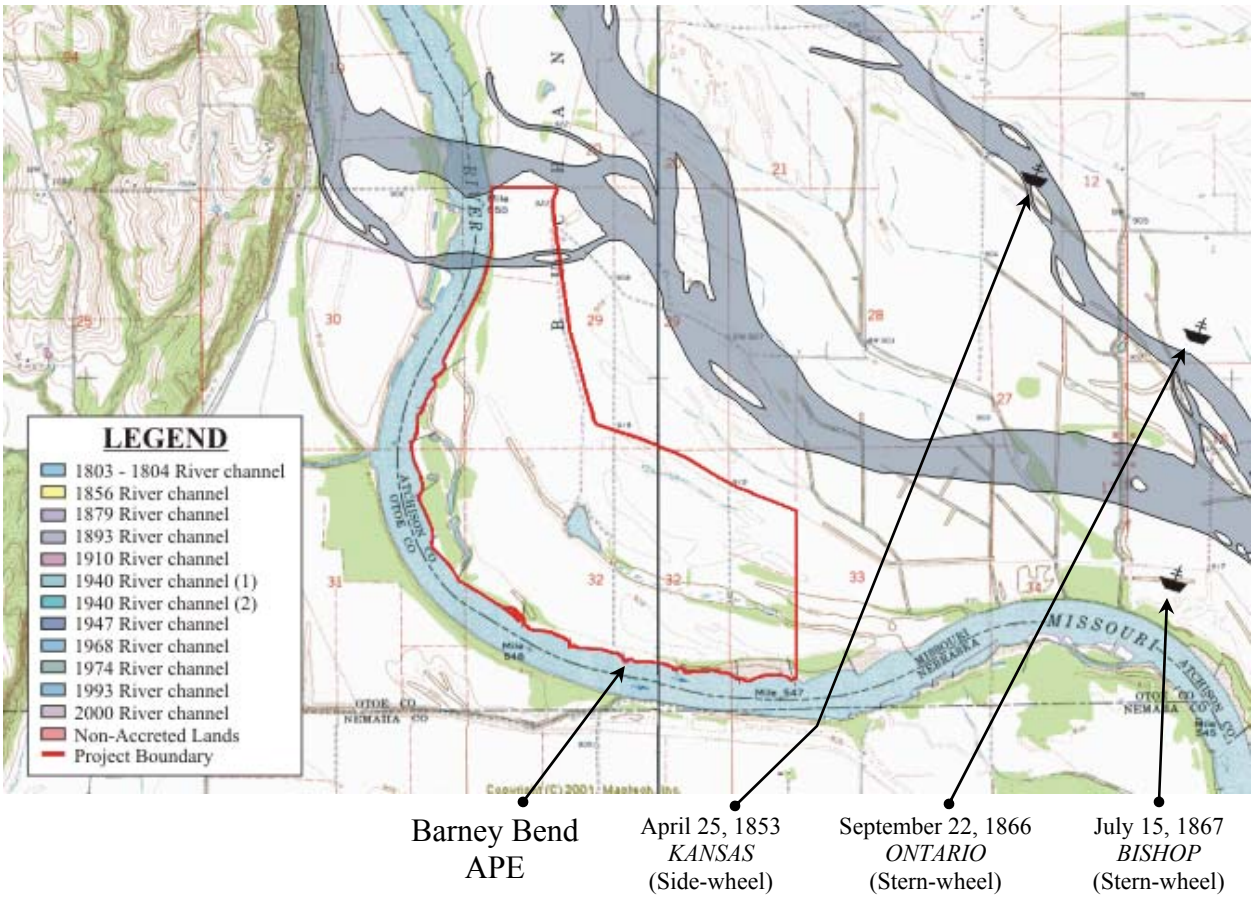

Figure 8. Course of the Missouri River based on the 1893 MRC map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Missouri River Commission 1893: Plate XXI; wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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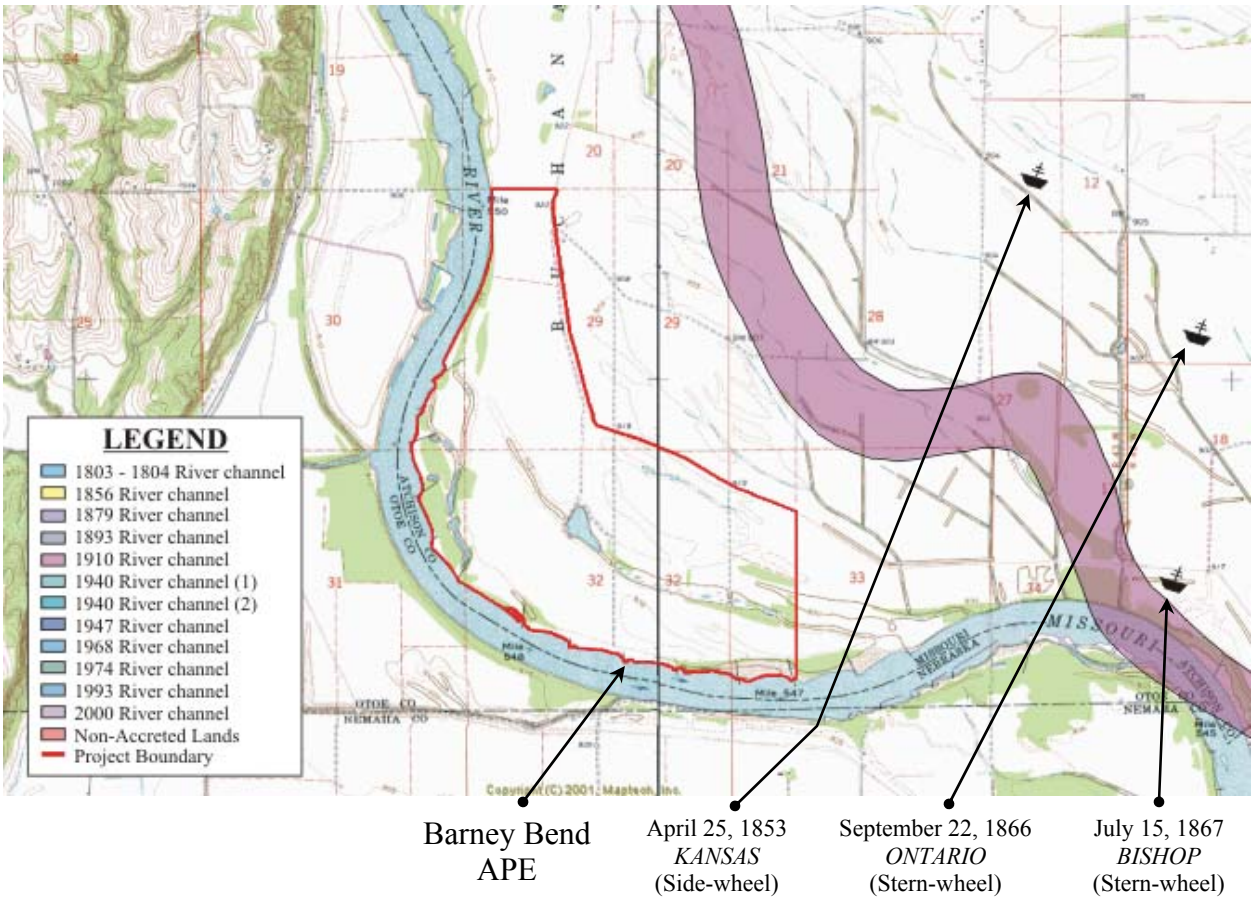

Figure 9. Course of the Missouri River based on the 1910 USDA soil survey map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Mann and Krusekopf 1910, wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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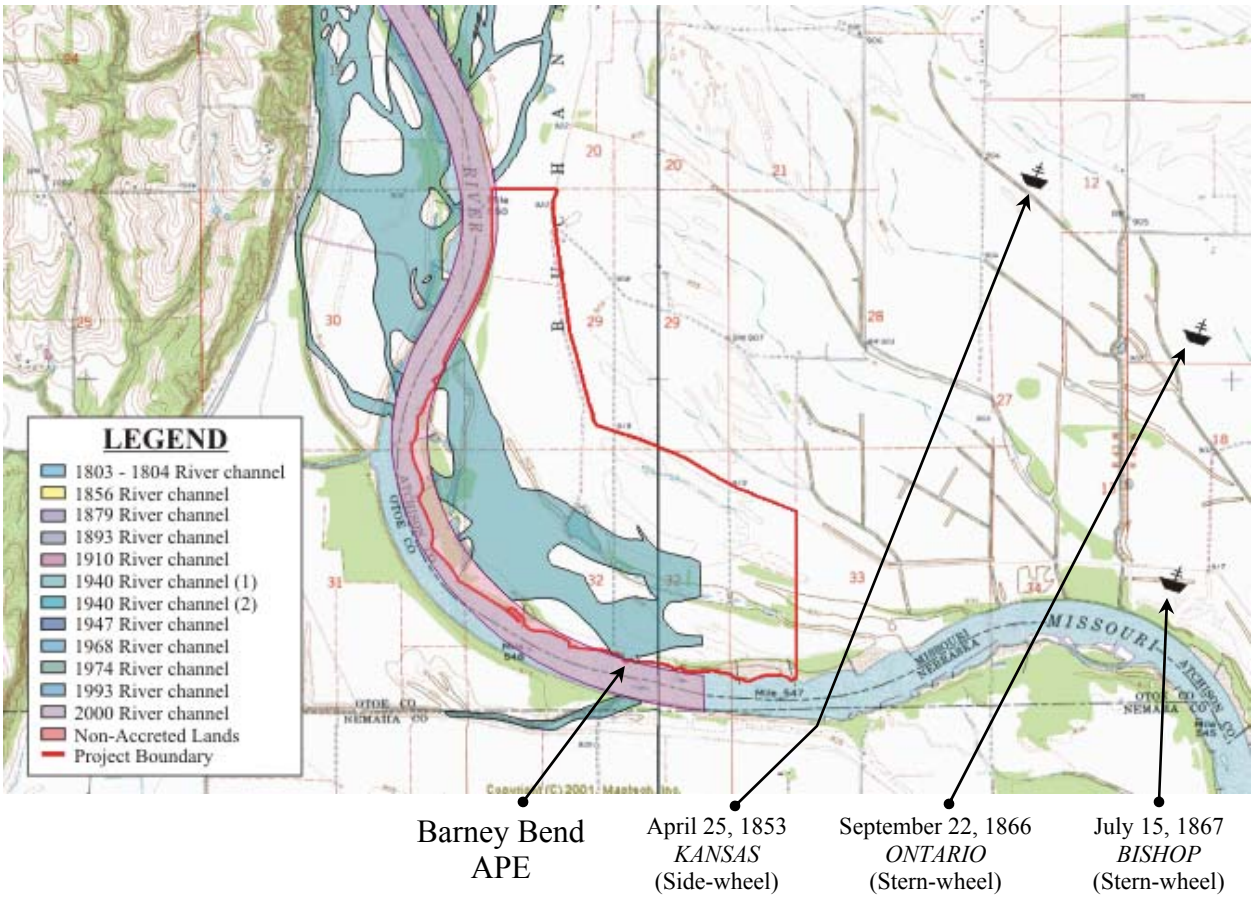

Figure 10. Course of the Missouri River based on the 1940 COE topographic river map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Army Corps of Engineers topographic survey maps 1940: Sheets No. 41 and 42;
wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]
NOTE: the river course is plotted in green, the peach indicates the COE projected river course obscuring data

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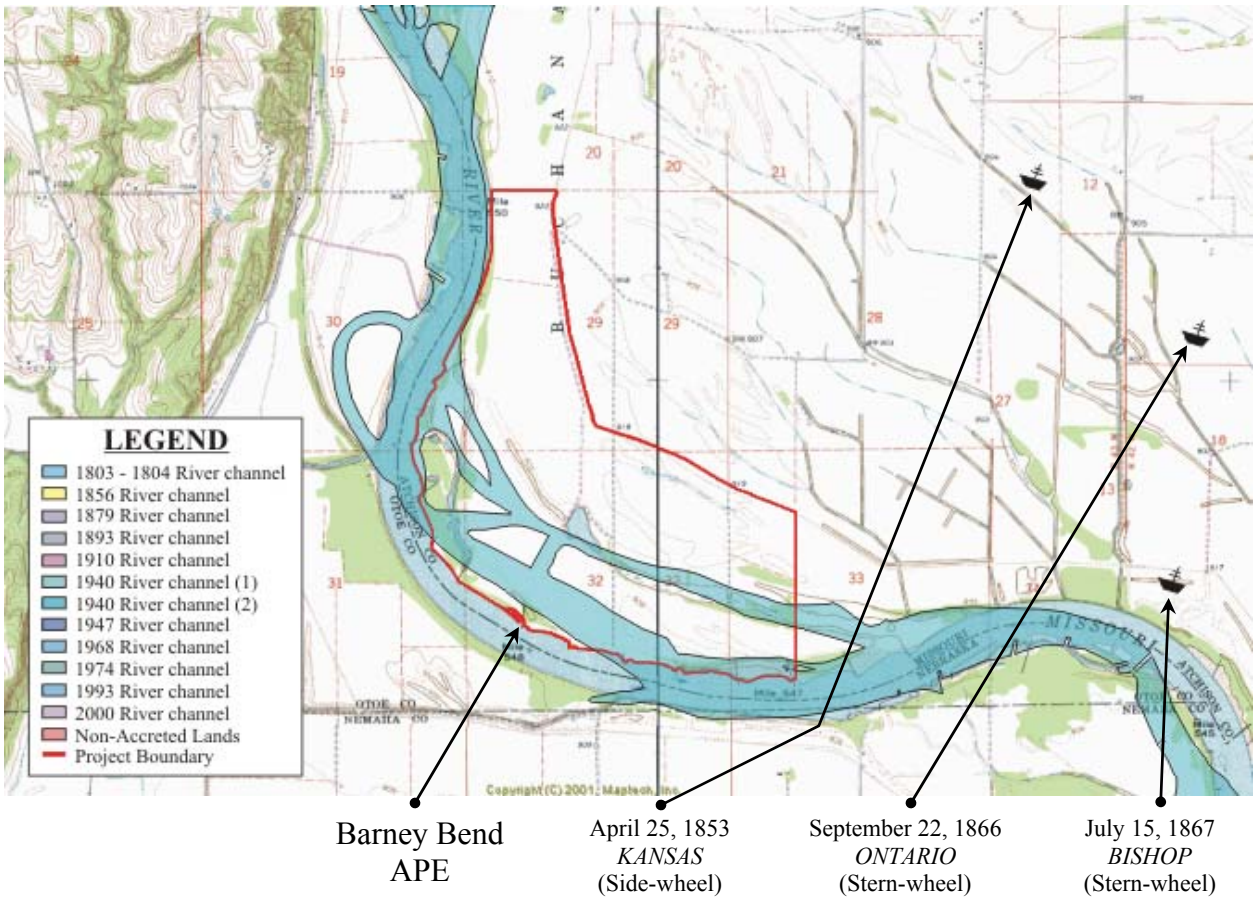

