DRAFT ENVIRONMENTAL ASSESSMENT

WITH

UNSIGNED FINDING OF NO SIGNIFICANT IMPACT

REGULATING WORKS PROJECT
MOSENTHEIN/IVORY LANDING PHASE 4
MIDDLE MISSISSIPPI RIVER MILES 175-170
ST. CLAIR COUNTY, IL
ST. LOUIS CITY, MO

OCTOBER 2013

US Army Corps of Engineers
St. Louis District

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1. Purpose of and Need for Action

The U.S. Army Corps of Engineers St. Louis District (District) is responsible for providing a safe and dependable navigation channel, 9 feet deep and not less than 300 feet wide, with additional width in the bends as required, on the Middle Mississippi River (MMR). The MMR is defined as that portion of the Mississippi River that lies between the confluences of the Ohio and Missouri rivers (Figure 1). This is achieved through the authorized Regulating Works Project. The Regulating Works Project consists of bank stabilization and sediment management to ensure adequate navigation depth and width. Project improvements are achieved through the construction of river training structures, revetment, rock removal, and construction dredging. The Regulating Works Project is maintained through dredging and any needed maintenance to already constructed features. The long-term goal of the Regulating Works Project, as authorized by Congress, is to alleviate or eliminate the amount of annual maintenance dredging and the occurrence of vessel accidents through the construction of river training structures to provide a sustainable navigation channel and reduce federal expenditures. Since the 1970s various environmental laws, regulations, and policies have resulted in considering the environment in the design and construction of the Regulating Works Project.

The Regulating Works, Mosenthein/Ivory Landing Phase 4 Construction Project (Mosenthein/Ivory Landing Phase 4 Project) is needed to address repetitive channel maintenance dredging issues in the project area. Frequent dredging has been required in the area in order to address navigation channel depth and width issues. Bankline failures and associated channel widening have contributed to navigation channel shoaling and loss of private land in the area. Repetitive maintenance dredging has been necessary between river miles (RM) 173.5 and 170.5. Construction of a river training structure and revetments would provide a sustainable alternative to repetitive maintenance dredging. Construction of the Mosenthein/Ivory Landing Phase 4 Project is proposed to begin in 2014.

The planning of specific construction projects for the Regulating Works Project, including the Mosenthein/Ivory Landing Phase 4 Project, requires extensive coordination with resource agency partners and the navigation industry. The U.S. Fish and Wildlife Service, Missouri Department of Conservation, Illinois Department of Natural Resources, and multiple navigation industry groups were involved in the planning of the Mosenthein/Ivory Landing Phase 4 Project.

Prior Reports

The Programmatic impacts of the District's Regulating Works Project are addressed by the 1976 Environmental Impact Statement (1976 EIS) – *Mississippi River between the Ohio and Missouri Rivers (Regulating Works)*, (USACE 1976). The Mosenthein/Ivory Landing Phase 4 Environmental Assessment addresses site-specific impacts not covered in the 1976 EIS.

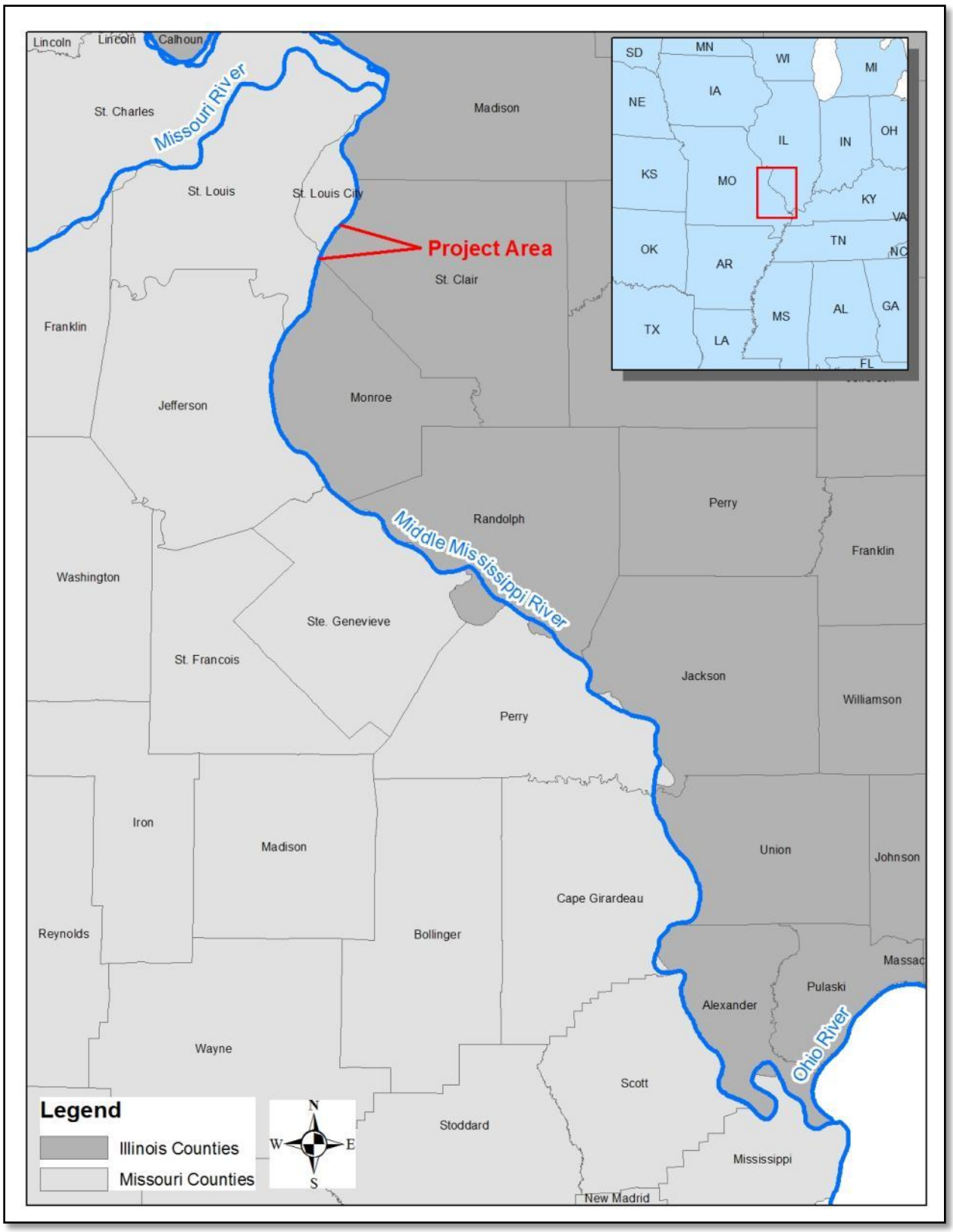

Figure 1. Project location.

2. Alternatives Including the Proposed Action

This section describes the alternatives or potential actions that were considered as ways to address the issues with maintaining the depth and width of the navigation channel at the Mosenthein/Ivory Landing Phase 4 Project site. Alternatives will be described and their environmental impacts and usefulness in achieving the project objectives will be compared.

Alternative 1: No Action Alternative. The No Action Alternative consists of not constructing any new river training structures or revetment in the project area but continuing to maintain the existing river training structures. Dredging would continue as needed to address the shoaling issues in the project area to fulfill the project's navigation purpose. Future loss of land due to bankline erosion would affect privately-owned property.

Alternative 2: Proposed Action. The Proposed Action consists of constructing rootless dike 173.4L and placing bankline revetment at four locations on the left descending bank (L) from RM 175 to 171 (see Table 1 and Figures 2 and 3 below).

Table 1. Features associated with the Proposed Action.

Location by river mile	Proposed Feature	Purpose
173.4 (L)	Construct new rootless dike 550 feet long. Top elevation will be 389 feet (+15 feet Low Water Reference Plane).	Needed to constrict the channel and increase capacity to transport sediment.
175 – 171 (L)	Place approximately 11,500 linear feet of new revetment intermittently from RM 175-171.	Needed to prevent bankline erosion and associated channel widening and shoaling.

