

**FINDING OF NO SIGNIFICANT IMPACT  
LITTLE BEND RIVER RESTORATION PROJECT  
LOWER BRULE SIOUX RESERVATION  
LYMAN COUNTY, SOUTH DAKOTA**

**December 2007**


In accordance with the National Environmental Policy Act and implementing regulations, an Environmental Assessment (EA), incorporated by reference herein, has been prepared for a proposed restoration project on the Lower Brule Sioux Tribe Reservation. The project is located near River Mile 1008 in Lake Sharpe, in sec. 1 and sec. 2, T. 108 N., R. 74 W., approximately 9 miles northwest of the town of Lower Brule in Lyman County, South Dakota. The project would consist of constructing a 200-foot-wide, 5,400-foot-long breakwater dike a couple hundred feet off of the shoreline in 4-foot-deep water. Approximately 340,340 cubic yards of fill would be placed into the lake to create the 25-acre dike and a 1-acre island and 11,180 tons of breakwater stone protection would be used to protect the side of the dike facing the lake and the northern tip of the dike. The fill material for the dike and island would be obtained by excavating a 2,300-foot-long borrow channel in the shoreline. Native riparian trees and shrubs would be planted on the dike and along the borrow channel. The project would meet goals of the Missouri River Recovery Program and provide valuable riparian forest, shallow water, and backwater habitat.

The No Action alternative was eliminated from further consideration because it would not fulfill the purpose and need of the proposed action, which is to restore backwater habitat lost as a result of the Missouri River Bank Stabilization and Navigation Project.

The EA and comments received from other agencies have been used to determine whether the proposed action requires the preparation of an Environmental Impact Statement (EIS). All environmental, social, and economic factors that are relevant to the proposal were considered in this assessment. These include, but are not necessarily limited to, prime farmland, water quality, air quality, noise, wetlands, wildlife, threatened and endangered species, and cultural resources. The primary benefit of the proposed project would be the creation of riparian forest, shallow water, and backwater habitat adjacent to the Missouri River. Adverse effects would include temporary noise, dust, and water quality impacts. However, these effects were deemed to be insignificant. No adverse impacts to threatened or endangered species or cultural resources are expected to occur as a result of the proposed project. The proposed actions would be in compliance with applicable environmental statutes.

It is my finding, based on the EA, the proposed Federal activity will not have any significant adverse impacts on the environment and the proposed project will not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an EIS will not be prepared.

Date: 7 Jan 08

*for*  LTC FN  
David C. Press Deputy District  
Colonel, Corps of Engineers Commander  
District Commander

Copy Furnished:

Chairman Michael Jandreau  
Lower Brule Sioux Tribal Council  
P.O. Box 187  
Lower Brule, South Dakota 57548

Joel Bich  
Lower Brule Wildlife Department  
22697 Little Bend Road  
Lower Brule, South Dakota 57548

Scott Jones  
Lower Brule Sioux Tribe  
Cultural Resources Department  
P.O. Box 187  
Lower Brule, South Dakota 57548

George Honeywell  
Lower Brule Sioux Tribe  
Environmental Protection Department  
P.O. Box 187  
Lower Brule, South Dakota 57548

**ENVIRONMENTAL ASSESSMENT  
WITH  
FINDING OF NO SIGNIFICANT IMPACT**

---

**LITTLE BEND RIVER RESTORATION PROJECT  
LOWER BRULE SIOUX TRIBE RESERVATION  
Lyman County, South Dakota**

---

Prepared by:

*U.S. Army Corps of Engineers, Omaha District*  
Environmental, Economics, and Cultural Resources Section  
Planning Branch, CENWO-PM-AE  
106 South 15<sup>th</sup> Street, Omaha, Nebraska 68102-1618  
Telephone Number: (402) 221-4628

December 2007

**This page intentionally left blank**

**ENVIRONMENTAL ASSESSMENT FOR  
LITTLE BEND RIVER RESTORATION PROJECT  
LOWER BRULE SIOUX RESERVATION  
Lyman County, South Dakota**

**December 2007**

**INTRODUCTION**

The U.S. Army Corps of Engineers, Omaha District (Corps) proposes the construction of a 5,400-foot-long breakwater dike in Lake Sharpe, 200 to 800 feet off of the right bank of the Missouri River near River Mile (RM) 1008. The proposed project site is located in sec. 1 and sec. 2, T. 108 N., R. 74 W., approximately 9 miles northwest of the town of Lower Brule in Lyman County, South Dakota. The proposed project is within the Lower Brule Sioux Tribe (LBST) Reservation (Appendix A, Appendix B). In May 2007 the Chairman of the LBST passed a resolution that the Tribe would like to enter into a sole source contract with the Corps to construct the proposed project (Appendix C, Enclosure 1). Native trees, shrubs, and vines would be planted on the dike and a shallow water area would be created in between the dike and shoreline that would eventually develop into a wetland. A borrow channel in the shoreline would be excavated to obtain fill material for the dike and a 1-acre island for shorebird habitat. The project would restore riparian forest habitat to the area, create a shallow water area, and meet goals of the Missouri River Recovery Program. The project would provide benefits for aquatic and wetlands species, neotropical migrant songbirds, and bald eagles (*Haliaeetus leucocephalus*), and would also protect cultural sites along the shoreline from erosion.

**2. PURPOSE AND NEED**

This project would provide four main benefits: 1) stop the loss of land due to wave and ice erosion, 2) protect archaeological and other cultural resources, 3) provide new cottonwood habitat for eagles and other wildlife, and 4) acquire knowledge regarding success of in-reservoir dikes in providing both shoreline protection and habitat (LBST 2005). Secondary benefits would include: 1) creation of shallow water habitat for game and nongame fishes, wading birds, and waterfowl, 2) creation of woody habitat for many neotropical and cavity-nesting birds, and 3) creation of job opportunities for local tribal members (LBST 2005).

**3. BACKGROUND**

In South Dakota, the Missouri River bisects the state for 532 river miles. The four main stem dams in the state inundated 423,710 acres of land. About 116,530 acres were river bottomland forest; this comprised about 75 percent of the entire state's cottonwood stands (SDGFP 1996).

On the Lower Brule Sioux Reservation, Lakes Francis Case and Sharpe flooded and destroyed nearly 26,000 acres (LBST 1996). Of this land, 6,911 acres were river bottomland forests, comprising 95 percent of the cottonwood habitat on the entire reservation (LBST 1996). Studies at the time of dam construction reported these projects would result in a 75 percent loss of plants and game on the reservation (Lawson 1996).

These actions terminated the connection between the river ecosystem and tribal members. For hundreds of years, this system had been integral to the Lakota culture for medicinal and ceremonial plants, plants and animals for food, trees for firewood, forested areas for livestock wintering and many other daily uses. The initial inundation, as well as on-going shoreline erosion that has been estimated at an average rate of 10 feet per year, have destroyed cultural and archaeological sites that are sacred to the Lower Brule people as well as other river Tribes (LBST 2005).

The loss of vast stands of cottonwoods has had devastating impacts on many fish and wildlife species including the culturally and nationally significant bald eagle. Many components of bald eagle habitat have been lost including nesting, roosting and foraging sites (LBST 2005).

#### **4. AUTHORITY**

The authority for this project is the Missouri River Recovery Program.

#### **5. ALTERNATIVES CONSIDERED**

Only one action alternative was developed for this project and analyzed in this document. A 200-foot-wide, 5,400-foot-long breakwater dike would be constructed in Lake Sharpe from fill material obtained by excavating a borrow channel in the shoreline. A shallow water area would be created in between the dike and the shoreline and would eventually develop into a wetland. A 1-acre shorebird habitat island would also be created.

##### **5.1. Alternative 1: No Action**

Under the No Action alternative, nothing would be done to stop erosion at Little Bend, nor to create riparian forest and shallow water habitat near the shoreline. Riparian cottonwood forest and wetland habitat would continue to be scarce on the Lower Brule Sioux Tribe Reservation. This alternative would also allow the cultural site at Little Bend to continue to erode until the integrity of the site is destroyed and it loses its cultural, historical, and scientific significance.

##### **5.2. Channel (Preferred Alternative)**

The project would consist of constructing a 200-foot-wide, 5,400-foot-long breakwater dike a couple hundred feet off of the shoreline in 4-foot-deep water (Appendix D). Approximately 340,340 cubic yards of fill would be placed into the lake

to create the 25-acre dike and a 1-acre island and 11,180 tons of breakwater stone protection would be used to protect the side of the dike facing the lake and the northern tip of the dike. The fill material for the dike and island would be obtained by excavating a 2,300-foot-long borrow channel in the shoreline. The sides of the backwater channel would have 4:1 slopes. Equipment used in the breakwater construction and borrow channel excavation would include bulldozers, backhoes, earth moving scrapers, and trucks.

The top of the dike would be planted with native riparian tree and shrub species such as cottonwood, green ash, honeylocust, box elder, silver maple, peachleaf willow, and diamond willow, and vine species such as riverbank grape, American bittersweet, Virginia creeper, and western virgin's bower. The area between the rows of trees and an open area on the downstream end of the dike would be seeded with a native grass mix. Bare-root stock would be used and the plants would be irrigated. Irrigation water for the seeded areas, bare-root tree, and shrub stock would be pumped from the lake using two floating intake structures and "hard hose traveling gun" irrigation systems. It is anticipated that the irrigation will take place from June through September for five years beginning in 2008.

Eleven peninsulas of varying sizes would be created off of the dike to create an additional planting area at a lower elevation. The peninsulas would be planted with plum, chokecherry, wood's rose, golden currant, redosier dogwood, gray dogwood, silverberry, sandbar willow, Missouri gooseberry, and black currant. The detailed tree planting plan is within the management and monitoring plan for the project (Appendix E).

The area between the dike and the shoreline would be a shallow water area 0 to 2 feet in depth. The shallow area would not be vegetated and would be allowed to develop naturally. It is expected to gradually develop into a wetland environment over the next 50 years.

A 1-acre island would also be created within the shallow water area. It would be maintained as bare soil and would provide nesting and loafing area for gulls, terns, and shorebirds.

## **6. AFFECTED ENVIRONMENT**

### **6.1. Physiography/Topography**

The Little Bend site is located in the Missouri Plateau section of the Great Plains physiographic province (an area that has a common geologic history) (Schumacher 1986). Based on the United States Geological Survey (USGS) map provided in Appendix A, Enclosure 2, the island in the proposed project area is relatively level, with an elevation of 1423 feet above mean sea level (msl) and the elevation of the proposed borrow site ranges from 1425 to 1450 feet msl.

## 6.2. Soils

The area proposed for dredging consists of Orton Variant loam (0 to 2 percent slopes), Orton loam (2 to 7 percent slopes), and Schambler loam (6 to 40 percent slopes) (Schumacher 1986). Orton Variant loam is a deep, well drained, nearly level soil on terraces. This soil is suited to windbreaks and environmental plantings. Except for species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well. Orton loam is a well drained, gently sloping soil on terraces. The soil is suited to windbreaks and environmental plantings but optimum growth is unlikely because the soil is droughty. Schambler loam is excessively drained, moderately sloping to steep soil on ridges, knolls, and terrace escarpments. The soil is too droughty and steep for windbreaks and environmental plantings. It is a probable source of sand and gravel.

## 6.3. Cropland/Prime Farmland

The United States Department of Agricultural (USDA) considers prime farmland to be land that has the best combination of physical and chemical characteristics which is readily available for producing crops. Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. The South Dakota State Conservationist, with the Natural Resources Conservation Service (NRCS), was contacted regarding prime or unique farmland within the project site. On July 3, 2007 the NRCS provided a letter identifying the presence of two prime farmland soils in the proposed project area, Orton variant loam, 0 to 2 percent slopes, and Orton loam, 2 to 7 percent slopes (Appendix C, Enclosure 2). These soils are only considered to be prime farmland if they are irrigated, and the portion of this area that is irrigated is outside of the project area.

## 6.4. Fluvial Characteristics

Historically, the Missouri River was a highly dynamic ecosystem, consisting of a meandering river channel and a flood plain characterized by a diverse array of forests, wetlands, backwater channels, oxbow lakes, and prairie. However, during the 20th century the Corps channelized the river below Sioux City, Iowa for navigation, constructed bank stabilization structures along the banks of the river to protect private property, and completed six main stem dams in the upper reach of the river for flood control, navigation, hydropower, fish and wildlife, recreation, municipal and industrial water supply, and irrigation. When Big Bend Dam was finished in 1963 it was the last of the main stem dams completed, creating 80-mile-long Lake Sharpe behind it.

The pool elevation in Lake Sharpe is held near elevation 1420 feet msl. Water fluctuations are minor and the pool normally fluctuates only 1 foot from elevation



1420 feet msl during the week in response to power demands (USACE 2003). Since the main stem reservoirs first filled to normal operating levels in 1967, the Lake Sharpe level has fluctuated between a maximum of elevation 1422.1 to a minimum of 1415.0 feet msl, with an average level of 1420.4 feet msl (USACE 2003).

The constant pool elevations on the lake allow wind, wave, and ice to attack the same elevations year-round, making erosion a major problem on Lake Sharpe (USACE 2003). For example, in the proposed project area, a station just upstream of the northern edge of the proposed dike location indicated that 52 feet of shoreline were lost between 1992-2006 (personal communication, Joel Bich, LBST Department of Fish, Wildlife, and Recreation). Corps measurements of range line 1052.6 show 72 feet of shoreline were lost between 1963-1997 (personal communication, Joel Bich, LBST Department of Fish, Wildlife, and Recreation).

#### 6.5. Water Quality

Lake Sharpe is used as a water supply by the cities of Fort Thompson, Lower Brule, Pierre, and Fort Pierre, South Dakota. The reservoir is an important recreational resource (USACE 2007).

Pursuant to the Federal Clean Water Act, the State of South Dakota has designated the following water quality-dependent beneficial uses for Big Bend Reservoir: recreation, coldwater permanent fish life propagation, domestic water supply, agricultural water supply, commerce and industrial waters, and fish and wildlife propagation. The State of South Dakota has recently removed Lake Sharpe from the State's Section 303(d) list of impaired waters. The reservoir was previously listed as impaired due to accumulated sediment from the Bad River watershed. A total maximum daily load (TMDL) was developed and is being implemented (USACE 2007). A TMDL is a calculation of the maximum amount of a pollutant that a body of water can receive and still meet water quality standards (EPA 2007).

#### 6.6. Air Quality

Sources of suspended particulate matter and air pollutants in the project area include agricultural and recreational boating activities in the vicinity of the dredging site. However, because Lyman County is highly rural, there are no facilities in the county that require air quality permits and there are no major sources of air pollution (Telephone conversation record with the South Dakota Department of Environmental and Natural Resources (SDDENR) air quality division, Appendix C, Enclosure 3). The SDDENR has never conducted air quality monitoring in Lyman County as there has never been a reason to expect the county is not in attainment with Environmental Protection Agency air quality standards.

## 6.7. Noise

Sources of noise near the project site may result from recreational boating, hunting, and agricultural activities. These activities are seasonal. In the spring and fall, tractor and truck use increases on farms near the project site. Recreational boating on Lake Sharpe primarily occurs during the summer months. Background noise levels are generally low.

## 6.8. Wetlands

A National Wetlands Inventory (NWI) map was checked for information regarding potential wetlands in the proposed project area. According to the NWI map (Appendix A, Enclosure 3) there are no wetlands in the proposed project area. There are some degraded, cattail-dominated wetlands on the mushroom-shaped peninsula that is in the area, but these would not be affected by the project.

## 6.9 Vegetation

The upland portion of the project area (top of the bank) consists primarily of mixed grass prairie. Vegetation on the peninsula consists primarily of cattails. Shelterbelts consisting of trees such as Russian olive are located to the west of the borrow channel location.

## 6.10. Fish

The Lake Sharpe walleye fishery is among the best in the Nation, with generally high catch rates of average-size fish. The walleye in Lake Sharpe average 1 1/2 to 3 pounds, but larger fish are frequently taken. Average harvest is over 60,000 walleyes per year. State studies of fish abundance are performed annually. Studies suggest that although yellow perch rebounded substantially after some low production years noted in the early 1970s, populations have been slowly declining since 1989. State data also indicated that populations of white bass, white crappie, freshwater drum, goldeye, and carp are still substantial and stable, while catfish numbers have increased since 1982. Populations of the buffalofish, northern pike, shovelnose sturgeon, creek chub, blue suckers, and other fish dependent on riverine habitat or vegetated slackwater habitat are still very limited (USACE 2003).

## 6.11. Wildlife

In the early 1980s, the Lower Brule Sioux Tribe reintroduced elk and buffalo into a big game range located in 3,000 acres of rough Missouri River breaks just west of the town of Lower Brule (USACE 2003). Common mammal species that are likely to be found in the project area include mule deer, coyotes, bobcats, red foxes, badgers, spotted and striped skunks, raccoons, mink, beaver, muskrats, white-tailed jackrabbits, and numerous ground squirrel and mouse species.

Bank-dwelling birds such as kingfishers and bank swallows use the cliff banks along the lake. Various species of ducks, geese, shorebirds, and gulls are also common. In the uplands, landward of the erosion site, ring-necked pheasants, sharptailed grouse, prairie chickens, mourning doves, meadowlarks, upland sandpipers, and horned larks are likely to use the area.

Birds of prey likely to be found in the project area include bald eagles, golden eagles, turkey vultures, ospreys, and numerous species of hawks, falcons, and owls.

## 6.12. Federally Threatened and Endangered Species

In a letter dated August 1, 2007, the United States Fish and Wildlife Service (USFWS) provided a list of federally threatened and endangered species that may occur in the project area, including the endangered pallid sturgeon (*Scaphirhynchus albus*), endangered interior least tern (*Sterna antillarum*), threatened piping plover (*Charadrius melodus*), and threatened bald eagle (*Haliaeetus leucocephalus*) (Appendix C, Enclosure 4).

### 6.12.1. Pallid Sturgeon, *Scaphirhynchus albus* (Endangered)

The pallid sturgeon was listed as an endangered species on September 6, 1990. It inhabits the Missouri River and the Mississippi River below the mouth of the Missouri. Little is known about the basic biology, life history, and habitat utilization of this species.

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

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

#### 6.12.2. Interior Least Tern, *Sterna antillarum* (Endangered) and Piping Plover, *Charadrius melodus* (Threatened)

The interior least tern was listed as endangered in 1985. The severe decline in interior least tern populations is largely attributable to river channelization, irrigation diversion, and damming along the species' prime nesting ground. The piping plover was listed as threatened in 1995 as well. Piping plovers and least terns use similar habitat within the river. These species both prefer nesting habitat that consists of riverine sand and gravel bars that are sparsely vegetated and within a wide unobstructed river channel. These birds regularly use the Missouri River for feeding and reproduction.

#### 6.12.3. Bald Eagle, *Haliaeetus leucocephalus*

Because the population of bald eagles nationwide has recovered to an estimated 9,789 breeding pairs, the bald eagle was delisted from the endangered species list on August 8, 2007. The bald eagle will no longer be protected under the Endangered Species Act, although it will still be protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (Eagle Act). Under the MBTA, it is illegal to pursue, hunt, take, capture, kill, possess, sell barter, purchase, export, or import migratory birds, their parts, nests or eggs, except as permitted by regulation. The Eagle Act prohibits the disturbance, take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export, or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

#### 6.13. State Threatened and Endangered Species

In a letter dated July 5, 2007 (Appendix C, Enclosure 5) the South Dakota Department of Game, Fish and Parks stated that according to the Natural Heritage Database, there are no known State listed threatened or endangered species in the project area.

#### 6.14. Cultural Resources

On June 22, 2007, a Corps archaeologist submitted a coordination letter to regional Tribes requesting their comments on cultural resources in the general project area as required under the Programmatic Agreement for the Missouri River Main Stem System (USACE 2004). A determination letter, which contains the Corps archaeologist's determination on the impact the project will have on any cultural sites, was sent to the regional Tribes on October 15, 2007. Because the determination letter contains sensitive data, it is not included as an appendix to this EA.

## 6.15. Socioeconomic Resources

The project area is located in Lyman County, South Dakota. The population of Lyman County was 3,919 in 2005 (U.S. Census Bureau 2006). This county saw a 0.6 percent increase in population from 2000-2005 and a 7.1 percent increase from 1990-2000. In 2004, 62.1 percent of Lyman County residents reported their race as Caucasian alone, 36.3 percent of residents reported their race as American Indian and Alaska Native, and the remaining 1.6 percent consisted of other races or a mixture of races. The project area is five miles northwest of the town of Lower Brule, which had a population of 599 in 2000, an 8.5 percent decrease from the 1990 population.

In 2003, Lyman County had a median household income of \$29,547 compared to \$38,008 for the State of South Dakota. In 2003, the percent of persons below poverty level was 18.6 percent in Lyman County, compared to 12.4 percent for the State of South Dakota. The unemployment rate for Lyman County was 5.5 percent in 2005, higher than the statewide unemployment rate of 3.9 percent (U.S. Department of Labor 2006a, 2006b). In 2002 in Lyman County (co. is 1640 square miles), 885,332 acres, or 88.1 percent of the land, was farmland; the average farm size was about 2,108 acres; and 87.1 percent of the farmland, or 392,333 acres, was planted to crops (NASS 1997).

The Lower Brule Sioux Tribe's major economic occupation is cattle ranching and farming (Mni Sose 2006). The Tribe operates two large irrigated farms, 5,900 acres under the Lower Brule Farm Corporation, a tribal construction enterprise, and guided hunting for small game, big game, and a goose camp operation. The Tribe also operates the Golden Buffalo Casino and Motel with a convention center, an RV Park, and a gas station. A recent tribal venture is the offering of tour packages, on a daily and weekly basis, including historical and cultural attractions for both national and global tourists from several countries.

Commercial business by private operators include a convenience store, laundromat, a video arcade/fast food shop, hunting/fishing guide service, arts and handcrafts, a small motel, and a branch of Norwest Bank.

The majority of employment is provided by the Lower Brule Sioux Tribe, the Golden Buffalo Casino, Bureau of Indian Affairs, and the Indian Health Service.

## 7. ENVIRONMENTAL CONSEQUENCES

With the no action alternative, the future environment at the proposed project site would consist of a continuation of current existing conditions. The text below describes what the future environment of the site would be if the proposed project were implemented.

### 7.1. Physiography/Topography

Excavation of material at the proposed dredging site for the borrow channel would increase the local relief, or the difference in elevation between the high banks and the flat backwater area below. Agricultural lands near the borrow channel would not change in elevation and are higher in elevation than the dredging area, so they would experience no added threat of flooding due to the dredging. The changes in physiography and topography of the dredging area resulting from the project site would have no significant impacts.

### 7.2. Soils

As a result of the proposed dredging project, a portion of the Orton Variant loam (0 to 2 percent slopes), Orton loam (2 to 7 percent slopes), and Schambler loam (6 to 40 percent slopes) soil units on the Lyman County Soil Survey would be replaced with the water soil-mapping unit. Because a relatively small area would be affected, this project would have no significant impact on the local soil resource.

### 7.3. Cropland/Prime Farmland

The South Dakota State Conservationist with the NRCS determined that construction of the proposed project would impact prime farmland if the irrigated areas were impacted by the project (Appendix C, Enclosure 2). Because these irrigated areas would not be impacted, the project would have no significant impact on prime farmland.

### 7.4. Fluvial Characteristics

The project would include the creation of approximately 22 acres of shallow water habitat that is less than 5 feet deep with velocities less than 2 feet per second to form at relatively slow stages of the Missouri River. The shallow water area and borrow channel areas would increase the quality and quantity of spawning, rearing, and foraging areas for native fish; and increase the duration of this connectivity. The project would have beneficial impacts and no significant adverse impacts on fluvial characteristics of the Missouri River. The Corps flood plain section approved of the proposed project, and stated a flood plain permit would not be needed (Appendix C, Enclosures 6 and 7).

### 7.5. Water Quality

The SDDENR does not require a National Pollutant Discharge Elimination System (NPDES) permit for the project since it is not on state land (Telephone conversation record with SDDENR water quality division, Appendix C, Enclosure 8). The SDDENR granted a 401 water quality certification on November 21, 2007 (Appendix C, Enclosure 9). The Environmental Protection Agency (EPA) does not require a NPDES permit for the project because 1) the project is located immediately adjacent to Lake Sharpe and likely encompasses the historic extent of the lake; 2) the purpose of the project is for lake restoration, and similar maintenance activities are excluded from construction stormwater permit coverage; and 3) the scope of the project

includes providing riparian habitat which will likely be hydrologically connected to the lake (Appendix C, Enclosure 10).