Figure 11. Course of the Missouri River based on the 1940 COE alluvial plain map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Army Corps of Engineers alluvial plain survey maps 1940: Sheet No. 10;
wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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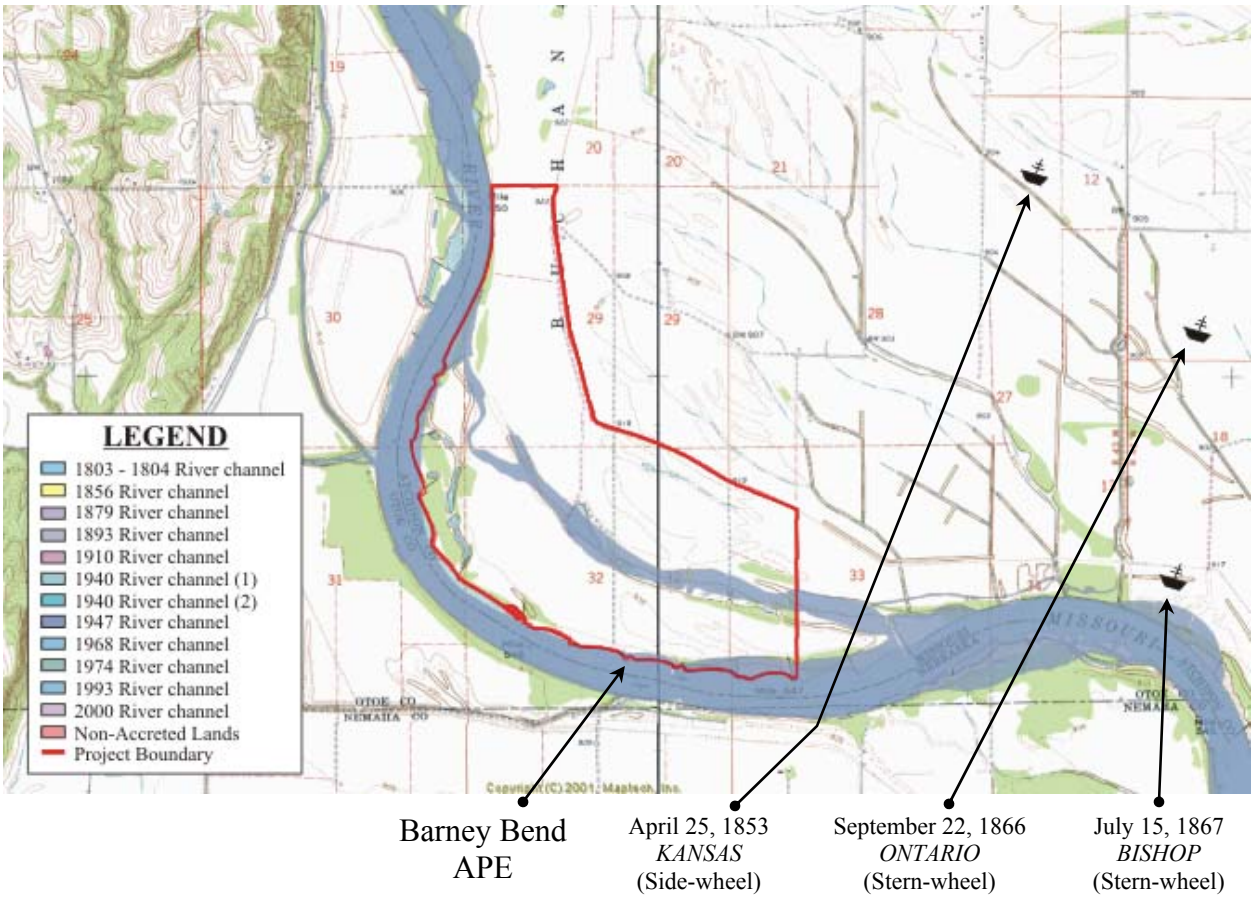

Figure 12. Course of the Missouri River based on the 1947 Missouri River topographic map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from USGS Missouri River Rulo, NEBR. to Yankton, S.D. 1947: Sheet No. 58;
wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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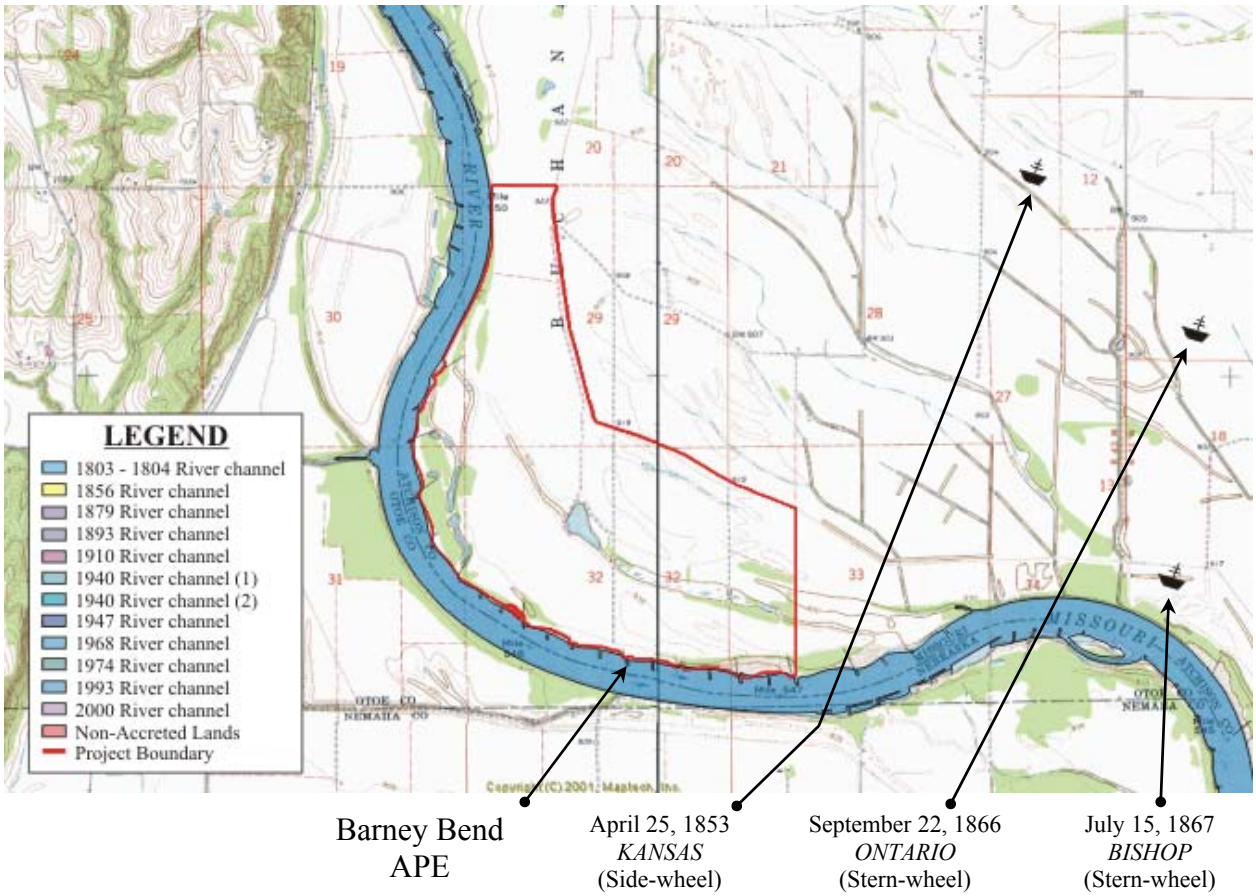

Figure 13. Course of the Missouri River based on the 1968 COE hydrographic survey map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Corps of Engineers hydrographic survey 1968, sheets 16 and 17;
wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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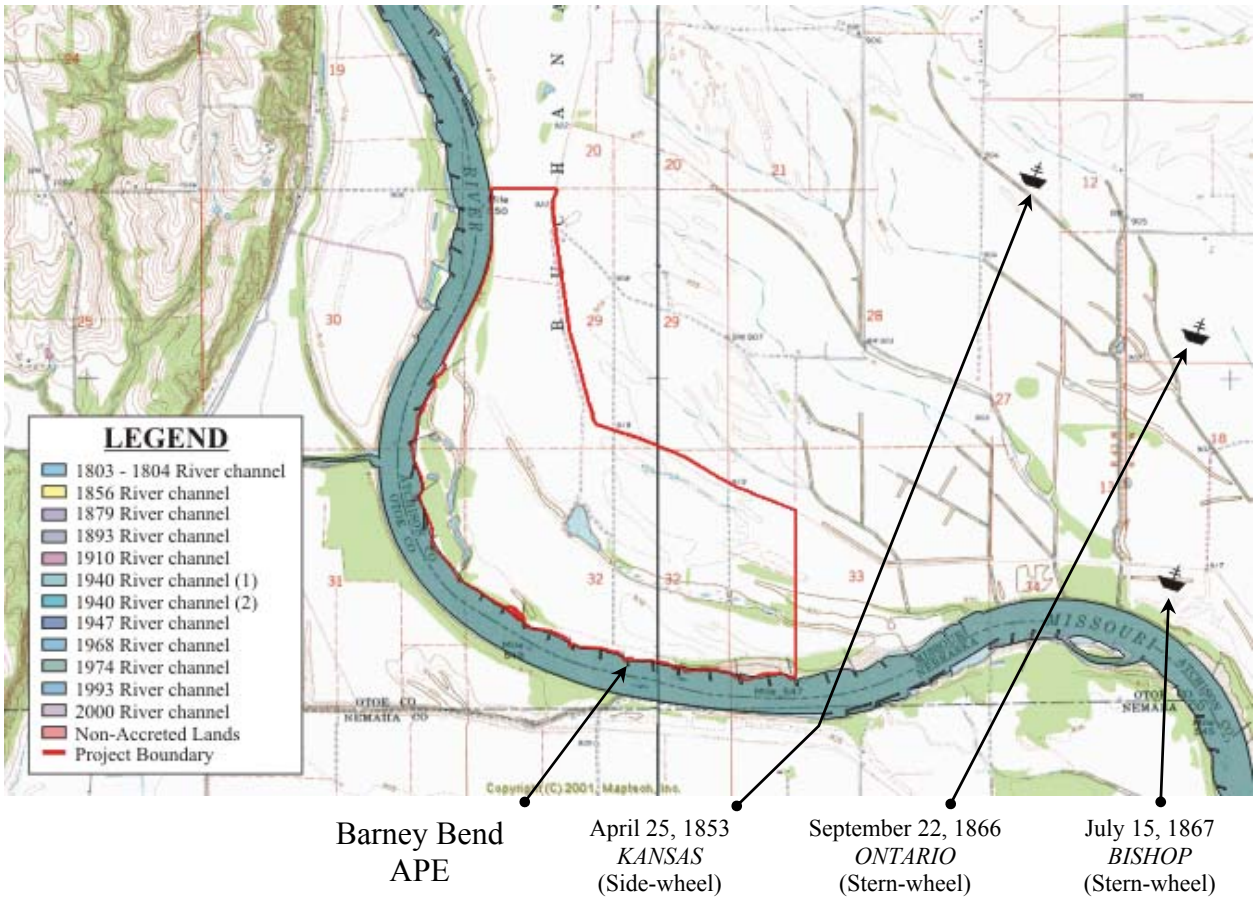

Figure 14. Course of the Missouri River based on the 1974 COE map.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Omaha District Army Corps of Engineers Missouri River Map: sheets 16 and 17;
wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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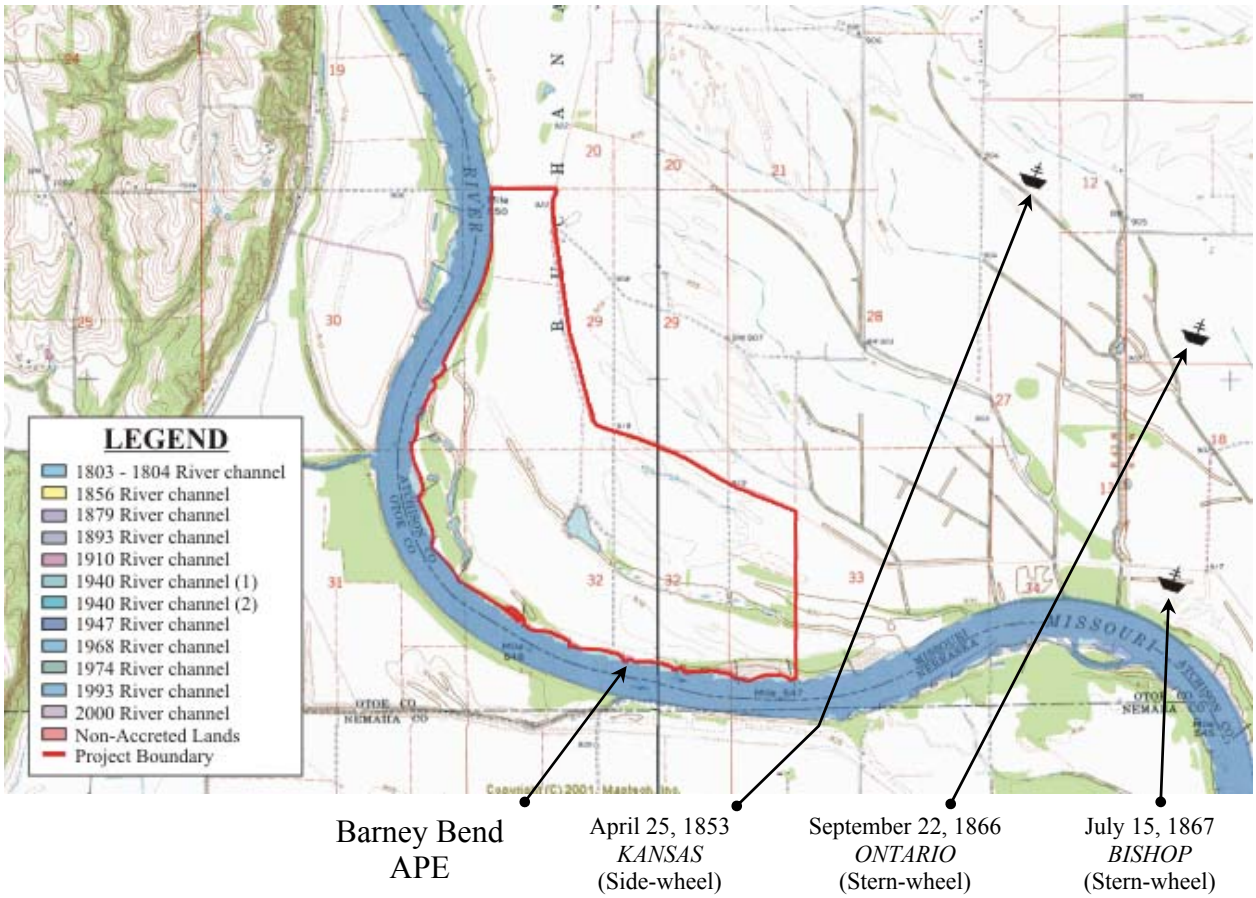