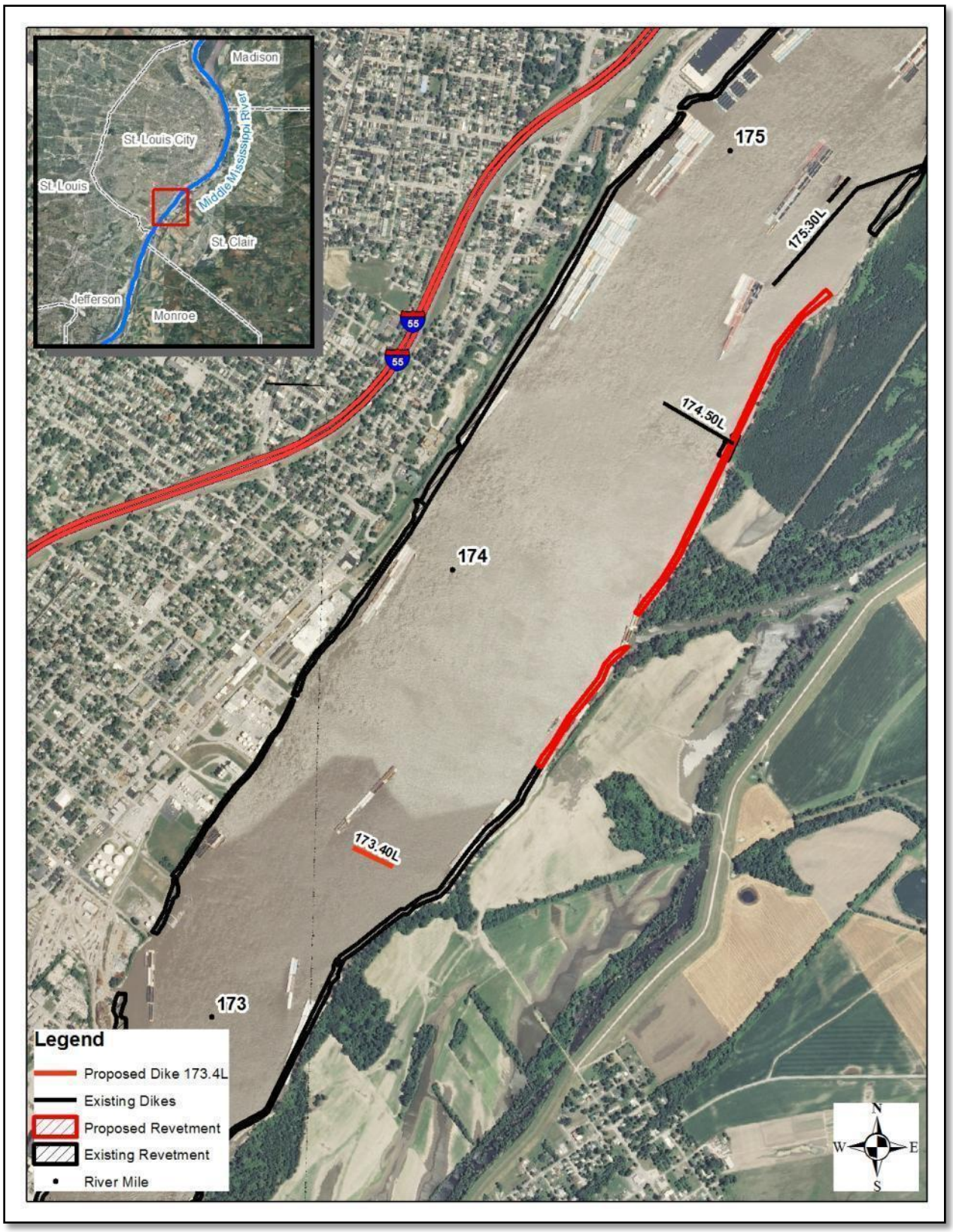

Figure 2. Locations of proposed revetment and proposed dike 173.4L.

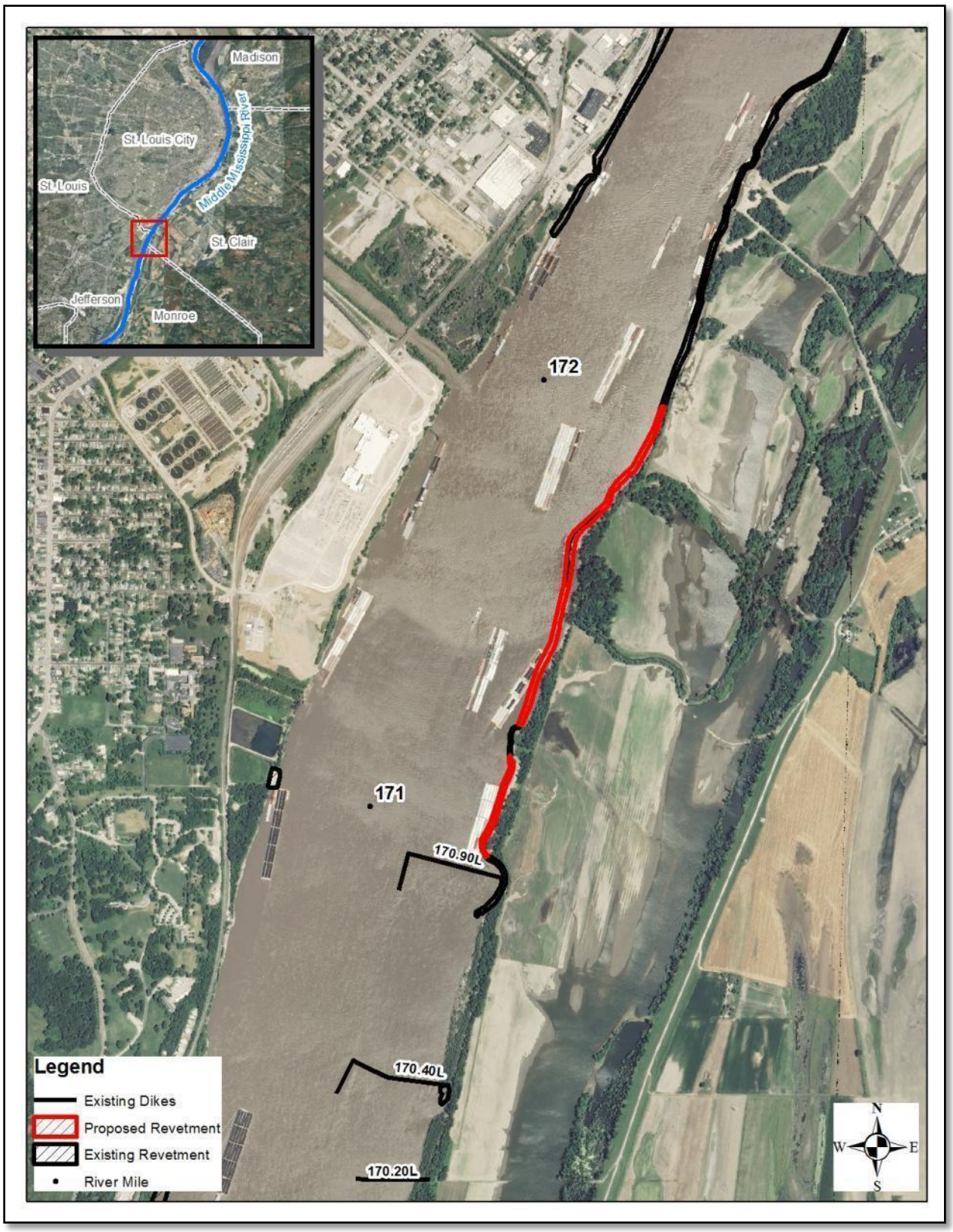

Figure 3. Locations of proposed revetment between river miles 172 and 171.

Development of Alternatives. In order to develop potential alternatives to address the navigation channel problems in the Mosenthein/Ivory Landing Phase 4 Project area, the District utilized a Hydraulic Sediment Response model (HSR model). HSR models are small-scale physical sediment transport models used by the District to replicate the mechanics of river sediment transport. HSR models allow the District to develop multiple configurations of river training structures for addressing the specific objectives of the project in question in a cost-effective and efficient manner. The process of alternatives development using HSR models starts with the District calibrating the model to replicate project site conditions. Various configurations of river training structures are then applied to the models to determine their effectiveness in addressing the needs of the project. For the Mosenthein/Ivory Landing Phase 4 Project the District utilized the Carondelet HSR model study. The Carondelet HSR model study analyzed 31 different configurations of river training structures to determine the best combinations for reducing the need for dredging in the lower Mosenthein/Ivory reach while minimizing environmental impacts and not impacting fleeting areas in the vicinity. Ultimately, construction of a new dike at RM 173.4L was determined to provide the best results for the project. Detailed information on the Alternatives considered can be found in the on-line Carondelet HSR model study report:

http://mvs-wc.mvs.usace.army.mil/arec/Reports_HSR_Model.html

The revetment associated with the Proposed Action is necessary in order to prevent channel widening in the project area. The left descending bank in the project area has eroded up to 140 feet in the past 20 years. Channel widening has reduced the river's energy and ability to transport sediment in the area, resulting in sediment deposition and repetitive dredging requirements in the navigation channel. The addition of revetment in the proposed locations would maintain current channel planform and prevent future channel widening.