#### 7.6. Air Quality

Minor increases in dust and equipment exhaust are expected during construction. These increases would be temporary and would not be expected to be high enough to result in Lyman County becoming a non-attainment area for any National Ambient Air Quality Standard parameters. Therefore, the proposed project would have no significant impacts on air quality.

#### 7.7. Noise

Minor increases in noise from construction equipment are expected at the project during construction. The expected increases in noise would be minor, temporary, and similar to those already occurring in the area from farm machinery. Therefore, the expected increases in noise levels from project construction would not be significant.

#### 7.8. Wetlands

The only wetlands in the vicinity of the project area are degraded, cattail-dominated wetlands on the mushroom-shaped peninsula. Because this area would not be impacted by the project, there would be no negative impact on area wetlands. This project would benefit the local wetland resource by eventually creating 22 acres of wetlands as the shallow water area silts in over time. The Corps is expected to grant a 404 permit for this project.

#### 7.9. Vegetation

The project would restore riparian cottonwood forest vegetation that is currently scarce on the reservation. Although the excavation of the borrow channel would not affect the shelterbelt trees, the excavation would remove some mixed grass prairie. The amount of mixed grass prairie removed would be considered insignificant.

#### 7.10 Fish

While habitat shapes the fish communities that make up the Missouri River, little is known about exactly what factors actually control fish production in this reach of the river. The proposed project should benefit fish because it would provide a more natural diversity of aquatic habitats by creating a channel and shallow water habitat that is protected from wave action. The net impact to the fishery is considered a positive one.

For detailed information on benefits of the project to pallid sturgeon, please refer to the Federally Threatened and Endangered Species section of this environmental assessment (EA).

## 7.11. Wildlife

Some animals may be disturbed or displaced during construction; however, this would be a temporary and minor impact. After construction is complete, the riparian forest habitat, backwater, and borrow channel would attract and provide food and cover for a diversity of neotropical birds, waterfowl, mammals, and other wildlife. Small mammals would be able to find food and cover in the area. Several species of passerines such as common yellowthroats, indigo buntings, and sedge wrens would be expected to utilize the drier wetland areas. Other bird species such as herons, rails, red-winged blackbirds, and marsh wrens would be expected to utilize wetter wetland areas. Waterfowl such as mallards, blue-winged teal, and northern pintails would use the open water areas. Moist-soil regions would provide brood and foraging habitats for game birds such as northern bobwhite quail, turkeys, and pheasants. Hawks and other raptors would hunt for prey in and around the borrow channel and forest. Deer would use the project area as a nursery and feeding area. The backwater would also provide valuable habitat for a number of furbearers such as raccoons, mink, muskrats, and beaver.

Grubbing and clearing of vegetation such as grasses, forbs, and shrubs prior to dredging may temporarily impact resident nests, if present; however, this impact is small in comparison to available nesting areas. Additionally, the completed project would provide benefits to riparian bird species by increasing available habitat as well as restoring a more natural ecosystem.

## 7.12. Federally Threatened and Endangered Species

The effects of the endangered and threatened species that may occur in the project area are listed below. The Corps has determined that the project would have no effect on pallid sturgeon and the project may affect, but is not likely to adversely affect, interior least terns and piping plovers. In a letter dated September 25, 2007, the USFWS concurred with this determination (Appendix C, Enclosure 11).

### 7.12.1. Pallid Sturgeon, *Scaphirhynchus albus* (Endangered)

As noted by the August 1, 2007 letter from the USFWS, several individuals of the pallid sturgeon have been collected in Lake Sharpe, although it is difficult to determine the potential presence or absence of the species at the proposed site. Given the small numbers of pallid sturgeon that occur in the reservoir, and that most pallid sturgeon biologists believe the Lake Sharpe pallid sturgeon population will exist only until the existing fish die of old age, (Personal communication, Mark Drobish, Corps fishery biologist), the Corps determines that this project would have no effect on pallid sturgeon.

### 7.12.2. Interior Least Tern, *Sterna antillarum* (Endangered) and Piping Plover, *Charadrius melodus* (Threatened)

According to the August 1, 2007 letter from the USFWS and the LBST (Personal communication, Joel Bich, LBST Wildlife Department), there are no records of nesting



least terns or piping plovers in the project area. The proposed project would be constructed during the winter, during the absence of least terns and piping plovers from South Dakota. The project would include the construction of a 1-acre island that would be maintained as bare ground in order to create nesting and foraging habitat for a variety of gulls, terns, and shorebirds. Although it is doubtful least terns and piping plovers would show up on the 1-acre island given its small size and that the nearest nesting area is over 70 miles away, it is possible that a couple may discover the island when flying over and decide to use it (Personal communication, Greg Pavelka, Corps wildlife biologist). If least terns or piping plovers use the island, the LBST would monitor the birds. The island may have a beneficial effect on terns and plovers by providing appropriate nesting and foraging habitat. Therefore the Corps determines that this project may affect, but is not likely to adversely affect, the least tern and piping plover.

#### 7.12.3. Bald Eagle, *Haliaeetus leucocephalus*

In the USFWS letter dated August 1, 2007, the USFWS mentioned the bald eagle (*Haliaeetus leucocephalus*) would be delisted on August 8, 2007 and determinations of impacts to the bald eagle will no longer be required under the Endangered Species Act. Although a determination is not required, the bald eagle is still protected under the MBTA and the Eagle Act. The closest bald eagle nest to the proposed project is 18 miles to the southeast of the project area and there is no documentation of bald eagles nesting in the Little Bend/Narrows area (Personal communication, Joel Bich, LBST Wildlife Department), so this project would not disturb bald eagles. The project would benefit bald eagles by creating cottonwood forest habitat.

#### 7.13. Cultural Resources

The likelihood of significant adverse impacts to any historic or archaeological resources resulting from construction of the mitigation project is minimal. No cultural sites have been identified in the immediate project area that would be impacted by the project construction, management, and monitoring (Appendix C, Enclosure 12). For these reasons, the proposed project is not likely to adversely impact cultural resources. A “no adverse effect” finding was submitted to the South Dakota State Historic Preservation Officer (SHPO). The SHPO concurred with this finding (Appendix C, Enclosure 12).

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

#### 7.14. Socioeconomic Resources

Construction and implementation of the proposed project are expected to positively impact the population and income of the local area. The proposed project would provide additional recreational activities to residents and visitors to the area in the form of increased wildlife viewing, hiking, and hunting opportunities.

### 8. CUMULATIVE EFFECTS

Cumulative effects are those that result from the incremental effects of the action when added to past, present, and reasonably foreseeable future actions within a region. Analysis of cumulative effects for the proposed project requires evaluation of actions that have occurred throughout the Missouri River.

Significant cumulative effects have already occurred throughout the Missouri River, which have caused or contributed to the decline of listed species known to occur in the project area. Anthropogenic alteration of river hydrographs and dynamic processes has resulted in dramatic changes and the loss of proper riverine ecosystem functioning. Specifically, at Lake Sharpe, the major effects of the Big Bend Dam have been inundation of riparian forest, wetland, and prairie habitat, loss of overbank flooding, and loss of channel migration. The proposed restoration plan would form new riparian forest and backwater habitat, and shallow water habitat that would eventually develop into wetlands. These improvements would, to an incremental degree, provide a reduction in the cumulative effects of these conditions in the local area. None of the measures proposed for restoration are expected to contribute to a negative cumulative effect. Throughout the area of consideration for cumulative effects, the proposed restoration plan would not contribute to adverse cumulative conditions. The project is considered to be cost effective and beneficial due to the paucity of existing backwater, wetland, and prairie habitats in the region. Furthermore, the project does not preclude future restoration, including large-scale changes to hydrologic and sediment regime.

### 9. MONITORING AND EVALUATION

A management and monitoring plan has been created for this restoration project (Appendix E). The purpose of the management portion of the plan is to document the management activities that would be used in this restoration project, such as dike construction oversight, ground preparation, and installation of weed barrier fabric and irrigation. Most of the management activities would take place during the initial year of the project, although some activities are ongoing, including the irrigation of planted vegetation and weed control. The purpose of the monitoring portion of the plan is to document pre-project and post-project conditions for an environmental restoration and shoreline protection project. Pre-project conditions would be assessed during the year prior to project construction and post-project conditions would be assessed during the five years after project construction. There are provisions in the monitoring plan for the LBST to make management changes as necessary to increase the likelihood of project success.

Prepared by: Kristine T. Nemec  
Kristine T. Nemec  
Environmental Resources Specialist

Date: Dec. 13, 2007

Approved by: Larry Janis  
Larry Janis Chief  
Environmental, Economics and  
Cultural Resources Section  
Planning Branch

Date: 12/14/07

## 10. REFERENCES

Duffy, W.G., C.R. Berry, and K.D. Keenlyne. 1996. Biology of the pallid sturgeon with an annotated bibliography through 1994. Cooperative Fish and Wildlife research Unit, Technical Bulletin 5. South Dakota State University, Brookings, South Dakota.

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

Lawson, M.L. 1996. An analysis of the impact of the Pick-Sloan dam projects on the Lower Brule Sioux Tribe. Morgan, Angel and Associates, Washington, D.C.

LBST (Lower Brule Sioux Tribe Department of Fish, Wildlife, and Recreation). 1996. Habitat mitigation plan for Lake Sharpe on the Lower Brule Sioux Reservation.

LBST. 2005. Project proposal, Big Bend Dam/Lake Sharpe Project. Project name: Little Bend Shoreline Protection and Cottonwood Habitat Enhancement Project, Lower Brule Sioux Reservation, December, 2005.

Mni Sose. 2006. Mni Sose Intertribal Rights Coalition, Inc. webpage. Lower Brule Sioux Tribe Community Environmental Profile. <http://www.mnisose.org/profiles/lwrbrule.htm> Accessed December 22, 2006.

NASS (National Agricultural Statistics Service). 1997. 1997 Census of Agriculture. U.S. Department of Agriculture, Washington, D.C.

Schumacher, T.M. 1986. Soil survey of Lyman County, South Dakota. U.S. Department of Agriculture, Soil Conservation Service, in cooperation with U.S. Department of Agriculture, Forest Service, United States Department of the Interior, Bureau of Indian Affairs; and South Dakota Agricultural Experiment Station. 165p.

SDGFP (South Dakota Game, Fish, and Parks Department). 1996. Habitat Mitigation Plan for Oahe/Sharpe Reservoirs, South Dakota.

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

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

USACE (U.S. Army Corps of Engineers). 2003. Big Bend Dam/Lake Sharpe Master Plan, Missouri River, South Dakota. Update of Design Memorandum MB-90. U.S. Army Corps of Engineers, Omaha District. 295pp.

USACE. 2004. Programmatic Agreement for the Operation and Management of the Missouri River Main Stem System for Compliance with the National Historic Preservation Act.

USACE. 2007. 2006 Annual Report, Water Quality Conditions in the Missouri River Main Stem System. Water Quality Unit, Hydrologic Engineering Branch, Omaha District.

U.S. Census Bureau. 2006. State and County Quick Facts. US Census Bureau, Washington, D.C. Accessed August 9, 2006.  
<http://quickfacts.census.gov/qfd/states/46/46085.html>

U.S. Department of Labor. Bureau of Labor Statistics. 2006a. Labor force data by county, 2005 annual averages. <ftp://ftp.bls.gov/pub/special.requests/la/laucnty05.txt>. Accessed August 9, 2006.

U.S. Department of Labor. Bureau of Labor Statistics. 2006b. Unemployment rates for states. <http://www.bls.gov/lau/lastrk05.htm> Accessed August 9, 2006.

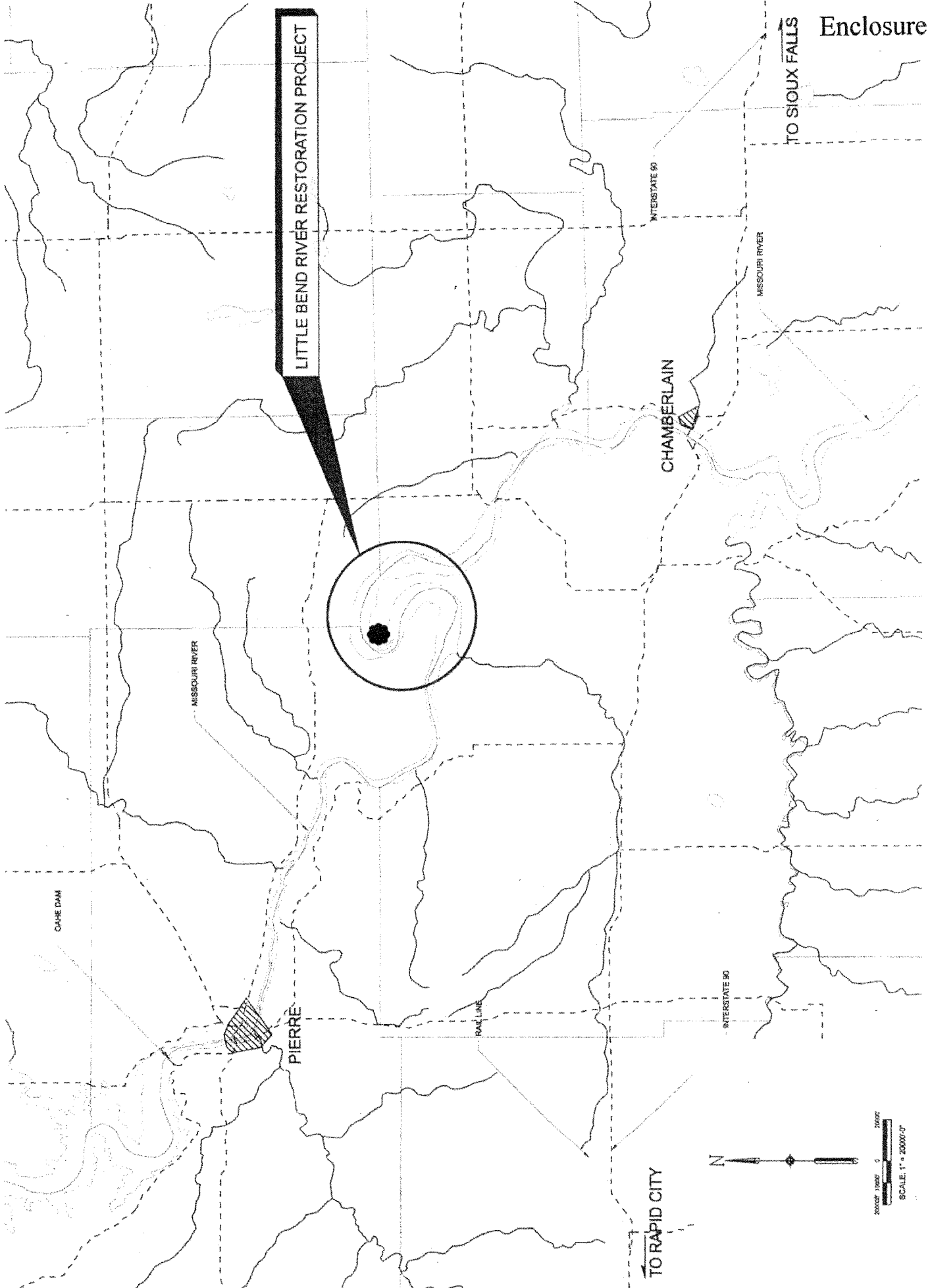
USFWS (U.S. Fish and Wildlife Service). 2000. Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System. Denver, Colorado and Fort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

USFWS. 2003. 2002 Annual Report, Lower Mississippi River Pallid Sturgeon Monitoring and Population Assessment Report, prepared for the U.S. Army Corps of Engineers Northwest Division, Wyatt Doyle and Andrew Starostka, U.S. Fish and Wildlife Service, Columbia Missouri Fishery Resources Office.

This page intentionally left blank.

# **APPENDIX A:**

## **SITE MAPS**

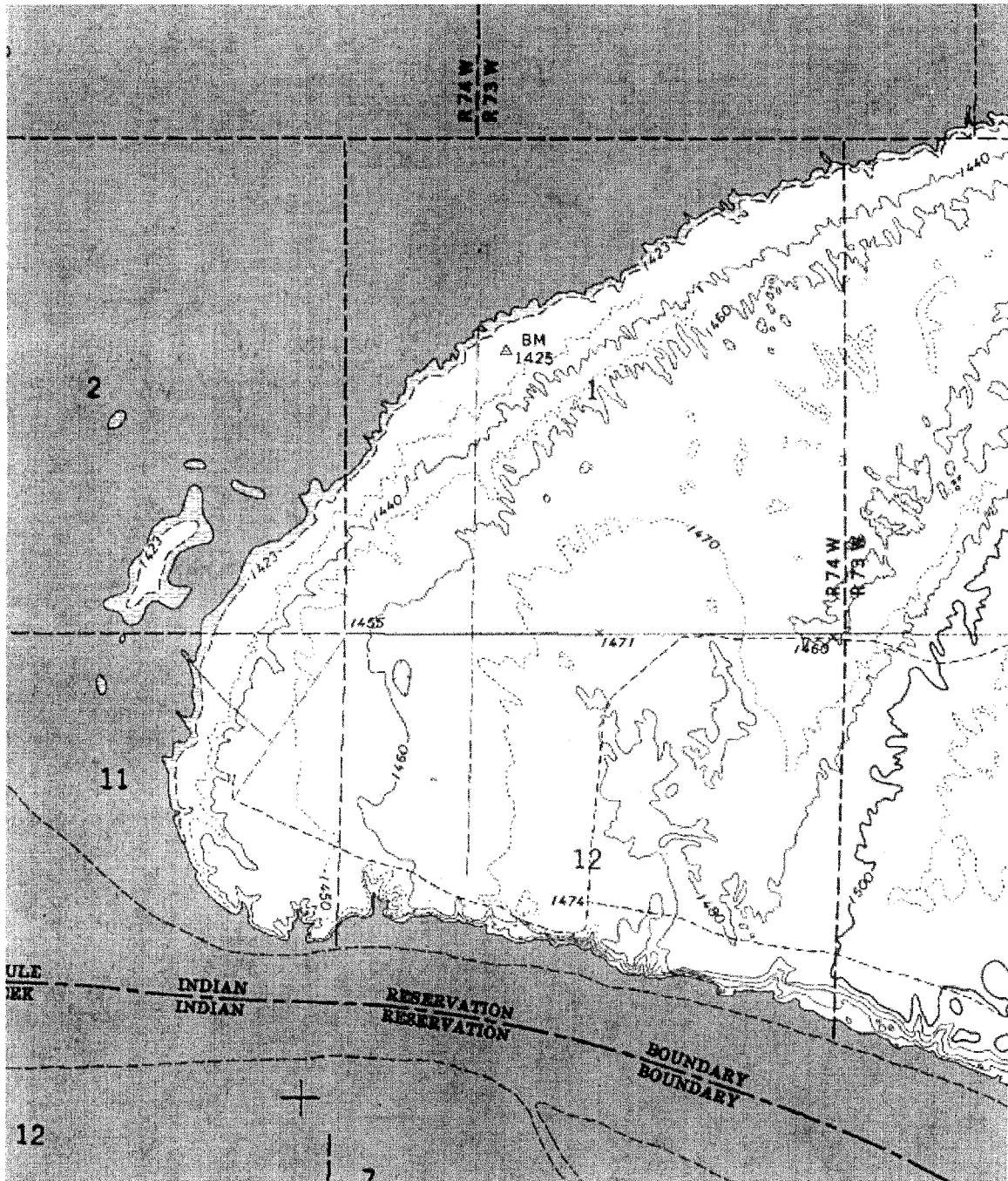


LITTLE BEND RIVER RESTORATION PROJECT

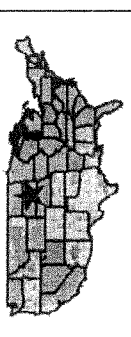
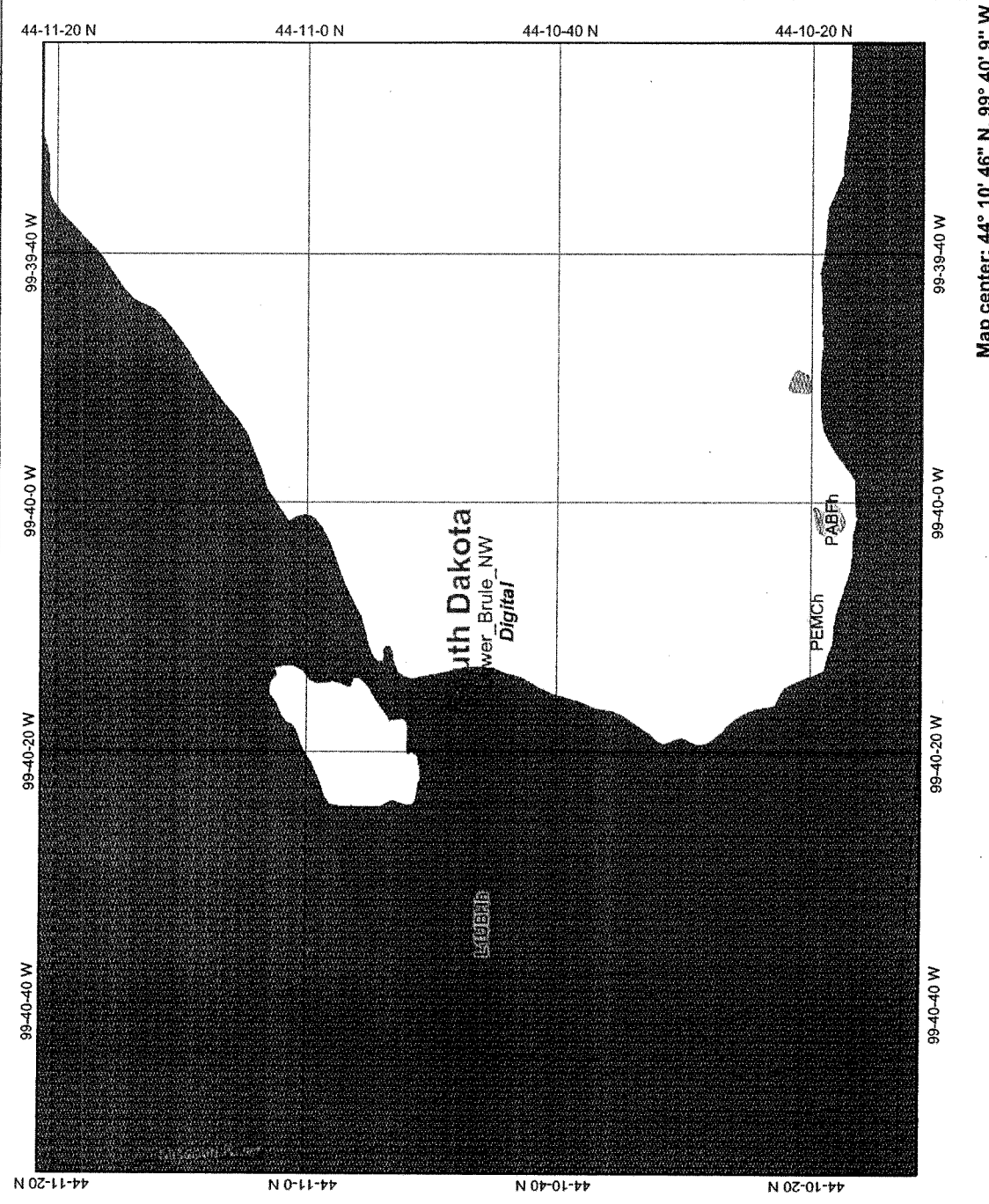
TO RAPID CITY

TO SIOUX FALLS





# National Wetlands Inventory map



**Legend**

CONUS\_wet\_scan

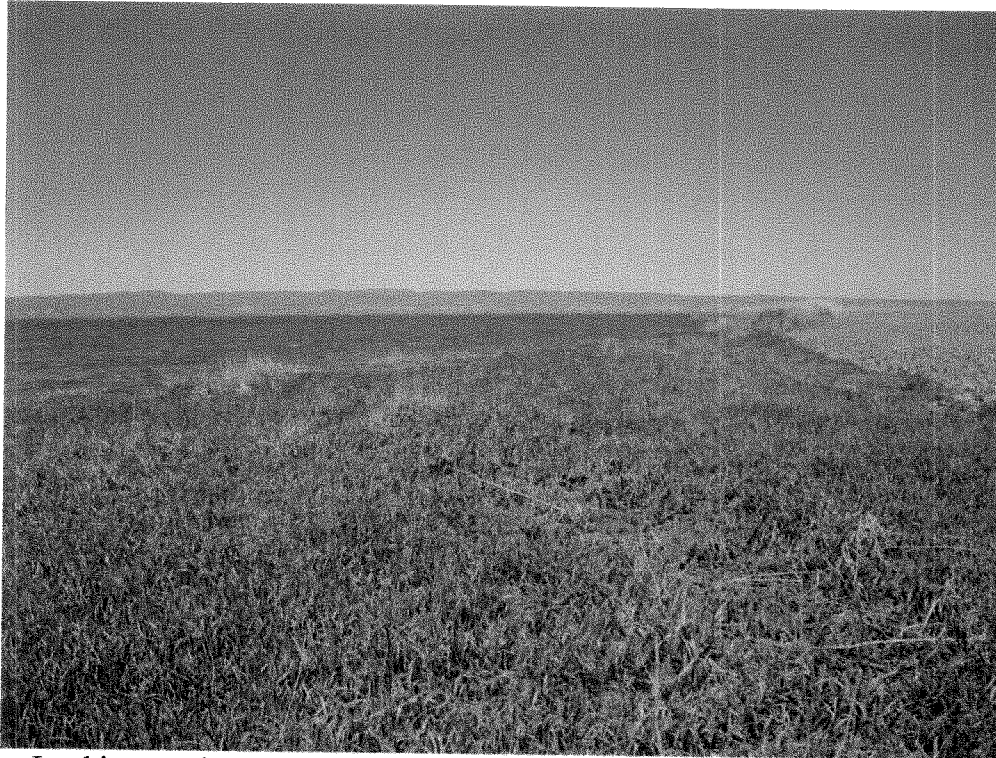
- 0
- 1
- Out of range
- Interstate
- Major Roads
- Other Road
- Interstate
- State highway
- US Highway
- Roads
- Cities
- USGS Quad Index 24K
- Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan
- NHD Streams
- Counties 100K
- States 100K
- South America
- North America

Scale: 1:15,144

This map is a user generated static output from an internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

# **APPENDIX B:**

## **SITE PICTURES**



Looking northeast to area where northern portion of dike will be located.