Figure 15. Course of the Missouri River based on the 1993 COE aerial photograph.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Corps of Engineers aerial photograph 1993; wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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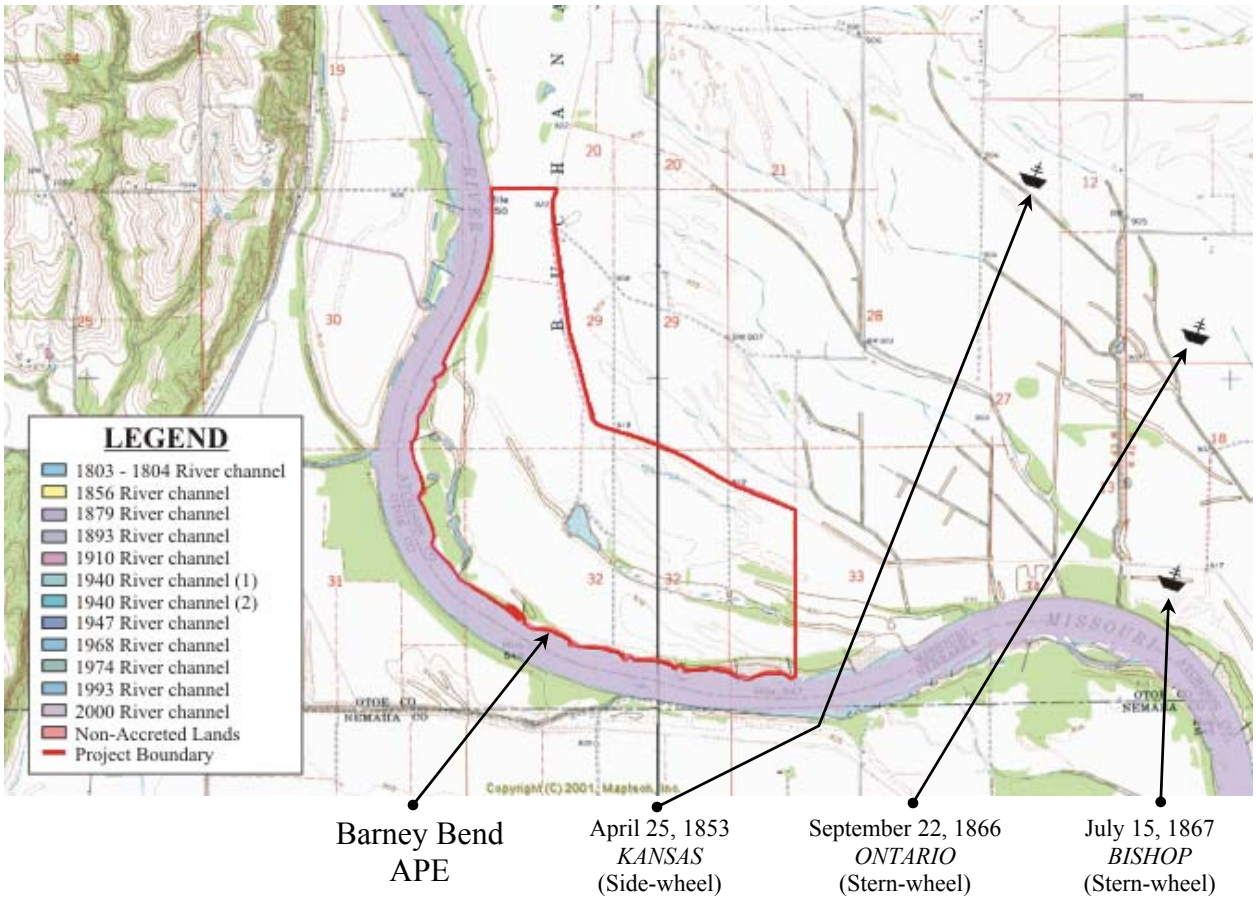

Figure 16. Course of the Missouri River based on the 2000 COE aerial photograph.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from Corps of Engineers aerial photograph 2000; wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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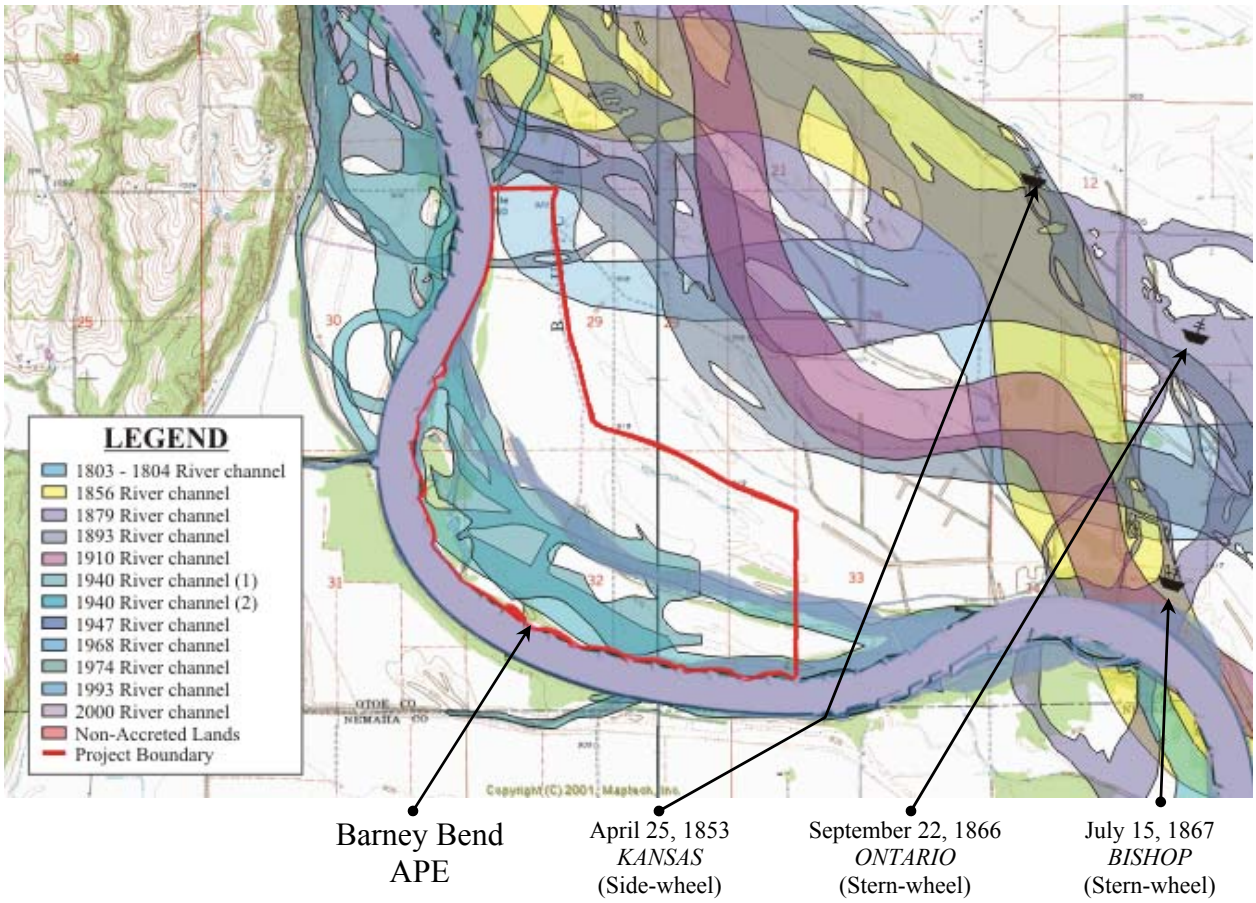

Figure 17. Accreted lands at Barney Bend.

(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[from http://lewisclark.geog.missouri.edu/website/lewisclark1/viewer.htm; Curators of the University of Missouri 2002a; from GLO plat T7N R15E dated February 15, 1856; from Missouri River Commission 1879: Plate XXI; from Missouri River Commission 1893: Plate XXI; from Mann and Krusekopf 1910; from Army Corps of Engineers topographic survey maps 1940: sheets No. 41 and 42; from Army Corps of Engineers alluvial plain survey maps 1940: Sheet No. 10; from USGS Missouri River Rulo, NEBR. to Yankton, S.D. 1947: Sheet No. 58; from Corps of Engineers hydrographic survey 1968, sheets 16 and 17; from Omaha District Army Corps of Engineers Missouri River Map: sheets 16 and 17; from Corps of Engineers aerial photograph 1993; from Corps of Engineers aerial photograph 2000; and wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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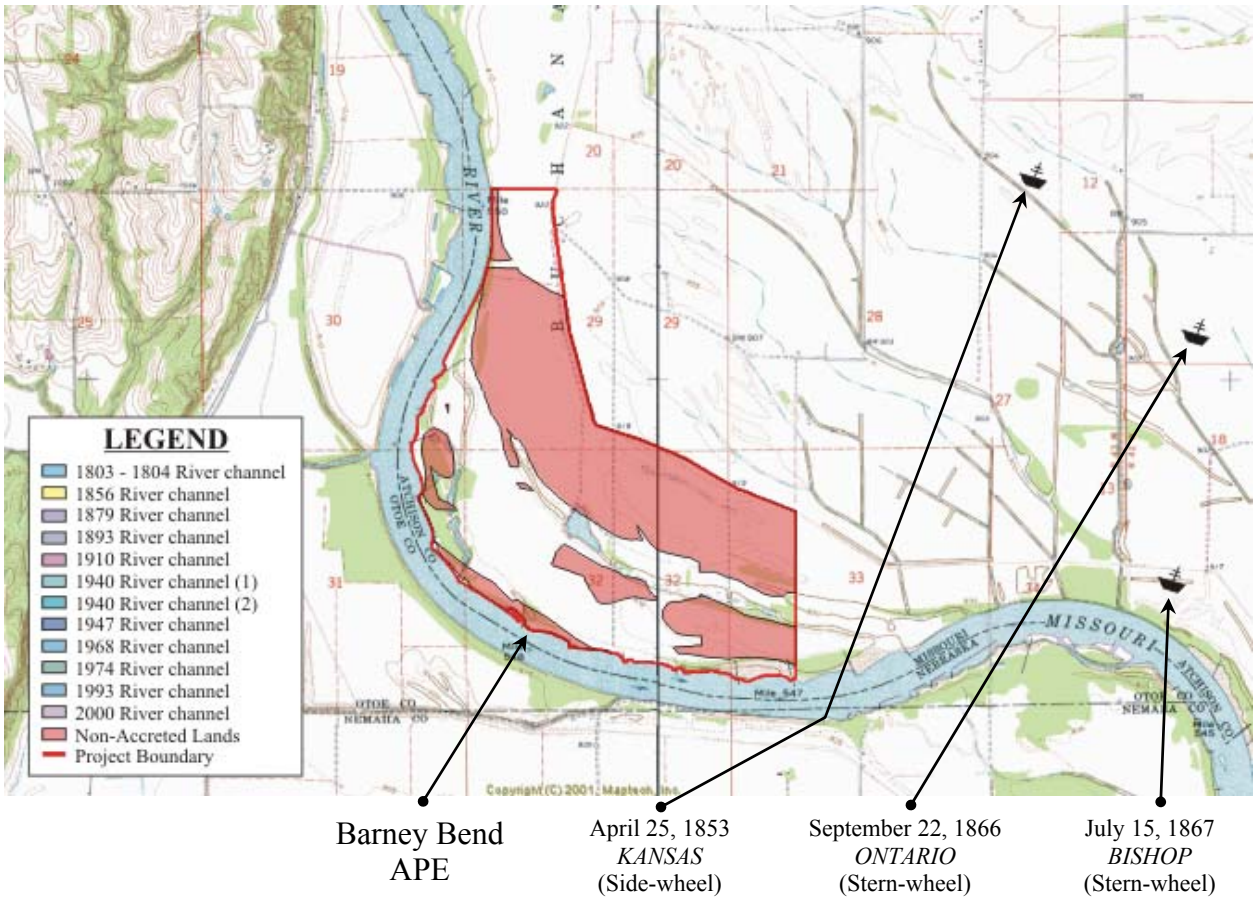

Figure 18. Non-Accreted lands at Barney Bend.
(USGS Hamburg, IOWA – MO. – NEBR. 7.5' 1966 PR 1984 and Julian, NEBR. – MO. – IOWA 7.5' 1966 PR 1984)
[wreck data from MRC Steamboat Wrecks on the Missouri 1897: Plate 69]

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Archaeological Survey of Missouri
Request for Information

ASM Identification Number_____ **Date** 8/16/06

This ASM file search was requested by Timothy C. Klinger

Organization **Historic Preservation Associates, LLC**

Address **90 S. College Avenue, Fayetteville, AR 72701**

Project Type CRM ☒ MAS Member ☒ Other ☐

Project Name **Barney Bend**

Federal Agency/Project Sponsor **U.S. Army Corps of Engineers, Kansas City District**

ASM file search specification supplied by user (List by County, Township, Range, and Section):

Athchison County
T7N R15E off the 6th Prinicipal Meridian, sections 20, 21, 27, 28, 29, 30, 31, 32, 33, and 34

T66N R43W off the 5th Prinicipal Meridian, sections 1, 2, 12, 13

University of Missouri–Columbia

Appendix 1. ASM Request for Information (8-16-06).

Archaeological Survey of Missouri
Request for Information
© University of Missouri–Columbia

ASM Identification Number: 06-8-61 **Date:** August 17, 2006

Requested by: Timothy C. Klinger Organization: Historic Preservation Associates

Address: P.O. Box 1064, Fayetteville, Arkansas 72702

Project Type: CRM (x) MAS Member ( ) Other ( )

Project Name: Barney Bend

Federal Agency/Project Sponsor: Kansas City District, Corps of Engineers

ASM file search specifications supplied by user (List by County, Township, Range, and Section)

Atchison County T66N, R43W, S20, 29, 32, 33

Results of ASM File Search

No sites located

University of Missouri-Columbia

Appendix 2. ASM Request for Information Results (8-17-06).

Records Search Request

1. Your name – Timothy C. Klinger

2. Your telephone number and fax number – 479-442-3779, 479-582-3779 FAX

3. Project – KCD COE Missouri River Barney Bend Mitigation Area

4. Affiliation, company, or government agency – Historic Preservation Associates, LCC

5. Mailing address – P. O. Box 1064, Fayetteville, Arkansas 72702

6. Billing address (if different from mailing address) – same

7. Indication if you want the information mailed or faxed to you – Both plus e-mail if possible

8. Section, Township, Range and section portion (¼ or ½; if applicable) for each location – T6N R15E sections 3, 4, 5, and 6
   T7N R15E sections 19, 30, 31, 32, 33, and 34
   in Nemaha and Otoe counties, Nebraska bounded on the west by the Missouri River

9. Limits of search (i.e. just sections listed; listed sections and sites directly adjacent to those sections; radius from location in meters or miles; or other means of identifying the entire area)

Thanks in advance for your quick attention to this request. Tim

Appendix 3. Nebraska Request for Information (8-16-06).

NEBRASKA STATE HISTORICAL SOCIETY
1500 R STREET, P.O.BOX 82554, LINCOLN, NE 68501-2554
(402) 471-3270 Fax: (402) 471-3100 1-800-833-6747 www.nebraskahistory.org

FAX COVER SHEET

This fax is considered a confidential document.

			FROM:
TO:	**Timothy C. Klinger**		**Administration** Fax: 402-471-3100
Fax:	**(479) 582-3779**	X	**Archeology** Fax: 402-471-3316
From:	**Rene Botts**		**Gerald R. Ford Conservation Center** Fax: 402-595-1178
Phone:	**402-471-4766**		**Historic Preservation** Fax: 402-471-3316
Date:	**August 17, 2006**		**Library/Archives** Fax: 402-471-8922
Time:	**4:19 PM**		**Museum of Nebraska History** Fax: 402-471-3314
Pages:	**Including cover sheet**		**Research & Publications** Fax: 402-471-3100

Visit our website at: www.nebraskahistory.org

The mission of the Nebraska State Historical Society is to safeguard and interpret Nebraska's past and make it accessible in ways that enrich present and future generations.

MESSAGE:

Timothy,

Attached please find your site search request, three GIS maps, 25OT12 and 25OT129 site forms, and a file search disclaimer.

Survey references

93-0128 Brodnicki, Edward 1993 Letter Report on Borrow Pit Survey in Section 36, T7N, R14E, Otoe County, Nebraska.

01-0040 Brodnicki, Edward 2000 A Cultural Resource Reconnaissance Study of the Proposed Kansas Bend Fish and Wildlife Mitigation Project, Nemaha County, Nebraska.

I have estimated your bill at $70.00. Please contact me if you have any questions about these site search results. Your bill will come later from our administrative division. I do not email site search results.

René

René A. Botts
phone: 402-471-4766
Fax: 402-471-3316

AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER

Appendix 4. Nebraska Request for Information Results (8-17-06).

NEBRASKA STATE HISTORICAL SOCIETY
1500 R STREET, P.O.BOX 82554, LINCOLN, NE 68501-2554
(402) 471-3270 Fax: (402) 471-3100 1-800-833-6747 www.nebraskahistory.org

SITE SEARCH DISCLAIMER – For your information

Attached are the results of the archeological site file search you requested from the Nebraska State Historical Society Archeology Division. The search does not include architectural or structural resources. A file search for those types of properties must be conducted through the Nebraska State Historic Preservation Office (NeSHPO). The search also only includes archeological properties that have been identified and recorded to date and does not guarantee that additional sites are not present in your project area. If your project is a federal undertaking (funding, licensing), or if you are unsure of federal involvement, close coordination with the NeSHPO is required for compliance with the National Historic Preservation Act or other pertinent federal legislation.