Extensive coordination with navigation and natural resource agency partners was conducted for all features associated with the project to ensure that all concerns were considered and incorporated into project designs. The primary concern voiced was the need to avoid impacts to existing barge fleeting locations in the project area. Ultimately all partner concerns were satisfactorily resolved and consensus was reached on a path forward. Detailed information on the Alternatives development process, partner agency coordination, and alternatives eliminated from further consideration can be found in the on-line HSR model study report.

Summary of Environmental Consequences

The impacts of each Alternative on the human environment are covered in detail in Section 4, Environmental Consequences. Table 2 below provides a summary of the impacts of each Alternative by resource category.

Table 2. Summary of impacts of the No Action Alternative and the Proposed Action.

	No Action Alternative	**Proposed Action**
Achievement of project objectives	Does not reduce the need for repetitive maintenance dredging in the Project Area, and, therefore, does not meet the project objectives.	Is expected to reduce the amount of repetitive maintenance dredging in the Project Area, thereby reducing federal expenditures and meeting project objectives.
Impacts on Stages	No impacts anticipated.	No impacts anticipated at average and higher flows. Trend toward slightly lower stages at low flows expected to continue.
Impacts on Water Quality	Localized, temporary increase in suspended sediment concentrations at discharge sites.	Localized, temporary increase in suspended sediment concentrations during construction activities. Decrease in suspended sediment in immediate vicinity of revetment long-term due to reduction in bankline erosion.
Impacts on Air Quality	Minor, local, ongoing impacts due to use of dredging equipment.	Minimal air quality impacts; below de minimis levels.
Impacts on Fish and Wildlife	Entrainment of fish and macroinvertebrates at dredge locations. Avoidance of dredge and disposal areas by mobile organisms. Loss of fish and macroinvertebrates at disposal sites.	Avoidance of sites during construction. No conversion of aquatic habitat to terrestrial. Increased fish and macroinvertebrate use of structure locations due to increased bathymetric, flow, and substrate diversity. Some loss of fish and macroinvertebrate habitat due to reduced woody debris inputs.
Impacts on Threatened and Endangered Species	May affect but not likely to adversely affect threatened and endangered species.	May affect but not likely to adversely affect threatened and endangered species.
Impacts on Navigation	Increasing requirement for repetitive maintenance dredging due to continued bankline erosion; increasing potential for barge groundings	Reduction in the amount and frequency of repetitive maintenance dredging in the project area; reduction in barge grounding rates
Impacts on Historic and Cultural Resources	Impacts to historic and cultural resources unlikely.	No known historic resources would be affected. Impacts to unknown historic and cultural resources unlikely.

3. Affected Environment

This section presents details on the historic and existing conditions of resources within the project area that would potentially be affected by project-related activities. The section is broken into four resource categories: physical resources, biological resources, socioeconomic resources, and historic and cultural resources. This section does not address impacts of the Alternatives, but provides a background against which Alternatives can be compared in Section 4, Environmental Consequences.

Physical Resources

Stages - Rated gages, locations where both discharge and stage is collected and combined to create a rating curve, are good sources of long term stage and discharge data. Only three rated gages exist on the MMR: St. Louis, Chester and Thebes. Due to backwater effects from the Ohio River the gage at Thebes is not a good indicator of changes in stage over time. Throughout the period of record the two agencies that have been responsible for the collection of gage data on the MMR are the Corps of Engineers and U.S. Geological Survey (USGS). The USGS has been the primary agency responsible for stream gaging since 1933. Due to discrepancies in methodology and instrumentation used by the Corps and USGS it is impossible to analyze the entire period of record with confidence; therefore, only data collected by the USGS will be used here to describe the changes in stage for fixed discharges over time (Watson et al. 2013a; Watson et al. 2013b; Huizinga 2009; Munger et al. 1976).

Stages have been decreasing over time for flows below 200,000 cfs at the St. Louis gage (see Figure 4 below). For other in-bank flows between 200,000 cfs and 500,000 cfs there has been no change over time. There is a slight upward but statistically insignificant trend for stages at the overbank flow of 700,000 cfs. Stages at Chester for lower in-bank flows up to 200,000 cfs have decreased with time. There was no change in stages at flows of 200,000 cfs and 400,000 cfs. There was a slightly increasing trend at 300,000 cfs. For overbank flows of 500,000 cfs and 700,000 cfs, there were slight increasing trends observed at the Chester gage.

In general, at both the St. Louis and Chester gages there has been a decrease in stage over time for lower flows, no change in stages over time for flows between midbank and bankfull, and a slight increase in stages for high overbank flows (Huizinga 2009). Huizinga (2009) and Watson et al. (2013a) attributed the slight increase in out of bank flows to the construction of levees and the disconnection of the river from the floodplains. Both Watson et al. (2013a) and Huizinga (2009) observed a shift occurring in the out of bank flows in the mid-1960s and attributed it to the completion of the Alton to Gale levee system which paralleled the entire MMR. At these high flows navigation structures are submerged by 7 to 10 feet.

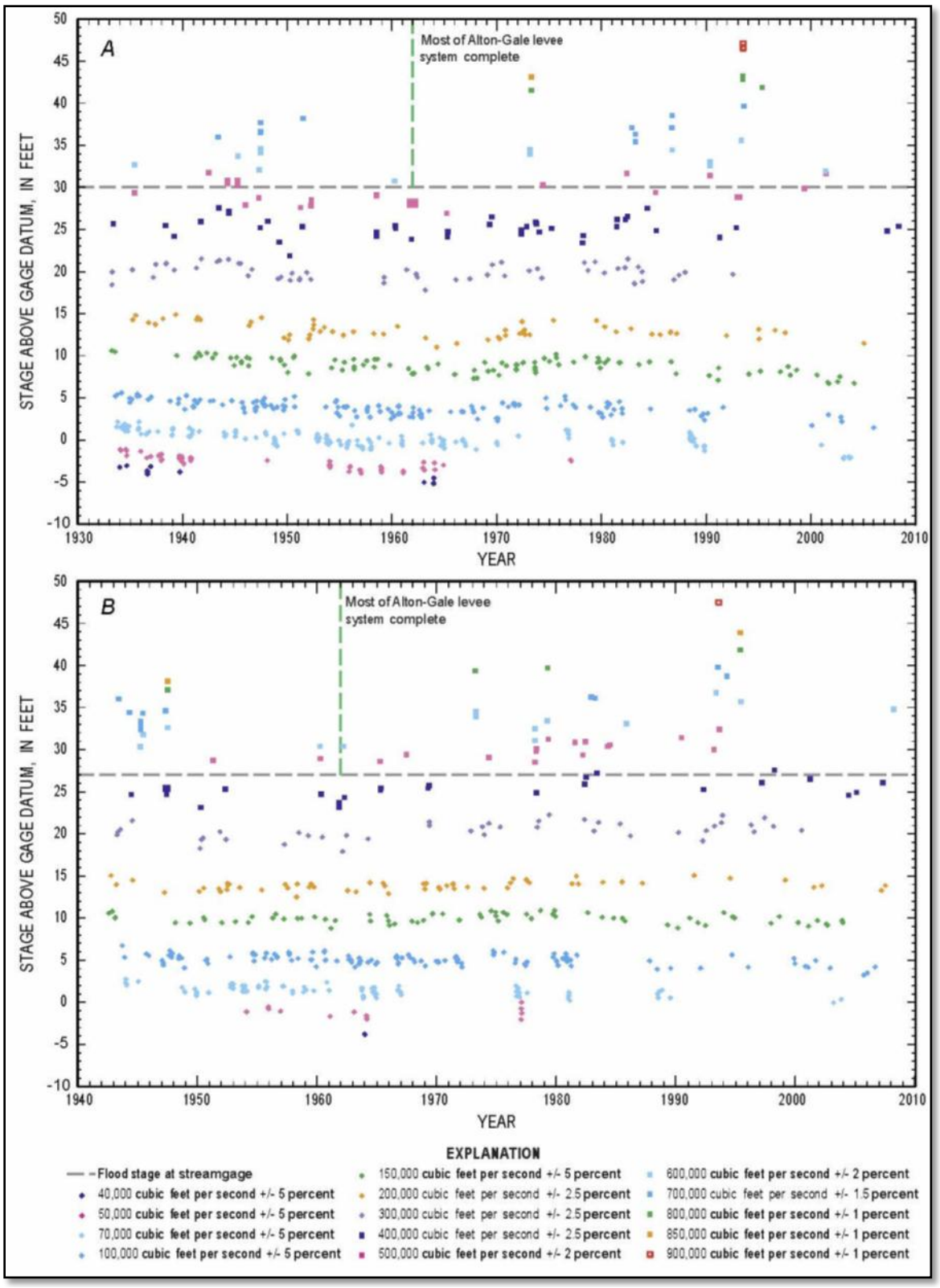

Figure 4. Stage for a given discharge range with time from measurements made at the streamgages at (A) St. Louis, Missouri, and (B) Chester, Illinois, on the Middle Mississippi River (from Huizinga 2009).