Looking northeast to area where northern portion of dike will be located.



Looking south from area where northern part of dike will be located.



Looking south at island.



Looking west along the northern shore of the island.



Typical vegetation on the island.



Looking north from the island at the lake.



Looking south at southernmost tree line.



Looking east towards hill area where borrow channel will be located.



Looking west at area where end of borrow channel will be.





Looking west at island and existing trees.



Looking north at area where borrow channel will be.

# **APPENDIX C: CORRESPONDENCE**

**RESOLUTION 07-151  
LOWER BRULE SIOUX TRIBAL COUNCIL**

**APPROVE ENTER INTO SOLE SOURCE CONTRACT ON LITTLE  
BEND RIVER RESTORATION PROJECT**

*WHEREAS, the Lower Brule Sioux Tribe is a federally recognized Indian Tribe organized pursuant to the Indian Reorganization Act of 1934; and*

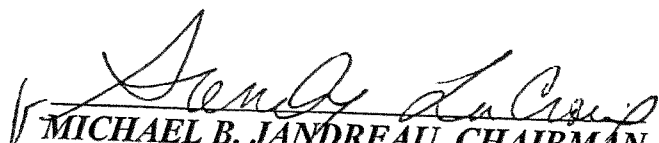
*WHEREAS, as empowered by the Constitution and Bylaws, Article VI, Section 1, (e), the Tribal Council as authorized by law to safeguard and promote the peace, safety, morals, and general welfare of the Lower Brule Sioux Tribe and to regulate the conduct of trade and the use and disposition of property upon the reservation provided that any ordinance directly affecting nonmembers of the reservation shall be subject to review by the Secretary of the Interior; and*

*WHEREAS, the Lower Brule Sioux Tribe is desirous into entering into a sole source contract with the U.S. Army Corp of Engineers for the Little Bend Restoration Project and that the Department of Wildlife, Fish & Recreation would take the lead, with assistance from Lower Brule Employment Enterprise, to implement and manage this project; and*

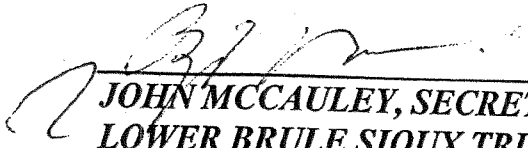
*NOW THEREFORE BE IT FURTHER RESOLVED, that the Lower Brule Sioux Tribal Council does hereby request to enter into a sole source contact with the U.S. Army Corp. of Engineers for the Little Bend River Restoration Project and that the Department of the Wildlife, Fish & Recreation would take the lead in executing this contract and implementing the project.*

**CERTIFICATION**

*The foregoing Resolution as duly adopted by the Lower Brule Sioux Tribal Council, assembled in Regular Session, with quorum present, the 3rd day of May, 2007, by the affirmative vote of five members for, none opposing, none absent and none not voting.*

  
**MICHAEL B. JANDREAU, CHAIRMAN  
LOWER BRULE SIOUX TRIBAL COUNCIL**

**ATTEST:**

  
**JOHN MCCAULEY, SECRETARY/TREASURER**  
**LOWER BRULE SIOUX TRIBAL COUNCIL**

United States Department of Agriculture

06 JUL 2007

Enclosure 2



Natural Resources Conservation Service  
Kennebec Field Office  
Box 156  
Kennebec, South Dakota 57544

Phone: (605) 869-2238  
Fax: (605)869-2205

July 3, 2007

Ms. Kristine Nemec  
Environmental, Economics,  
and Cultural Resources Section  
Planning Branch  
Department of the Army  
Corps of Engineers  
Omaha District  
106 South 15<sup>th</sup> Street  
Omaha, NE 68102-1618

Dear Ms. Nemec:

I received a letter from your department dated June 26, 2007 requesting prime farmland soil information for a project in Lyman County, SD on Lake Sharp. I am providing you a list and map of the prime farmland soils in the area.

We only have two soils in the project area that are designated as prime farmland and I do not know exactly if they will be in your impact area. These prime farmlands are only prime farmland soil, if they are being irrigated. So if you do not disturb the pivots irrigation area, then you will not disturb the prime soils.

If you need additional information please contact me at [shane.reis@sd.usda.gov](mailto:shane.reis@sd.usda.gov) or by phone at 605-869-2238 ext# 3.

Sincerely,

A handwritten signature in black ink, appearing to read "Shane Reis".

Shane Reis  
District Conservationist

Attachments

*Helping People Help the Land*

An Equal Opportunity Provider and Employer

Section II  
Soil and Site Information

Prime Farmland  
Lyman County, South Dakota

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map symbol	Soil name
AaA	Agar silt loam, 0 to 3 percent slopes (Prime farmland if irrigated)
AaB	Agar silt loam, 3 to 6 percent slopes (Prime farmland if irrigated)
Bg	Bigbend silt loam (Prime farmland if irrigated)
FaA	Fairlo silt loam, 0 to 3 percent slopes (Prime farmland if irrigated)
FaB	Fairlo silt loam, 3 to 6 percent slopes (Prime farmland if irrigated)
Hm	Hilmoe silty clay (Prime farmland if irrigated)
LOA	Lowry silt loam, 0 to 2 percent slopes (Prime farmland if irrigated)
LOB	Lowry silt loam, 2 to 6 percent slopes (Prime farmland if irrigated)
MCA	Mcclure silt loam, 0 to 3 percent slopes (Prime farmland if irrigated)
McB	Mcclure silt loam, 3 to 6 percent slopes (Prime farmland if irrigated)
Mp	Mobridge silt loam
Mr	Munjor fine sandy loam (Prime farmland if irrigated)
Ok	Onita silt loam
OrB	Orton loam, 2 to 7 percent slopes (Prime farmland if irrigated)
OtA	Orton variant loam, 0 to 2 percent slopes (Prime farmland if irrigated)
ReB	Ree silt loam, 2 to 6 percent slopes (Prime farmland if irrigated)
RIA	Reliance silty clay loam, 0 to 3 percent slopes (Prime farmland if irrigated)
RIB	Reliance silty clay loam, 3 to 6 percent slopes (Prime farmland if irrigated)
Wt	Witten silty clay (Prime farmland if irrigated)

# Prime Farmland

Date: 7/3/2007

Customer(s): DON J LUCAS

District: AMERICAN CREEK CONSERVATION DISTRICT

Field Office: KENNEBEC SERVICE CENTER

Agency: Natural Resource Conservation Service

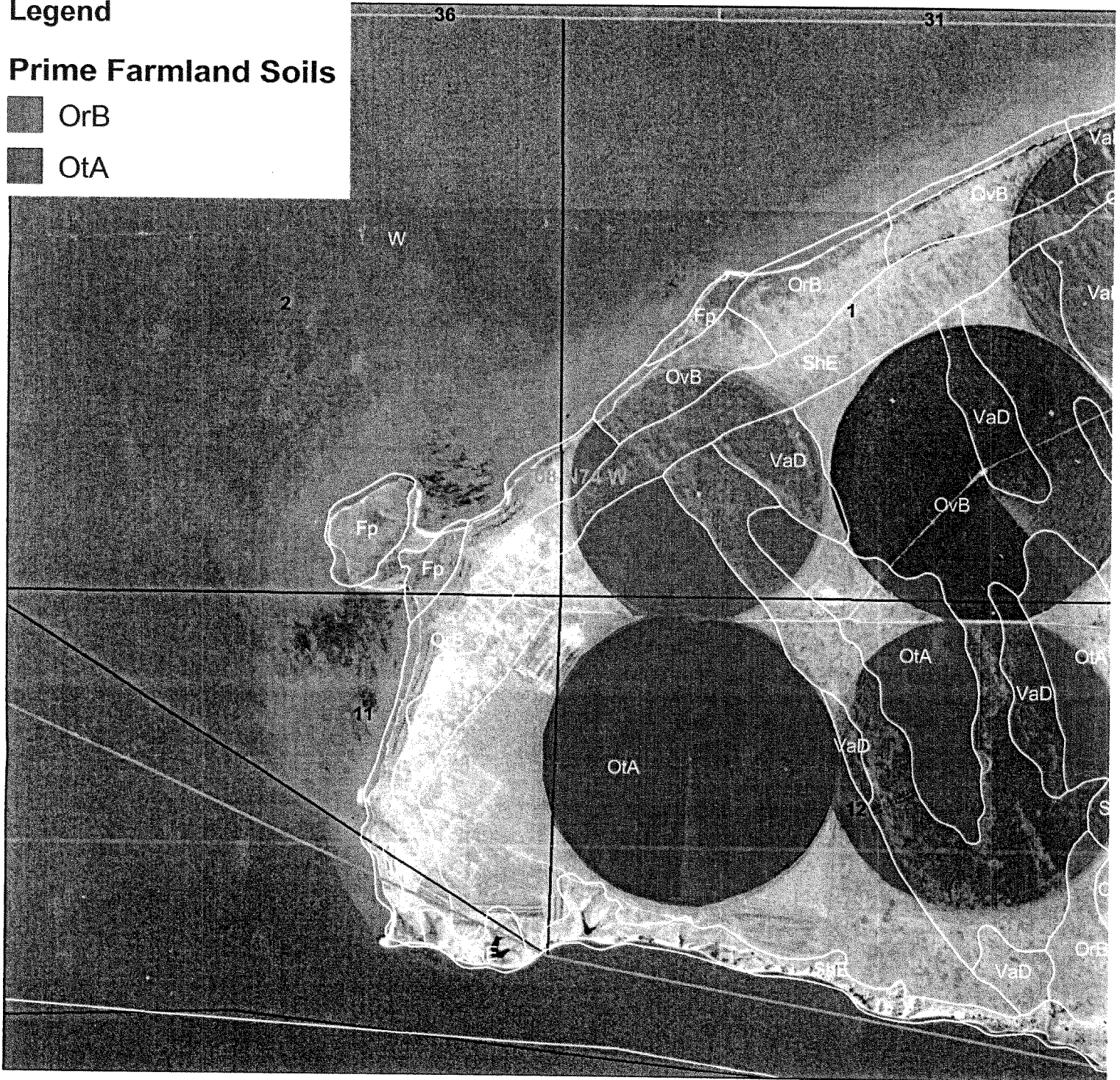
Assisted By: Shane E Reis

Legal Description: Sect. 1, 2, 11, and 12 of 108N - 74 W

## Legend

### Prime Farmland Soils

- OrB
- OtA



1 inch equals 1,250 feet



**Telephone Conversation Record**

Brad Schultz  
South Dakota Department of Environment and Natural Resources  
(605) 773-6038  
August 10, 2006

County is very unpopulated, rural so there are no major sources of air pollution. No permitted source in the whole county. They have never done any monitoring, never had any complaints or any situation they had to respond to.

Recorded by: Kristine Nemeč



19 AUG 2007



## United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Ecological Services  
420 South Garfield Avenue, Suite 400  
Pierre, South Dakota 57501-5408

August 1, 2007

Mr. Larry Janis  
Department of the Army  
Corps of Engineers, Omaha District  
106 South 15<sup>th</sup> Street  
Omaha, Nebraska 68102-1618

Re: Proposed Riparian Forest Restoration  
and Shoreline Protection Project, Lake  
Sharpe, Lyman County, South Dakota

Dear Mr. Janis:

This letter is in response to your June 26, 2007, request (received by our office on July 2, 2007) for federally listed species which may occur at the above referenced proposed project site. The project involves construction of a 200' wide x 5,400' long breakwater dike within Lake Sharpe, near Missouri River mile 1008, Sections 1 and 2, Township 108 North, Range 74 West, Lyman County, South Dakota. The project involves ~340,340 cubic yards of fill for creation of a 25-acre dike and a one-acre island. The dike is to be planted with irrigated native riparian trees, shrubs, and grasses. A shallow water zone (0-2 feet deep) between the dike and existing shoreline, with a one-acre island, would be unvegetated with the expectation that this backwater area will eventually develop into a wetland environment.

In accordance with section 7(c) of the Endangered Species Act (ESA), as amended, 16 U.S.C. 1531 et seq., we have determined that the following federally listed species may occur in the project area (this list is considered valid for 90 days):

<u>Species</u>	<u>Status</u>	<u>Expected Occurrence</u>
Bald eagle ( <u>Haliaeetus leucocephalus</u> )	Threatened	Migration, Winter Resident, Possible Nesting.
Least tern ( <u>Sterna antillarum</u> )	Endangered	Migration, Possible Nesting.
Piping plover ( <u>Charadrius melodus</u> )	Threatened	Migration, Possible Nesting.
Pallid sturgeon ( <u>Scaphirhynchus albus</u> )	Endangered	Resident in Missouri River, Recently Collected in Lake Sharpe.

Bald eagles occur throughout South Dakota year round, and new nests are appearing each year. No construction should occur within one-quarter mile of any known active bald eagle nest. The species' nesting season is January to August. Any nests found should be reported to this office. Please note that ESA protections related to the bald eagle are applicable to your project until August 8, 2007. At that time, the removal of the bald eagle from the endangered species list becomes effective, and determinations of impacts to the bald eagle will no longer be required under the ESA. However, the bald eagle will continue to be protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). These laws protect bald eagles from a variety of harmful actions and impacts. The National Bald Eagle Management Guidelines are available online at:

<http://www.fws.gov/migratorybirds/baldeagle.htm>. We recommend that you review these guidelines as they serve to advise you of circumstances where the BGEPA may apply to your activities so that your agency may avoid potential violations of this law on this and future projects.

None of Lake Sharpe was formally designated as critical habitat for the piping plover. However, a small peninsula/island within the Lower Brule Sioux Tribe Reservation boundary (which occurs downstream of the proposed project site) was mentioned as an area in need of special management in our September 11, 2002, final Designation of Critical Habitat for the Northern Great Plains Breeding Population of the Piping Plover. Additionally, the entire Missouri River in South Dakota serves as a migration corridor for both least terns and piping plovers; thus, these species may occur along Lake Sharpe. These occurrences may be expected at sparsely vegetated interchannel sandbars, islands, and shorelines that could serve as foraging areas for migrants or possibly dispersing juveniles and post-breeding adults. Nonbreeding adults may also utilize such sites in Lake Sharpe. We are not aware of any recent records of nesting piping plovers in the project area; the reservoir generally lacks the primary constituent elements for the species as defined in the final critical habitat rule. Least tern nests have also not recently been documented at Lake Sharpe. If the onsite habitat may be conducive to least tern and piping plover foraging (habitat described above), timing the construction of the project during the absence of these migrants in South Dakota would likely preclude disturbance to individuals that could utilize the site.

Imperiled by alteration of river flows, no confirmed breeding of wild pallid sturgeon has been documented in Lake Sharpe. However, the pallid sturgeon still occurs in the Missouri River, including Lake Sharpe, as evidenced by collections of several individuals from this reservoir in 2006. In light of the high mobility of this species, it is difficult to determine the potential presence or absence of the species at the proposed project site. However, in the absence of spawning activities and the nature of the activity, it does not appear likely that the species would be impacted.

If the U.S. Army Corps of Engineer or their designated representative determines that the project "may adversely affect" listed species in South Dakota, it should request formal consultation from this office. If a "may affect - not likely to adversely affect" determination is made for this project, it should be submitted to this office for concurrence. If a "no effect" determination is made, further consultation may not be necessary. However, a copy of the determination should be sent to this office.

If changes are made in the project plans or operating criteria, or if additional information becomes available, the Service should be informed so that the above determinations can be reconsidered.

The Service appreciates the opportunity to provide comments. If you have any questions on these comments, please contact Natalie Gates of this office at (605) 224-8693, Extension 234.

Sincerely,

A handwritten signature in black ink, appearing to read "Pete Gober". The signature is written in a cursive style with a large initial "P" and "G".

Pete Gober  
Field Supervisor  
South Dakota Field Office

10 JUL 2007  
Enclosure 5



**DEPARTMENT OF GAME, FISH AND PARKS**

Foss Building  
523 East Capitol  
Pierre, South Dakota 57501-3182

July 5, 2007

Ms. Kristine Nemeč  
Department of the Army- Environmental Planning Section  
Corps of Engineers, Omaha District  
106 South 15<sup>th</sup> Street  
Omaha, NE 68102-1618

**RE: Riparian Forest Restoration and Shoreline Protection Project  
Lake Sharpe, South Dakota**

Dear Ms. Nemeč:

This letter is in response to your request for a listing of State listed threatened and endangered species that may be affected by the proposed habitat restoration project. The project is located on the right bank of the Missouri River, Township 108 North, Range 74 West, Sections 1 & 2, Lyman County, South Dakota.

Based upon the information submitted with the preliminary coordination letter, we do not anticipate that the project will have any significant impacts to fish and wildlife resources. According to the Natural Heritage Database, there are no known State listed threatened or endangered species in the project area. If the project design changes or if new information becomes available, please submit the updated project for further review.

Thank you for the opportunity to provide comments. If you have any questions, please contact me at (605) 773-6208.

Sincerely,

A handwritten signature in black ink that reads "Leslie Petersen". The signature is written in a cursive style with a long horizontal line extending to the right.

Leslie Petersen  
Aquatic Resource Coordinator

CENWO-ED-HB

May 25, 2007

## MEMORANDUM FOR CENWO-PM-AE (Nemec)

SUBJECT: Comments on Lake Sharpe Offshore Construction Project located adjacent to the Lower Brule Sioux Tribe Reservation

1. We have reviewed the proposed project and offer the following comments:

a. The importance of preserving potential Native American Cultural Resource Sites in support of the National Historic Preservation Act of 1966, as amended is recognized and the proposed project is recommended as long as the dike and berm construction project is built in accordance with the Land Development Guidance at Corps Reservoir Projects (NWDR 1110-2-5).

Paragraph 5.b.2 of NWDR 1110-2-5 states in part that "The cut and fill operations must not cause any property to be flooded more frequently than before the development (Project) was in place. This can be done by ensuring that for every elevation on the modified area-capacity curve, an equal or larger reservoir volume would be created by the development. For example, for any "fill" volume, an equal or greater volume of "cut" must be removed at an elevation equal to or below the fill elevation but above the conservation pool elevation. The overall intent of cut and fill balancing is to ensure long term flood storage will not be adversely impacted."

b. The proposed project has been designed to deter future erosion and sedimentation of the normal bankline. While fill material associated with this project will be placed within the reservoir pool area, the anticipated benefits from reducing overall erosion and sedimentation outweigh the project impacts. Construction of the project as proposed is approved by Flood Plain Management Services Section of the Hydrologic Engineering Branch.

c. The Omaha District Hydrologic Engineering Branch is interested in the success of this project in controlling erosion and sedimentation at Lake Sharpe and would appreciate a copy of any associated reports regarding future project operation. Please forward reports concerning this project to CENWO-ED-HB (Behm).

2. If you have any questions regarding this memorandum, please contact Mr. Jody Ruckman at (402) 221-4872.



RANDALL L. BEHM, P. E., CFM  
Chief, Flood Plain Management Service  
Hydrologic Engineering Branch  
Engineering Division

**Telephone Conversation Record**

Randy Behm  
Corps Flood Plain section  
402-221-4596  
September 14, 2007

I called to check with Randy if a floodplain permit is needed for the Little Bend River Restoration Project. He couldn't recall the details of the project so I forwarded him the letter his section emailed us in May with their comments on the project. He said we do not need to obtain a floodplain permit, looking at paragraph 1b from the letter. The benefits of the project outweigh the project impacts. If needed, floodplain could write a letter elaborating on this and explaining to agencies why a permit is not needed. A lot of the reservoirs in the district have been mapped out for floodplain boundaries, give him a call if ever need more information on Corps reservoirs and FEMA maps.

Recorded by:

Kristine Nemeec

## Telephone Conversation Record

John Miller  
South Dakota Department of Environment and Natural Resources  
November 15, 2006

I described the proposed project to John – approximately 6,000 foot long dike, closed at one end, open at upstream end, they will plant trees along dike. He does not have a problem with this. He thinks the digging of a channel in the shoreline to get fill material for the dike is ok, but start digging out the middle of the channel away from the water first. He says don't breach to water until done, and breach downstream first and upstream last. If you start digging the channel at the river's edge, each time you take a scoop you have possible impacts to the river.

John said once they create that channel, with the flows that come in go into this channel, you would need to have erosion control methods. If water start eroding away on the backside defeating purpose of the project, tried to riprap coming into the channel.

Wants to know if allow beavers to create dams to slow flows down, how deep channel is going to be, depending on river level and drought.

If work when no ice on the lake, build a rock spur that would deflect flows away from the dike so when water hits the dike dirt stays in place

If frozen then can't really impact water quality, if 6 inches of ice then 4 feet of water then different story but if frozen down 3 feet then don't have the likelihood of losing material; just don't have the volume of water flowing through.

Silt curtain – if there's ice on the river, can't use. If no ice, then reuse silt curtain for dike; not that concerned about the channel.

No problems with planting trees

I asked him about NPDES permits  
402 – point source discharges, normally directed towards wastewater treatment facilities; also for stormwater, over an acre of land disturbed on state land, supposed to have stormwater construction approval permit, which falls under NPDES. But what they do on tribal land we don't necessarily have approval for so that is not going to be a worry when it comes to water. 402 permits pertain to wastewater, but stormwater, which comes down storm culverts comes under NPDES, directed towards larger communities like Omaha and Sioux Falls and does not come into play in Lower Brule, stormwater permit needs to get permit from SDDENR for over one acre but this is on tribal land, should contact EPA

Don't worry about NPDES as far as state land  
Construction is on tribal land, may want to contact EPA regarding stormwater

Contact Greg Davis with EPA at 303-312-6314 to see if Lower Brule needs to have  
stormwater construction permit

He would like to visit when we are further along on design. I said may be January or  
February before a visit.

He said 404 permit for Jandreau project came out of Omaha office, he sent his 401 water  
quality letter to Kathy Iske. When do public notice on this it is done as a joint public  
notice, State of South Dakota and Corps.

Recorded by:

Kristine Nemec



**DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES**

PMB 2020  
JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182  
[www.state.sd.us/denr](http://www.state.sd.us/denr)

November 21, 2007

Kristine Nemec  
US Army Corps of Engineers  
106 S. 15<sup>th</sup> Street  
Omaha, NE 68102

RE: NWO 2007-3006  
Little Bend Restoration Project  
Missouri River (Lake Sharpe)

Dear Ms. Nemec:

The Department of Environment and Natural Resources has reviewed the request for water quality certification. The project will consist of placing material for the protection of the shoreline and the creation of habitat. This project is located in Sections 1, 2 and 11, Township 108 North, Range 74 West, Lyman County, South Dakota. Section 401 of the Clean Water Act requires this review before a 404 permit is granted.