If human burials are discovered in your project area please promptly contact local law enforcement and the Nebraska State Historical Society Archeology Division for compliance with Nebraska law (Stat. 12-1201 through 12-1212). All human burials are protected under state law regardless of project ownership, licensing, or funding.

CONTACTS:

Archeological Site File Searches and Collections Management:
Rene Botts, Collections Manager
Archeology Division
Nebraska State Historical Society
PO Box 82554
Lincoln, NE 68501
Phone 402-471-4766
Fax 402-471-3316
rbotts@nebraskahistory.org

Architectural/Structural Properties Site Searches
Greg Miller, Historic Contexts Preservation Historian
Nebraska State Historic Preservation Office
Nebraska State Historical Society
PO Box 82554
Lincoln, NE 68501
Phone 402-471-4408
Fax 402-471-3316
gmiller@nebraskahistory.org

Human Burials and Contract Archeological Services:
Rob Bozell, Associate Director
Archeology Division
Nebraska State Historical Society
PO Box 82554
Lincoln, NE 68501
Phone 402-471-4789
Fax 402-471-3316
rbozell@nebraskahistory.org

Federal Undertakings Assistance
Greg, Miller, Historic Contexts Preservation Historian
Nebraska State Historic Preservation Office
Nebraska State Historical Society
PO Box 82554
Lincoln, NE 68501
Phone 402-471-4775
Fax 402-471-3316
gmiller@nebraskahistory.org

AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER

Appendix 5. Nebraska Request for Information and Results Disclaimer (8-17-06).

Appendix D

Baseline Habitat Assessment

Appendix D
Baseline Habitat Assessment

The following documents are included within this appendix: Baseline Terrestrial Habitat Assessment and Baseline Shallow Water Habitat Assessment.

HDR | ONE COMPANY *Many Solutions*℠

Technical Memorandum

Subject:	Baseline Terrestrial Habitat Assessment		
Client:	Kansas City District, U.S. Army Corps of Engineers		
Project:	Barney Bend	Project No:	38094
Date:	11/30/2006		
By:	Michael Swenson, HDR Kansas City		

Document2

Introduction

The Lower Hamburg Mitigation Site (Lower Hamburg) comprises 2,586 acres owned by the U.S. Army Corps of Engineers (Corps). The southern portion of Lower Hamburg, known as Barney Bend, comprises approximately 986 acres of the site and is generally located between River Miles (RM) 546.5 and 550. Parcels for Lower Hamburg were acquired from private willing sellers from 1995 - 1998. Currently, Barney Bend is largely undeveloped and experiencing agricultural leasing and natural succession of terrestrial habitat. The area is bounded on the north by Federal levee 575. Management responsibilities for Barney Bend are contracted to the Missouri Department of Conservation (MDC) under a Cooperative Agreement.

The Corps has proposed the construction of a flow-through chute at Barney Bend, which is currently in the planning phase. The purpose of this technical memorandum is to assess the acres of habitat types that were present in the Barney Bend area at the time of its purchase.

Methods

Methodology used to evaluate baseline (pre-project) habitat conditions for the year 1995 follows the guidance established in the Missouri River Fish and Wildlife Mitigation Program Draft Monitoring and Evaluation Plan (Corps, 2004) and the Mitigation Restoration Project Photo Interpretation Guide (Corps 2006). The methodology generally consists of a desktop photo interpretation evaluation using aerial photography

(or infrared photography if available) from specific years (or best available data) and classifying the habitat types on Barney Bend using the National Wetland Inventory (NWI) and National Land Cover Data (NLCD) classification systems. This methodology relies on skills to photo interpret imagery and on knowledge of land use types and land management typical of the region and on Barney Bend. Conditions were evaluated by using 1995 aerial photography data. The 1995 aerial photography consisted of FSA National Aerial Photography Program (NAPP) Digital Orthophoto MrSID black and white Mosaic.

Results and Discussion

The baseline (year 1995) terrestrial habitat assessment of Barney Bend is found in Table 1 and shown in Figure 1.

TABLE 1: Baseline Terrestrial Habitat Assessment of Barney Bend.

Baseline Habitat Type	Acres
Main Channel, Deep Water	N/A
Main Channel, Shallow Water	N/A
Main Channel, Sand bars/shoreline	2.25
Side Channels or Chutes	N/A
Backwater Areas	N/A
Scour/Blow Holes	N/A
Tributaries and streams	N/A
Emergent Wetlands	3.86
Scrub-shrub Wetlands	N/A
Forested Wetlands	N/A
Developed	N/A
Barren	N/A
Forested	80.89
Shrubland	32.89
Orchard/Vineyard	N/A
Grassland	43.33
Cultivated, Levees	823.49
Total	986.71

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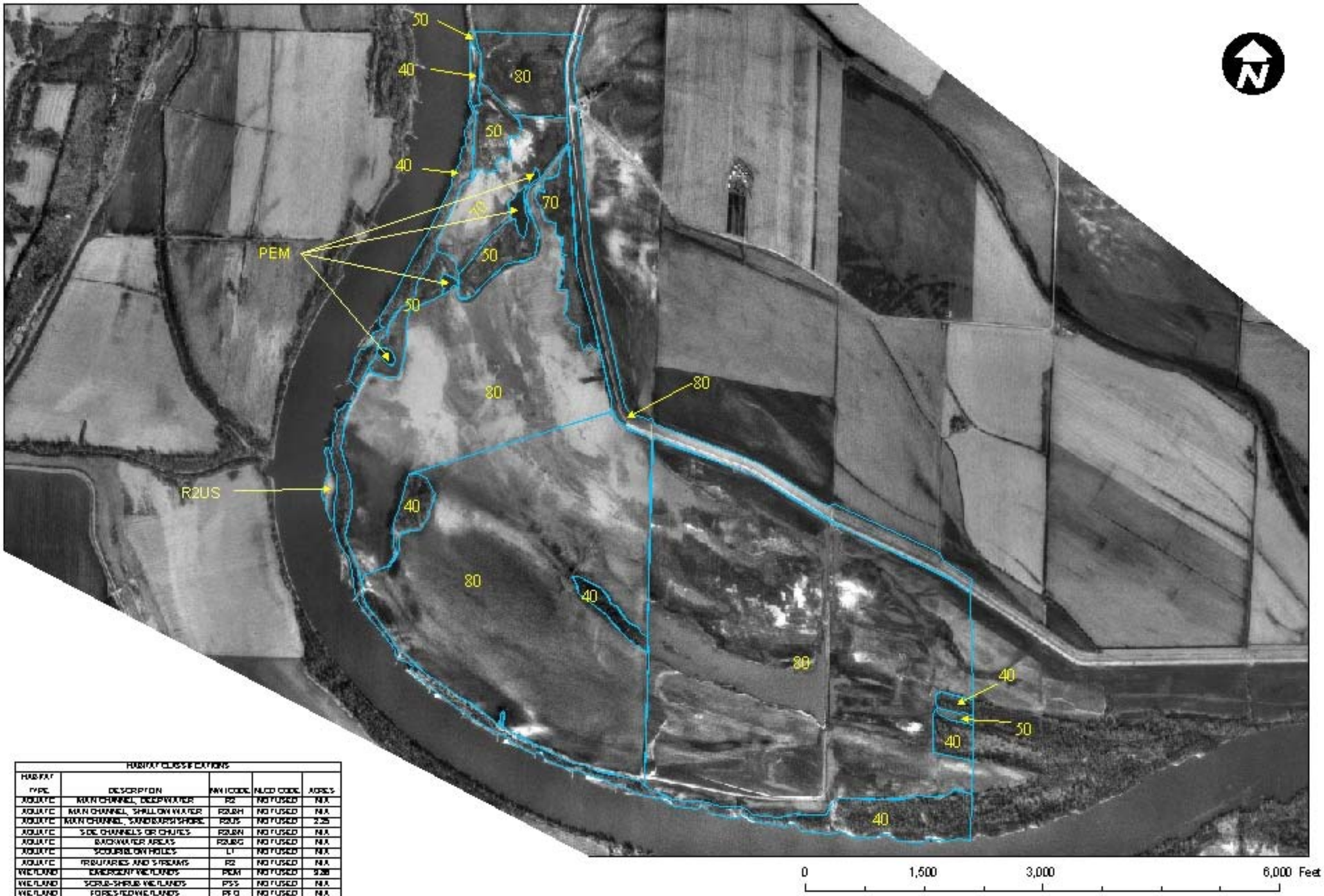
U.S. Army Corps of Engineers. 2006. Missouri Restoration Project Photo Interpretation Guide. Kansas City District.

U.S. Department of Agriculture, FSA. USGS Digital Ortho Quad Mosaic 1995. Atchison County.



HABITAT CLASSIFICATIONS				
HABITAT TYPE	DESCRIPTION	NWI CODE	NLCD CODE	ACRES
AQUATIC	MAIN CHANNEL, DEEP WATER	R2	NOT USED	N/A
AQUATIC	MAIN CHANNEL, SHALLOW WATER	R2UBH	NOT USED	N/A
AQUATIC	MAIN CHANNEL, SANDBAR/SHORE	R2US	NOT USED	2.25
AQUATIC	SIDE CHANNELS OR CHUTES	R2UBN	NOT USED	N/A
AQUATIC	BACKWATER AREAS	R2UBG	NOT USED	N/A
AQUATIC	SCOUR/BLOW HOLES	L1	NOT USED	N/A
AQUATIC	TRIBUTARIES AND STREAMS	R2	NOT USED	N/A
WETLAND	EMERGENT WETLANDS	PEM	NOT USED	9.28
WETLAND	SCRUB-SHRUB WETLANDS	PSS	NOT USED	N/A
WETLAND	FORESTED WETLANDS	PFO	NOT USED	N/A
UPLAND	DEVELOPED	N/A	20	N/A
UPLAND	BARREN	N/A	30	N/A
UPLAND	FORESTED	N/A	40	20.29
UPLAND	SHRUBLAND	N/A	50	92.29
UPLAND	ORCHARD/VINYARD	N/A	60	N/A
UPLAND	GRASSLAND	N/A	70	49.29
UPLAND	CULTIVATED, LEVEES	N/A	80	329.49
		TOTAL ACRES		502.71

HDR
HDR ENGINEERING INC.
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KANSAS CITY, MISSOURI 64111
PHONE: (816) 360-2700

US Army Corps of Engineers

BARNEY BEND BASELINE TERRESTIAL HABITAT

DATE
NOV., 2006

FIGURE
1

HDR | ONE COMPANY *Many Solutions*℠

Technical Memorandum

Subject:	Baseline Shallow Water Habitat Analysis		
Client:	Kansas City District Corps of Engineers		
Project:	Missouri River Mitigation – Barney Bend PIR	Project No:	000000000038094
Date:	01/22/2007		
By:	Marsha Roberts, HDR Kansas City		

Document2

Distribution:

John Denlinger, HDR Kansas City; Tim Fobes, HDR Kansas City; Jeff Turner, HDR Kansas City; Mike Snyder, HDR Kansas City.

Introduction

The amount of existing shallow water habitat (SWH) was estimated at the Barney Bend Mitigation Site (Barney Bend). Shallow water habitat is defined by the U.S. Fish and Wildlife Service (USFWS) as shallow open water areas (e.g. submerged sandbars, main channel/side channel convergence areas, island tips etc.) connected to the Missouri River channel that are less than five feet deep and have a velocity of flow for most of the year. Barney Bend is adjacent to the left descending bank of the Missouri River, between River Miles (RM) 546.5 and 550.0. This was the bank area used to estimate the SWH. The existing SWH was estimated from the best available data.

Median August Discharge and Corresponding Water Surface Elevations

For the purposes of this baseline SWH analysis, the median August discharge and corresponding Missouri River water surface elevations were developed along Barney Bend. Discharge records along the Missouri River were available from U.S. Geological Survey (USGS) gaging stations. The nearest USGS gaging station to Barney Bend is located approximately 13 river miles upstream near Nebraska City, Nebraska (USGS 06807000). The gage records at Nebraska City were used for Barney Bend.

Hydraulic rating curves were then developed for the Barney Bend Site. These rating curves were developed from an available Digital Elevation Model data provided by the Kansas City District. At Barney Bend, the calculated water surface elevations at the median August discharge ranged from 901.5 ft NGVD at the downstream end to 904.8 ft NGVD at the upstream end of the shallow water habitat location.

Baseline Shallow Water Habitat

The baseline SWH was estimated for Barney Bend from the data sources listed above. Six representative cross section locations were selected to estimate the baseline SWH. At each of these cross sections, the amount of baseline SWH was calculated at the water surface elevation corresponding to the median August discharge, and at several elevations both above and below. The SWH measured at each cross section was then translated into acres of SWH based on the distance between the cross sections and the overall riverbank length of the site. The available SWH acres existing at Barney Bend are provided in Table 1.

TABLE 1
Effects of Water Depth on Existing Shallow Water Habitat Availability at Barney Bend

+/- Water Surface Elevation at median August Discharge (feet)	Shallow Water Habitat Available (acres)
-5	17.3
-4	17.4
-3	17.1
-2	16.8
-1	16.5
0	14.9
1	13.3
2	11.4
3	9.4
4	10.8
5	10.3

NOTES:

Average main river channel velocity used in the analysis was 3 - 5 ft/sec. Water velocity along the bank would be expected to be significantly less.

Further Considerations

The baseline SWH estimates presented above are based on limited available data. The majority of the SWH is located directly along the riverbank. The Kansas City District provided Digital Elevation Model data for the river bed, overbank and floodplain areas. The available data has been used to develop the riverbank geometry, and the SWH was estimated using this riverbank geometry data. The accuracy of the SWH estimates could be greatly improved by obtaining more detailed riverbank geometry data from site-specific field survey consisting of bank cross sections from the toe of the riverbank to approximately 500 ft beyond the top of the riverbank.

References

USACE Kansas City District. Digital Elevation Model Data at Barney Bend.

USACE Kansas City District. Aerial Photography for Barney Bend.

USACE Northwest Division. Missouri River Shallow Water Habitat Report for 2004.

USGS Topographic Mapping, Hamburg Quadrangle (o40095e6), IA.-NEBR.

USGS Topographic Mapping, Julian Quadrangle (o40095e7), IA.-NEBR.

Appendix E

Biological Assessment

Appendix E
Biological Assessment

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BIOLOGICAL ASSESSMENT FOR THE BARNEY BEND CHUTE AT THE LOWER HAMBURG MITIGATION SITE

1.0 INTRODUCTION

Under provisions of the Endangered Species Act of 1973 (16 U.S.C. Section 1531 et seq., as amended), Federal agencies are directed to conserve threatened and endangered species and the habitats in which these species are found. Federal agencies are required to ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened and endangered (T&E) species or their critical habitat. This Biological Assessment (BA) provides documentation to meet Federal requirements for the proposed action. This BA only addresses Federally-listed T&E species.

The proposed development of the Barney Bend Chute (Barney Bend) is considered a construction activity, thus a BA must be prepared to address potential impacts to Federally-listed or proposed T&E species. This BA has been prepared in accordance with Section 7 of the Endangered Species Act (ESA) and in accordance with the 1998 procedures set forth by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service.

1.1 PURPOSE AND NEED

The purpose of the Missouri River Fish and Wildlife Mitigation Program (Mitigation Program), and site-specific projects, is to mitigate the loss of fish and wildlife habitat due to the Missouri River Bank Stabilization and Navigation Project (BSNP). 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 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 active channel that is self-maintaining.