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

Section 303(d) of the Clean Water Act requires states to generate lists of impaired water bodies every two years. Impaired water bodies are those that do not meet state water quality standards for the water bodies' designated uses. On the 2012 303(d) list for Illinois, the Mississippi River in the vicinity of the project area was listed as impaired for fish consumption due to mercury and PCB contamination and impaired for public and food processing water supplies due to manganese concentration. The Mississippi River is not on the 2012 303(d) list for Missouri.

Illinois has fish consumption advisories for the Mississippi River for channel catfish (one meal per week), common carp (one meal per week), and sturgeon (one meal per month) due to PCB contamination. Missouri has fish consumption advisories for the Mississippi River for shovelnose sturgeon (1 per month) due to PCB and chlordane contamination, and for flathead catfish, blue catfish, channel catfish, and common carp (1 per week) due to PCB, chlordane, and mercury contamination.

Air Quality – The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead. EPA regulates these pollutants by developing human health-based or environmentally-based permissible pollutant concentrations. EPA then publishes the results of air quality monitoring, designating areas as meeting (attainment) or not meeting (nonattainment) the standards or as being maintenance areas. Maintenance areas are those areas that have been redesignated as in attainment from a previous nonattainment status. A maintenance plan establishes measures to control emissions to ensure the air quality standard is maintained in these areas. On the Missouri side, the Mosenthein/Ivory Landing Phase 4 Project area is designated as a nonattainment area for 8-hour ozone (1997 and 2008 standards) and particulate matter and is designated as a maintenance area for 1-hour ozone and carbon monoxide (USEPA 2013). On the Illinois side, the project area is designated as a nonattainment area for 8-hour ozone (2008 standard) and particulate matter and is designated as a maintenance area for 1-hour ozone and 8-hour ozone (1997 standard; USEPA 2013).

Biological Resources

Fish and Wildlife – The changes in fish and wildlife habitat in the Mississippi River Basin that have occurred over the past 200 years are well documented. Many studies have analyzed the historic changes in habitat in the Mississippi River Basin from pre-colonization times to present

day (e.g., Simons et al. 1974; UMRBC 1982; Theiling et al. 2000; WEST 2000; and Heitmeyer 2008). A variety of actions have impacted the makeup of the Mississippi River basin since colonization including urbanization, agriculture, levee construction, dam construction, and river training structure placement. Many of the changes in the Middle Mississippi River planform are attributable to improvements made for navigation including river training structure placement and associated sedimentation patterns.

An analysis of changes in river planform in the MMR was recently conducted by the District (Brauer et al. 2005; Brauer et al. 2013). The analysis utilized historic and modern maps, surveys, and aerial photography to calculate changes through time in planform width, channel width, channel surface area, side channel width, etc. The analysis demonstrates that the MMR went through a period of planform widening in the mid-nineteenth century followed by a period of planform narrowing from the end of the nineteenth century through the mid-twentieth century. The period of narrowing corresponded to the widespread use of river training structures and bank protection for navigation improvements. The first training structures were mainly permeable wooden structures which focused the river's energy into the main channel by reducing the velocities between the structures, causing sediment to deposit in channel border areas. This sediment deposition caused a significant narrowing effect on the channel. Since 1968, however, the channel width appears to have reached dynamic equilibrium with very little change (see Figure 5 below). In the 1960s, the Corps began constructing impermeable dikes primarily out of stone. The use of impermeable dikes reduced the rate of deposition between the structures when compared to the previously used permeable structures. Another change was the reduction of the design elevation of dike fields. Unlike in the past, the area between the structures did not fill with sediment, grow vegetation and become part of the floodplain. In the 43 years between 1968 and 2011 the average planform width remained relatively steady with a net reduction in average planform width of 167 feet. This was the result of the changes in structure material and elevation.

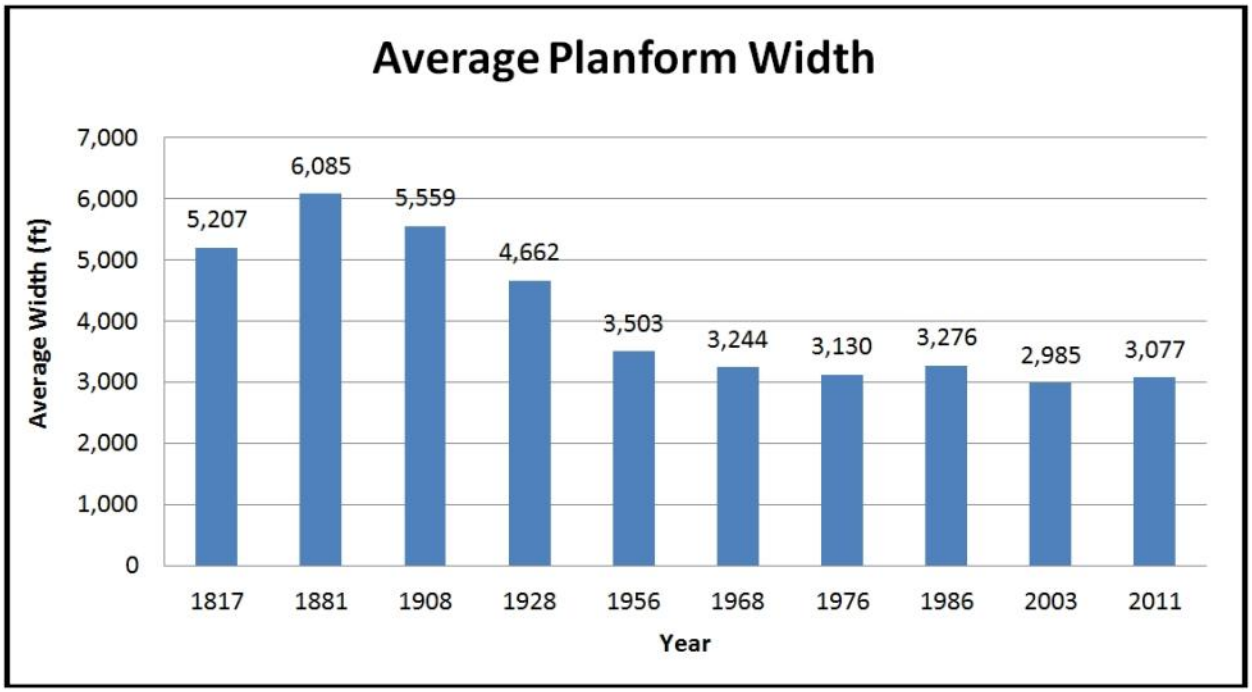

Figure 5. Average planform width of the MMR from 1817 to 2011.

In response to natural resource agency partner concerns about the potential impacts of traditional dikes on fish and wildlife habitat, the St. Louis District began to experiment with innovative dike configurations that attempt to achieve the navigational objectives of a safe and dependable navigation channel in an environmentally sensitive manner. The District has designed and implemented many different dike configurations including notched dikes, rootless dikes, L-dikes, W-dikes, chevron dikes, multiple roundpoint structures, etc. The intent of the innovative dike designs is to provide bathymetric and flow diversity compared with the traditional structures constructed since the 1960s while maintaining the function of deepening the navigation channel. The District currently builds very few traditional wing dike structures in the MMR.

The fish community in the project area is expected to be typical of the Middle Mississippi River fish community in general. Fish community monitoring in the project area conducted from 2003 to 2007 (RM 183 to 182; Schneider 2012) collected a total of 35 species of fish representing 14 families. The most commonly encountered native species included channel catfish (*Ictalurus punctatus*), freshwater drum (*Aplodinotus grunniens*), gizzard shad (*Dorosoma cepedianum*), goldeye (*Hiodon alosoides*), blue catfish (*I. furcatus*), shoal chub (*Macrhybopsis hyostoma*), smallmouth buffalo (*Ictiobus bubalus*), and flathead catfish (*Pylodictis olivaris*). These species accounted for approximately 85% of the fish captured, by number. Also included in the collections were 5 species of non-native fish including silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), and bighead carp (*Hypophthalmichthys nobilis*). These species accounted for approximately 5% of the fish captured, by number. Silver carp were likely under-represented in the collection due to the sampling methodologies employed. The Middle Mississippi River sees some commercial and recreational fishing pressure. Commercial fishermen typically target common carp, bigmouth and smallmouth buffalo, catfish, freshwater drum, and recently silver carp. Recreational fishermen typically target catfish.