The department is granting water quality certification with the following conditions:

- (1) At a minimum Best Management Practices must be followed and in place to prevent violation of the surface water quality standards.
- (2) Construction in the water should occur when the flows are at a minimum.
- (3) Equipment should not be used in the water if possible.
- (4) If it becomes evident that the water quality standards may be violated, all necessary steps must be taken to prevent the violation from occurring.

This certification does not authorize the above referenced activity. The activity may occur only by issuance of the U.S. Corps of Engineers Section 404 permit. If you have questions pertaining to this certification, please contact John Miller, at (605) 773-3351. Thank you for ensuring the continued protection of our natural resources.

Sincerely,

Steven M. Pirner  
Secretary

cc: Steve Naylor, US COE, Pierre  
Brent Truskowski, US EPA, Denver

**Nemec, Kristine T NWO**

---

From: Davis.Gregory@epamail.epa.gov  
 Sent: Tuesday, November 21, 2006 5:24 PM  
 To: Nemec, Kristine T NWO  
 Subject: Re: Lower Brule project

Thanks Kristine,

In my opinion, this project does not require a section 402 Permit (i.e., a NPDES discharge permit for construction stormwater discharges), provided the entire project can be permitted through a section 404 dredge and fill permit.

In general, construction stormwater permits are required for all projects that disturb greater than one acre. There are a few exceptions to this rule, one of which is for projects resulting in the discharge of dredged or fill material into navigable waterways (i.e., instream projects). EPA does not have guidance regarding specifically the geographic scope of what this exception encompasses. For example, this could be extended to include the 100 year flood plain, or it could be minimized to encompass only projects within the navigable portion of a navigable waterway.

For this project, I consider this to be outside the scope of a NPDES construction stormwater permit due to its nature as a lake restoration project. The reasons supporting this rationale are:

1. The project is located immediately adjacent to Lake Sharpe and likely encompasses the historic extent of the lake; 2. The purpose of the project is for lake restoration, and similar maintenance activities are excluded from construction stormwater permit coverage; and 3. The scope of the project includes providing riparian habitat which will likely be hydrologically connected to the lake.

\_Greg

---

Greg Davis  
 EPA Region 8 Storm Water Coordinator  
 Mailcode: 8P-W-P  
 999 18th Street, Suite 300  
 Denver, CO 80202-2466

Phone: 303-312-6314  
 Fax: 303-312-6741

<http://www.epa.gov/region8/stormwater>

Please inform me if you would like to receive updates related to storm water permits, BMPs, and NPDES regulations.

"Nemec, Kristine  
 T NWO"  
 <Kristine.T.Neme  
 c@nwo02.usace.ar  
 my.mil>

To  
 Gregory Davis/P2/R8/USEPA/US@EPA  
 cc

11/17/2006 02:20  
 PM

Lower Brule project

Subject

Greg,

The project I described to you on the phone will consist of removing about 300,000 cubic yards of fill material from land near the shoreline to create an approximately 6,000-foot long, 200-foot wide dike in Lake Sharpe a couple hundred feet from the shoreline. The purpose of the dike is to protect the shoreline and provide riparian habitat as several hundred trees and shrubs will be planted on the dike. The project is located on the Lower Brule Sioux Tribe Indian Reservation, about 9 miles northwest of the town of Lower Brule.

Kristine Nemec  
Environmental Resources Specialist  
U.S. Army Corps of Engineers, Omaha District  
106 South 15th Street  
Omaha, NE 68102  
Phone: 402-221-4628  
Fax: 402-221-4886  
kristine.t.nemec@usace.army.mil



RECEIVED

SEP 11 2007

DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS, OMAHA DISTRICT  
106 SOUTH 15<sup>TH</sup> STREET  
OMAHA NE 68102-1618

01 OCT 2007

Enclosure 11

REPLY TO: U.S. FISH & WILDLIFE SERVICE  
ATTENTION OF

September 7, 2007

Planning, Programs and Project Management Division

Mr. Pete Gober  
Field Supervisor  
U.S. Fish and Wildlife Service  
South Dakota Field Office  
420 South Garfield Avenue, Suite 400  
Pierre, South Dakota 57501-5408

The U.S. Fish and Wildlife Service concurs with your conclusion that the described project will not adversely affect listed species. Contact this office if changes are made or new information becomes available.

9-25-07  
Date

P. Gober  
SD Field Supervisor  
USFWS

Dear Mr. Gober:

The U.S. Army Corps of Engineers, Omaha District (Corps) has received and reviewed your letter regarding federally listed species which may occur at the Little Bend River Restoration project site in sections 1 and 2, T. 108 N., R. 74 W., Lyman County, South Dakota. This project is being constructed and monitored in coordination with the Lower Brule Sioux Tribe (LBST). This project involves the construction of a 200-foot wide by 5,400-foot long breakwater dike within Lake Sharpe, the construction of a one-acre island, and the excavation of a borrow channel. The purpose of this letter is to request your agency's concurrence with the Corps' determination for the endangered least tern (*Sterna antillarum*), threatened piping plover (*Charadrius melodus*), and endangered pallid sturgeon (*Scaphirhynchus albus*).

According to your letter and the LBST (Personal communication, Joel Bich, LBST Wildlife Department), there are no records of nesting least terns or piping plovers in the project area. The proposed project would be constructed during the winter, during the absence of least terns and piping plovers from South Dakota. The project would include the construction of a one-acre island that would be maintained as bare ground in order to create nesting and foraging habitat for a variety of gulls, terns, and shorebirds. Although it is doubtful least terns and piping plovers would show up on the one-acre island given its small size and that the nearest nesting area is over 70 miles away, it is possible that a couple may discover the island when flying over and decide to use it (Personal communication, Greg Pavelka, Corps wildlife biologist). If least terns or piping plovers use the island, the LBST would monitor the birds. The island may have a beneficial effect on terns and plovers by providing appropriate nesting and foraging habitat. Therefore the Corps determines that this project may affect, but is not likely to adversely affect, the least tern and piping plover.

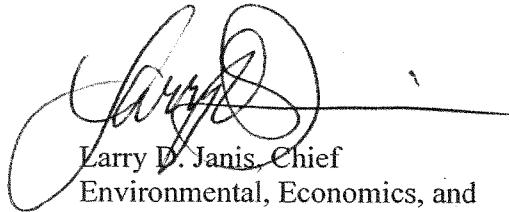
As noted in your letter, several individuals of the pallid sturgeon have been collected in Lake Sharpe, although it is difficult to determine the potential presence or absence of the species at the proposed site. Given the small numbers of pallid sturgeon that occur in the reservoir, and that most pallid sturgeon biologists believe the Lake Sharpe pallid sturgeon population will exist only until the existing fish die of old age, (Personal communication, Mark Drobish, Corps fishery biologist), the Corps determines that this project will have no effect on pallid sturgeon.

In your letter, you also mentioned the bald eagle (*Haliaeetus leucocephalus*) was delisted on August 8, 2007 and determinations of impacts to the bald eagle will no longer be required under the Endangered Species Act. Although a determination is not required, we would like to note that the closest bald eagle nest to the proposed project is 18 miles to the southeast of the project area and there is no documentation of bald eagles nesting in the Little Bend/Narrows area (Personal communication, Joel Bich, LBST Wildlife Department), so this project would not disturb bald eagles. The project would benefit bald eagles by creating cottonwood forest habitat.

The Corps requests your written concurrence with regard to this determination. We would appreciate a response by October 12, 2007.

If you have any questions or require additional information, please contact Ms. Kristine Nemec of my staff at (402) 221-4628.

Sincerely,

A handwritten signature in black ink, appearing to read "Larry D. Janis", is written over a horizontal line. The signature is stylized and cursive.

Larry D. Janis, Chief  
Environmental, Economics, and  
Cultural Resources Section  
Planning Branch

CENWO-OD-OA-ARCH

28 November 2007

MEMORANDUM FOR CENWO-OD-BB-Key

**SUBJECT: Little River Bend**

**Location:** W ½ of the SW ¼ of Section 1, the SE ¼ of Section 2, N ½ of the NE ¼ of Section 11, W ½ of the NW ¼ of the NW ¼ of Section 12, T 108 N, R 74, Lyman Co., SD (USGS 7.5 minute Topo Quad: Lower Brule NW).

1. The Section 106 and Programmatic Agreement review of this project has been completed. Concurrence with the **No Historic Properties Affected** determination has been received from SD SHPO.
2. The project may proceed as planned.
3. If any cultural material, historic properties or human remains are discovered in the course of construction, the activities are to cease immediately and both Rick Harnois and I are to be contacted.
4. If you have any questions, please contact me at 605.638.0840.

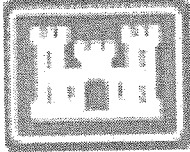
*J. Winter*

J. Winter  
Field Archaeologist  
Oahe Project

# **APPENDIX D:**

## **404 PERMIT ACTIVITY**

## PUBLIC NOTICE



US ARMY CORPS  
OF ENGINEERS

OMAHA DISTRICT

APPLICANT: OMAHA DISTRICT  
CORPS OF ENGINEERS  
APPLICATION NO: NWO 2007-3006  
WATERWAY: MISSOURI RIVER  
(LAKE SHARPE)  
ISSUE DATE: SEPTEMBER 21, 2007  
EXPIRATION DATE: OCTOBER 12, 2007

---

Regulatory Office, 28563 Powerhouse Rd, Room 118, Pierre, SD 57501  
<https://www.nwo.usace.army.mil/html/od-rsd/frame.html>

---

21-DAY NOTICE

### JOINT NOTICE OF PERMIT PENDING

US ARMY CORPS OF ENGINEERS  
US ENVIRONMENTAL PROTECTION AGENCY  
AND  
SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Under the provisions of Federal Regulation 33 CFR § 209.145 and instructions from the Office, Chief of Engineers, Washington, DC, relative to Federal projects involving the discharge of dredged or fill material in waters of the United States, notice is hereby issued to advise interested parties of the proposed Little Bend Restoration Project located in the Missouri River (Lake Sharpe), at mile 1008.0, in Sections 1, 2 & 11, Township 108 North, Range 74 West, Lyman County, South Dakota.

Sections 313 and 404 of the Clean Water Act (33 USC 1323 and 1344) requires each agency of the Federal Government engaged in any activity resulting, or which may result in the discharge or runoff of pollutants, to comply with Federal, state, interstate and local requirements respecting the control and abatement of water pollution to the same extent as any person is subject to such requirements. In accordance with 33 CFR § 209.145, activities involving the discharge of dredged or fill material to be performed by the Corps of Engineers will be subject to public review procedures that are followed in processing applications for Section 404 permits.

The proposed project will consist of constructing an off-shore breakwater dike, approximately 200 feet wide by 5,400 feet long in 4-foot deep water, construction of a one-acre island inside of the dike and placement of stone erosion protection along the lake side of the dike. Approximately 340,300 cubic yards of earth fill material and 11,180 tons of breakwater stone protection will be placed in Lake Sharpe to create the 25-acre dike and one-acre island. The fill material will consist of materials excavated from a 2,300 feet long borrow channel in the shoreline forming a backwater channel with 4:1 side slopes. The work will be accomplished with the use of

bulldozers, backhoes, earth-moving scrapers, and trucks. The top of the dike and eleven peninsulas of varying sizes created along the inside dike system will be planted with riparian tree and shrub species such as cottonwood, ash, locust, willow, chokecherry, currant and dogwood,



including woody vines such as river bank grape and American bitter sweet. Open areas between the rows of trees will be planted with native grasses. Irrigation water for the seeded areas and bare-root tree and shrub stock will be pumped from the lake utilizing two floating intake structures and "hard hose traveling gun" irrigation systems. It is anticipated that the irrigation will take place from June through September for five years beginning in 2008. The area between the dike and shoreline will be shallow water 0-2 feet in depth. The shallow area will be allowed to develop naturally into a wetland environment. The proposed one-acre island will be created within the shallow water area and maintained as bare soil to provide a basking area for reptiles such as turtles and snakes.

The project is being funded under the Missouri River Recovery Program. It would provide three main benefits: 1) stop the loss of land due to wave and ice erosion, 2) provide new cotton wood habitat for bald eagles, and 3) use as a study area to acquire knowledge regarding success of in-reservoir dikes in providing both shoreline protection and habitat. Secondary benefits would include creation of shallow water habitat for game and nongame fishes, wading birds and waterfowl and creation of woody habitat for many neotropical and cavity nesting birds.

The South Dakota Department of Environment and Natural Resources, Division of Environmental Services, 523 East Capitol Avenue, Pierre, South Dakota, 57501-3181, will review the proposed project for state certification in accordance with the provisions of Section 401 of the Clean Water Act. The certification, if issued, will express the State's opinion that the operations undertaken by the applicant will not result in a violation of applicable water quality standards. The South Dakota Department of Environment and Natural Resources hereby incorporates this public notice as its own public notice and procedures by reference (ARSD 74:51:01).

Omaha District will comply with the National Historic Preservation Act of 1966, as amended. We have checked the National Register of Historic Places and "its current supplements," and no property listed in the Register or proposed for listing is located in the immediate permit area. However, Omaha District will evaluate potential impacts to unlisted properties and we may conduct or require a reconnaissance survey of the permit area or check for unknown historic properties, if warranted. The proposed project will also be reviewed in accordance with an existing programmatic agreement (Missouri River Programmatic Agreement) with Indian Tribes. In addition, we will evaluate input by the State Historic Preservation Officer and the public in response to this public notice,

In compliance with the Endangered Species Act, a preliminary determination has been made that the described work will not affect species designated as threatened or endangered or adversely affect critical habitat. In order to complete our evaluation of this activity, comments are solicited from the U.S. Fish and Wildlife Service and other interested agencies and individuals.

The decision whether to issue a permit will be based on an evaluation of the probable impacts including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposals must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the activity will be

considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water

supply and conservation, water quality, energy needs, safety, food production, and, in general the needs and welfare of the people. In addition, the evaluation of the impacts of the project on public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act (40 CFR Part 230).

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state, with particularity, the reason for holding a public hearing. The request must be submitted to the US Army Corps of Engineers, South Dakota Regulatory Office, 28563 Powerhouse Road, Room 118, Pierre, South Dakota 57501.

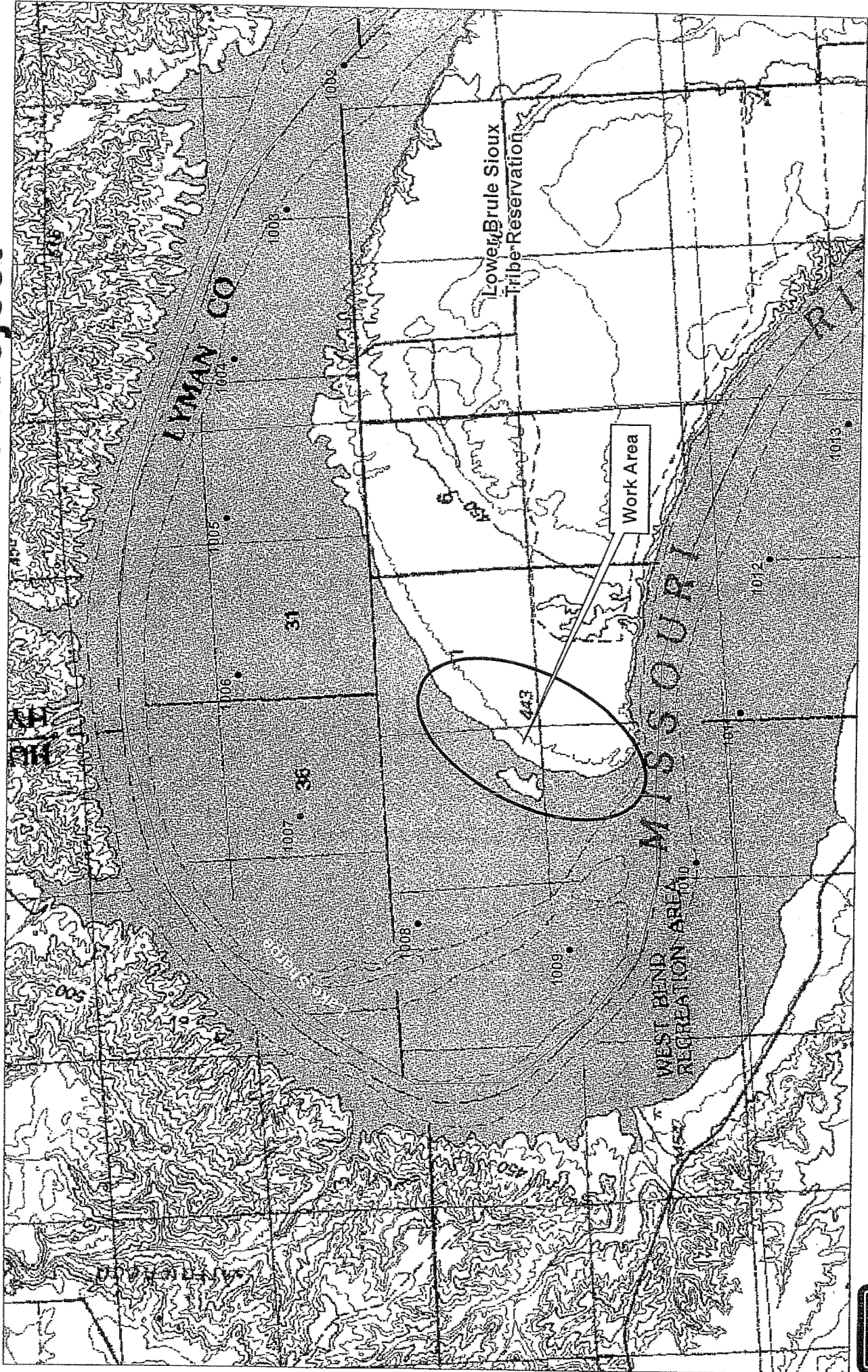
Any interested party (particularly officials of any town, city, county, state, Federal agency, Indian Tribe, or local association whose interests may be affected by the proposed work) is invited to submit to this office, written facts, arguments, or objections on or before October 12, 2007. Any agency or individual having an objection to the proposed work should specifically identify it as an objection with clear and specific reasons. Comments, both favorable and unfavorable, will be accepted, made a part of the record and will receive full consideration in subsequent actions on this permit application. All replies to the public notice should be addressed to the address listed in the previous paragraph. Thomas A. Lowin, telephone number (605) 224-8531, may be contacted for additional information.

Comments received after the close of the business day on the expiration date of this public notice will not be considered.

This project, if authorized, will be under the provisions of Section 404 of the Clean Water Act.

Drawings showing the location and extent of the work are attached to this notice.

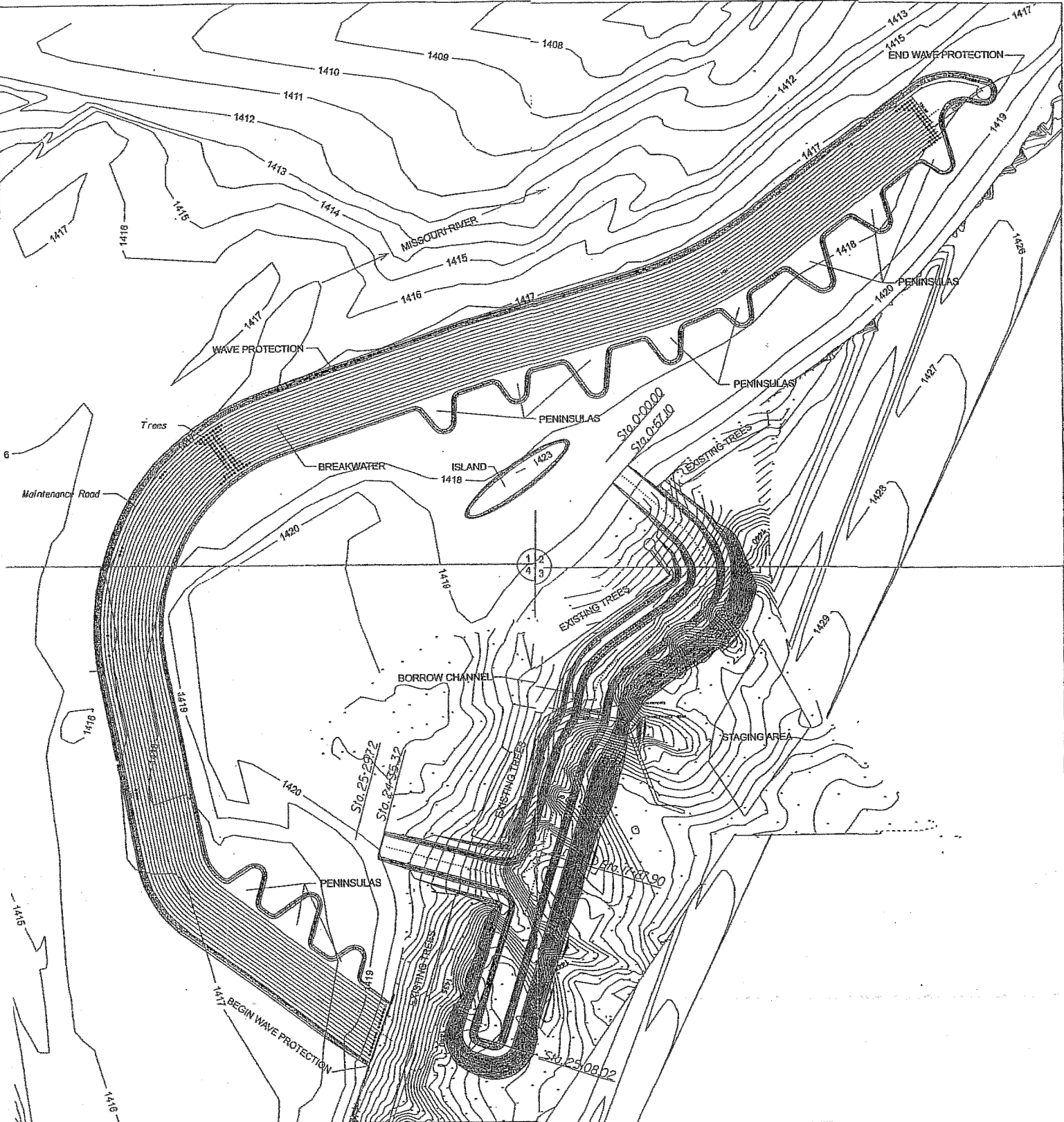
# Little Bend Breakwater Dike Project



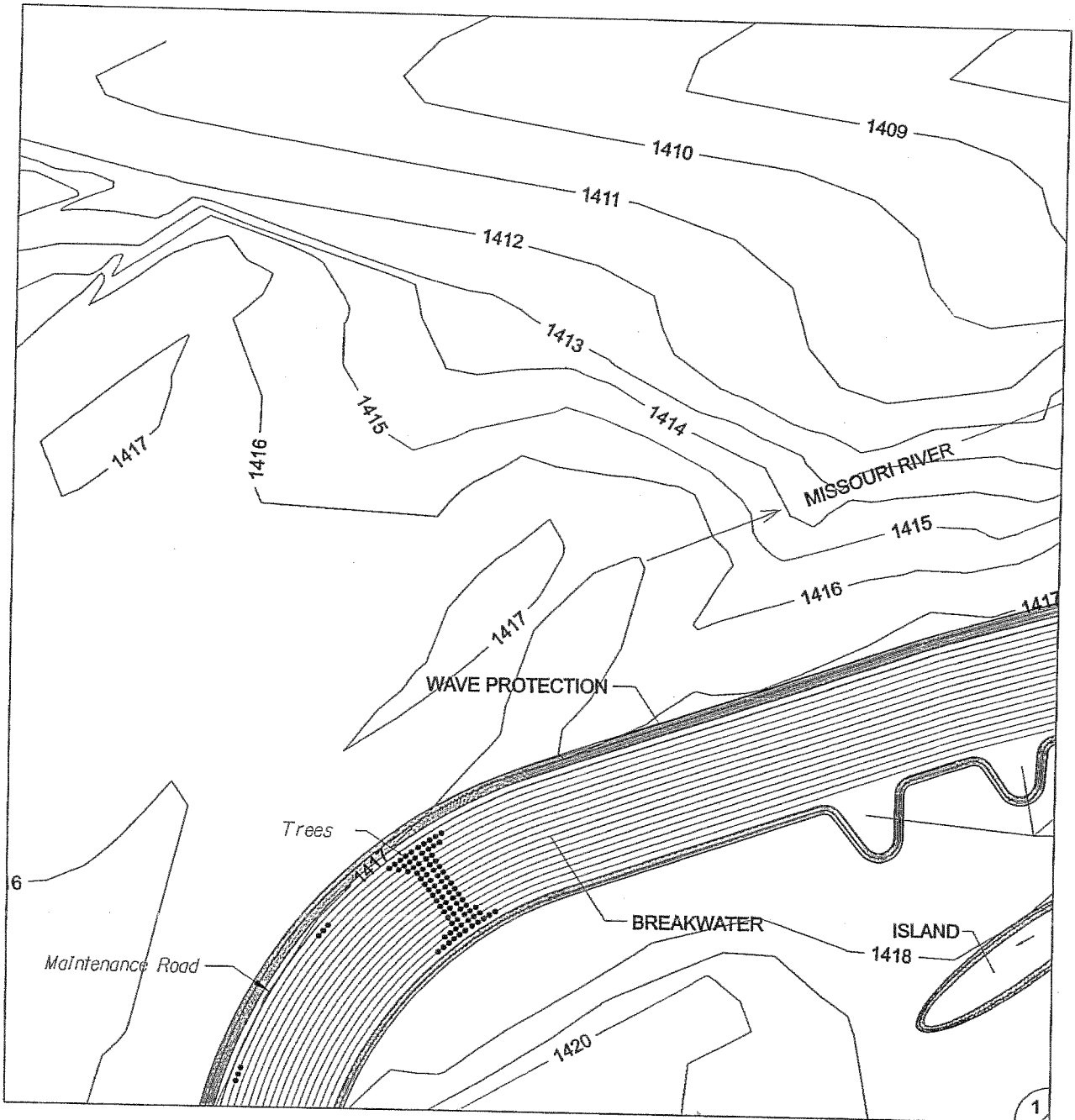
US Army Corps  
of Engineers ©  
Omaha District