The need for the Mitigation Program, and site-specific projects, rests in the loss of a unique floodplain ecosystem including diverse fish and wildlife habitat and species, and

the changing public values that have placed significant importance on fish and wildlife species and ecological resources. The historic variety and quality of aquatic habitats have been eliminated or altered by construction of the navigation channel. Dikes and revetments have greatly reduced the meandering and flooding of the river and thus have allowed for land clearing and expansion of agricultural practices into the historic floodplain. The Corps estimated that by 2003, approximately 522,000 acres of fish and wildlife habitat in the natural channel and meander belt of the Missouri River would be lost as a result of the construction, operation, and maintenance of the BSNP.

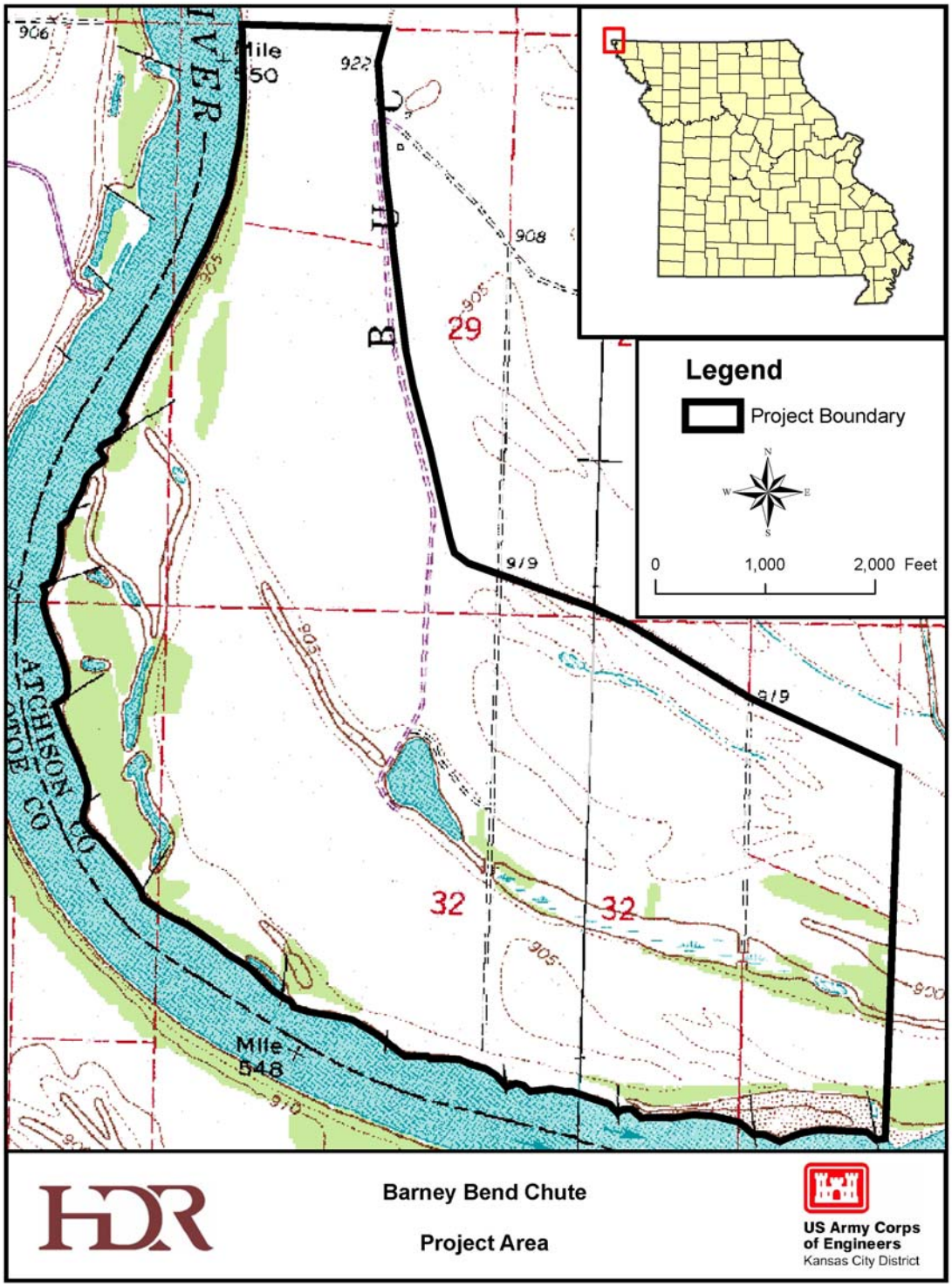
Habitat loss and resultant adverse impacts to fish and wildlife resources need to be mitigated as authorized by the U.S. Congress through the Water Resources Development Acts of 1986 and 1999. Acquisition and development of lands along the Missouri River need to occur to adequately mitigate the resources lost to channelization and bank stabilization.

To achieve the objective of the Mitigation Program, public and non-public lands suitable for developing, restoring, and preserving aquatic and terrestrial habitats were identified. One site identified for acquisition and habitat development was the property now known as Lower Hamburg Mitigation Site, which includes the Barney Bend area. Development of Barney Bend for fish and wildlife habitat would contribute to achieving the goals and purpose of the Mitigation Program to mitigate for the loss of habitat that resulted from the BSNP.

1.2 PROJECT DESCRIPTION

The proposed project would develop fish and wildlife habitat at Barney Bend. The focus of habitat development would be construction of a flow-through chute. Other habitat development activities at the site would include reestablishing native terrestrial habitats. Barney Bend is generally located between RM 546.5 to 550, within rural Atchison County, Missouri and is adjacent to the left descending bank of the Missouri River (Figure B-1). The site is located in Sections 29, 32, and 33 of T66N, R43W.

Figure B-1. Barney Bend Project Location



Lower Hamburg consists of existing public lands acquired by the Kansas City District Corps for the Mitigation Program. The northern parcel has experienced significant habitat development including construction of a chute to reopen a historic channel and enhancement of a backwater slough. Construction of the chute and backwater slough was completed in 2004. Other habitat development activities have occurred on the site including shallow water habitat development, tree planting, warm season grass plantings, food plots and active management by MDC. Barney Bend, the southern parcel, is largely undeveloped and experiencing agricultural leasing and natural succession of terrestrial habitat.

2.0 THREATENED AND ENDANGERED SPECIES

Information regarding species biology, habitat, and range was gathered from USFWS and publications referenced herein. The information provided through these various sources was assumed to be correct in context and data. No intensive surveys of Barney Bend or vicinity were conducted. The status, conservation measures, and determination of effect for each species are also summarized in this document. As previously noted, this BA only addresses Federally-listed T&E species.

The list of Federal T&E species that are reported to occur in the project area was provided by the USFWS in correspondence dated September 29, 2006. The following species were identified:

- Bald eagle (*Haliaeetus leucocephalus*)
- Indiana bat (*Myotis sodalis*)
- Pallid sturgeon (*Scaphirhynchus albus*)

An impact assessment was conducted for T&E species known to, or thought likely to, occur within the project area based on current available information. Habitat requirements, distribution, project impacts, conservation measures, and determination of effect for each species are discussed in this section.

2.1 BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

Federal Status:	Threatened	Critical Habitat:	No
State Status:	Endangered	Recovery Plan:	Yes

2.1.1 Species Biology and Habitat Requirements

Adult bald eagles are large, dark brown, with a white head, white tail, and large yellow beak. During the first four years, the plumage of immature bald eagles is dark brown with varying amounts of white. The immature has a white streaked wing lining and a mottled white tail with a wide dark band at the tip. Bald eagles have tan upper wing coverts that contrast with the dark brown primaries and secondaries (Jacobs 2001). Females generally weigh up to 14 pounds and have a wingspan up to 8 feet. Males are smaller, weighing 7 to 10 pounds with a wingspan of 6 ½ feet. Life span of bald eagles in the wild can reach 30 years (Corps 2003).

Bald eagles nest in large trees with specific size and structural characteristics. Proximity to shorelines of lakes, rivers, or seacoasts and sufficient distance from human activity also influences their selection of nesting sites. Bald eagles usually nest in the same territories each year and often use nests repeatedly (Corps 2001). Wintering bald eagles require night roosts located in sheltered timber stands near an abundant food supply such as fish, waterfowl, or carrion.

Bald eagles are common migrants and winter residents throughout Missouri and are uncommon breeders along some of the major rivers and larger reservoirs in the state (USFWS 2006). During the winter, bald eagles congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. Wintering eagles usually occupy river habitats between November 15 and March 1 and use large diameter riparian tree species as daytime perches and night roosts. Bald eagles usually perch within a riparian corridor or along lake shores and prefer areas with limited human activity. At night, wintering bald eagles may congregate at communal roosts and will travel as much as 20 km (12 miles) from feeding areas to a roost site. The period from January 1^{t} to March 1^{t} is important for initiating nesting activity. The most critical time for incubation and rearing of young is from March 1 to May 15 (USFWS 2006).

Bald eagles are known to prefer trees greater than 11 inches diameter at breast height (dbh) and within 100 to 600 feet of water for perching sites. Eagles tend to roost on the tallest trees (greater than 63 feet above ground level). Cottonwood (*Populus deltoides*) and sycamore (*Platanus occidentalis*) are often selected over other trees for perching and roosting.

2.1.2 Distribution

Bald eagles occur over most of North America at some time during the year and breed at specific locations over at least half of the continent. The largest populations occur in the Pacific Northwest, western Canada, and southern Alaska. Bald eagles are common migrants and winter residents throughout the lower Missouri River and are uncommon breeders along some of the major rivers.

There is potential for the bald eagle to be present within the project limits, predominantly during the winter months.

2.1.3 Effects of the Proposed Project

The proposed project is located in a geographic area with potential habitat and potential presence of the bald eagle. The bald eagle would likely benefit indirectly from construction of the proposed project because the increased terrestrial and shallow water habitat would provide another potential forage base for use while wintering along the Missouri River.

Human activity (i.e., construction) in the vicinity of wintering eagles could cause a relatively minor adverse effect by causing disruptions of normal behavior and by displacing eagles to non-preferred, marginal habitat (Stalmaster 1978). However, no known nests occur in the vicinity of the Site, and any disturbance would be temporary in nature and would cease when construction has been completed.

During the construction of the flow-through chute there may be clearing of potential roosting/perching trees, however, loss of trees matching this description would be avoided whenever possible. The acres of trees that would cleared for construction of the chute would be minimal in comparison to the acres available in the surrounding areas; therefore construction of the flow-through chute would have minimal impact on the

species due to an abundance of alternative roosting/perching sites within the project area and along the Missouri River.

The proposed project would result in long-term beneficial effects to the bald eagle from the restoration of shallow water habitat and terrestrial habitat that would provide additional roosting and nesting trees and increased prey.

2.1.4 Conservation Measures

A field survey would be conducted prior to construction activities to identify existing bald eagle roost, perch, or nest sites. If these are discovered, the Corps would coordinate with USFWS to establish buffer zones in construction area(s) to prevent adverse impacts on eagles.

Bald eagles are known to prefer trees greater than 11 inches dbh and within 100 to 600 feet of water for perching sites. Eagles also tend to roost on the tallest trees (greater than 63 feet above ground level). Cottonwood and sycamore are often selected over other trees for perching and roosting (USFWS 2006). Measures would be taken to minimize the loss of trees matching this description to minimize the potential loss of perching and roosting trees.

2.1.5 Determination of Effect

The proposed project may affect, but is not likely to adversely affect, the bald eagle. Mitigation measures outlined as conservation measures in Section 2.1.4 and in the proposed action would reduce the level of impact to insignificant.

2.2 INDIANA BAT (*MYOTIS SODALIS*)

Federal Status:	Endangered	Critical Habitat:	Yes
State Status:	Endangered	Recovery Plan:	Yes

2.2.1 Species Biology and Habitat Requirements

The Indiana bat is a medium-sized member of the genus *Myotis*. The fur is dull grayish brown to nearly black; when parted, it exhibits a faint three-colored pattern. The basal two-thirds of each hair is brownish black, followed by a narrow grayish band and a cinnamon brown tip (Schwartz and Schwartz 2001). The ventral fur is slaty at the base,

and grayish-white at the tips with a cinnamon brown tinge, giving it a pinkish-white overall appearance (Thomson 1982).

The Indiana bat is identified by the general coloration and the following combination of characteristics: the wing is attached along the side of the foot and reaches the base of the toes, the ears do not project more than 1/16 inch beyond the nostrils when laid forward, the calcar normally has a small keel, the hind foot is more than ¼ inch in length, and the hairs on the toes are short and sparse (Schwartz and Schwartz 2001).

Indiana bats require specific roost sites in caves or mines that attain appropriate temperatures for hibernation. The species chooses roosts with a low risk of freezing and ideal sites are 50°F or below when the bats arrive in October and November. A mid-winter temperature range of 37-43°F appears to be ideal (Indiana Bat Recovery Team 1999). Relative humidity at roost sites during hibernation usually is above 74% but below saturation (although relative humidity as low as 54% has been documented) and is thought to be an important factor in successful hibernation (Indiana Bat Recovery Team 1999).

There is not a full understanding of the summer habitat requirements of the Indiana bat (Indiana Bat Recovery Team 1999, Thomson 1982). During April and May, Indiana bats migrate hundreds of miles to their summer habitat. Floodplain and riparian forest are important for roosting and foraging habitat, however upland forest has also been shown to be used by Indiana bats for roosting, and upland forest, old fields, and pastures with scattered trees have been shown to provide foraging habitat (Indiana Bat Recovery Team 1999). Dead and dying trees are used as roost sites. In addition, trees with morphological characteristics that include exfoliating bark with space for bats to roost between the bark and the bole of the tree are important. Indiana bat roost trees tend to be greater than 9 inches DBH (optimally greater than 20 inches dbh) with loose or exfoliating bark (USFWS 2006). The following list of trees provide long-term (6 to 8 years) roosting habitat for the Indiana bat: slippery elm (*Ulmus rubra*), cottonwood, Green ash (*Fraxinus pennsylvanica*), oaks (*Quercus spp*.), and hickories (*Carya spp.*; Indiana Bat Recovery Team 1999).

Indiana bats forage primarily around and near riparian and floodplain trees and solitary trees and forest edge on the floodplain (Indiana Bat Recovery Team 1999). Indiana bats

forage more over forested areas than over water (Schwartz and Schwartz 2001). Moths are preferred to other food types; however beetles, caddisflies, and various other flies constitute a small portion of the diet (Schwartz and Schwartz 2001).

Most mating occurs in early October during the swarming period. A single young is born in late June or early July. The young are reared in small maternity colonies of around 25 to 100 adults. Young bats are weaned at 25-37 days and some have been found volant by mid-July (Schwartz and Schwartz 2001).

2.2.2 Distribution

Indiana bats are found over most of the eastern half of the United States, however, large hibernating populations are found only in Indiana, Missouri, and Kentucky. Approximately 95 percent of the species hibernates in six caves in Missouri and nine caves in more eastern states. From late fall through winter, Indiana bats in Missouri hibernate in caves in the Ozarks and Ozark Border Natural Divisions (USFWS 2006). The Indiana bat roosts throughout the state in spring and summer.

There is a potential for the Indiana bat to exist within project limits during the summer roosting period from April 1 to September 30.

2.2.3 Effect of the Proposed Project

The proposed project is located in a geographic area with potential habitat and potential presence of the Indiana bat. Construction of a flow-through chute may require clearing of potential roosting trees. This activity would result in insignificant effects to the species because of additional alternative roosting sites within the area and along the Missouri River.

The proposed project is designed to restore fish and wildlife habitat, including terrestrial habitats. The Indiana bat would experience long-term beneficial effects as a result of the restoration of potential roosting and foraging habitat.

2.2.4 Conservation Measures

A field survey would be conducted prior to construction activities to identify potential Indiana bat roost trees. If these are discovered, the Corps would coordinate with

USFWS to prevent adverse impacts to Indiana bats. Measures would be taken to minimize the loss of trees that may be potential roosting trees.

2.2.5 Determination of Effect

The proposed project would result in insignificant effects to the Indiana bat and therefore may affect but is not likely to adversely affect the Indiana bat. The intent of the proposed project to restore native floodplain habitat combined with the identified conservation measures would result in long-term beneficial effects to the Indiana bat.