Macroinvertebrates are an important part of the river ecosystem as they serve as a food source for a variety of fish and wildlife species. Common macroinvertebrate fauna encountered in the MMR consist of a variety of oligochaete worms, flies, mayflies, caddisflies, and stoneflies. Sampling by Battle et al. (2007) near Cape Girardeau, Missouri showed densities of macroinvertebrates in fine substrates downstream from wing dikes ranging from approximately 3,700 to 11,700 individuals per square meter. Sixty-eight taxa were collected from fine sediments with the dominant groups being oligochaete worms, midges, and mayflies. Densities on rocks on the upstream side of wing dikes ranged from 57,800 to 163,000 individuals per square meter. Fifty taxa were collected from rock substrate with the dominant group being caddisflies.

Threatened and Endangered Species – Based on coordination with the U.S. Fish and Wildlife Service, eight federally threatened or endangered species could potentially be found in the project area. The eight species, federal protection status, and habitat can be found in Table 3. No critical habitat is located in the project area.

Table 3. Federally listed threatened and endangered species potentially occurring in the project area.

Species	Status	Habitat
Indiana bat (*Myotis sodalis)*	Endangered	Hibernacula: Caves and mines; Maternity and foraging habitat: small stream corridors with well developed riparian woods; upland and bottomland forests
Least tern (interior population) (*Sterna antillarum*)	Endangered	Large rivers - nests on bare alluvial and dredge spoil islands
Pallid sturgeon (*Scaphirhynchus albus*)	Endangered	Mississippi and Missouri Rivers
Gray Bat *(Myotis grisescens)*	Endangered	Caves and mines; forages over rivers and reservoirs adjacent to forests
Spectaclecase *(Cumberlandia monodonta)*	Endangered	Medium to large rivers with coarse sand and gravel
Sheepnose *(Plethobasus cyphyus)*	Endangered	Medium to large rivers with gravel/mixed sand and gravel
Pink Mucket *(Lampsilis abrupta)*	Endangered	Medium to large rivers with strong currents
Decurrent False Aster *(Boltonia decurrens)*	Threatened	Recently disturbed areas within wet prairies, shallow marshes, and shores of open rivers, creeks, and lakes

Socioeconomic Resources

Navigation

The Middle Mississippi River is a critically important navigation corridor that provides for movement of a wide variety of commodities of local, national, and international importance. The St. Louis Harbor is the third largest inland port in the nation. Approximately 106 million tons of cargo passed through the MMR in 2011, the most recent year with data available (USACE 2013). Food and farm products (37 million tons), coal (26 million tons), crude materials (14 million tons), fertilizers (12 million tons), and petroleum products (10 million tons) accounted for the majority (93%) of shipments in 2011.

Repetitive channel maintenance dredging occurs regularly in the project area from RM 173.5 to 170.5 (see Figure 6). The area has required dredging 35 times since 2000 at an average cost of $240,000 per dredging event.

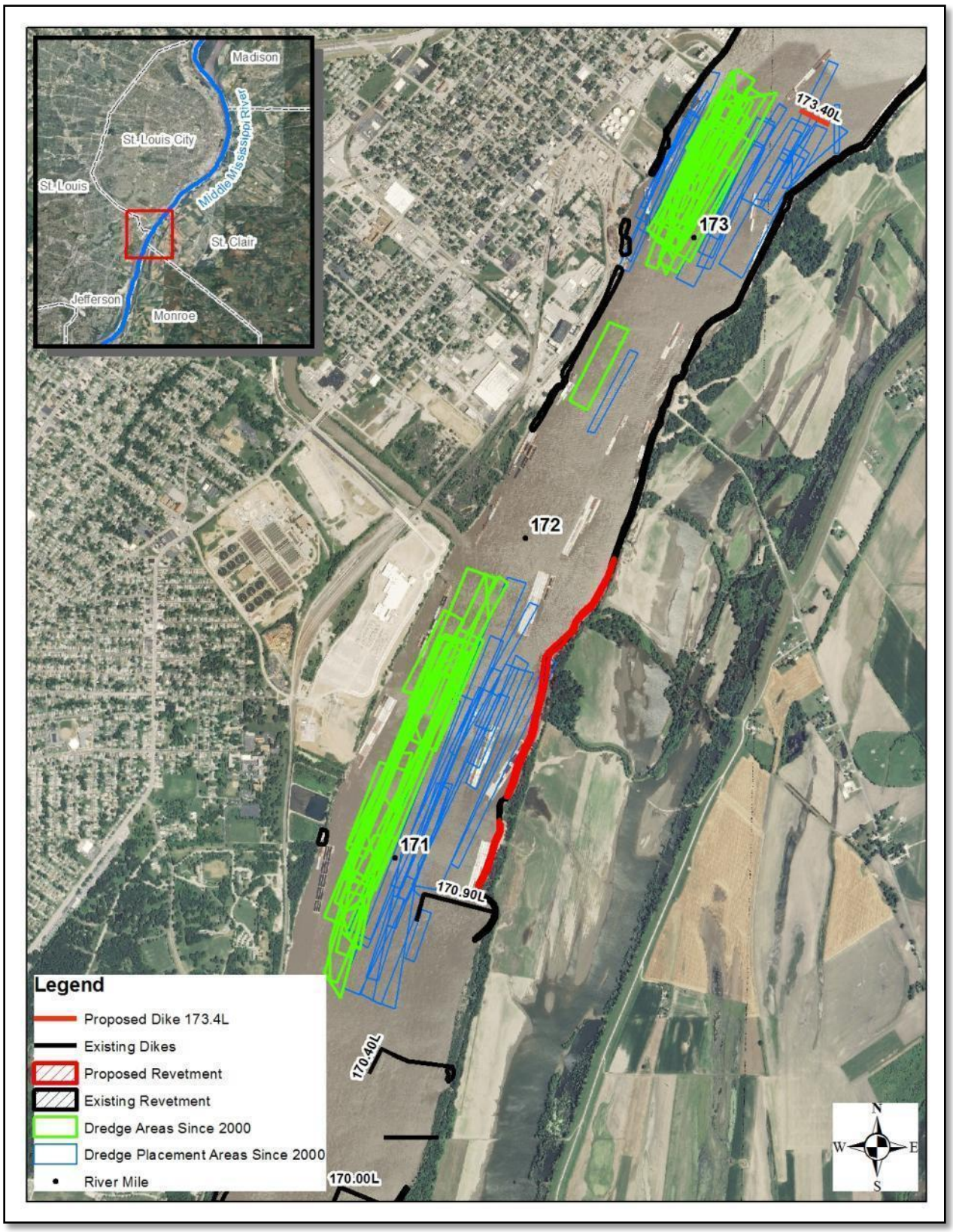

Figure 6. Repetitive dredging areas between river miles 173.5 and 170.5 since 2000.

Historic and Cultural Resources

During the summer of 1988 when the Mississippi River was at one of its lowest levels on record, the St. Louis District Corps of Engineers conducted an aerial survey of exposed shipwrecks between Saverton, Missouri, and the mouth of the Ohio River. The nearest wreck to the proposed features was located approximately at RM 176. No cultural resource was visible on the exposed riverbed at the location. In 2010 and 2013 high resolution multi-scan hydro-surveys of the project area were conducted and no topographic anomalies were detected.

The proposed revetments are located on relatively recently accreted lands. The location of the Illinois bank of the Mississippi River between RM 171 and 175 has changed appreciably in the last 150 years. River regulating structures and practices have led to a significant narrowing of the MMR with accretion of land along the Illinois bank. Much of this transformation at this location was due to the "capture" of Arsenal Island. Originally formed upstream on the Missouri side of the river in the first half of the 19th century, this ephemeral landform continuously shifted downstream and, moreover, in 1874, the navigation channel shifted from the east to the west of the island. Between 1878 and 1882 the Federal government constructed a dike from the northeastern tip of the island, and then a closing structure south of the dike, which led to rapid land accretion largely closing the eastern channel. Maps and historical narratives indicate that the riverbank generally stabilized near its current location in the 1880s. A pedestrian archaeological survey was conducted along the proposed revetment alignment in 2013 to ensure that no historical structures or features would be adversely affected. Two USACE archaeologists conducted the survey over the course of two days and no significant resources were encountered.

4. Environmental Consequences

The Environmental Consequences Section of this report details the impacts of the Alternatives on the human environment. The section is organized by resource, in the same order in which they were covered in Section 3, Affected Environment. Within each resource category, impacts will be broken out by Alternative. The No Action Alternative consists of not constructing any new river training structures in the project area but continuing to maintain the existing river training structures. Dredging under the No Action Alternative would continue as needed to address the shoaling issues in the project area, presumably at increasing levels due to continued bankline erosion. The Proposed Action consists of constructing rootless dike 173.4L and placing bankline revetment at four locations on the left descending bank from RM 175 to 171.