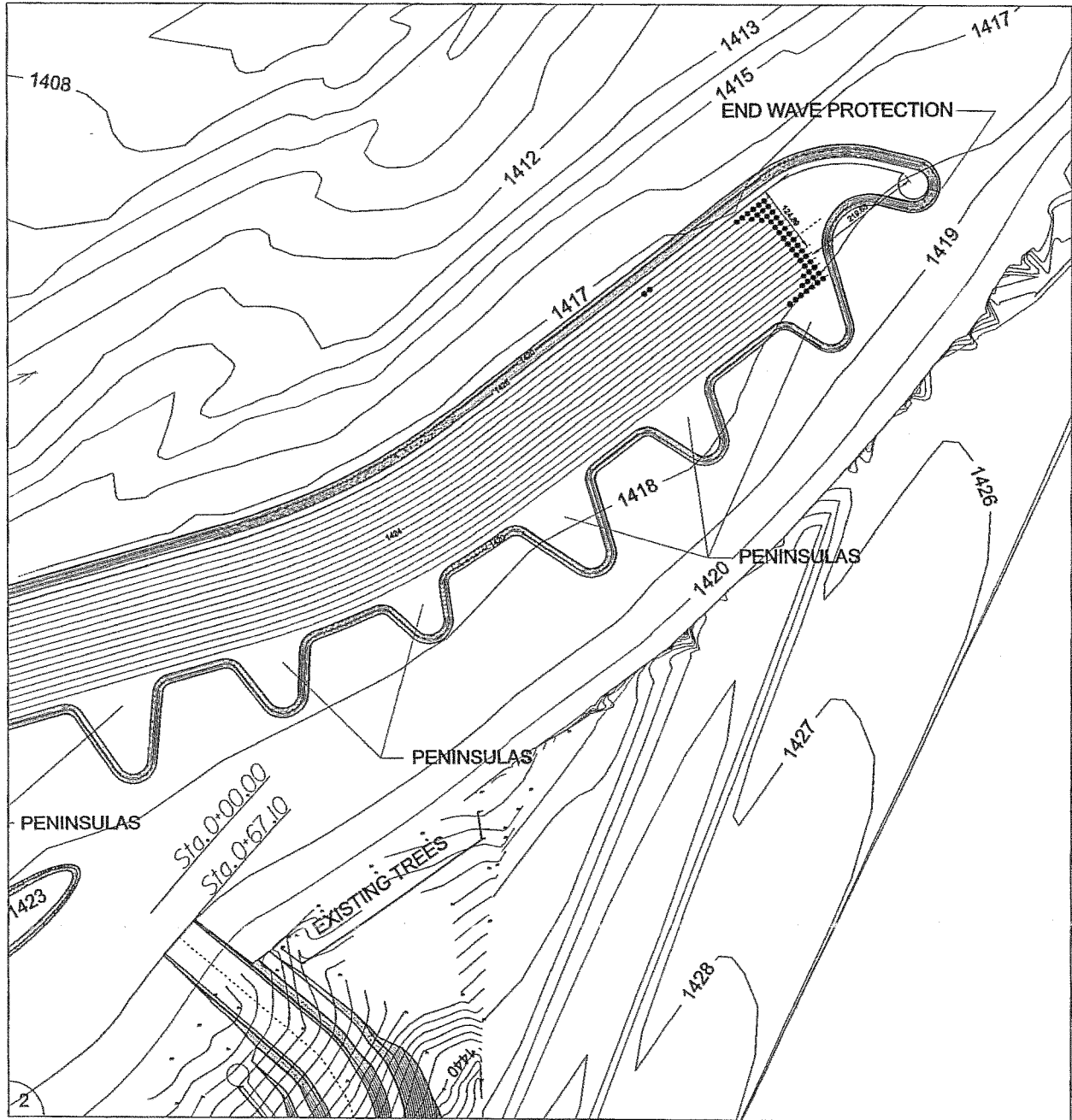
Legal: T-108-N, R-74-W, Sections 1&2, Lyman County

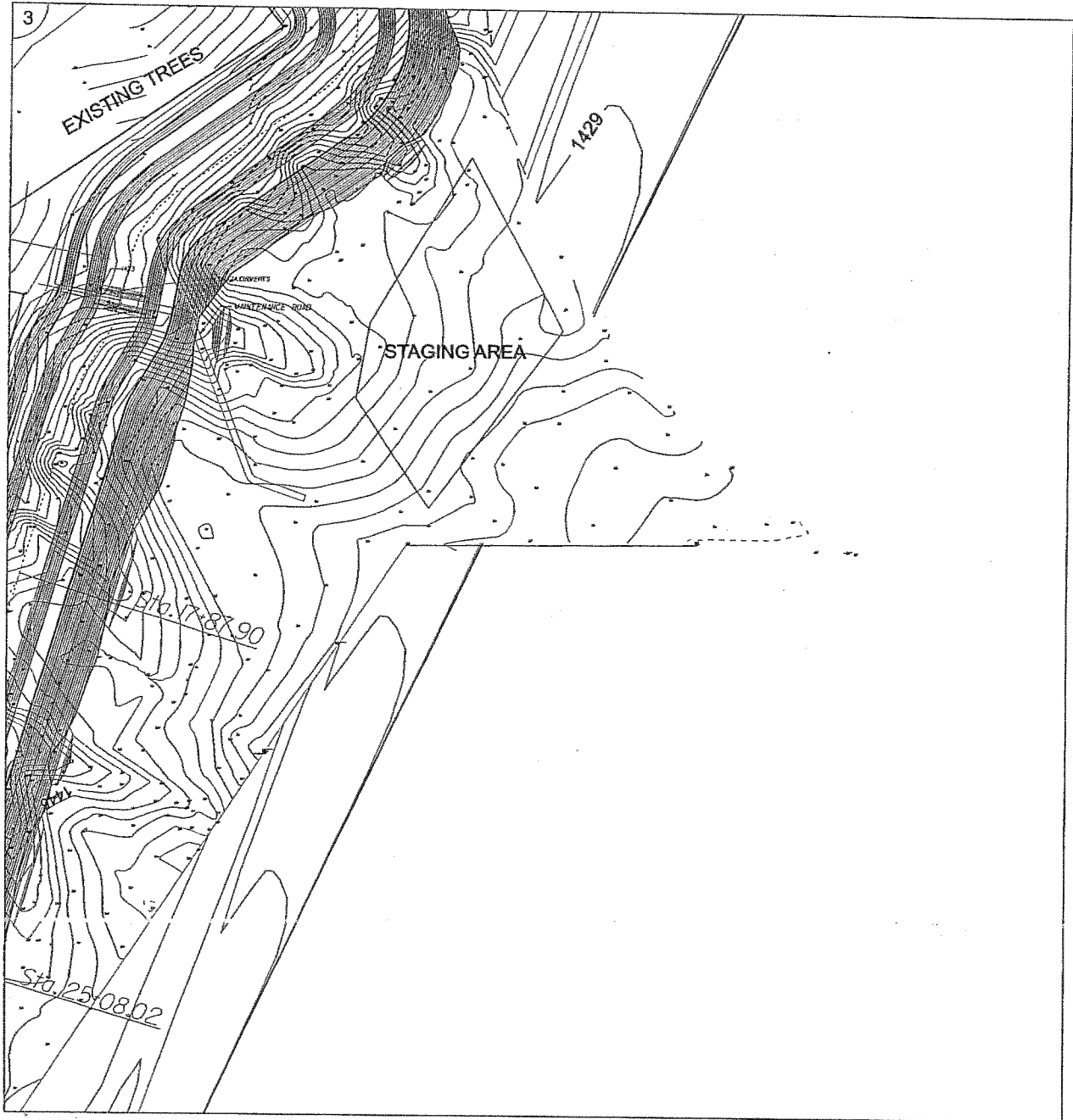
Lake Sharpe, Missouri River  
No. NWO 2007-3006 Sheet 1 of 8 Big Bend Project

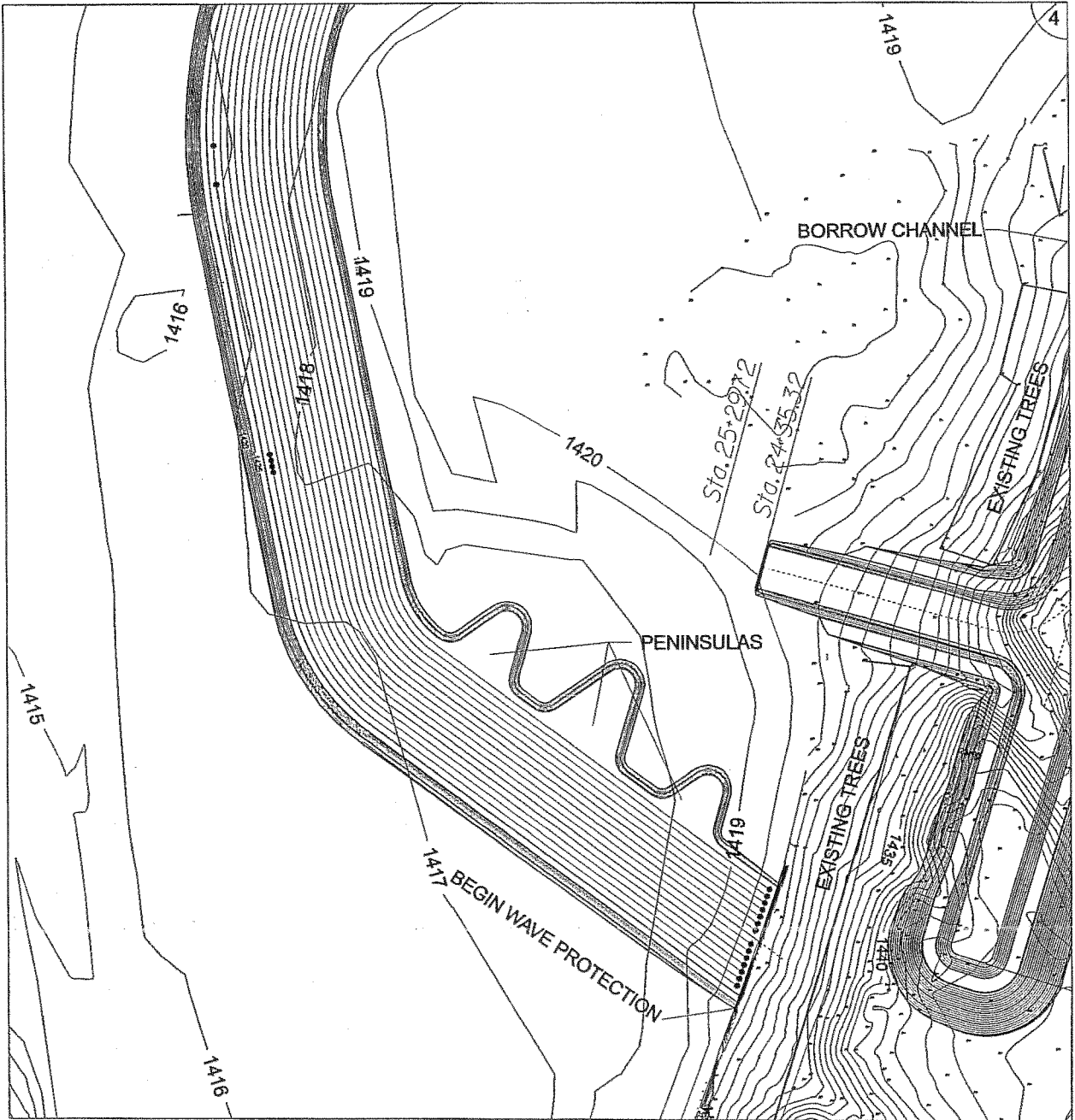


PLAN

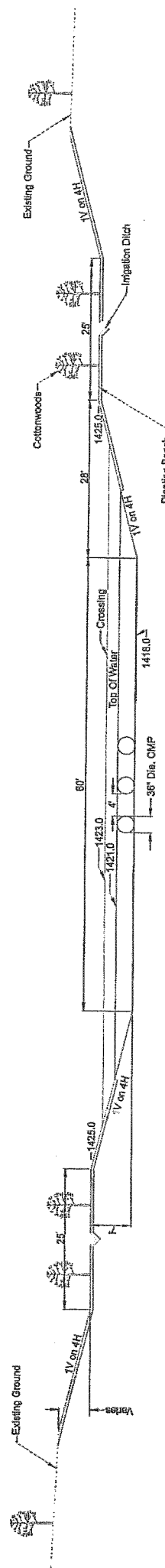
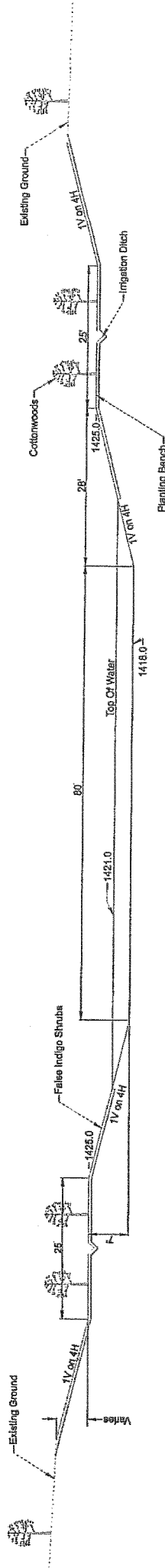




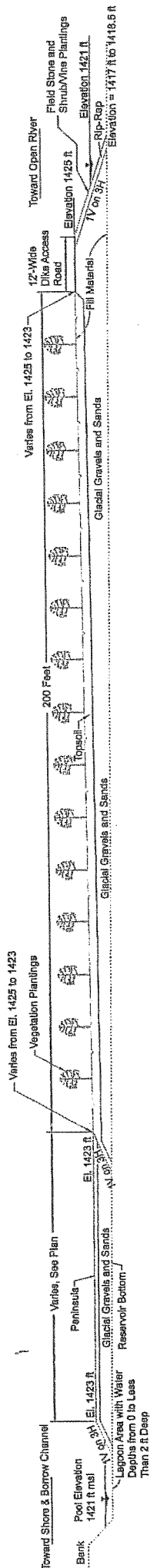








SECTIONS



SECTION



## Nemec, Kristine T NWO

---

**From:** Truskowski.Brent@epamail.epa.gov  
**Sent:** Friday, October 12, 2007 2:10 PM  
**To:** Lowin, Thomas A NWO  
**Cc:** Nemec, Kristine T NWO  
**Subject:** Public Notice Application No: NWO 2007-3006

Mr. Lowin,

I have reviewed the subject Public Notice and have the following comments. The Applicant should be required to investigate the planting of the low water area and bare dirt island in order to provide the wetland plants and grasses a chance to establish, hopefully helping to prevent invasive species and other weeds from establishing before the wetland develops. I am also concerned about how the trees are shown being planted, and the description of the planting that Ms. Nene provided. The trees on the levee should be planted in a natural appearance rather than evenly spaced in lines. Although random plantings may be more difficult to plant and irrigate, I think they will provide a more natural appearance to this structure.

Ms. Nene deferred my questions on some of the design features to Terry Matuska in her office. Although I doubt I will have comments on the design, I request that I be allowed to provide comments on the design after Terry Matuska and I have a chance to talk, hopefully Monday or Tuesday of next week.

Brent Truskowski  
Project Officer  
303-312-6235  
Wetlands & Tribal Unit  
Environmental Protection Agency, Region 8

**Nemec, Kristine T NWO**

---

**From:** Truskowski.Brent@epamail.epa.gov  
**Sent:** Thursday, October 18, 2007 2:54 PM  
**To:** Nemec, Kristine T NWO; Lowin, Thomas A NWO  
**Subject:** Re: FW: Cross section question on Little Bend River Restoration Project

No further comments. Thanks Tom.

Brent Truskowski  
Project Officer  
303-312-6235  
Wetlands & Tribal Unit  
Environmental Protection Agency, Region 8

"Nemec, Kristine  
T NWO"  
<Kristine.T.Nemec@usace.army.mil  
>

To  
Brent  
Truskowski/EPR/R8/USEPA/US@EPA  
cc

10/17/2007 09:43  
AM

Subject  
FW: Cross section question on  
Little Bend River Restoration  
Project

Brent,

Will you be providing your final comments in a letter format to Tom Lowin or email format?

Kristine

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

From: Nemec, Kristine T NWO  
Sent: Thursday, October 11, 2007 5:01 PM  
To: 'truskowski.brent@epa.gov'  
Subject: Cross section question on Little Bend River Restoration Project

Brent,

I just wanted to let you know that Terry Matuska, the engineer that drew up the plans and cross sections, is out of the office tomorrow so I hope to hear back from him on Monday or Tuesday about your cross section question.

Kristine Nemec  
Environmental Resources Specialist  
U.S. Army Corps of Engineers  
106 S. 15th Street  
Omaha, NE 68102  
(402) 221-4628

**APPENDIX F:  
COMPLIANCE WITH  
ENVIRONMENTAL STATUTES**

**American Indian Religious Freedom Act (AIRFA) of 1978, 42 U.S.C. 1996**

*In compliance.*

AIRFA protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. The Little Bend project would not adversely affect the protections offered by this Act. Access to sacred sites by Tribal members would not be affected.

**Bald Eagle Protection Act, 16 U.S.C. Sec. 668, 668 note, 668a-668d**

*In compliance.*

The closest bald eagle nest to the proposed project is 18 miles to the southeast of the project area and there is no documentation of bald eagles nesting in the Little Bend/Narrows area, so this project would not disturb bald eagles. The project would benefit bald eagles by creating cottonwood forest habitat.

**CEQ Memorandum, August 10, 1980, Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory**

*Not applicable.*

This memorandum states that each Federal agency shall take care to avoid or mitigate adverse effects on rivers identified in the Nationwide Inventory (FR 1980). No portion of this project is listed on the Nationwide Rivers Inventory.

**Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.**

*In compliance.*

The purpose of this Act is to protect public health and welfare by the control of air pollution at its source, and to set forth primary and secondary National Ambient Air Quality Standards to establish criteria for States to attain, or maintain. The SDDENR stated that Lyman County is in attainment of all ambient air quality standards. Some temporary emission releases may occur during construction activities; however, air quality is not expected to be impacted to any measurable degree.

**Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.**

*In compliance.*

The objective of this Act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters (33 U.S.C. 1251). The Corps regulates discharges of dredge or fill material into waters of the United States pursuant to Section 404 of the Clean Water Act. This permitting authority applies to all waters of the United States including navigable waters and wetlands. The selection of disposal sites for dredged or fill material is done in accordance with the Section 404(b)(1) guidelines, which were developed by the U.S. Environmental Protection Agency (EPA) (see 40 CFR Part 230). A Public Notice regarding the proposed Section 404 activities for the Little Bend River Restoration project was issued September 21, 2007, and the public comment period expired October 12, 2007. The EPA submitted comments during this period. The EPA stated that the applicant should investigate the planting of the low water area and bare dirt island in order to provide the wetland plants and grasses a chance to establish and suggested the trees should be planted on the levee in a more natural appearance rather than in evenly spaced lines, providing a more natural appearance (Appendix D). The dredging activity for this project will be covered under a type of a 404 permit called an Individual permit. Individual permits are issued following a full public interest review of an individual application for a Department of the Army permit. After evaluating all comments and information received, a final decision on the application is made. The permit decision is generally based on the outcome of a public interest balancing process where the benefits of the project are balanced against the detriments. A permit will be granted unless the proposal is found to be contrary to the public interest. Section 401 of the Clean Water Act allows states to grant or deny water quality certification for any activity that results in a discharge to waters of the United States and requires a Federal permit or license. Certification requires a finding by the state that the activities permitted will comply with all water quality standards individually or cumulatively over the term of the permit. The SDDENR has granted section 401 water quality certification (Appendix C).

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980**

*Not applicable.*

Typically CERCLA is triggered by (1) the release or substantial threat of a release of a hazardous substance into the environment; or (2) the release or substantial threat of a release of any pollutant or contaminant into the environment which presents an imminent threat to the public health and welfare. To the extent such knowledge is available, 40 CFR Part 373 requires notification of CERCLA hazardous substances in a land transfer. This project will not involve any real estate transactions.

**Endangered Species Act, as amended. 16 U.S.C. 1531, et seq.**

*In compliance.*

Section 7 (16 U.S.C. 1536) states that all Federal departments and agencies shall, in consultation with and with the assistance of the Secretary of the Interior, insure that any actions authorized, funded, or carried out by them do not jeopardize the continued existence of any threatened or endangered (T&E) species, or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical. This project is in compliance with the Endangered Species Act; see the Endangered Species section of the EA.

**Environmental Justice (E.O. 12898)**

*In compliance.*

Federal agencies shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States. The project does not disproportionately impact minority or low-income populations.

**Farmland Protection Policy Act, 7 U.S.C. 4201, et seq. (Subtitle I of Title XV of the Agriculture and Food Act of 1981), effective August 6, 1984**

*In compliance.*

This Act instructs the Department of Agriculture, in cooperation with other departments, agencies, independent commissions and other units of the Federal government, to develop criteria for identifying the effects of Federal programs on the conversion of farmland to nonagricultural uses. The Lyman County District Conservationist with the NRCS was contacted and it was determined that construction of the proposed project would not impact prime or unique farmland soils.

**Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq.**

*In compliance.*

The Act establishes the policy that consideration be given to the opportunities for outdoor recreation and fish and wildlife enhancement in the investigating and planning of any Federal navigation, flood control, reclamation, hydroelectric or multi-purpose water resource project, whenever any such project can reasonably serve either or both purposes consistently. The purpose of this project can be considered fish and wildlife enhancement and it will not negatively impact recreational use of the river.

**Fish and Wildlife Coordination Act (FWCA), as amended, 16 U.S.C. 661, et seq.**

*In compliance.*

The FWCA requires governmental agencies, including the Corps, to coordinate activities so that adverse effects on fish and wildlife will be minimized when water bodies are proposed for modification. The Corps has coordinated with the South Dakota Department of Game, Fish, and Parks and the USFWS. Neither agency had concerns regarding the project.

**Floodplain Management (E.O. 11988)**

*In compliance.*

Section 1 requires each agency to provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use,



including but not limited to water and related land resources planning, regulating, and licensing activities. This project will not adversely affect the flood holding capacity or flood surface profiles of any stream.