2.3 PALLID STURGEON (*SCAPHIRHYNCHUS ALBUS*)

Federal Status:	Endangered	Critical Habitat:	No
State Status:	Endangered	Recovery Plan:	Yes

2.3.1 Species Biology and Habitat Requirements

Pallid sturgeon have a flattened, shovel-shaped snout; a long, slender, and completely armored caudal peduncle; and they lack a spiracle (USFWS 1993). The mouth is toothless, protrusible, and ventrally positioned under the snout. The principal features distinguishing the pallid sturgeon from the shovelnose sturgeon are the paucity of dermal ossifications on the belly, 24 or more anal fin rays, and 37 or more dorsal fin rays (Pflieger 1975). Pallid sturgeon is one of the largest freshwater fish in North America and specimens have been reported approaching 86 pounds (USFWS 1993).

Pallid sturgeon is well adapted to life on the bottom in swift waters of large, turbid, free-flowing rivers (USFWS 1993). Pallid sturgeon prefer riverine habitat with rocky or sandy substrate and water depths of 4 to 5 meters (Duffy et al. 1996). Limited data is available concerning preferred habitats in Missouri, but the species has been captured in tributary mouths, over sandbars, along main channel borders, and in deep holes elsewhere in the Missouri and Mississippi Rivers (USFWS 2006). Small sturgeon have been captured in areas with shoals, island tips, and secondary channels (USFWS 2006). The ratio of wild pallid sturgeon to all river sturgeon collected has dropped from 1 in 398 (0.25%) previously collected to 1 in 647 (0.15%) collected from 1996-2000 (Grady et al. 2001). All but one of the pallid sturgeon collected by Grady et al. (2001) were collected in deep

holes associated with wing dikes and the remaining fish was collected in a side channel border habitat.

Sexual maturity for males is estimated to be 7 years to 9 years with intervals between spawning of 2 years to 3 years. Females are not expected to reach sexual maturity until 7 years to 15 years with up to 10-year intervals between spawning. Pallid sturgeons are long lived with individuals perhaps reaching 50 years of age (USFWS 1993).

2.3.2 Distribution

The range of the pallid sturgeon is primarily the Missouri River and the Mississippi River downstream of its confluence with the Missouri River (USFWS 2006).

2.3.3 Effect of the Proposed Project

The proposed project is located in a geographic area with potential habitat and potential presence of the pallid sturgeon. The goal of the Mitigation Program, of which Barney Bend is a component, is to create fish and wildlife habitat. The proposed project at Barney Bend is primarily intended to construct a flow-through cute that would provide additional shallow water habitat for the pallid sturgeon. The proposed project is anticipated to result in beneficial effects to the pallid sturgeon.

2.3.4 Conservation Measures

The pallid sturgeon is anticipated to benefit from project actions therefore no conservation measures are required for this species.

2.3.5 Determination of Effect

The proposed project may affect, but is not likely to adversely affect the pallid sturgeon. Project actions would be beneficial to the species.

3.0 CONCLUSION

The T&E species identified in this BA have potential to occur or the species habitat potentially occurs at Barney Bend. The goal of the Mitigation Program, of which Barney Bend is a component, is to restore fish and wildlife habitat along the lower Missouri River. In addition, all project features are designed to enhance, create, or restore terrestrial and aquatic habitat at Barney Bend. These activities would result in long-term

benefits to all of the listed species discussed herein. Project actions would be beneficial to the pallid sturgeon, therefore this species is classified as “may affect, but is not likely to adversely affect.” Conservation measures are necessary to assure no adverse effects to the bald eagle and Indiana bat occur. With planned conservation measures in place, potential impacts to these two species can be classified as “may affect, but is not likely to adversely affect.”

4.0 REFERENCES

Duffy, W. G., C. R. Berry, and K. D. Keenlyne. 1996. Biology of the pallid sturgeon with an annotated bibliography through 1994. Technical Bulletin No. 5, South Dakota Cooperative Wildlife Research Unit, Brookings, South Dakota.

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Stalmaster, M.V. and J.R. Newman. 1978. Behavioral responses of bald eagles to human activity. Journal of Wildlife Management. 42(3): 506-513.

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

U.S. Fish and Wildlife Service (USFWS). 2006. Personal communication, email from Jane Ledwin. September, 29, 2006.

Appendix F

Environmental Permits and Clearances

Appendix F
Environmental Permits and Clearances

The final version of the Environmental Permits and Clearances appendix will include the following documents: MDNR Water Pollution Control Program, General Permit # MO-G699000; MDNR Water Pollution Control Program Form E – Application for General Permit (Form E); Storm Water Pollution Prevention Plan (SWPPP); Missouri Emergency Management Agency (SEMA), Engineering "No-Rise" Certification; and the 404 and 401 permit for Nationwide Permit No. 27 Stream and Wetland Restoration Activities. For this Draft PIR submittal, this appendix includes the following document: MDNR General Permit # MO-G699000 and SWPPP.

Section 402 of the Clean Water Act requires that a National Pollutant Discharge Elimination System (NPDES) permit be acquired for discharge of storm water on construction sites that disturb one or more acres of land. The Water Pollution Control Program of the MDNR maintains authority over this permit program for the state of Missouri. The Corps has obtained a general operating permit (MO-G699000) for work pertaining to the Mitigation Program. MDNR Form E is still required to be submitted for each individual project under the Mitigation Program.

MDNR permit requirements include the preparation of a SWPPP. The SWPPP is prepared to ensure the design, implementation, management and maintenance of Best Management Practices in order to reduce the amount of sediment and other pollutants in storm water discharges associated with land disturbance activities; comply with the Missouri Water Quality Standards; and ensure compliance with the terms and conditions of the general land disturbance permit.

Section 60.3 (d) (3) of the National Flood Insurance Program (NFIP) regulations states that a community shall "prohibit encroachments, including fill, new construction,

substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base (100-year) flood discharge." (1995 SEMA; http://www.sema.state.mo.us/) Submittal of the "No Rise" Certification satisfies this requirement.

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

GENERAL PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

MO-G699000

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

All Outfalls

Habitat Restoration Projects: return water and stormwater runoff from dredged material deposition sites, bank notching/chute excavation to allow the river to actively scour and widen and other disturbance along the Missouri and Mississippi Rivers for fish and wildlife mitigation projects and shallow water habitat development projects.

This permit authorizes only wastewater, including storm waters, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6 of the Law.

August 19, 2005
Effective Date

Doyle Childers, Director, Department of Natural Resources
Executive Secretary, Clean Water Commission

August 18, 2010
Expiration Date

Edward Galbraith, Director of Staff, Clean Water Commission

MO 780-0041 (10-93)

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Discharges shall not violate Water Quality Standards 10 CSR 20-7.031.

2. There are no regular sampling requirements in this permit. However, the department may require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of off-site contamination outside the scope of the proposed activities. If such an action is needed, the department will specify in writing any additional sampling requirements, including such information as location, extent, and parameters.

STANDARD CONDITIONS

In addition to specified conditions stated herein, this permit is subject to the attached Part I standard conditions dated October 1, 1980, and hereby incorporated as though fully set forth herein.

APPLICABILITY

1. This permit authorizes the discharge of return water and stormwater from dredged material deposition sites, bank notching/chute excavation to allow the river to actively scour and widen and other disturbance resulting from habitat construction projects along the Missouri and Mississippi Rivers for fish and wildlife mitigation projects and shallow water habitat development projects owned or constructed by the U.S. Army Corps of Engineers to waters of the state of Missouri. A Missouri State Operating Permit that specifically identifies the project must be issued before any construction can occur.

2. This permit does not apply to discharges to streams or lakes other than the Missouri or Mississippi Rivers and adjacent wetlands.
3. This permit will not be issued for discharges within 1000 feet of drinking water supply intakes.

4. This permit will not be issued for discharges within two stream miles upstream of biocriteria reference locations identified or described in 10 CSR 20, Chapter 7. These regulations are available at many libraries or on the internet at http://www.sos.state.mo.us/adrules/csr/csr.asp. A site specific permit will be required if these conditions exist.

5. This general permit does not authorize directing storm waters across private property not owned or operated by the permittee.

6. This general permit does not authorize any discharge to waters of the state of sewage, process wastewaters, or pollutants such as:
   (a) Hazardous substances and oil and grease that may be contained in dredged sediment,
   (b) Wastewater generated from air pollution control equipment or the containment of scrubber water in lined ponds, or
   (c) Domestic wastewaters, including gray waters.

7. If at any time the Missouri Department of Natural Resources determines that the quality of waters of the state may be better protected by requiring the owner/operator of the permitted site to apply for a site specific permit, the department may require any person to obtain a site specific operating permit [10 CSR 20-6.010 (13) and 10 CSR 20-6.200(5)].

   The department may require the permittee to apply for and obtain a site specific or different general permit if:

   (a) The permittee is not in compliance with the conditions of this general permit;
   (b) The discharge no longer qualifies for this general permit due to changed site conditions and regulations; or
   (c) Information becomes available that indicates water quality standards have been or may be violated.

8. Any owner/operator authorized by a general permit may request to be excluded from the coverage of the general permit and apply for a site specific permit [10 CSR 20-6.010 (13) and 10 CSR 20-6.200(5)].

REQUIREMENTS AND POLLUTION PREVENTION PLAN GUIDELINES

Note: These requirements do not supersede nor remove liability for compliance with county and other local ordinances.

1. Water Quality Standards
   (a) Discharges to waters of the state shall not cause a violation of water quality standards rule under 10 CSR 20-7.031, including both specific and general criteria.
   (b) General Criteria. The following general water quality criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:
      (1) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
      (2) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
      (3) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
      (4) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life;
      (5) There shall be no significant human health hazard from incidental contact with the water;
      (6) There shall be no acute toxicity to livestock or wildlife watering;
      (7) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community;
      (8) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247.

2. Good housekeeping practices shall be maintained on the site to keep solid waste from entry into waters of the state.

3. All fueling facilities present on the site shall adhere to applicable federal and state regulations concerning underground storage, aboveground storage, and dispensers, including spill prevention, control and counter measures.

4. Substances regulated by federal law under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that are transported, stored, or used for maintenance, cleaning or repair shall be managed according to the provisions of RCRA and CERCLA.

5. An individual shall be designated by the permittee as responsible for environmental matters. Staff of the permitted facility shall ensure that Best Management Practices (BMPs) are continually implemented and effective.

6. This permit may be reopened and modified, or alternatively revoked and reissued, to:
   (a) Comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
      (1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit or
      (2) controls any pollutant not limited in the permit.
   (b) Incorporate new or modified effluent limitations or other conditions, if the result of a waste load allocation study, toxicity test or other information indicates changes are necessary to assure compliance with Missouri’s Water Quality Standards.
   (c) Incorporate new or modified effluent limitations or other conditions if, as the result of a watershed analysis, a Total Maximum Daily Load (TMDL) limitation is developed for the receiving waters which are currently included in Missouri’s list of waters of the state not fully achieving the state’s water quality standards, also called the 303(d) list.

   The permit as modified or reissued under this paragraph shall also contain any other requirements of the Clean Water Act then applicable.

7. In the event soil contamination or hazardous substances are discovered at the site during dredging activities, the permittee shall request guidance from the Department’s Hazardous Waste Program in writing.

TRANSFER OF OWNERSHIP

This permit may be transferred to a new owner by submitting an "Application for Transfer of Operating Permit" signed by the seller and buyer of the facility, along with the appropriate modification fee.

TERMINATION

In order to terminate the permit, the permittee shall notify MDNR by submitting Form H, included with the State Operating Permit. The permittee shall complete Form H and mail it to MDNR at the address noted in the cover letter of this permit.

This general permit will expire five years from the effective date of the permit (see page 1). The issue date is the date the State Operating Permit is issued to the applicant. The expiration date may or may not coincide with the date the authorized project or development is scheduled for completion.

If the project completion date will be after the expiration date of this general permit, then the permittee must reapply to the department for the permit to be re-issued. In order for the permit to be re-issued, the permittee should submit the appropriate application form(s) at least 180 days before the expiration of the permit if dredging activity is expected to continue past the expiration date of this general permit.

If the permittee does not apply for the renewal of this permit, this permit will automatically terminate on the expiration date. Continued discharges from a dredging project that has not been fully stabilized are prohibited beyond the expiration date; unless the permit is reissued or the permittee has filed a timely application for the reissuance of this permit.

DUTY TO COMPLY

The permittee shall comply with all conditions of this general permit. Any noncompliance with this general permit constitutes a violation of Chapter 644, Missouri Clean Water Law, and 10 CSR 20-6.200. Noncompliance may result in enforcement action, termination of this authorization, or denial of the permittee's request for renewal.

Storm Water Pollution Prevention Plan

U.S. Army Corps of Engineers

Kansas City District
601 East 12th Street
Kansas City, Missouri 64106

Missouri River Bank Stabilization and Navigation
Fish and Wildlife Mitigation Program

Barney Bend
Atchison County, Missouri

December 2006

Prepared by:

HDR Engineering, Inc.

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1.0 INTRODUCTION

This Storm Water Pollution Prevention Plan (SWPPP) has been prepared for the Barney Bend Chute (site), as part of the Missouri River Fish and Wildlife Mitigation Program to ensure the design, implementation, management, and maintenance of Best Management Practices (BMP) in order to reduce the amount of sediment and other pollutants in storm water discharges associated with land disturbance activities; comply with the Missouri Water Quality Standards; and ensure compliance with the terms and conditions of the general land disturbance permit.

This SWPPP was written with the assistance of and information from the September 1992 EPA guidance document *Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices;* and the 1995 Missouri Department of Natural Resources' (MDNR) guidance document *Protecting Water Quality: A field guide to erosion, sediment and storm water best management practices for development sites in Missouri*.

This SWPPP also incorporates the requirements of MDNR's storm water discharge permitting requirements (a copy of the general permit and the respective Notice of Termination (NOT) are included in Appendix A to this plan).

All contractors and subcontractors must read and follow the SWPPP for the project. All contractors and subcontractors must also sign the certification statement included as Appendix B before conducting any professional service at the site identified in the SWPPP.

2.0 SITE DESCRIPTION

2.1 Location

Barney Bend is part of the larger Lower Hamburg Fish and Wildlife Mitigation Site, and is generally located between river mile (RM) 546.5 to RM 550. Barney Bend is located within rural Atchison County, Missouri and is adjacent to the left descending bank of the Missouri River. The site is located in Sections 29, 32, and 33 of T66N, R43W. Construction of the proposed project would take place on U.S. Army Corps of Engineers (Corps) owned land that is currently managed by the Missouri Department of Conservation.

2.2 Owner and Operator

The owner of the project is the Kansas City District Corps. Their address is:

U.S. Army Corps of Engineers, Kansas City District
700 Federal Building
601 East 12th Street
Kansas City, Missouri 64106-2896
Attn: David R. Hibbs
Phone: (816) 389-3136

The primary operator of the site is the Missouri Department of Conservation (MDC). Their Address is:

Missouri Department of Conservation, St. Joseph Conservation Center
701 N.E. College Drive
St. Joseph, MO 64507
Attn: Nate Mechlin
Phone: (660) 744-6201

The Corps would be in charge of all aspects of construction for this project. A contractor or contractors would do the actual construction, but the Corps would oversee the work. All decisions would be made by the Corps. MDC manages the site for the Corps through annual sole-source contracts. Operation, maintenance, repair, and rehabilitation of the flow-through chute is the responsibility of the Corps.

2.3 Construction Description

Construction would consist of river structure modifications and activities associated with constructing a flow-through chute in order to create aquatic (including shallow water habitat) and terrestrial habitats.