Physical Resources

Stages

Impacts of the No Action Alternative on Stages – Stages in the vicinity of the project area and the Middle Mississippi River would be expected to be similar to current conditions under the No Action Alternative.

Impacts of the Proposed Action on Stages – With implementation of the Proposed Action, stages at average and high flows both in the vicinity of the project area and on the Middle Mississippi River are expected to be similar to current conditions. An abundance of research has been conducted analyzing the impacts of river training structures on water surfaces dating to the 1940s. This research has analyzed historic gage data, velocity data, and cross sectional data. Physical and numerical models have also been used to determine the effects of dikes on water surfaces. It should be noted that some published research supports the contention that river training structures raise flood heights. A summary of research on the effects of river training structures on flood heights can be found in Appendix A. Based on an analysis of this research by the Corps and other external reviewers, the District has concluded that river training structures do not affect water surface elevations at higher flows.

With respect to water surface elevations at low flows, analysis of the data shows a trend of decreasing stages over time. This decrease could be a result of river training structure placement and/or a decrease in the sediment load in the river due to construction of reservoirs on Mississippi River tributaries (Huizinga 2009). The same conclusion regarding decreasing stages at low flows was reached in the 1976 Regulating Works EIS (USACE 1976). The 1976 EIS concluded that, as a result of stage decreases, many of the remaining side channels in the MMR might be lost at some point in the future due to sedimentation. While much research has been performed on the impacts of river training structures at high flows, similar research has not been performed on the impacts at low flows. However, since the 1976 EIS, there has been an increasing recognition of the importance of side channel habitat on the MMR and increased emphasis on side channel restoration. Through the District's Biological Opinion Program (http://mvs-wc.mvs.usace.army.mil/arec/Bio_Op.html), Avoid and Minimize Program (http://mvs-wc.mvs.usace.army.mil/arec/AM.html), innovative river training structure design, and other restoration initiatives, side channel restoration and preservation on the MMR has occurred and will continue to occur for the foreseeable future, resulting in a substantial preservation of the side channels that existed in 1976. While the Proposed Action may have

some effect on water surface elevations at lower flows resulting in some impact to side channels, these impacts are being minimized through other USACE programs, which have currently seen success in restoring and preserving side channels affected by river training structures.

Water Quality

Impacts of the No Action Alternative on Water Quality – Periodic dredging activities would continue to cause re-suspension of river sediments at the point of discharge, causing turbidity, increased suspended sediment concentration, and decreased light penetration. The impact would be localized and would dissipate quickly. Dredged sediments in the area are typically sand with little associated fines and would, therefore, not be expected to release contaminants into the water column at concentrations that alone or in combination with other contaminants would cause toxic effects to aquatic organisms.

Impacts of the Proposed Action on Water Quality – Construction activities would cause temporary increases in turbidity and suspended sediment concentrations in the immediate vicinity of the structure locations. The impact would be localized and would dissipate quickly. Sediments in the area are typically sand with little associated fines and would, therefore, not be expected to release contaminants into the water column at concentrations that alone or in combination with other contaminants would cause toxic effects to aquatic organisms.

The proposed dike structure is designed to change the sedimentation patterns in the project area and would, therefore, cause some minor temporary changes in the suspended sediment concentration in the immediate area. The proposed revetment is designed to reduce bankline erosion in the project area and would, therefore, reduce suspended sediment concentration in the immediate vicinity.

Limestone material used for construction could potentially affect local water chemistry (e.g., alkalinity, hardness, and pH). However, given the prevalence of limestone in the watershed geology and the quick dissipation of any associated fine materials in the water column, the impact is likely to be negligible.

The District is currently in the process of obtaining authorization for the project under sections 404 and 401 of the Clean Water Act. All permits necessary for completion of the project will be obtained prior to project implementation.

Air Quality

Impacts of the No Action Alternative on Air Quality – Air quality in the vicinity of the project area would be expected to be similar to current conditions. Equipment used for repetitive dredging activities would generate emissions on an occasional, ongoing basis from the use of petroleum products. Impacts would be minor and local in nature.

Impacts of the Proposed Action on Air Quality – When a federal action is being undertaken in a nonattainment area, the federal agency responsible for the action is required to determine if its action conforms to the applicable State Implementation Plan (SIP). A SIP is a plan that provides for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS) and includes emission limitations and control measures to attain and

maintain the NAAQS. An analysis was conducted to determine the conformity of the Mosenthein/Ivory Landing Phase 4 Project to the SIPs for the states of Missouri and Illinois. As a result of the analysis, the District has concluded that the project would have minimal air quality impacts and they would be below the de minimis levels for the area.

Biological Resources

Fish and Wildlife

Impacts of the No Action Alternative on Fish and Wildlife – Periodic maintenance dredging and dredged material disposal operations would have the potential to affect fish and wildlife resources through direct removal of individual organisms (entrainment) at the dredging site. The degree to which fish and wildlife resources are impacted is largely a factor of the density of the organisms in the area of the dredge cut at the time of dredging operations. Macroinvertebrate densities tend to increase with greater sediment stability, lower water velocities, and higher silt and organic matter concentrations (Galat et al. 2005). Given the shifting nature of the sediments, high water velocities, and low silt concentrations in the main channel of the MMR, the area is not ideal habitat for colonization by bottom-dwelling macroinvertebrates (Koel and Stevenson 2002; Sauer 2004), but likely provides habitat for low densities to exist. Various fish species likely utilize the habitat as well and could be impacted at dredge sites. The Corps' Engineer Research and Development Center published a Technical Note in 1998 that summarized existing literature regarding potential impacts to aquatic organisms from dredging operations (Reine and Clarke 1998). Fish entrainment rates varied widely among species and studies and were reported as ranging from <0.001 to 0.594 fish/cubic yard of material dredged.

The St. Louis District recently contracted a dredge monitoring study for the Chain of Rocks East Canal Levee Project (Blodgett 2010). The project involved the use of sand dredged from the main channel of the MMR for construction of a seepage berm on the Chain of Rocks Canal Levee. Because there was concern that dredging operations could entrain endangered pallid sturgeon in the project area, monitoring of dredged material was conducted to quantify impacts of dredging operations on the fish community. A total of approximately 800,000 cubic meters of material was dredged during the project, and fish entrainment monitoring was conducted during approximately 15% of the operation. No pallid sturgeon were captured during the study. Nine shovelnose sturgeon and 38 other fish representing 6 species were captured during the study.

Aside from direct impacts from dredge entrainment, fish and wildlife could also be impacted directly by disposal of dredged material. Organisms in the vicinity of the disposal area could be affected by changes in water quality including increased suspended solids and could be covered by settling sediments. Increased suspended solids in the water column could cause abrasion of body and respiratory surfaces. Most mobile organisms in the vicinity of the disposal location, however, would likely avoid the area during dredging operations. Changes in water quality would be short-lived and localized in extent.

Recovery of fish and wildlife resources at the dredge and disposal location occurs over a period of weeks, months, or years, depending on the species in question (USACE 1983). Areas with unstable sediment such as those in the main channel of the MMR are much more likely to have associated fish and wildlife species more adapted to physically stressful conditions and, therefore, would be more likely to withstand stresses imposed by dredging and disposal and recover more quickly (USACE 1983).

In summary, the amount of dredging going forward would remain similar to what has been experienced recently. Dredging impacts would include potential entrainment of aquatic species as well as behavioral changes associated with noise and turbidity levels. Some mortality of individual fish and invertebrates would be anticipated. Overall impacts to the fish and invertebrate communities in the project area would be expected to be localized, minor, and short-term in nature.

Impacts of the Proposed Action on Fish and Wildlife

Dike Effects – The hydrodynamics around training structures are complex and vary greatly depending upon the type of training structure in question and where it is located within the river channel. A traditional wing dike constructed perpendicular to flow and tied in to the river bank would be expected to deepen the adjacent navigation channel, cause a scour hole to develop at the dike tip, and cause sediment accretion downstream from the structure near the river bank. Shields (1995) studied 26 groups of traditional dikes in the Lower Mississippi River and determined that the aquatic volume and area of associated low-velocity habitat (important aquatic habitat) were reduced by 38% and 17%, respectively. Most of the changes occurred shortly after construction, and after initial adjustment, habitat area and volume fluctuated about a condition of dynamic equilibrium. As detailed in Section 3 above, dike construction on the MMR has, historically, caused a narrowing of the river planform over time due to this sediment accretion process followed by growth of terrestrial vegetation. However, the analysis of changes in river planform in the MMR recently conducted by the District (Brauer et al. 2005; Brauer et al. 2013) demonstrates that channel widths in the MMR appear to have reached a state of dynamic equilibrium where very little conversion to terrestrial habitat is occurring subsequent to river training structure placement. In addition, innovative structures such as the proposed rootless dike are intended to provide bathymetric diversity, flow refuge, and split flow conditions that differ from traditional wing dikes. Based on the model studies conducted for the project and District experience with similar river training structures, the proposed dikes are expected to deepen the adjacent navigation channel, create bathymetric diversity in the immediate vicinity of the structure, provide flow refuge immediately downstream, and create split-flow conditions at certain river stages.