**Land and Water Conservation Fund Act (LWCF), as amended, 16 U.S.C. 4601-4601-11, et seq.**

*Not applicable.*

Planning for recreation development at Corps projects is coordinated with the appropriate states so that the plans are consistent with public needs as identified in the State Comprehensive Outdoor Recreation Plan. The Corps must coordinate with the National Park Service (NPS) to insure that no property acquired or developed with assistance from this Act will be converted to other than outdoor recreation uses. If conversion is necessary, approval of NPS is required, and plans are developed to relocate or re-create affected recreational opportunities. No lands involved in the proposed project were acquired or developed with LWCF funds.

**Migratory Bird Treaty Act (MBTA) of 1918 as amended, 16 U.S.C. 703-711, et seq.**

*In compliance.*

The MBTA is the domestic law that affirms, or implements, the United States' commitment to four international conventions with Canada, Japan, Mexico and Russia for the protection of shared migratory bird resources. The MBTA governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts and nests. The take of all migratory birds is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent overutilization. Executive Order 13186 (2001) directs executive agencies to take certain actions to implement the act. The Corps will avoid impacts to migratory birds, and their nests, to the extent possible.

**National Historic Preservation Act, as amended, 16 U.S.C. 470a, et seq.**

*In compliance.*

Federal agencies having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking shall take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. Discussion between the Corps and the Iowa State Historic Preservation Officer is ongoing, and final coordination with regard to this law will be completed prior to construction. Discussion is included in the environmental assessment with respect to the requirements of this law. The Corps has made the determination that the proposed project does not have the potential to adversely impact cultural resources and SHPO concurrence is expected. Caution will be exercised during all phases of work in order to minimize any disturbance to deeply buried cultural resources. The contractor will be explicitly warned about this possibility and instructed that if any resources are found, he or she shall stop work and contact the District Office contacted immediately.

**National Environmental Policy Act (NEPA), as amended, 42 U.S.C. 4321, et seq.**

*In compliance.*

This EA and finding of no significant impact have been prepared for the proposed action. An environmental impact statement is not required.

**Noise Control Act of 1972, 42 U.S.C. Sec. 4901 to 4918**

*In compliance.*

This Act establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. Federal agencies are required to limit noise emissions to within compliance levels. Noise emission levels at the project site will increase above current levels temporarily due to construction; however, appropriate measures will be taken to keep the noise level within the compliance levels.

**North American Wetlands Conservation Act, 16 U.S.C. Sec. 4401 et seq.**

*Not applicable.*

This Act establishes the North American Wetlands Conservation Council (16 U.S.C.4403) (NAWCC) to recommend wetlands conservation projects to the Migratory Bird Conservation Commission (MBCC). Section 9 of the Act (16 U.S.C. 4408) addresses the restoration, management, and protection of wetlands

and habitat for migratory birds on Federal lands. Federal agencies acquiring, managing, or disposing of Federal lands and waters are to cooperate with the Fish and Wildlife Service to restore, protect, and enhance wetland ecosystems and other habitats for migratory birds, fish and wildlife on their lands, to the extent consistent with their missions and statutory authorities. This project does not involve Federal lands.

**Protection of Wetlands (E.O. 11990)**

*In compliance.*

Federal agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agencies responsibilities. Each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands, which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors. Each agency shall also provide opportunity for early public review of any plans or proposals for new construction in wetlands. This project will not adversely impact any existing wetlands and will eventually create 22 acre of wetlands as the shallow water area silts in and converts to wetlands over time.

**Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)**

*In compliance.*

This law prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The Secretary's approval authority has since been delegated to the Chief of Engineers. Because the Corps of Engineers is doing this project, no authorization is required because the law specifically exempts the Corps of Engineers from regulation under Section 10.

**Watershed Protection and Flood Prevention Act, 16 U.S.C. 1101, et seq.**

*Not applicable.*

This Act authorizes the Secretary of Agriculture to cooperate with states and other public agencies in works for flood prevention and soil conservation, as well as the conservation, development, utilization, and disposal of water. This act imposes no requirements on Corps Civil Works projects.

**Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.**

*Not applicable.*

This act establishes that certain rivers of the Nation, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The area in which the proposed activity would occur is not designated as a wild or scenic river, nor is it on the National Inventory of Rivers potentially eligible for inclusion.

# **APPENDIX E:**

## **MANAGEMENT AND MONITORING PLAN**

**Little Bend River Restoration Project  
Management and Monitoring Plan**



**Prepared by**

**U.S. Army Corps of Engineers  
Omaha District**

**and**

**Lower Brule Sioux Tribe  
Department of Wildlife, Fish, and Recreation**

**December 2007**

This page intentionally left blank.

## **Executive Summary**

The U.S. Army Corps of Engineers (Corps) has prepared this management and monitoring plan in coordination with the Lower Brule Sioux Tribe Department of Wildlife, Fish and Recreation (LBST).

The purpose of the management plan (Part 1) is to document the management activities that will be used in this restoration project. Management activities will include dike construction oversight; vegetation management, including ground preparation, machine-planting and hand-planting trees, shrubs, and vines (including re-planting), installation of weed barrier fabric, irrigation, and weed control; and access control, including installation and maintenance of locked gates restricting vehicular access and pathways allowing foot traffic. Most of the management activities will take place during the initial year of the project, although some activities are ongoing during the five-year monitoring period, including the irrigation of planted vegetation and weed control.

The purpose of the monitoring plan (Part 2) is to document pre-project and post-project conditions for an environmental restoration and shoreline protection project, the Little Bend River Restoration Project, near River Mile (RM) 1008 on Lake Sharpe, South Dakota. The restoration project will consist of creating approximately 26 acres of riparian cottonwood forest habitat, 22 acres of shallow water habitat, a 2,300-foot-long backwater channel, and a 1-acre island. The monitoring plan includes a description of the planting plan, irrigation plan, maintenance plan, and monitoring plan for the success of the restoration project as a whole. Monitoring of the fish, zooplankton, and macrophyte communities will begin in 2007 (year 0) to record baseline pre-project conditions. Monitoring of these and other communities, including the plant, bird, reptile, and amphibian communities, as well as erosion rates and the status of local cultural resources, will continue on an annual basis for the subsequent five years, 2008-2012 (years 1 to 5) to document post-project conditions. At the end of each year, the LBST will create a monitoring report to be submitted to the Corps Environmental, Economics, and Cultural Resources section. The information in the annual monitoring reports will allow the LBST to assess the success of the project and make management changes as necessary to increase the likelihood of project success.

## **Introduction**

### **Project Location**

The shoreline protection and restoration project is located in Lake Sharpe off of the right bank of the Missouri River near RM 1008. The project site is located in sec. 1 and sec. 2, T. 108 N., R. 74 W., approximately 9 miles northwest of the town of Lower Brule in Lyman County, South Dakota (Figure 1). The project location is within the Lower Brule Sioux Tribe Reservation. The project area is bordered on the north and west by Lake Sharpe and on the east and south by irrigated cropland.

Lake Sharpe extends roughly 80 river miles (RM 987 to RM 1066) from Big Bend Dam, one mile southwest of Fort Thompson, South Dakota, to north of Fort Pierre and Pierre, South

Dakota. Big Bend Dam is 60 road miles from Pierre and 25 road miles from Chamberlain, South Dakota. The Big Bend project covers parts of five South Dakota counties – Buffalo, Hughes, Hyde, Lyman, and Stanley counties.

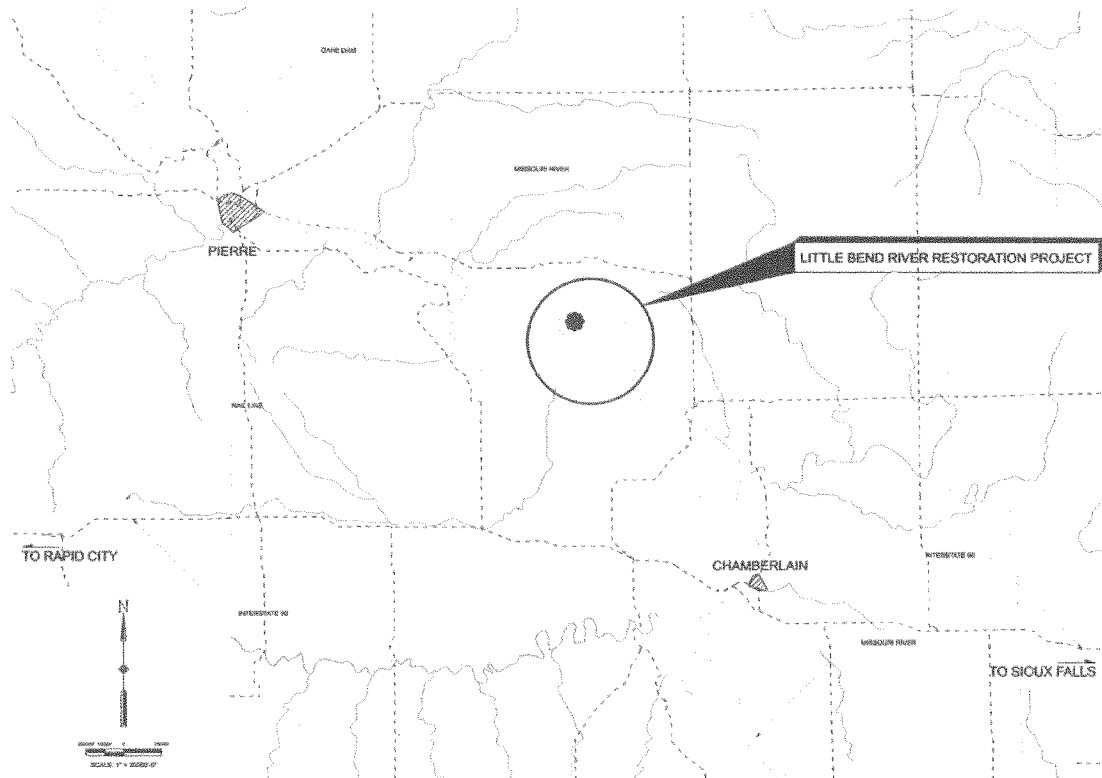


Figure 1. Location map for Little Bend River Restoration Project

## Project Background

In South Dakota, the Missouri River bisects the state for 532 river miles. The four main stem Missouri River dams in the state inundated 423,710 acres of land. About 116,530 acres were river bottomland forest, which comprised about 75 percent of the entire State's cottonwood stands (SDGFP 1996).

On the Lower Brule Sioux Reservation, Lakes Francis Case and Sharpe flooded and destroyed nearly 29,000 acres (LBST 1996). Of this land, 6,911 acres were river bottomland forests that were lost (LBST 1996). This comprised 95 percent of the cottonwood habitat on the entire reservation. Studies at the time of dam construction reported that these projects would result in a 75 percent loss of plants and game on the reservation.

These actions disrupted the connection between the river ecosystem and tribal members. For hundreds of years, this system had been integral to the Lakota culture for medicinal and ceremonial plants, plants and animals for food, trees for firewood, forested areas for livestock wintering and many other daily uses. The initial inundation, as well as on-going shoreline

erosion that has been estimated at an average rate of 10-feet-per year, have destroyed cultural and archaeological sites that are sacred to the Lower Brule people as well as other river Tribes.

The loss of vast stands of cottonwoods has had devastating impacts on many fish and wildlife species including the culturally and nationally significant bald eagle. Many components of bald eagle habitat have been lost including nesting, roosting and foraging sites.

In order to offset some of these environmental impacts, in 2005 the LBST created a proposal for a cottonwood habitat enhancement and shoreline protection project at Little Bend. The LBST has identified tree, shrub, and vine species that were typical of the pre-dam river (Appendix Table 1) and selected some of these native species for the restoration project. In early 2006 the Corps agreed to fund the project and provide technical assistance as part of the Missouri River Recovery program.

In 2006, the LBST also began planning a pilot project at the Jandreau site, located between Medicine Creek and the Narrows along the south shore of Lake Sharpe. This site is listed on the National Register of Historic Places, and it was chosen by a diverse group of multiple Tribes and agencies as a site to construct a “pilot project.” This pilot project was constructed in early 2007, and consisted of a 1,000-foot-long by 100-foot-wide dike that would both protect the cultural resources site from erosion and restore flood plain habitat that was lost when the flood plain was flooded to fill Lake Sharpe. An approximately 3.7-acre terrace was constructed on the landward side of the breakwater upon which several different species of flood plain trees and shrubs were planted. Whereas the primary purpose of the Jandreau pilot project was to provide protection for a cultural resource site, the primary purpose of the Little Bend River Restoration Project is to restore riparian habitat.

## **Project Overview**

The Little Bend River Restoration Project will consist of constructing a 200-foot-wide, 5,400-foot-long breakwater dike a couple hundred feet off of the shoreline in 4-foot-deep water. Approximately 340,340 cubic yards of fill will be placed into the lake to create the 26-acre dike and a 1-acre island and 11,180 tons of breakwater stone protection will be used to protect the side of the dike facing the lake and the northern tip of the dike. The fill material for the dike will be obtained by excavating 373,040 cubic yards of soil from a 2,300-foot-long borrow channel in the shoreline. The sides of the backwater channel will have 4:1 slopes. Equipment used in the breakwater construction and borrow channel excavation will include bulldozers, backhoes, earth moving scrapers, and trucks.

The top of the dike will be planted with riparian tree and shrub species including cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), honeylocust (*Gleditsia triacanthos*), box elder (*Acer negundo*), silver maple (*Acer sachharinum*), peachleaf willow (*Salix amygdaloides*), and diamond willow (*Salix eriocephala*). Vine species planted at the base of every tenth tree on the dike and on the riprapped side of the dike will include riverbank grape (*Vitis riparia*), American bittersweet (*Celastrus scandens*), Virginia creeper (*Parthenocissus inserta*), and western virgin’s bower (*Clematis ligusticifolia*). The area between the rows of trees will be seeded with a native grass/forb mix. Bare-root stock will be used and the plants will be



irrigated. Eleven peninsulas of varying sizes will be created off of the dike to create an additional planting area at a lower elevation. The peninsulas will be planted with cottonwood, plum (*Prunus americana*), chokecherry (*Prunus virginiana*), wood's rose (*Rosa woodsii*), golden currant (*Ribes aureum*), redosier dogwood (*Cornus stolonifera*), gray dogwood (*Cornus racemosa*), silverberry (*Elaeagnus commutata*), sandbar willow (*Salix interior*), Missouri gooseberry (*Ribes missouriense*), sand cherry (*Prunus besseyi*) and black currant (*Ribes americanum*).

Additionally, all areas disturbed by construction activities will be reseeded to a native grass and forb mixture. Tree, shrub, vine and grass plantings will be managed for five years to ensure success of the planting. This will include irrigation, weed control and replanting plants that don't survive the first two years.

Various effects of this project will be monitored for a five-year period. This will include measurements of plant survival and changes in populations of neotropical birds, wading birds, waterfowl, shorebirds, gulls and tern, waterfowl, amphibians, and reptiles, fishes and zooplankton. Rates of erosion and protection of cultural resources will also be monitored.

The area between the dike and the shoreline will be a shallow water area 0 to 2 feet in depth. The shallow area will not be vegetated and will be allowed to develop naturally. It is expected to gradually develop into a wetland environment over the next 50 years.

A 1-acre island will be created within the shallow water area. It will be maintained as bare soil and will provide nesting and loafing area for gulls, terns and shorebirds.

## **Part One. Management**

Management for this project will include dike construction oversight and the establishment and maintenance of trees, shrubs, vines and grasses/forbs in the project area. Dike construction oversight will include all aspects of ensuring dike construction occurs according to specifications. Vegetation management will include ground preparation, machine-planting and hand-planting trees, shrubs and vines (including re-planting), installation of weed barrier fabric, irrigation, and weed control. Access control will also be established for the project which will include installation and maintenance of locked gates, restricting vehicular access and pathways allowing foot traffic. These management items are described below.

### **Management Goal #1: Provide management oversight for the construction of the borrow area, dike, riprap and all other aspects of construction.**

Construction management and oversight will entail daily on-going inspection of all aspects of construction. This will include interacting with construction supervisor to ensure that all specifications and regulations regarding construction are satisfied.

**Management Goal #2: Prepare ground for vegetation planting.**

Ground preparation will consist of establishing the planting base for proper root/seed-to-soil contact. This will consist of the use of tractors and implements such as levelers, disks, sub-soilers, packers, and harrows.

**Management Goal #3: Establish grasses/forb stand in all exposed areas outside of tree/shrub/vines zones.**

The establishment of grass/forb plantings will consist of selection of a seed mixture of native grasses and herbaceous plants suitable for this site (Appendix Table 2). Seed will be machine-planted using a tractor and native grass seed drill.

**Management Goal #4: Place straw mulch on exposed areas planted to grass.**

Straw mulching will be used to conserve moisture in upland areas planted to grasses and forbs. A tractor and straw chopper implement will be used to shred large round straw bales and place straw mulch over newly planted stands.

**Management Goal #5: Mechanically establish trees and shrubs in rows on dike and terraces.**

Trees and shrubs will be planted on the dike and terraces in rows by using a tractor and mechanical tree planter. Tree/shrub spacing, row spacing and other specifications from the tree plan (Appendix Table 3) will be followed.

**Management Goal #6: Manually establish vines within rows and on riprap as well as trees/shrubs on points and edges.**

Vines, trees, and shrubs will be planted manually using tree spades as specified in the tree plan (Appendix Table 3). Vines will be planted in tree rows, within one foot of newly planted trees for every tenth tree along each row. Trees and shrubs will be hand-planted on the points and cottonwood cuttings will be planted on point edges. In Years 1 to 2, trees, shrubs, and vines will be replanted as needed (see Monitoring Goals 1 to 3).

**Management Goal #7: Mechanically install weed barrier fabric.**

Along each tree and shrub row, weed barrier fabric (6-feet-wide) will be installed with a fabric roller implement over newly-planted plants within four weeks of planting. Prior to installing fabric, planter ridges will be packed; after installing fabric, fabric roller ridges will be packed.

**Management Goal #8: Manually install weed barrier fabric.**

Along riprap, points and edges, weed barrier fabric will be installed over

newly-planted plants. Fabric squares six-feet-wide will be used on riprap and points while fabric squares three-feet-wide will be used on edges.

**Management Goal #9: Control weeds on sandbar island.**

Weed control on the sandbar island will consist of manually applying glyphosate herbicide at least twice per growing season, possibly more often as needed. The chemical will be applied using a backpack sprayer unit.

**Management Goal #10: Install irrigation system.**

For irrigating trees, shrubs, and vines, as well as between-row grass/forb plantings, an irrigation system will be installed. Two floating intake structures will be employed on the inner side of the dike and attached to aluminum mainlines, one for the upstream half of the dike and one for the downstream half. Attached to this mainline will be a hard hose traveling gun irrigation system, which includes the gun, hard hose, and reel.

**Management Goal #11: Irrigate planted vegetation.**

The above irrigation system will be operated beginning immediately after planting and repeated throughout the season as needed. Water will be applied once per week during periods without adequate rainfall.

**Management Goal #12: Mechanically control weeds between tree rows, points, and in upland areas.**

Weeds will be controlled between tree rows, around shrubs on points, and in upland areas using a tractor with a rotary mower and a front deck self-propelled mower. Mowing will take place approximately every 2 to 3 weeks throughout the growing season.

**Management Goal #13: Manually control weeds within tree rows and in riprap.**

Weeds will be controlled in tree rows and within fabric squares by manually pulling. This will be done by walking down each row and along each fabric square twice during the growing season, once in early summer and once in late summer.

**Management Goal #14: Install and maintain signage for visitors.**

Signs will be designed, fabricated, and installed at the project entrance gate. Signs will consist of one large entrance sign, several safety/instruction signs near the entrance, and several interpretive signs within the planting.

## **Management Goal #15: Install gates for access control.**

Two swinging, heavy, steel tubing gates will be installed at the dike entrance to disallow vehicle traffic, however allow foot traffic into the area. Gate posts will be anchored in cement and a padlock installed.

## **Part Two. Monitoring**

Monitoring in this report is defined as the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective (Elzinga et al. 2001). The management framework in which monitoring is conducted has been called “adaptive management.” In this framework, monitoring measures progress toward or success at meeting an objective and provides the evidence for management change or continuation (Elzinga et al. 2001).

Methods for measuring the success of meeting each project goal are described below. Each goal has one or more corresponding objectives; whereas a project goal is a broad statement, an objective is more specific and describes something that can be measured.

### **Project Standards and Field Indicators/Measurements**

#### **Monitoring Goal #1: Provide new cottonwood forest habitat for bald eagles.**

In the Great Plains, cottonwoods are important nesting and roosting trees for bald eagles. For example, cottonwood trees compromised 92 percent of diurnal tree perches used by wintering bald eagles in the Missouri River flood plain in central South Dakota (Steenhof et al. 1980). In a 2004 South Dakota bald eagle nest survey, all but one of 30 active bald eagle nests were in cottonwood trees, and one-third were along the Missouri River, primarily on the reach below Fort Randall Dam that is shared with Nebraska (Aron 2005). Nests often occur in dead or dying cottonwoods that may fall at any time (Aron 2005). The large size of cottonwoods make them the most suitable tree in this area for bald eagle nests, which are approximately 1.5 to 1.8 meters wide, and 0.7 to 1.2 meters deep (Aron 2005).

However, the main stem reservoirs constructed along the Missouri River inundated many acres of cottonwoods. On the LBST reservation, Lakes Sharpe and Frances Case inundated an estimated 6,911 acres of bottomland forest, or 95 percent of the cottonwood habitat (LBST 1996). The remaining mature cottonwoods have few areas for their seeds to grow, as cottonwood seeds require bare soil exposed to sunlight to germinate (Braatne et al. 1996). Historically, point bars on the inside of the meandering Missouri River created ideal conditions for cottonwood seedlings (Johnson 1992), but the current reservoir conditions allow few new cottonwoods to establish. In 2000, the U.S. Fish and Wildlife Service designated the reach of the Missouri River between Oahe Dam and Big Bend Dam, which includes Lake Sharpe, as a high priority reach for cottonwood restoration and bald eagle management (USFWS 2000). The creation of cottonwood forest habitat in this restoration project will fulfill recommendations of the Biological Opinion and create valuable habitat for bald eagles, which have cultural significance to the LBST.

**Objective 1.1: Ensure 85 percent survival of 5,920 cottonwoods planted on the dike, benches, and peninsulas. Survival will be determined at the end of the first (2008) and second (2009) growing seasons.**

Cottonwood trees will be counted late each summer during years 1 to 2 before the trees start to lose leaves. A biologist will walk down the rows along the dike, benches, and peninsulas and count all of the living and dead cottonwood trees. A tree is considered dead if it snaps when bent. Dead trees will be replaced with new cottonwood seedlings in the same location the following spring. Although there are no mature cottonwood trees in the immediate project area, some natural cottonwood regeneration may occur on the edges of the dike from seed that is carried by the water or wind. Therefore, the number of cottonwoods that naturally recruit along the inside (shoreward) perimeter of the dike will be counted at the same time that the planted trees are counted.

**Objective 1.2: Assess the growth of the cottonwood forest by measuring the diameter of selected cottonwood trees.**

The growth rate of the cottonwood forest will be measured by recording the diameter at breast height of every 20th cottonwood tree planted along the dike late each summer when the cottonwood trees are counted. This will allow the LBST to assess the growth of the cottonwoods and their progress each year.

**Monitoring Goal #2: Create woody habitat for neotropical and cavity-nesting birds.**

Although riparian vegetation occurs on less than 1 percent of the western North American landscape, it provides habitat for more bird species than all other vegetation types combined (Knopf et al. 1988). In South Dakota, riparian cottonwood forests provide especially important habitat for nesting birds. For example, one study conducted in Missouri River cottonwood woodlands between Mobridge and Pierre in central South Dakota found tree nesting species (e.g., flycatchers, kingbirds, orioles) to be the most abundant types of birds followed by cavity nesting species (e.g., woodpeckers, house wrens, nuthatches) (Rumble and Gobeille 2004). Cottonwood woodlands supported more cavity nesting birds than green ash, juniper, or bur oak woodlands (Rumble and Gobeille 2004). The restoration of cottonwood woodland at this project site will therefore provide valuable habitat for a variety of birds.