2.4 Soils

Soils of Barney Bend are in the Onawa-Paxico-Haynie association. These soils make up approximately 7 percent of the soils in Atchison County, Missouri [U.S. Department of Agriculture (USDA) 1994]. The Haynie and Sarpy soil series are located on Barney Bend. The Haynie series consists of very deep, nearly level, moderately well drained soils on high and low floodplains along the Missouri River. Permeability is moderate in the upper part of the profile and rapid in the lower part. The Sarpy series consists of very deep, excessively drained soils on high, convex natural levees on low floodplains along the Missouri River. Permeability is rapid in the Sarpy soil. Surface runoff is slow and available water capacity is low (USDA 1994). The soil mapping units as shown in the Soil Survey of Atchison County, Missouri (USDA 1994) on Barney Bend are the Haynie silt loam, sandy substratum, frequently flooded and Sarpy loamy fine sand, frequently flooded. Both of these soil units are classified as hydric soils by the USDA (2005).

2.5 Runoff Coefficient

The current and final runoff coefficient for the site is approximately 0.20.

2.6 Site Area and Estimated Disturbance

The site is approximately 977 acres of which a maximum of approximately 24 acres by activities associated with construction of the flow-through chute. Wetlands would be protected by silt fencing or similar sediment control measures.

2.7 Site Map

A topographic map showing the site boundaries is included in Appendix C.

2.8 Sequence of Major Activities

The typical order of activities would be as follows:

1. Installation of the necessary erosion and sediment control devices prior to construction. These control devices (i.e., silt fence, straw bales, diversion dikes, etc.) would remain in place until all soil disturbing activities have been completed and a uniform perennial vegetative cover with a density of 70 percent has been established, or equivalent measures have been implemented;
2. Clearing of designated areas for construction;
3. Construction of access roads;
4. Modifications to river structures, activities associated to and construction of the flow-through chute; and
5. Final stabilization.

2.9 Name of Receiving Water

The receiving water for this project would be the Missouri River which borders the west and south boundary of the site.

2.10 Pollutants

The primary pollutant sources are disturbed soils and subsequent surface water runoff within the construction area. Other potential pollutant sources could include petroleum products associated with the construction equipment. However, it is not anticipated that petroleum products would likely be stored in bulk on-site.

2.11 Construction Access

Access to the general vicinity of the site is from the east on county maintained gravel roads. Direct access to the site is from 130th Street. If necessary, additional access roads would be constructed. These roads would have a soil base and could be topped with gravel. All on-site parking and equipment staging areas would be graveled.

3.0 EROSION AND SEDIMENT CONTROLS

Erosion and sediment controls are implemented during the construction period to prevent and/or control the loss of soil from the construction site into receiving waters associated to the project. Erosion and sediment control devices would be temporary or permanent features.

It is unlikely that temporary stabilization would be required due to the short duration of the proposed construction activities associated with this project. If needed however, temporary stabilization practices could include temporary seeding, mulching, sand bagging, vegetative buffer strips, erosion control mats, protection of trees, preservation of mature vegetation, etc. to maintain soils in disturbed areas so that they are less apt to be carried off-site by storm water runoff or wind. Disturbed areas of the site where construction activities temporarily cease for 21 days would be stabilized with temporary seed and mulch no later than 14 days from the last construction activity in the area. Disturbed areas would be seeded with a native grass mix approved by MDC.

Permanent stabilization practices would include seeding, mulching, fertilizing, topsoil, erosion control blankets, compost, erosion stabilization mats, etc. Disturbed areas of the site where construction activities cease permanently would be stabilized with permanent seed no later than 14 days after the last construction activity in the area. Disturbed areas would be seeded with a native grass mix approved by MDC. Additionally, trees and shrubs could be planted to help stabilize the soil by holding soil particles in place.

Mulches which would include straw, woodchips, and soil adhesives, etc. would be used to protect recently seeded areas from raindrop impacts, increase soil infiltration, and provide seeded areas with cover, organic matter and greater moisture holding capacity. Additionally, gravel would be used on temporary access roads and parking areas.

3.1 Structural Practices

Structural practices such as silt fences, straw bales, diversion dikes, etc. would be used to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices would be implemented during construction to minimize erosion and sediment runoff.

3.1.1 Silt (Filter) Fences

Silt fences would be installed to effectively retain sediment-laden runoff from leaving the project site immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (clearing and grubbing, excavation, embankment, and grading). Additionally, these fences slow down the velocity of the runoff. Silt fences would be placed perpendicular to the flow of runoff, parallel to the contours, and down slope of disturbed areas. Additionally, silt fences could be placed around spoil piles in work areas.

3.1.2 Straw Bales

Straw bales would be used during construction in areas where erosion is visible to control sedimentation and erosion. Additionally, these bales would slow down the velocity of the runoff. Straw bales would be placed perpendicular to the flow of runoff, parallel to the contours, and down slope of disturbed areas. Additionally, straw bales could be placed around spoil piles in work areas.

3.1.3 Diversion Dikes

Diversion dikes would be used to divert uncontaminated runoff away from disturbed areas or to divert contaminated runoff towards a stabilized outlet or containment structure.

3.1.4 Sediment Basin

It is unlikely that a sediment basin would be required for this project. If necessary, a temporary or permanent sediment basin would be installed in any drainage location where more than 10 acres in the upstream drainage area would be disturbed at one time (wetland area). This basin(s) would provide at least 3,600 cubic feet of storage for every acre of land which it drains (flows from upland areas that are undisturbed could be diverted around the basin). Drainage locations with 10 or fewer disturbed acres would require that sediment traps, filter fences, or equivalent measures be installed along the downhill boundary of the construction site.

3.2 Storm Water Management

It is not anticipated that any storm water management activities would be required in order to construct the project.

3.3 Final Stabilization and Clean Up

Upon completion of construction activities, disturbed areas would be graded, permanently stabilized, and areas requiring revegetation would be revegetated with a natural grass mixture approved by MDC. Wherever possible, topsoil will be preserved prior to construction. This topsoil would be used to help re-establish vegetation at the site. Final/permanent stabilization practices would be implemented within 14 days of final construction. When a uniform perennial vegetative cover with a density of 70 percent has been established or equivalent measures (riprap, gabions, or geotextiles) have been employed, final stabilization would be deemed complete.

All temporary soil erosion and sediment control measures would be disposed of within 30 days after final site stabilization is achieved. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures would be permanently stabilized to prevent further erosion and sedimentation or redistributed onto stabilized areas of the site.

4.0 OTHER CONTROLS

4.1 Waste Materials

Waste materials would be collected and placed in dumpsters with securable lids. These dumpsters would meet all local and State solid waste management regulations. All trash and construction debris from the site would be deposited into a dumpster. A schedule would be followed detailing how many times a week the dumpster needed to be emptied. If necessary, the dumpster would be emptied more often than scheduled. Waste materials would be hauled to a specified local dump. No waste materials would be buried on-site. All site personnel would be made aware of the disposal procedures. Proper disposal procedures would be posted on-site.

4.2 Hazardous Waste Materials

Hazardous waste materials would be disposed of in the manner specified by federal, state, and local regulations and/or by the manufacturer. All site personnel would be instructed to be aware of this requirement.

4.3 Sanitary Waste

Sanitary waste would be collected from portable units as required and disposed of off-site.

5.0 MAINTENANCE AND INSPECTIONS

Routine inspections would be performed to determine the condition and effectiveness of erosion and sediment control measures. Based on these inspections, destroyed vegetative cover would be restored, and damaged control measures would be repaired. These restorations and repairs would take place within 24 hours of identification.

Inspections would take place at least once every seven calendar days. Additionally, inspections would take place within 72 hours of the end of any storm that produces a half-of-an-inch or more of rainfall at the site. Inspections should take place at least once a month on sites that have been finally stabilized.

Disturbed areas should be inspected for evidence of, or the potential for pollutants entering the drainage system. All control measures should be inspected to ensure that they are operating properly. Points where vehicles exit the site should be inspected for signs of off-site sediment tracking.

Inspection report forms should be completed for each inspection. These reports should be retained within a project file and kept on-site or at an “agency approved” locale. Based on these reports, revisions to the SWPPP could be required and should be made accordingly within seven calendar days following the inspection. All incidences of non-compliance should be noted within the report.

Sediment would be removed from control measures when it reaches one-third the height of the silt fence or straw bale. An inspector would initiate immediate installation of any

additional temporary erosion control measures in any area deemed in need of protection.

Temporary erosion control measures would be left in place until the site is permanently stabilized with vegetation (at least 70 percent ground cover). Following the completion of construction and planting activities, an inspector would conduct periodic site reviews to ensure that vegetation has satisfactorily established on-site. If vegetation cover is not adequate, special steps to correct the problems would be implemented such as over-seeding, mulching, sodding, or the use of erosion control blankets.

Copies of the report forms to be completed by the inspector are attached in Appendix D and will be photocopied and used as needed for individual inspections.

6.0 OTHER POLLUTION PREVENTION CONTROLS

6.1 Product Specific Practices

This section covers control measures and practices that would be used for specific materials associated with the construction activity including fuels and petroleum products associated with construction equipment.

6.2 Petroleum Products

All on-site vehicles would be monitored for fuel and oil leaks and receive proper preventative maintenance to reduce the chance of leakage. It is not anticipated that petroleum products would be stored in bulk on-site. However, if storage on-site becomes necessary, storage areas would likely be located on the landward side of flood control levee if possible. All storage containers would be clearly labeled and tightly sealed. Any spills would be cleaned up immediately after discovery. Waste oil and other petroleum products would not be discharged onto the ground or into water bodies. Other petroleum products used on-site would be applied according to the manufacturers' recommendations. Petroleum containers would be stored properly.

Although not anticipated, bulk storage tanks having a capacity of greater than 55-gallons would not likely be situated on the river side of the flood control levee. Any such bulk storage tanks should be provided with secondary containment such as a temporary earthen berm or other means. After each rainfall, the contractor would inspect the contents of the secondary containment area. If a sheen is not visible on the collected water, the water can be pumped to the ground in a manner that does not cause scouring. If a sheen is present, the water must be containerized for appropriate off-site disposal.

Although not anticipated to be present, bulk fuel or lubricating oil dispensers would have a valve that must be held open (manually) to allow the flow of fuel. During fueling operations the contractor would have personnel present to detect and contain spills.

6.3 Non-Storm Water Discharges

No non-storm water discharges are anticipated with this project. Non-storm water discharges include uncontaminated groundwater, natural springs, process waste waters, cooling waters, wash waters, and sanitary wastewater. These wasters can carry substances such as paint, oil, fuels, chemicals and other pollutants.

6.4 Good Housekeeping

The proper use of materials and equipment along with the use of general common sense greatly reduces the potential for contaminating storm water runoff. The following is a list of good housekeeping practices to be used during the construction project:

- Storing of hazardous materials, chemicals, fuels, and oils, and fueling of construction equipment would not be performed within 150 feet of any stream bank, wetland, water supply well, spring, or other water-body.
- An effort would be made to store only enough product required to do this job.
- Materials stored on the site would be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products would be kept in their original containers with the original manufacturer's label.
- Substances would not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of the product would be used before disposing of the container.
- Manufacturer's recommendation for proper use and disposal of a product would be followed.
- If surplus product must be disposed, the manufacturers or local and state recommended methods for proper disposal would be followed.

6.5 Product Handling

Because of the chemical makeup of specific products, certain handling and storage procedures are required to promote the safety of handlers and prevent the possibility of pollution. Care would be taken to follow all directions and warnings for products used on-site. All relevant information can be found on the Material Safety Data Sheet (MSDS) for each product. The MSDS should be located with each product container.

7.0 Spill Prevention and Control Plan (SPCC)

7.1 Spill Control and Cleanup

The following spill control and cleanup practices would be followed to prevent storm water pollution in the event of a spill:

- Spills would be contained and cleaned up immediately after discovery.
- Manufacturer's methods for spill cleanup of a material would be followed as described on the material's MSDS.

- Materials and equipment needed for cleanup procedures would be kept readily available on the site, either at an equipment storage area or in the contractor's trucks.
- Personnel on the site would be made aware of cleanup procedures and the location of spill cleanup equipment.
- If a spill occurs that is reportable to the federal, state, or local agencies, the contractor would be responsible for making the notifications. A procedure for determining a federally reportable spill is included in Appendix E along with a copy of the Spill Report Form to be filled out in case of a spill. A spill of a reportable quantity would be documented and a record of the spills would be kept with this SWPPP.

The federal reportable spill quantity for petroleum products is defined in 40 CFR 110 and is any oil spill that:

- Violates applicable water quality standards
- Causes a film or sheen upon or discoloration of the water surface or adjoining shoreline
- Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

Missouri requires that notification of reportable spills also be made to the MDNR.

7.2 Who to Contact

If a spill is reportable, the contractor's superintendent will notify the Corps project representative and the following authorities:

Federal: National Response Center - 1-800-424-8802
EPA Regional Emergency Response Center – 1-913-551-7050

State: Missouri Environmental Emergencies - 1- 573-634-2436

If a reportable release occurs, a modification to the SWPPP's SPCC must be made within 14 days. The modification would include: a description of the release; the date of the release; an explanation of why the spill happened; a description of procedures to prevent future spills and/or release from happening; and a description of response procedures should a spill or release occur again. These modifications to the SWPPP's SPCC would be made following notification from the contractor and would be documented on the spill reporting form in Appendix E.

A written description of the release must be submitted to the permitting authority that includes a description of the release. This description must include the type of material; an estimated amount of spill; the date of the release; an explanation of why the spill happened; and a description of the steps taken to prevent and control future releases.

8.0 RETENTION OF RECORDS

A copy of this SWPPP, site inspection forms, and records of construction activities would be maintained on-site from the date of the project initiation to the date of final stabilization.

9.0 STANDARD PERMIT CONDITIONS

In order to obtain a storm water discharge permit under the NPDES program, pursuant to Section 402 of the CWA (as amended) in the state of Missouri, the following measures would be taken, implemented and managed on a regular basis:

- Best management practices (BMPs) would be put into operation (i.e., implementing, installing, inspecting, and cleaning silt fence and other erosion control devices of eroded sediment).
- Temporary and permanent stabilization (i.e., groundcover) would be installed.
- Following construction, temporary erosion controls (i.e., silt fence, hay bales, etc.) would be left in place until at least 70 percent density of the vegetative cover has been established.
- Inspections after every half-inch or greater rainfall would be performed and documented.
- Routine site inspections would be performed every seven calendar days.
- Stabilized construction entrances would be installed and/or an alternative method of cleaning mud from vehicles exiting the disturbed area should be selected.
- Following clean up and when appropriate groundcover has been established a notice of termination (NOT) would be filed.

9.1.1 Compliance with Permit Conditions

The EPA, as well as the state of Missouri, has substantial penalties for non-compliance with the storm water permit. Any permit non-compliance constitutes a violation of the CWA and becomes grounds for enforcement action including: permit termination, revocation, re-issuance, modification; or denial of a permit renewal application. Individuals responsible for such violations are subject to criminal, civil, and administrative penalties, including fines up to $27,500 per day for non-compliance.