Regardless of the specific configuration of the river training structures utilized, rock structures can provide improved habitat for fish by providing areas of reduced flow, a more diverse substrate, and additional cover. In addition, they can provide more suitable substrate for a wide variety of benthic organisms. Barko et al. (2004) found that species richness was greatest at wing dikes in the Middle Mississippi River for both adult and age-0 fishes when compared with main channel borders. However, they did find differences in species composition. Hartman and Titus (2009) studied dikes and reference sites on the Kanawha River, West Virginia and found that fish used dikes as much as or more than sites without dikes and that differences in taxonomic composition occurred. A study of larval fish use of dike structures on the Kanawha River found significantly higher capture rates of larval fish at dike sites than at reference sites (Niles and Hartman 2009). The difference in capture rates was attributed to reduced velocities provided by dikes. On the Upper Mississippi River, Madejczyk et al. (1998) found that fish abundance and diversity measures differed little among channel border habitat types in Pool 6, but significantly

larger fish were present at locations with structure (wing dikes, woody snags) than at sites with bare shorelines.

Limited sampling conducted by the St. Louis District at an offset dike field in the MMR at RM 60.0 to 57.5 (USACE 2012) showed an increase in bathymetric, flow, and sediment diversity from pre-construction to post-construction and showed similar fish community composition pre- and post-project. Schneider (2012) investigated fish community and habitat changes associated with chevron dike construction in the MMR St. Louis Harbor and found increased fish and habitat diversity associated with chevrons dikes as compared to pre-construction conditions and open water control sites.

In summary, the proposed rootless dike 173.4L is not expected to result in a loss of aquatic habitat due to sedimentation and conversion to terrestrial habitat. The structure is expected to increase bathymetric, flow, and sediment diversity in the immediate vicinity of the structure. Fish response to these changes in habitat is difficult to predict quantitatively, but, based on prior studies, fish use of the area may increase after construction related disturbance ends.

Revetment Effects – The proposed revetment is designed to prevent the continued erosion and migration of the associated bankline in the project area. Preventing bankline erosion could have a minor negative impact on the fish community in the area. Bankline erosion frequently leads to woody debris inputs to the system. Woody debris is an important habitat component in the MMR, providing nutrient inputs, macroinvertebrate colonization substrate, and habitat diversity for fish and wildlife resources. Although woody debris inputs through bankline erosion would be prevented, woody debris would still enter the system from the project area during overbank flow events.

Similar to rock dike structures, revetment can improve fish habitat by providing substrate diversity, additional cover, and more suitable substrate for a wide variety of benthic macroinvertebrate colonization (Beckett et al. 1983; Bingham 1982; Nord and Schmulbach 1973; Payne et al. 1989). Farabee (1986) studied fish at two revetted and two natural main channel border sites in Pool 24 over a 3-year period. Although the number of species at each bankline type were similar, total fish collected was greater on banklines with revetments, especially where larger stone was present. On the Lower Mississippi River, Pennington et al. (1983) found that the numbers of fish species taken from natural and revetted banks were similar. However, the relative abundance of individual species was different in the two habitats, with sport and commercial species more abundant by weight on revetted banks.

In summary, the proposed revetment is likely to reduce the amount of beneficial woody debris entering the system from the project area through bankline erosion. However, woody debris would continue to enter the system during overbank flow events, and revetment would benefit fish and wildlife by providing rock substrate.

Threatened and Endangered Species
A programmatic (Tier I) consultation (USACE 1999), conducted under Section 7 of the Endangered Species Act, considered the systemic impacts of the operation and maintenance of the 9-Foot Channel Navigation Project on the Upper Mississippi River System and addressed listed species as projected 50 years into the future (USFWS 2000). The consultation did not include individual, site specific project effects or new construction. It was agreed that site specific project impacts and new construction impacts would be handled under separate Tier II consultation. Although channel structure impacts were covered under the Tier I consultation, other site and species specific impacts could occur. As such, the Mosenthein/Ivory Landing Phase 4 Project requires Tier II consultation. Accordingly, the District has prepared a Tier II Biological Assessment to determine the potential impacts of the project on federally threatened and endangered species. As outlined in the Biological Assessment in Appendix B, the determination has been made that the Proposed Action is not likely to adversely affect federally threatened or endangered species.

Although the bald eagle was removed from the federal list of threatened and endangered species in 2007, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unregulated take of bald eagles, including disturbance. The U.S. Fish and Wildlife Service developed the National Bald Eagle Management Guidelines (USFWS 2007) to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute disturbance. No bald eagle nest trees are known to occur in the immediate vicinity of the project area at this time. If any nest trees are identified in the project area, the National Bald Eagle Management Guidelines will be implemented to minimize potential project impacts and appropriate coordination with the U.S. Fish and Wildlife Service will be conducted.

Socioeconomic Resources

Navigation
Impacts of the No Action Alternative on Navigation – With the No Action Alternative, the potential for barge groundings would be expected to increase. Repetitive maintenance dredging activities would be expected to continue and increase as the unstable banks continue to fail. Recent dredging costs in the project area have averaged approximately $650,000 per year. These expenditures would be expected to continue and increase in the future.

Impacts of the Proposed Action on Navigation – Implementation of the Proposed Action is expected to reduce the amount and frequency of repetitive maintenance dredging necessary in the project area. Barge grounding rates would also be expected to decrease in the area. The estimated cost of the Proposed Action is $4,000,000.

Historic and Cultural Resources

Impacts of the No Action Alternative on Historic and Cultural Resources – Continued dredging operations under the No Action Alternative are not anticipated to impact any known historic and cultural resources in the project area. Any undocumented historic and cultural resources that may have existed in the project area likely would have been destroyed by previous dredging activities.

Future maintenance dredging under the No Action Alternative would likely occur in the same locations as previous dredging, and, therefore, would be unlikely to impact undocumented historic and cultural resources.

Impacts of the Proposed Action on Historic and Cultural Resources – All construction work on the dike will be carried out via barge, without recourse to land access; therefore, any effects are limited to submerged cultural resources. Primary among these are historic period shipwrecks. Given the continual river flow and associated sedimentary erosion, deposition, and reworking, it is highly unlikely that any more ephemeral cultural material remains on the river bed.

As with other training structures, construction of revetment would be conducted via barge, without recourse to land access. The placement of the rock, however, has the potential to damage or destroy any resource on the bankline. With all revetment segments, historical research was conducted on the proposed location. The proposed work was determined to be on recently accreted land. Recently accreted land is highly unlikely to contain deeply buried cultural resources. A pedestrian archaeological survey was also conducted at the proposed placement sites. No significant resources were encountered.

Given the features' construction method (with no land impact), the recent age of the landform, and the lack of any survey evidence for extant wrecks or other significant cultural resources, it is the District's opinion that the proposed undertaking will have no significant effect on cultural resources. The Illinois State Historic Preservation Officers (SHPO) concurred that the proposed actions would not affect listed or eligible historic properties. A copy of the correspondence is included in Appendix C. If, however, cultural resources were to be encountered during construction, all work would stop in the affected area and further consultation would take place.

Twenty-eight federally recognized tribes affiliated with the St. Louis District were consulted and no objections to the project were raised. A copy of the consultation letter is included in Appendix C.

Cumulative Impacts

Council on Environmental Quality (CEQ) regulations define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR §1508.7). In order to assist federal agencies in producing better cumulative impact analyses, CEQ developed a handbook, "Considering Cumulative Effects under the National Environmental Policy Act" (CEQ 1997). Accordingly, the Mosenthein/Ivory Landing Phase 4 EA cumulative impact analysis generally followed the steps laid out by the handbook.