**Objective 2.1: Ensure 85 percent survival of 14,540 riparian trees and shrubs planted on the dike, benches, and peninsulas. Survival will be determined at the end of the first (2008) and second (2009) growing seasons.**

All of the riparian tree and shrub species planted on the dike, benches, and peninsulas will be counted late each summer during years 1 to 2 before the trees start to lose leaves. A biologist will walk down the rows along the dike, benches, and peninsulas and count all of the living and dead riparian tree and shrub species. A tree or shrub is considered dead if it snaps when bent. Dead trees and shrubs will be replaced with new seedlings of the same species in the same location the following spring.

### **Monitoring Goal #3: Plant native vines to benefit wildlife.**

Virginia creeper provides cover for many small birds and mammals. Songbirds are the principle consumers of the fruit, however deer, game-birds, and small mammals will also feed on them (USDA 2002). Western virgin's bower is very drought tolerant and provides excellent erosion control (USDA 2006). Songbirds, ruffed grouse, fox squirrel, and pheasant eat the fruits of bittersweet (USDA 2006).

**Objective 3.1: Ensure 85 percent survival of 1,576 vines planted along the riprap side of the dike and at the base of every tenth tree along the dike. Survival will be determined at the end of the first (2008) and second (2009) growing seasons.**

The survival of vines planted at the base of every tenth tree along the dike and within the riprap will be assessed during the annual evaluation of tree and shrub survival in the late summer of years 1 to 2. A vine will be considered dead if none of the leaves or stems are green. Dead vines will be replaced with new seedlings of the same species in the same location the following spring.

### **Monitoring Goal #4: Increase abundance and diversity of neotropical birds in the project area.**

While monitoring goal number two focuses on the successful establishment of woody habitat that will benefit neotropical birds, this goal assesses how successful that habitat is in attracting birds. The populations of many neotropical migratory bird species, or the approximately 60 to 80 percent of breeding bird species in the United States that migrate to wintering areas in tropical South and Central America (Morton 1992) are declining (Robbins et al. 1989). The declines are likely due to forest fragmentation within the species breeding range (Robbins et al. 1989) and the deforestation of tropical winter habitats (Terborgh 1989). Thus the ability of the restoration project to provide appropriate habitat and attract neotropical birds is an important goal to measure.

**Objective 4.1: Increase the abundance and diversity of neotropical birds compared to initial baseline survey in the project area. Abundance and diversity will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Birds will be surveyed three times each year, during the spring, summer, and fall of years 1 to 5. Two transects will be established a couple of rows in, along the entire length of the dike. If time permits, a third transect may be established near the middle of the dike. In addition, one transect will be established in the middle of each bench. Because the peninsulas are too small for a long linear transect, the transect through the peninsulas will consist of walking a U-shaped loop. The transects and peninsulas will be walked at a steady pace, and all birds seen or heard along the transect will be recorded.

Banding may not be used to monitor the bird community since the low density of birds that will visit the area when the vegetation is small precludes the use of banding. If the density

of birds becomes sufficiently large enough for banding to be used, fall banding surveys will be conducted.

**Monitoring Goal #5: Create shallow water habitat that will attract a diverse aquatic food web base, game and nongame fishes, wading birds, waterfowl, amphibians, and reptiles to the project area.**

Shallow water areas for the Missouri River have been defined as water 0 to 1.5 meters deep with velocities of 0 to 0.6 meters/second (USFWS 2000). Although this definition has typically been applied to shallow water areas restored within the channelized area of the Missouri River south of Sioux City, Iowa, it could also apply to the area between the dike and the shoreline in this project. This area will reduce the velocity of the reservoir water driven by wind fetch and in effect create a shallow water area that can provide habitat for wildlife. The shallow water habitat can benefit zooplankton and macrophytes, which are important contributors to a healthy aquatic food base, game and nongame fishes, wading birds, waterfowl, amphibians, and reptiles.

Zooplankton, particularly cladocerans are highly vulnerable to fish predation and we can monitor food web dynamics by tracking changes in zooplankton abundance, species composition, and morphology (Brooks and Dodson 1965). In general, as fish predation pressure increases, large bodied zooplankton such as *Daphnia* species (spp.) decrease and smaller bodied zooplankton such as *Bosmina* spp. increase (Johnson and Goettl 1999). Moreover, some *Daphnia* spp. will undergo morphological changes such as increasing spine length as a response to increases in fish predation.

Submerged macrophytes, or small aquatic plants, are of significant importance for the food web interactions and water quality of lakes (Jeppesen et al. 1998). Macrophytes affect the interactions between predaceous, planktivorous, and benthivorous fish and between fish and invertebrates (Jeppesen et al. 1998).

Survival and growth of young fish are associated with shallow water habitat with low velocity (Freeman et al. 2001). In addition, a greater diversity of fish species may be attracted to the area if a greater diversity of zooplankton and macrophytes develop in the shallow water area. In turn, the greater abundance of young fish should attract more wading birds and waterfowl. The calmer water conditions and diverse aquatic food base could also attract more amphibians and reptiles to the project area.

**Objective 5.1: Increase the diversity of zooplankton in the shallow water habitat area relative to baseline conditions. Diversity will be determined in 2007-2012 (years 0 to 5) during the monitoring period.**

As part of sampling the aquatic food web base, sampling for zooplankton will be conducted during the growing season (June, July, and August). Zooplankton will be collected using Wisconsin style zooplankton nets towed horizontally for 10 meters (the project area will be too shallow for vertical hauls). Zooplankton will be identified to either family (for cladocerans) or order (copepods and rotifers), and will be measured for total length.

Concomitant with sampling at the project site, zooplankton will also be monitored at a reference site approximately one kilometer from the project area. This reference site will give us baseline information to compare to the project area.

**Objective 5.2: Increase the abundance of macrophytes in the shallow water habitat area relative to baseline conditions. Abundance will be determined in 2007-2012 (years 0 to 5) during the monitoring period.**

Macrophytes development will be measured using fixed transects, determined by using a Global Positioning System. The presence or absence of aquatic macrophytes at fixed sites in each transect will be determined during each sampling period. This information will be incorporated into a mapping program to track the annual and seasonal development of macrophytes in the study area.

Concomitant with sampling at the project site, macrophytes will also be monitored at a reference site approximately one kilometer from the project area. This reference site will give us baseline information to compare to the project area.

**Objective 5.3: Increase the abundance and diversity of game and nongame fish in the shallow water habitat area relative to baseline conditions. Abundance and diversity will be determined in 2007-2012 (years 0 to 5) during the monitoring period.**

Monitoring the fish assemblage in the project area will require examining a suite of gears including: 1) electrofishing, 2) seining, 3) small mesh gill nets, 4) mini-fyke nets, and 5) experimental gill nets. All of these gears have inherent bias and are more effective at sampling certain sizes and/or species of fish. Thus, to identify the most effective gears for the fish species present in the project site, we will initially deploy all gears and then compare catches on an annual basis. These results will be used to focus sampling efforts on the most effective sampling gears. This flexible approach allows us to identify the most effective gears that maximize catch rates and offer the greatest precision of estimates.

The fish assemblage in Lake Sharpe is extensively monitored by the South Dakota Department of Game, Fish and Parks, and we can use their data to compare to fish use of the project area.

**Objective 5.4: Increase the amount of submersed vegetation available in the shallow water habitat area relative to baseline conditions. The amount of vegetation will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Submersed vegetation may not grow well in the shallow water habitat area depending on how well it is grazed by carp. If submersed vegetation becomes prevalent enough to be recorded, linear transects will be run throughout the shallow water habitat area and the number of vegetation clumps encountered along the transect will be recorded.



**Objective 5.5: Increase the abundance and diversity of wading birds in the shallow water habitat area relative to baseline conditions. The abundance and diversity will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Wading birds will be surveyed three times each year, during the spring, summer, and fall of years 1 to 5. The entire shoreline along the perimeter of the shallow water area, including along the base of the dike and the shoreline, will be walked at a steady pace and the species of wading birds heard and seen will be recorded.

**Objective 5.6: Increase the abundance and diversity of waterfowl in the shallow water habitat area relative to baseline conditions. The abundance and diversity will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Waterfowl will be surveyed three times each year, during the spring, summer, and fall of years 1 to 5. The spring survey would be a pair count, the summer survey a brood survey, and the fall survey would be a migratory survey.

**Objective 5.7: Increase the abundance and diversity of amphibians in the shallow water habitat area relative to baseline conditions. The abundance and diversity will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Amphibians will be surveyed three times each year, during the spring, summer, and fall of years 1 to 5. If time allows, two repetitions will be done each season, performed two weeks apart. As with the wading birds and waterfowl, a biologist will walk around the perimeter of the shallow water area at a steady pace and record all amphibian species observed. The 1-acre island will also be walked. Amphibians will be observed only on sunny days.

**Objective 5.8: Increase the abundance and diversity of reptiles in the shallow water habitat area relative to baseline conditions. The abundance and diversity will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Reptiles will be surveyed three times each year, during the spring, summer, and fall of years 1 to 5. As with the wading birds and waterfowl, a biologist will walk around the perimeter of the shallow water area at a steady pace and record all reptile species observed. The 1-acre island will also be walked. Large objects such as flat stones and logs will be lifted to look for reptiles. Reptiles will be observed only on sunny days.

**Monitoring Goal #6: Create a sandbar island that will attract gulls, terns, and shorebirds.**

Before the construction of the main stem dams, the Missouri River meandered, continually eroding and depositing soil, creating and destroying sandbars and islands (National Research Council 2002). However, the reservoirs have inundated the islands, reducing the available habitat for birds that depend on islands for foraging and nesting, such as gulls, terns, and plovers. The creation of a 1-acre sandbar island will add this habitat feature to the project area and its success in attracting gulls, terns, and shorebirds, should be assessed.

**Objective 6.1: Increase the abundance and diversity of gulls, terns, and shorebirds in the sandbar habitat. The abundance and diversity will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

Gulls and terns will be surveyed three times each year, during the spring, summer, and fall of years 1 to 5. A biologist will use binoculars from the shoreline to document use of the island by gulls, terns, shorebirds, and other birds. Each bird will be identified. If nesting occurs, nest success will also be remotely determined; on-island investigation will take place if possible without nest disturbance. If any least terns (*Sterna antillarum*) or piping plovers (*Charadrius melodus*) are observed foraging or nesting on the island the LBST will contact the Corps' tern and plover biologist, Greg Pavelka, at (402) 667-2581. The tern and plover biologist will coordinate with the LBST on monitoring the status of terns and plovers in the area.

**Monitoring Goal #7: Reduce the loss of land due to wave and ice action.**

The constant pool elevations on the lake allow wind, wave, and ice to attack the same elevations year-round, making erosion a major problem on Lake Sharpe (USACE 2003). A station just upstream of the northern edge of the proposed dike location indicated that 52 feet of shoreline were lost between 1992-2006 (personal communication, Joel Bich, LBST Department of Fish, Wildlife, and Recreation). Corps measurements of range line 1052.6 show 72 feet of shoreline were lost between 1963-1997 (personal communication, Joel Bich, LBST Department of Fish, Wildlife, and Recreation). The erosion exposes and destroys cultural and archaeological sites that are important to the Lower Brule and other Tribes that historically lived in the area. Therefore, the reduction of erosion in the project area is one goal of the restoration project.

**Objective 7.1: Reduce the amount of land eroded relative to the surrounding land upstream and downstream from the project area. The amount of land eroded will be determined in 2008-2012 (years 1 to 5) during the monitoring period.**

A new monitoring station will be established at the midpoint of the project area, midway across the dike. A marked steel post will be placed a specified distance from the shoreline. Steel posts will also be placed upstream and downstream of this post, in a line perpendicular to the river. Each spring in years 1 to 5, the distance between the shoreline and each of these posts will be measured with a measuring tape.

**Monitoring Goal #8: Protect archaeological and other cultural resources.**

While goal number seven focuses on reducing erosion in the project area, goal number eight specifically assesses the status of any cultural or archaeological sites in the project area. These sites should be checked to ensure erosion does not further impact these sites.

**Objective 8.1: Ensure that the erosion does not progress so far that it affects archaeological and cultural resources. Cultural resources will be monitored in 2008-2012 (years 1 to 5) during the monitoring period.**

An archaeologist will semi-annually monitor shoreline erosion and inspect cultural resources to ensure no adverse impacts to cultural resources.

**Monitoring Goal #9: Monitor erosion of the inside portion of the dike.**

While the lakeward side of the dike will be riprapped to prevent erosion of the dike, the inside of the dike will have peninsulas created from fill material. Although the inside of the dike is protected from waves, it may still experience erosion. The inside of the dike will be monitored each year to determine the amount of erosion that occurs.

**Objective 9.1: Ensure that erosion does not erode away the peninsulas and vegetation planted on the peninsulas.**

Each spring and fall, the inside perimeter of the dike will be walked and Global Positioning System will be used. A map showing the shape of the dike and peninsulas will be created to display changes caused by erosion.

**Annual Monitoring Reports**

The LBST will submit an annual monitoring report to the project biologist in the Corps Environmental, Economics, and Cultural Resources section by December 15th of each year during the monitoring period (2007-2012). The project biologist will forward the report to the Big Bend project office (CENWO-OD-BB), the South Dakota regulatory office (CENWO-OD-RSD), and the Corps flood plain section (CENWO-ED-HB).

The annual monitoring report will include a description of the field data collected for each monitoring goal scheduled to be assessed that year and pictures of the progress of the restoration project, including views of the backwater channel, dike, island, and shallow water habitat. Actions taken that year toward management goals will also be described. For example, management actions undertaken that year, such as when and how weed control efforts were used, will be described, as well as remedial measures planned for the following spring, such as the number of each plant species that will be planted to replace dead plants. The final annual monitoring report, produced in 2012, will include charts and/or tables that summarize trends in the data over the entire monitoring period.

## References

- Aron, C. 2005. South Dakota Bald Eagle (*Haliaeetus leucocephalus*) Management Plan. South Dakota Department of Game, Fish and Parks, Pierre, Wildlife Division Report No. 2005-01, 33 pp.
- Braatne, J.H., S.B. Rood, and P.E. Heilman. 1996. Life history, ecology, and conservation of riparian cottonwoods in North America. In: Steller, R. F., ed. Biology of Populus and its implications for management and conservation. Ottawa, Ontario: National Research Council of Canada, NRC Research Press: 57-85
- Brooks, J. L., and S. I. Dodson. 1965. Predation, body size, and the composition of zooplankton. *Science* 150:28-35.
- Elzinga, C.L., D.W. Salzer, J.W. Willoughby, and J.P. Gibbs. 2001. Monitoring plant and animal populations. Blackwell Science, Inc.
- Freeman, M.C., Bowen, Z.H., Bovee, K.D., and Irwin, E.R. 2001. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes. *Ecological Applications* 11:179-190.
- Jeppesen, E., M. Sondergaard, M. Sondergaard, and K. Christoffersen. 1998. The structuring role of submerged macrophytes in lakes. Springer-Verlag, New York, NY.
- Johnson, W.C. 1992. Dams and riparian forests: case study from the upper Missouri River. *Rivers* 3(4): 229-242.
- Johnson, B.M., and J.P. Goettl. 1999. Food web changes over fourteen years following introduction of rainbow smelt into a Colorado reservoir. *North American Journal of Fisheries Management* 19(3):629-642.
- Knopf, F.L., R.R. Johnson, T. Rich, F.B. Samson, and R.C. Szaro. 1988. Conservation of riparian ecosystems in the United States. *Wilson Bulletin* 100:272-284.
- LBST (Lower Brule Sioux Tribe). 1996. Habitat mitigation plan for Lake Sharpe on the Lower Brule Sioux Reservation. Lower Brule, South Dakota.
- Morton, E.S. 1992. What do we know about the future of migrant landbirds? Pp. 579-589 in J.M. Hagan, III and D.W. Johnston eds. Ecology and conservation of Neotropical migrant landbirds. Smithsonian Institution Press, Washington, DC.
- National Research Council. 2002. The Missouri River ecosystem: exploring the prospects for recovery. National Academy Press, Washington, DC.

Robbins, C.S., J.R. Sauer, R. Greenberg, and S. Droege. 1989. Population declines in North American birds that migrate to the Neotropics. Proceedings of the National Academy of Science. USA. 86:7658-7662.

Rumble, M.A., and J.E. Gobeille. 2004. Avian use of successional cottonwood (*Populus deltoides*) woodlands along the Missouri River. 152:165-177.

SDGFP (South Dakota Game, Fish, and Parks Department). 1996. Habitat Mitigation Plan for Oahe/Sharpe Reservoirs, South Dakota.

Steenhof, K., S.S. Berlinger, L.H. Fredrickson. 1980. Habitat use by wintering bald eagles in South Dakota. Journal of Wildlife Management 44(4):798-805.

Terborgh, J.W. 1989. Where have all the birds gone? Princeton University Press. Princeton, NJ.

USACE (U.S. Army Corps of Engineers). 2003. Big Bend Dam/Lake Sharpe Master Plan, Missouri River, South Dakota. Update of Design Memorandum MB-90. U.S. Army Corps of Engineers, Omaha District. 295pp.

USDA (U.S. Department of Agriculture). 2002. Plant fact sheet, Virginia creeper, *Parthenocissus quinquefolia*.

USDA (U.S. Department of Agriculture). 2006. Plant guide, Western clematis, *Clematis ligusticifolia*.

USDA (U.S. Department of Agriculture). 2006. Plant guide, American bittersweet, *Celastrus scandens*.

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

Appendix Table 1. Tree, shrub, and vine species identified by the Lower Brule Sioux Tribe Department of Fish, Wildlife, and Recreation as having been on the pre-dam river.

TREES	Plains cottonwood	<i>Populus deltoides</i>
	peachleaf willow	<i>Salix amygaloides</i>
	diamond (Missouri River) willow	<i>Salix eriocephala</i>
	green ash	<i>Fraxinus pennsylvanica</i>
	common hackberry	<i>Celtis occidentalis</i>
	common honeylocust	<i>Gleditsia triacanthos</i>
	American linden (basswood)	<i>Tilia americana</i>
	bur oak	<i>Quercus macrocarpa</i>
	box elder	<i>Acer negundo</i>
	sugar maple	<i>Acer saccharinum</i>
	American elm	<i>Ulmus americana</i>
SHRUBS	coyote (narrowleaf)/sandbar willow	<i>Salix exigua/interior</i>
	false indigo	<i>Amorpha fruticosa</i>
	redosier (red-stemmed) dogwood	<i>Cornus stolonifera</i>
	gray dogwood	<i>Cornus racemosa</i>
	Wood's rose	<i>Rosa woodsii</i>
	western snowberry	<i>Symphoricarpus occidentalis</i>
	American black currant	<i>Ribes americanum</i>
	golden currant	<i>Ribes aureum</i>
	Missouri gooseberry	<i>Ribes missouriense</i>
	sand cherry	<i>Prunus pumila</i>
	common chokecherry	<i>Prunus virginiana</i>
	American plum	<i>Prunus americana</i>
	juneberry (Saskatoon serviceberry)	<i>Amelanchier alnifolia</i>
	smooth sumac	<i>Rhus glabra</i>
	silverberry	<i>Elaeagnus commutata</i>
VINES	riverbank grape	<i>Vitis riparia</i>
	American bittersweet	<i>Celastrus scandens</i>
	western virgin's bower	<i>Clematis ligusticifolia</i>
	Virginia creeper	<i>Parthenocissus inserta</i>
	American hog peanut	<i>Amphicarpea bracteata</i>

Appendix Table 2. Grass seed mix.

Species - common name	Species - scientific name	Full Seeding PLS lb/ac	% of Mix	PLS lbs/ac	Total PLS lbs
green needlegrass	<i>Nassella viridula</i>	6.0	10%	0.60	6.0
slender wheatgrass	<i>Elymus trachycaulus</i>	8.0	10%	0.80	8.0
pubescent wheatgrass	<i>Agropyron trichoforum</i>	14.0	10%	1.40	14.0
Indian grass	<i>Sorghastrum nutans</i>	7.0	10%	0.70	7.0
Canada wild rye	<i>Elymus canadensis</i>	7.6	10%	0.76	7.6
big blue stem	<i>Andropogon gerardii</i>	6.0	5%	0.30	3.0
little blue stem	<i>Andropogon scoparius</i>	4.0	5%	0.20	2.0
switchgrass	<i>Panicum virgatum</i>	3.5	5%	0.18	1.8
sideoats grama	<i>Bouteloua curtipendula</i>	6.0	5%	0.30	3.0
blue grama	<i>Bouteloua gracilis</i>	1.2	5%	0.06	0.6
sand bluestem	<i>Andropogon hallii</i>	16.0	5%	0.80	8.0
sand dropseed	<i>Sporobolus cryptandrus</i>	1.0	5%	0.05	0.5
sand lovegrass	<i>Eragrostis trichodes</i>	2.0	5%	0.10	1.0
purple coneflower	<i>Echinacea angustifolia</i>	9.0	2%	0.18	1.8
prairie coneflower	<i>Ratibida columnifera</i>	1.5	2%	0.03	0.3
purple prairieclover	<i>Dalea purpurea</i>	3.8	5%	0.19	1.9
maximillian sunflower	<i>Helianthus maximiliani</i>	1.0	1%	0.01	0.1
			100%	6.65	66.5

Appendix Table 3. Tree planting plan.