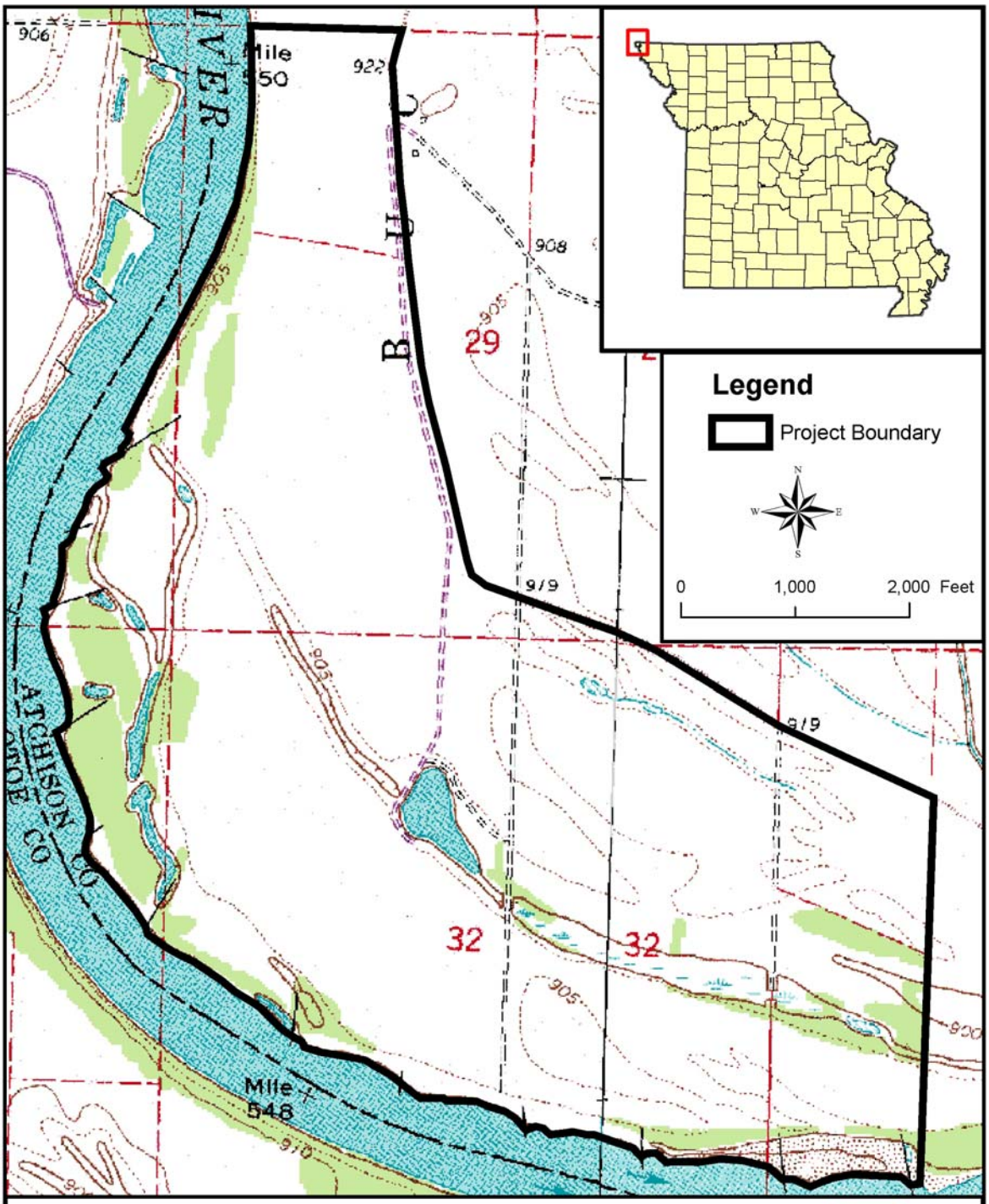
10.0 NOTICE OF TERMINATION

The implementation of this SWPPP and applicability of the conditions of the storm water permit will continue until the site has been fully stabilized and all storm water discharges from construction activities authorized by this permit are eliminated. At that time, a Notice of Termination would be filed with the permitting authority, MDNR.

APPENDIX A
MISSOURI OPERATING PERMIT
NOTICE OF TERMINATION

TO BE ADDED ONCE RECEIVED/COMPLETED

APPENDIX B
SITE LAYOUT



HDR

Barney Bend Chute

Project Area

US Army Corps of Engineers
Kansas City District

APPENDIX C
INSPECTION FORMS

U.S. Army Corps of Engineers
Kansas City District
Lower Hamburg Mitigation Site
Barney Bend

Inspection Report Form A
Storm Water Pollution Prevention Plan
(SWPPP)

Control	Location of Device	Is Control Stabilized/ Functioning Properly?	Is There Evidence Of Any Problems	Describe Any Problems	Describe Maintenance or Corrective Action Required {Include Date(s) and Responsible Person(s)}
Straw or Hay Bales/Silt Fences					
Timber Mats/Stone Pads/Bridges					
Waste Disposal					
Off-Site Vehicle Tracking					
Revegetation Condition (After Temporary or Permanent Planting)					
Changes Required to Erosion and Sediment Control Plan? Circle One Yes No					

U.S. Army Corps of Engineers Kansas City District	**Inspection Report Form B** Storm Water Pollution Prevention Plan (SW3P)

Start Date: ***/2007

Name of Construction Site: Barney Bend

Location of Construction Site: Atchison County, Missouri

Inspection Report Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations"

INSPECTION ACTIVITY

DATE	LOCATION		INSPECTOR

APPENDIX D
SPILL REPORT FORMS

Procedures for Determining if a Hazardous Material Spill is a Reportable Quantity

1) First determine the type and quantity of material that has been spilled.
2) Obtain a material safety data sheet (MSDS) for the spilled material and determine whether any of the constituents are listed in Table 302.4 in 40 CFR 302.
3) If none of the constituents in the spilled material are listed in the table (excluding) ethylene glycol), the spill is not reportable.
4) If the constituents in the spilled material are listed in the table, use the following equation to determine the pounds of material spilled:

Pounds Spilled = (V) (Wt %) (Sg) (0.0834)

Where:

V = Volume of the material spilled, in gallons

Wt% = The weight percent of the constituents in the spilled material (see the MSDS)

Sg = Specific gravity of spilled material (see MSDS)

For Example:

V = 7 gallons

Wt% = 3.5

Sg = 1.04

Pounds Spilled = (7) (3.5) (1.04) (0.0834) = 2.13 pounds

5) If, based on the calculation, the pounds spilled are greater than the Final RQ (reportable quantity) value listed in Table 302.4 of 40 CFR 302 or the State's reportable quantity minimum amount, the spill must be reported to the appropriate federal, state, and local agencies.

Barney Bend
Erosion and Sediment Control Plan
Spill Report Form

Spill Reported By: _____ _____
Name Phone Number

Date Reported: _____ Time: _____

Date of Spill: _____ Time: _____

Name of Facility:

_____

Legal Description: ____ 1/4 ____ 1/4 ____ 1/4 SEC ____, TWP _____, Range ____

County _____

Describe Spill Location and Events Leading to Spill:

_____

_____

_____

_____

_____

Material Spilled:

_____

Source of Spill:

_____

Amount Spilled (Gallons or Pounds):

_____

Amount Spill to Waterway (Gallons or Pounds):

_____

Nearest Municipality:

_____

Containment or Cleanup Action:

_____

_____

List Environmental Damage (fish kill, etc.):

_____

_____

List Injuries or Personal Contamination:

_____

_____

Date and Time Cleanup Completed or Terminated:

_____

If Cleanup Delayed, Nature and Duration of Delay:

_____

_____

Description of Materials Contaminated:

_____

_____

Approximate Depth of Soil Excavation:

_____

Action To Be Taken to Prevent Future Spills:

_____

_____

Agencies Notified:

Local: _____ Date: _____

State: _____ Date: _____

Federal: _____ Date: _____

Signed: _____

Contractor Superintendent or
Environmental Inspector

Appendix G

404(b)(1) Evaluation

Appendix G
404 (b)(1) Evaluation

Section 404(b)(1) of the Clean Water Act (33 U.S.C. 1344) provides guidelines required in specifying disposal sites for discharges of dredged or fill material into waters of the United States. The evaluation within the appendix satisfies these guidelines and evaluates the proposed disposal sites for this project.

Section 404 (b)(1) Evaluation (40 CFR 230)

US Army Corps of Engineers
Kansas City District

Applicant U.S. Army Corps of Engineers | **Applicant Number** _____

Activity Habitat Restoration | **Waterway** Missouri River

Legal Description: See below | **County** Atchison **State** MO

The site lies in Sections 29, 32, and 33 of T66N, R43W.

1. REVIEW OF COMPLIANCE (§230.10[a]-[d]) A review of the permit application indicates that:

	PRELIMINARY [1]		FINAL [2]	
	Yes	No	Yes	No
a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in, the aquatic ecosystem to fill its basic purpose information gathered for EA alternative (if no, see Section 2, and information gathered for EA alternative);	☒	☐ [3]	☐	☐
b. The activity does not appear to (1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of CWA; (2) jeopardize the existence of Federally listed endangered or threatened species or their habitat; and (3) violate requirements of any Federally designated marine sanctuary. (If no, see Section 2b and check responses from resources and water quality certifying agencies);	☒	☐ [3]	☐	☐
c. The activity will not cause or contribute to significant degradation of waters of the United States including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values (if no, see Section 2);	☒	☐ [3]	☐	☐
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (If no, see Section 5).	☒	☐ [3]	☐	☐

2. TECHNICAL EVALUATION FACTORS (SUBPARTS C-F)

	ADVERSE EFFECTS				
	N/A	None	Minimal	Substantive	Cumulative
a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)					
1. Substrate impacts	☐	☐	☒	☐	☐
2. Suspended particulates/turbidity impacts	☐	☐	☒	☐	☐
3. Water column impacts	☐	☐	☒	☐	☐
4. Alteration of current patterns and water circulation	☐	☒	☐	☐	☐
5. Alteration of normal water fluctuations/hydroperiod	☐	☒	☐	☐	☐
6. Alteration of salinity gradients	☒	☐	☐	☐	☐
b. Biological Characteristics of the Aquatic Ecosystem (Subpart D)					
1. Effect on threatened/endangered species and their habitat	☐	☒	☐	☐	☐
2. Effect on the aquatic food web	☐	☒	☐	☐	☐
3. Effect on other wildlife (mammals, birds, reptiles, and amphibians)	☐	☒	☐	☐	☐
c. Special Aquatic Sites (Subpart E)					
1. Sanctuaries and refuges	☒	☐	☐	☐	☐
2. Wetlands	☐	☒	☐	☐	☐
3. Mud flats	☒	☐	☐	☐	☐
4. Vegetated shallows	☒	☐	☐	☐	☐
5. Coral reefs	☒	☐	☐	☐	☐
6. Riffle and pool complexes	☒	☐	☐	☐	☐
d. Human Use Characteristics (Subpart F)					
1. Effects on municipal and private water supplies	☐	☒	☐	☐	☐
2. Recreational and commercial fisheries impacts	☐	☒	☐	☐	☐
3. Effects on water-related recreation	☐	☒	☐	☐	☐
4. Esthetic impacts	☐	☐	☒	☐	☐
5. Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves	☐	☒	☐	☐	☐

REMARKS: Explain on the attached sheet any substantive or cumulative adverse effects.

3. EVALUATION OF DREDGED OR FILL MATERIAL (SUBPART G) [4]

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material (Check only those appropriate).

1. Physical characteristics	☒
2. Hydrography in relation to known or anticipated sources of contaminants	☒
3. Results from previous testing of the material or similar material in the vicinity of the project	☐
4. Known, significant sources of persistent pesticides from land runoff of percolation	☒
5. Spill records for petroleum products or designated (Section 311 or CWA) hazardous substances	☐
6. Other public records of significant introduction of contaminants from industries, municipalities, or other sources	☐
7. Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	☐
8. Other sources (specify)	☐

List appropriate references (see attached sheet).

b. Testing Exclusion: An evaluation of the appropriate information in 3a above indicates that the proposed discharge material meets testing exclusion criteria for the following reason: **Yes** ☒ **No** ☐ [3]

1. Based on the information above, there is reason to believe the proposed dredge or fill material is not a carrier of contaminants…… ☒
2. The levels of contaminants are substantially similar at the extraction and disposal sites and not likely to result in degradation of the disposal site, and pollutants will not be transported to less contaminated areas; and/or…… ☐
3. Acceptable constraints are available and will be implemented to reduce contamination to acceptable levels within the disposal site and to prevent contaminants from being transported beyond the boundaries of the disposal site…… ☐

4. DISPOSAL SITE DELINEATION (§230.11[f])

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

1. Depth of water at disposal site…… ☒
2. Current velocity, direction, and variability at disposal site…… ☒
3. Degree of turbulence…… ☒
4. Water column stratification …… ☐
5. Discharge vessel speed and direction…… ☐
6. Rate of discharge…… ☒
7. Dredged material characteristics (constituents, amount and type of material, settling velocities)…… ☒
8. Number of discharges per unit of time…… ☐
9. Other factors affecting rates and patterns of mixing (specify)…… ☐

List appropriate references on attached sheet.

b. Mixing Zone Determination: An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable…… **Yes** ☒ **No** ☐

5. ACTIONS TO MINIMIZE ADVERSE EFFECTS (SUBPART H) All appropriate and practicable steps, as warranted, have been taken through application of recommendations of §230.70-230.77 to insure minimal adverse effects of the proposed discharge. **List Actions Taken (see attached sheet)**…… ☒ ☐

RETURN TO SECTION 1 FOR FINAL COMPLIANCE REVIEW.

6. FACTUAL DETERMINATIONS (§230.11)

A review of the appropriate information as identified in items 2-5 above indicates that there is minimal potential for short-term or long-term environmental effects of the proposed discharge as related to:

	Yes	No
a. Physical substrate at the disposal site (review sections 2a, 3, 4, and 5)……	☒	☐
b. Water circulation, fluctuation, and salinity (review sections 2a, 3, 4, and 5)……	☒	☐
c. Suspended particulates/turbidity (review sections 2a, 3, 4, and 5)……	☒	☐
d. Contaminant availability (review sections 2a, 3, and 4)……	☒	☐
e. Aquatic ecosystem structure and function (review sections 2b and c, 3 and 5)……	☒	☐
f. Disposal site (review sections 2, 4, and 5)……	☒	☐
g. Cumulative impact on the aquatic ecosystem……	☒	☐
h. Secondary impacts on the aquatic ecosystem……	☒	☐

7. EVALUATION RESPONSIBILITY

a. This evaluation was prepared by: _____ Date: _____

Position: _____

b. This evaluation was reviewed by: _____ Date: _____

Position: _____

8. FINDINGS

a. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines…… ☐

b. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines with the inclusion of the following conditions (see attached sheet)…… ☐

c. The proposed disposal site for discharge of dredged or fill material does not comply with the Section 404(b)(1) guidelines for the following reason(s):

1. There is a less damaging practicable alternative…… ☐
2. The proposed discharge will result in significant degradation of the aquatic ecosystem…… ☐
3. The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem …… ☐

Signature__ _____ Date ____ _____
Colonel, Corps of Engineers
District Commander

By_____

[1] A negative, significant. or unknown response indicates that the permit application may not be in compliance with the Section 404(b)(1) Guidelines.

[2] Negative responses to three or more of the compliance criteria at this stage indicates that the proposed projects may not be evaluated using this "short-form procedures." Care should be used in assessing pertinent portions of the technical information of items 2 a-d below, before completing the final review of compliance.

[3] Negative responses to one of the compliance criteria at this stage indicate that the proposed project does not comply with the guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the "short -form" evaluation process if inappropriate.

[4] If the dredged or fill material cannot be excluded from individual testing, the "short-form" evaluation process if inappropriate.

Section 404 (b)(1) Evaluation (40 CFR 230)
Attachment Page

References:

☐ Application File Number (RAMS)_____

☒ U.S. Geological Survey Maps

☐ U.S. Geological Survey Water Resources Data

☐ U.S. Environmental Protection Agency Fish Kill Data

☐ Missouri Department of Conservation Fish Kill Data

☐ U.S. Environmental Protection Agency Inquiry / Data / Administrative Notice

☐ U.S. Environmental Protection Agency Water Quality Data

☒ Other: U.S. Department of Agriculture, Soil Survey of Atchison County, Missouri, Soil Survey of Holt County

PRELIMINARY EVALUATION:

Impacts to aquatic ecosystems will be minimized by performing construction work in the fall and winter coinciding with low stages of the Missouri River. Additionally, increased sediment load in the Missouri River is desired to help simulate natural historic conditions of the river. Minimal impacts to substrate, suspended particulates/turbidity, and the water column are explained in Chapter 4 of the Draft Barney Bend Project Implementation Report (Corps, 2006).