**TREE PLANTING PLAN - LOWER BRULE SIOUX TRIBE DEPARTMENT OF WILDLIFE, FISH AND RECREATION**

NAME: LITTLE BEND DIKE PROJECT	SOIL TYPE: OrB, OvB, She
--------------------------------	--------------------------

PROGRAM: COE MRRA	MAINTENANCE PLAN: FABRIC/DRIP IRRIGATION
-------------------	--

YEAR PLANNED: 2007	LOCATION: Sec. 1, 2, 11 (T108N-R74W)
--------------------	--------------------------------------

On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted
A	1	RIPRAP	6	R GRAPE/AM BITTERSWEET	2700	450	
	2	HAND PL	10	COTTONWOOD	2700	270	
	2A	HAND PL	120	RIVERBANK GRAPE	2700	23	
	3	HAND PL	10	COTTONWOOD	2700	270	
	3A	HAND PL	120	AMERICAN BITTERSWEET	2700	23	
	4	HAND PL	10	COTTONWOOD	2700	270	
	4A	HAND PL	120	WESTERN VIRGIN'S BOWER	2700	23	
	5	HAND PL	10	COTTONWOOD	2700	270	
	5A	HAND PL	120	VIRGINIA CREEPER	2700	23	
	6	HAND PL	10	COTTONWOOD	2700	270	
	6A	HAND PL	120	RIVERBANK GRAPE	2700	23	
	7	HAND PL	10	GREEN ASH	2700	270	
	7A	HAND PL	120	AMERICAN BITTERSWEET	2700	23	
	8	HAND PL	4	REDOSIER DOGWOOD	2700	675	
	9	HAND PL	4	PLUM/CHOKE/SAND/CURRANT	2700	675	
	10	HAND PL	10	SILVER MAPLE	2700	270	
	10A	HAND PL	120	RIVERBANK GRAPE	2700	23	
	11	HAND PL	10	DIAMOND WILLOW	2700	270	
	11A	HAND PL	120	AMERICAN BITTERSWEET	2700	23	



On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted	
A	12	12	10	HONEYLOCUST	2700	270		
	12A	HAND PL	120	WESTERN VIRGIN'S BOWER	2700	23		
	13	12	10	BOX ELDER	2700	270		
	13A	HAND PL	120	VIRGINIA CREEPER	2700	23		
	14	12	10	PEACHLEAF WILLOW	2700	270		
	14A	HAND PL	120	RIVERBANK GRAPE	2700	23		
	15	12	10	COTTONWOOD	2700	270		
	15A	HAND PL	120	AMERICAN BITTERSWEET	2700	23		
	16	12	10	COTTONWOOD	2700	270		
	16A	HAND PL	120	WESTERN VIRGIN'S BOWER	2700	23		
	B	1 RIPRAP	HAND PL	6	R GRAPE/AM BITTERSWEET	2700	450	
		2	12	10	COTTONWOOD	2700	270	
		2A	HAND PL	120	RIVERBANK GRAPE	2700	23	
		3	12	10	COTTONWOOD	2700	270	
		3A	HAND PL	120	AMERICAN BITTERSWEET	2700	23	
		4	12	10	COTTONWOOD	2700	270	
4A		HAND PL	120	WESTERN VIRGIN'S BOWER	2700	23		
5		12	10	COTTONWOOD	2700	270		
5A		HAND PL	120	VIRGINIA CREEPER	2700	23		
6		12	10	COTTONWOOD	2700	270		
6A		HAND PL	120	RIVERBANK GRAPE	2700	23		
7		12	10	GREEN ASH	2700	270		
7A	HAND PL	120	AMERICAN BITTERSWEET	2700	23			
8	12	4	REDOSIER DOGWOOD	2700	675			
9	12	4	PLUM/CHOKE/SAND/CURRANT	2700	675			
10	12	10	SILVER MAPLE	2700	270			
10A	HAND PL	120	RIVERBANK GRAPE	2700	23			
11	12	10	DIAMOND WILLOW	2700	270			
11A	HAND PL	120	AMERICAN BITTERSWEET	2700	23			
12	12	10	HONEYLOCUST	2700	270			
12A	HAND PL	120	WESTERN VIRGIN'S BOWER	2700	23			

On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted
	13	12	10	BOX ELDER	2700	270	
	13A	HAND PL	120	VIRGINIA CREEPER	2700	23	
	14	12	10	PEACHLEAF WILLOW	2700	270	
	14A	HAND PL	120	RIVERBANK GRAPE	2700	23	
	15	12	10	COTTONWOOD	2700	270	
	15A	HAND PL	120	AMERICAN BITTERSWEET	2700	23	
	16	12	10	COTTONWOOD	2700	270	
	16A	HAND PL	120	VIRGINIA CREEPER	2700	23	
C	1	12	10	COTTONWOOD	1800	180	
	2	12	10	COTTONWOOD	1800	180	
	3	12	4	SANDBAR WILLOW	1800	450	
D	1	12	10	COTTONWOOD	3500	350	
	2	12	10	COTTONWOOD	3500	350	
	3	12	4	FALSE INDIGO	3500	875	
Point 1	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOKECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 2	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOKECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	

On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 3	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOCHECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 4	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOCHECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 5	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOCHECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	

On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 6	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOKECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 7	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOKECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 8	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOKECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	

On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 9	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOCHECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 10	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOCHECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
Point 11	SQUARES	HAND PL	1.5	PLUM	6	20	
	SQUARES	HAND PL	1.5	CHOCHECHERRY	6	20	
	SQUARES	HAND PL	1.5	WOOD'S ROSE	6	20	
	SQUARES	HAND PL	1.5	GOLDEN CURRANT	6	20	
	SQUARES	HAND PL	1.5	REDOSIER DOGWOOD	6	20	
	SQUARES	HAND PL	1.5	GRAY DOGWOOD	6	20	

On map Site #	Row Number	Between Row Space (ft)	Within Row Space (ft)	Plant Species from North or West	Row Length (Feet)	Number of Plants	Number of Plants Planted
	SQUARES	HAND PL	1.5	SILVERBERRY	6	20	
	SQUARES	HAND PL	1.5	SANDBAR WILLOW	6	20	
	SQUARES	HAND PL	1.5	MISSOURI GOOSEBERRY	6	20	
	SQUARES	HAND PL	1.5	BLACK CURRANT	6	20	
				Totals	173,160	15,790	

222  
750 FT  
ROLLS

Acreage

Approximately 26 acres

PLANT TOTALS

COMMENTS	PLANT TOTALS	Number of Plants Planted
WFR PLANT, FABRIC	COTTONWOOD	4840
BIG GUN IRRIGATION ON DIKE	GREEN ASH	540
SPRINKLER IRRIGATION ON TERRACES??	HONEYLOCUST	540
	BOXELDER	540
	SILVER MAPLE	540
	PEACHLEAF WILLOW	540
	DIAMOND WILLOW	540
	PLUM	558
	CHOCHECHERRY	558
	WOOD'S ROSE	220
	GOLDEN CURRANT	558
	REDOSIER DOGWOOD	1570
	GRAY DOGWOOD	220
	SILVERBERRY	220
	SAND BAR WILLOW	670
	MISSOURI GOOSEBERRY	220
	BLACK CURRANT	220

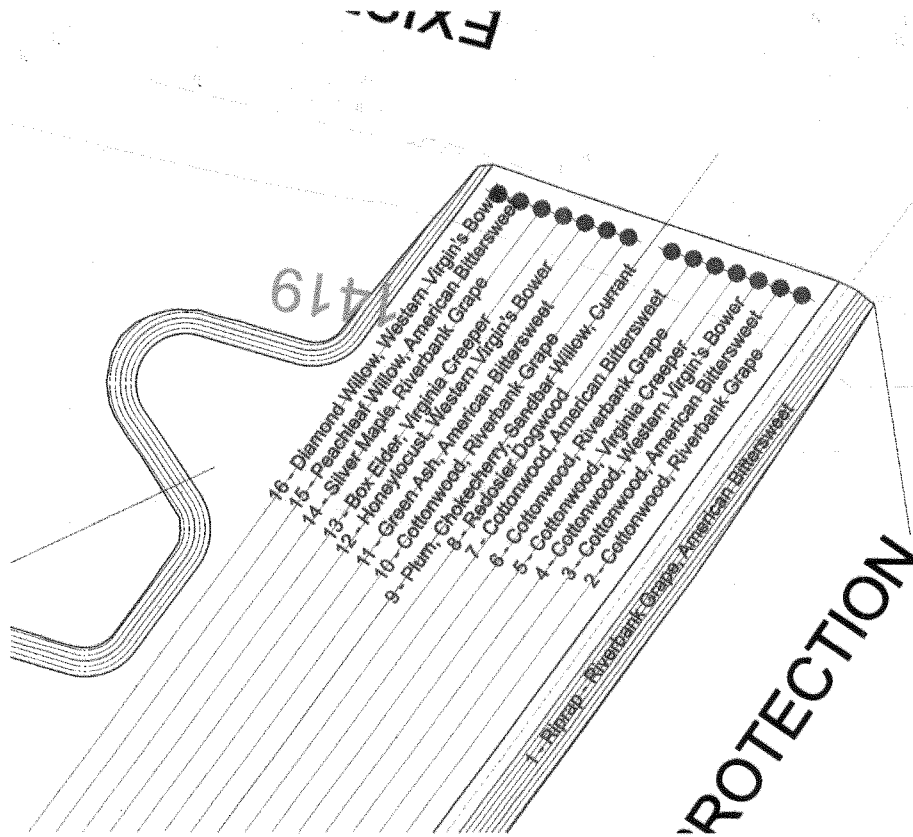
PLANT TOTALS (continued)	
FALSE INDIGO	875
SAND CHERRY	338
RIVERBANK GRAPE	405
AMERICAN	
BITTERSWEET	405
WESTERN VIRGINS	
BOWER	338
VIRGINIA CREEPER	338
TOTAL	15,790

Project plan with planting areas A, B, C, and D indicated.

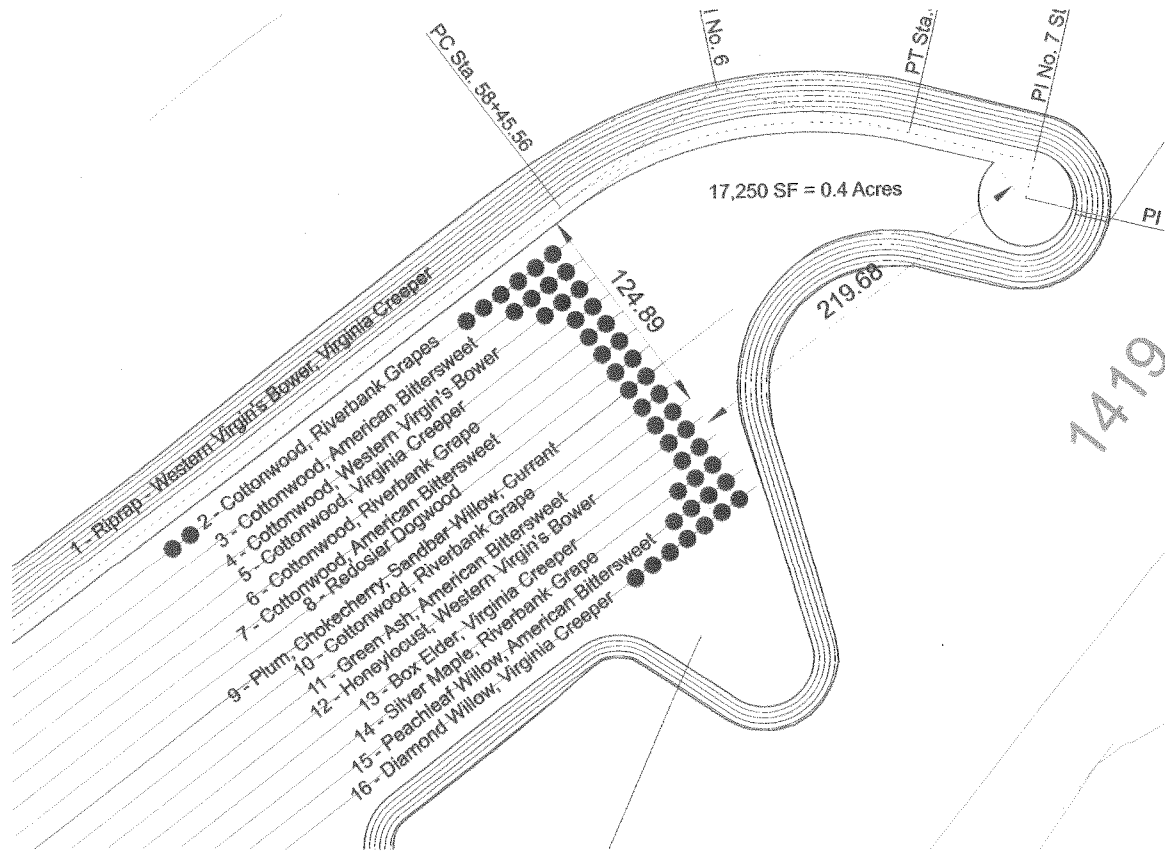




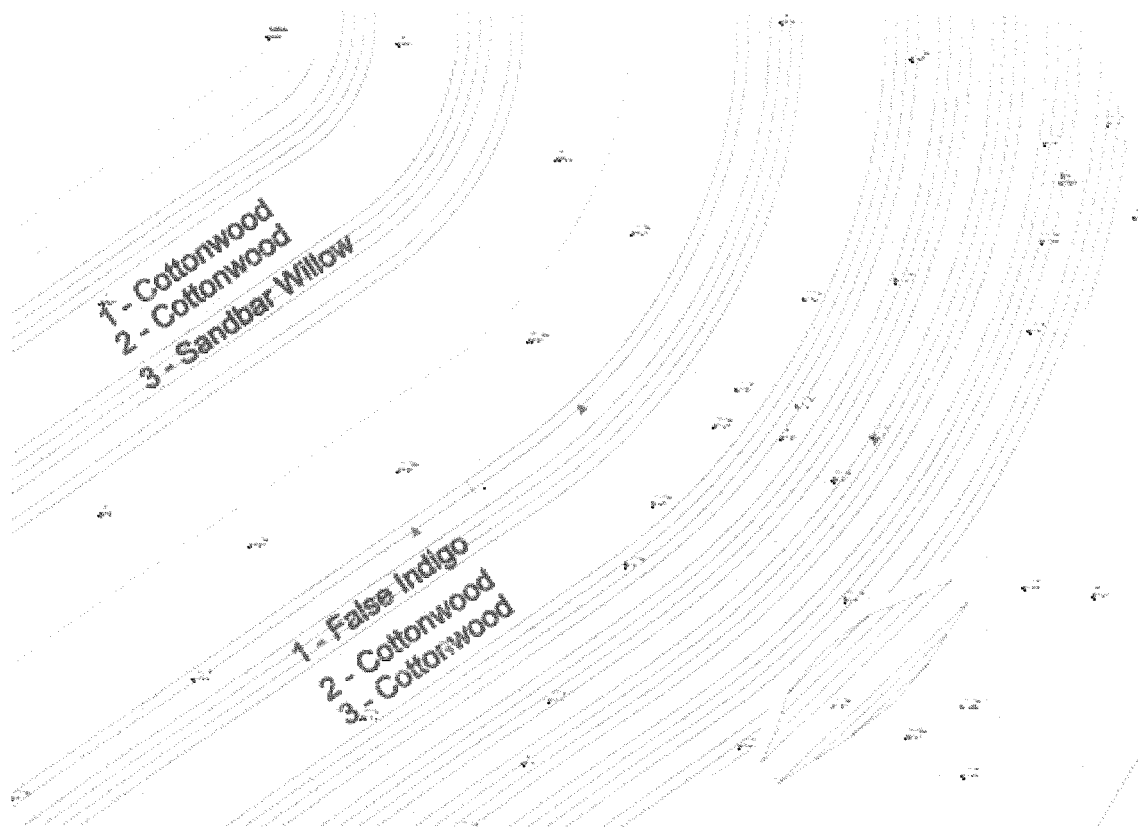
Diagram of planting area A, southern portion of the dike.



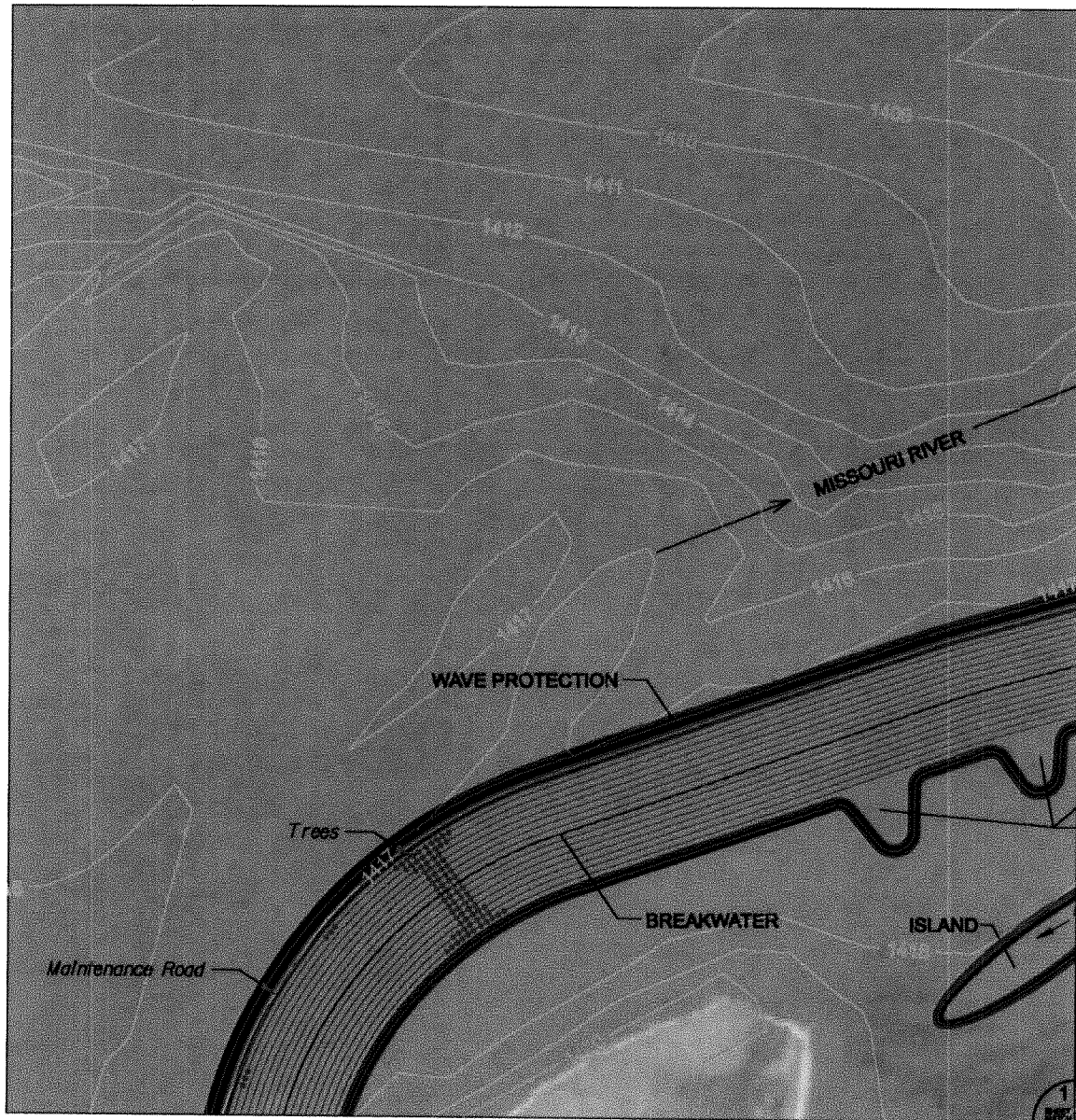
**Diagram of planting area B, northern portion of the dike.**



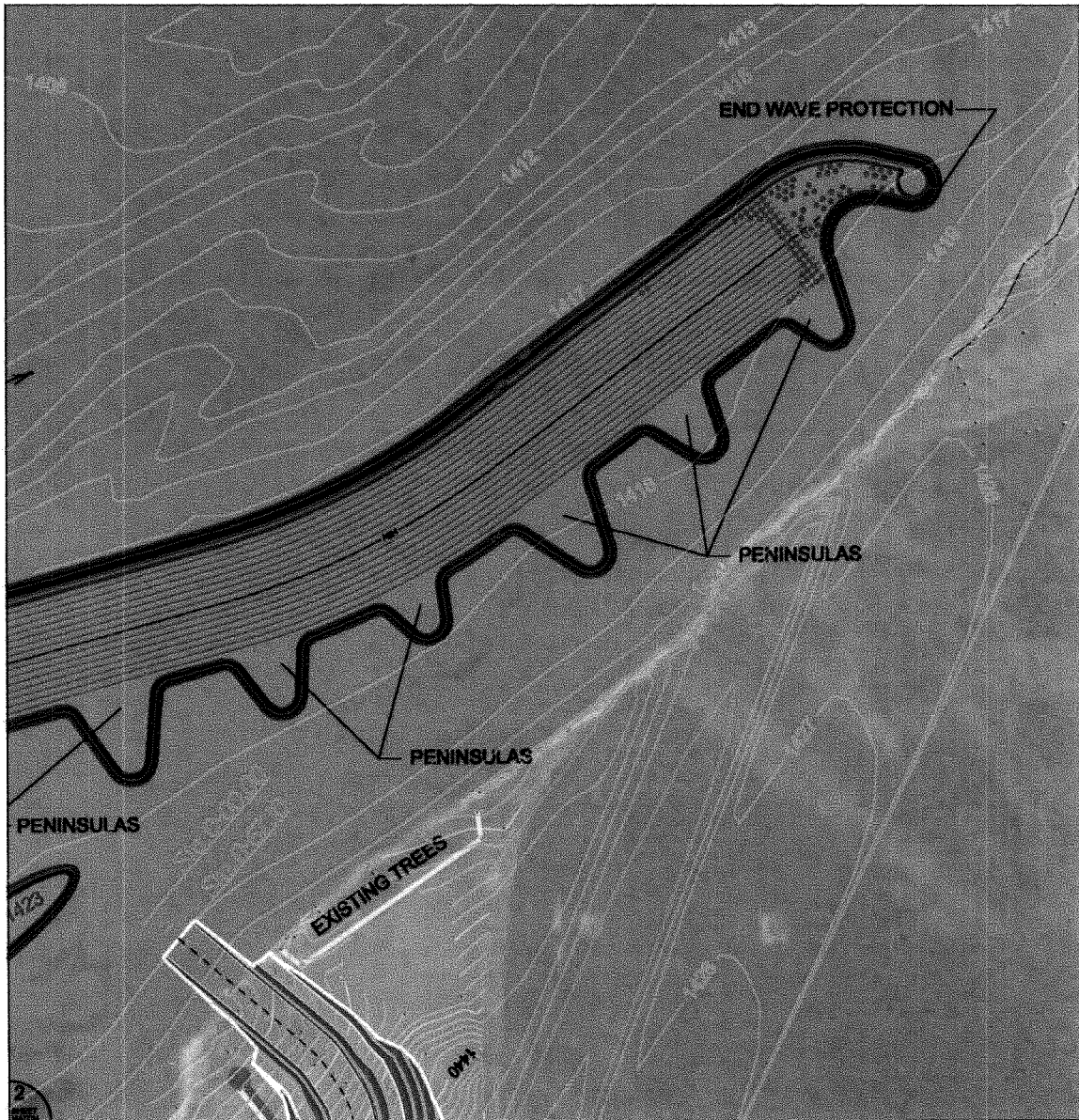
**Diagram of planting areas C (west side) and D (east side) along the borrow channel.**



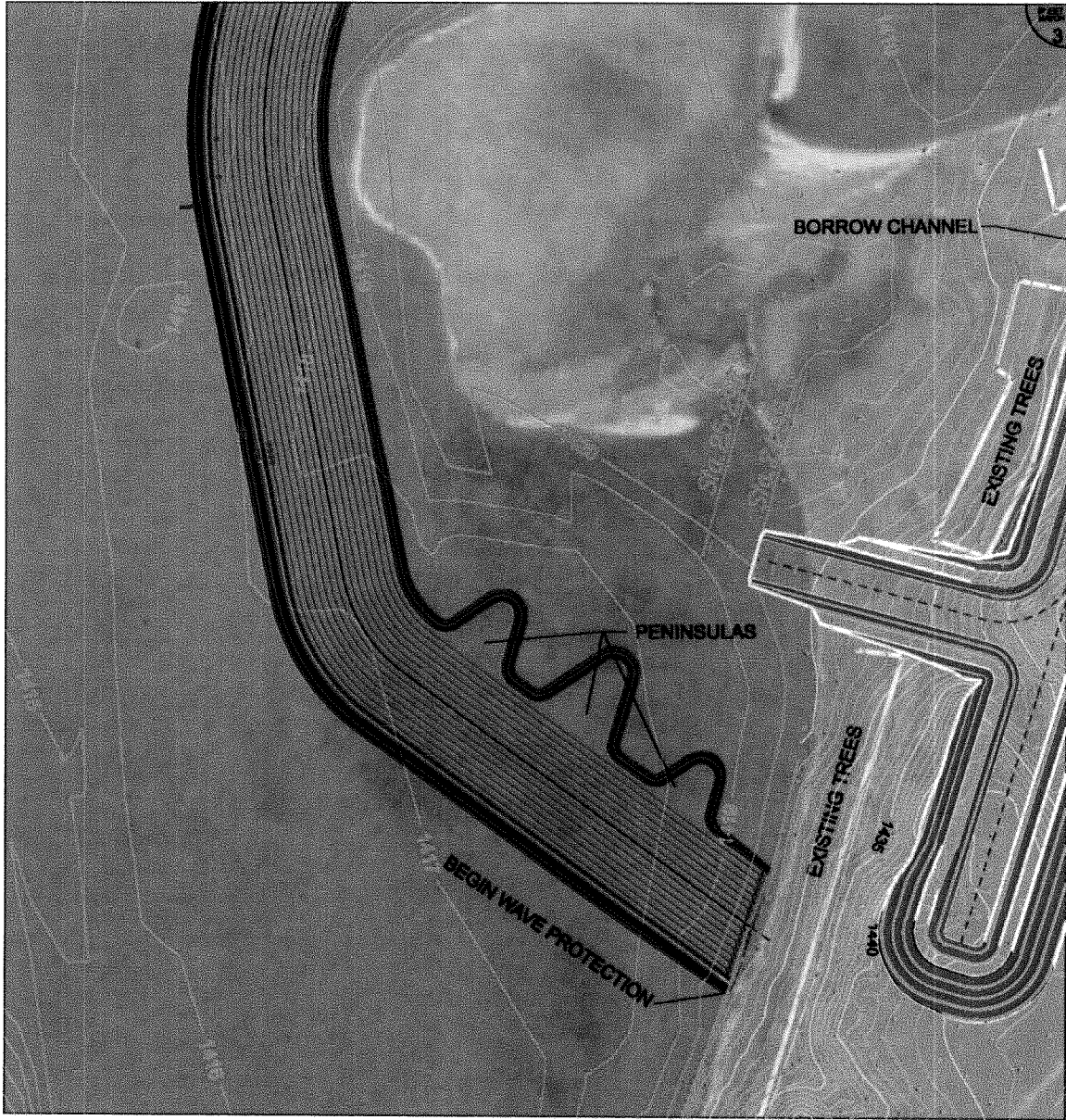
**Close-up of the northwestern portion of the project area.**



**Close-up of northeastern portion of the project area.**



Close-up of the southern portion of the project area.



**Close-up of the eastern portion of the project area.**