As summarized in Table 4 below, the cumulative impact analysis involved determining the incremental impact of the Project Alternatives on resources in the area in the context of all of the other past, present, and reasonably foreseeable future actions that might also impact each resource category. The analysis looked beyond the footprint of the project area and beyond the Middle Mississippi River to include impacts to the resources throughout the Upper Mississippi

River watershed. Clearly the human environment in the Middle Mississippi River and the Upper Mississippi River watershed has been, and will continue to be, significantly impacted by a wide range of stressors. The Regulating Works Project, in combination with the other stressors throughout the watershed, has had past impacts, both positive and negative, on the human environment. However, this analysis is meant to characterize the incremental impact of the current action in the broader context of other actions affecting the same resources. Although past actions associated with the Regulating Works Project have impacted these resources, the current method of conducting business for the Project – involving partner agencies throughout the planning process, avoiding and minimizing impacts during the planning process, and utilizing innovative river training structures to provide habitat diversity while still providing benefits to the navigation system – has been successful in accomplishing the desired effect of avoiding significant environmental consequences. Although our understanding of the processes and stressors that bear upon the resources of the Middle Mississippi River continues to evolve, an equilibrium in habitat conditions appears to have been reached. Accordingly, no significant impacts to the human environment are anticipated for the Regulating Works, Mosenthein/Ivory Landing Phase 4 Construction Project.

Table 4. Summary of cumulative impacts.

Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Proposed Action
Stages	Flows and stages impacted by watershed land use changes, levee construction, mainline and watershed dam construction, consumptive water use, climate change	Continued impacts due to land use changes in watershed, consumptive water use, levee construction, climate change	Continued impacts due to land use changes in watershed, consumptive water use, levee construction, climate change	No impacts on stages anticipated	No impacts on stages anticipated at average and high flows. At low flows, current trend of decreasing stages expected to continue.
Water Quality	Increasing human populations and industrialization result in increased water quality problems. Establishment of Clean Water Act, NEPA, USEPA, state environmental agencies and associated regulations greatly improve conditions.	Continued population growth and development result in increased potential for water quality impacts. Continued regulation enforcement and societal recognition prevent water quality degradation.	Continued regulation enforcement and societal recognition. Continued population growth and development result in increased potential for water quality impacts.	Localized, temporary increase in suspended sediment concentrations at dredge material discharge sites	Localized, temporary increase in suspended sediment concentrations during construction activities; decrease in suspended sediment in immediate vicinity of revetment long-term due to reduction in bankline erosion
Air Quality	Increasing human populations and industrialization result in deterioration of air quality. Establishment of Clean Air Act, NEPA, USEPA, air quality standards improve conditions. Non-attainment status in Project Area.	Continued population growth and development result in increased potential for air quality impacts. Continued regulation enforcement and societal recognition. Continued non-attainment status in Project Area.	Continued population growth and development result in increased potential for air quality impacts. Continued regulation enforcement and societal recognition. Possible achievement of attainment status through implementation of State Implementation Plans.	Minor and local impacts due to use of dredging equipment	Minimal air quality impacts; below de minimis levels

Table 4. (cont.)

Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Proposed Action
Fish and Wildlife (including threatened and endangered species)	Transformation of river system from natural condition to pooled lock and dam system; in MMR, loss of floodplain habitat due to levees, agriculture, urbanization; loss of natural river habitat – loss of dynamic habitat due to river channel being stabilized with dikes/revetment; dredging impacts; USACE, other federal, state, and private habitat restoration and land mgmt programs implemented to try to reverse habitat loss; introduction of exotic species/reduced native species biomass; implementation of innovative river training structures to provide habitat diversity; recognition of T&E species through Endangered Species Act; listing of multiple T&E species in MMR; implementation of District Biological Opinion Program and Avoid and Minimize Program	Maintenance of current habitat conditions due to maintenance of lock and dam system and maintenance of existing dikes/revetment; continued use of innovative river training structures to provide habitat diversity; habitat restoration and land mgmt through USACE, other federal, state, and private programs; habitat changes associated with recent and current innovative dike construction; maintenance of current floodplain habitat conditions due to continued agriculture use/ maintenance of existing levees/ urbanization; dredging impacts; native species continue to be impacted by exotic species; continued implementation of Biological Opinion Program and Avoid and Minimize Program	Continued maintenance of habitat conditions due to maintenance of lock and dam system and maintenance of existing dikes/revetment; continued use of innovative river training structures to provide habitat diversity; continued habitat restoration and land mgmt through USACE, other federal, state, and private programs; maintenance of current floodplain habitat conditions due to continued agriculture use/ maintenance of existing levees/ urbanization; new exotic species likely to be introduced; continued implementation of Biological Opinion Program and Avoid and Minimize Program	Entrainment of some fish and macroinvertebrates at dredge locations; avoidance of dredge and disposal areas by mobile organisms; some loss of fish and macroinvertebrates at disposal sites; may affect but not likely to adversely affect threatened and endangered species	Avoidance of sites during construction; no conversion of aquatic habitat to terrestrial; increased fish and macroinvertebrate use of structure locations due to increased bathymetric, flow, and substrate diversity; some loss of fish and macroinvertebrate habitat due to reduced woody debris inputs; may affect but not likely to adversely affect threatened and endangered species

Table 4. (cont.)

Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Proposed Action
Navigation	1927 River and Harbor Act authorized USACE to provide 9-foot Nav channel on MMR; USACE transformed free-flowing Mississippi River system into navigable waterway with 37 lock and dam complexes, some dredging, dikes, revetment; growth of port facilities and inland waterways and traffic throughout Mississippi River system provided for movement of commodities with local, national, and international importance	Operation of lock and dam system continues; traditional and innovative stone dike, revetment construction, rock removal, and dredging continue to provide safe and dependable navigation channel; navigation continues to be an important part of local / national / international transportation and commerce activities	Operation of lock and dam system continues; traditional and innovative stone dike, revetment construction, rock removal, and dredging continue to provide safe and dependable navigation channel; navigation continues to be an important part of local / national / international transportation and commerce activities	Increasing requirement for repetitive maintenance dredging due to continued bankline erosion; increasing potential for barge groundings	Reduction in the amount and frequency of repetitive maintenance dredging in the project area; reduction in barge grounding rates
Historic and Cultural Resources	Historic and cultural resources subjected to natural processes and manmade actions (e.g., erosion, floodplain development); recognition of importance of historic and cultural resources through National Historic Preservation Act (and others)	Historic and cultural resources continue to be impacted by human activities as well as natural processes; continued societal recognition of importance of historic and cultural resources	Historic and cultural resources continue to be impacted by human activities as well as natural processes; continued societal recognition of importance of historic and cultural resources	Impacts to historic and cultural resources unlikely.	No known historic resources would be affected. Impacts to unknown historic and cultural resources unlikely.

Mitigation

Mitigation measures are used to avoid, minimize, or compensate for adverse impacts to environmental resources. The Mosenthein/Ivory Landing Phase 4 Project has avoided and minimized adverse impacts throughout the project development process. No adverse impacts have been identified that would require compensatory mitigation.

5. Relationship of Proposed Action to Environmental Requirements

Federal Policy	Compliance Status
Bald Eagle Protection Act, 16 USC 668-668d	Full
Clean Air Act, 42 USC 7401-7542	Full
Clean Water Act, 33 USC 1251-1375	Partial 1*
Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC 9601-9675	Full
Endangered Species Act, 16 USC 1531-1543	Full
Farmland Protection Policy Act, 7 USC 4201-4208	Full
Fish and Wildlife Coordination Act, 16 USC 661-666c	Full
Land and Water Conservation Fund Act, 16 USC 460d-461	Full
Migratory Bird Treaty Act of 1918, 16 USC 703-712	Full
National Environmental Policy Act, 42 USC 4321-4347	Partial 2*
National Historic Preservation Act, 16 USC 470 et seq.	Full
Noise Control Act, 42 USC 7591-7642	Full
Resource Conservation and Recovery Act, 42 USC 6901-6987	Full
Rivers and Harbors Act, 33 USC 401-413	Partial 1*
Water Resources Development Acts of 1986 and 1990	Full
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)	Full
Floodplain Management (EO 11988 as amended by EO 12148)	Full
Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities (EO 11282 as amended by EO's 11288 and 11507)	Full
Protection and Enhancement of Environmental Quality (EO 11991)	Full
Protection and Enhancement of the Cultural Environment (EO 11593)	Full
Protection of Wetlands (EO 11990 as amended by EO 12608)	Full
Responsibilities of Federal Agencies to Protect Migratory Birds (EO 13186)	Full

1* Required permits will be sought during document review
2* Full compliance after submission for public comment and signing of FONSI

6. Conclusion

The St. Louis District has assessed the impacts of the Proposed Action on the physical, biological, socioeconomic, and historic and cultural resources of the project area and determined that the proposed work would have no significant direct, indirect, or cumulative impacts upon the human environment.

7. List of Preparers

Name	Role	Experience
Mike Rodgers	Project Manager	12 years, hydraulic engineering
Jasen Brown	Project Manager	12 years, hydraulic engineering
Eddie Brauer	Engineering Lead	12 years, hydraulic engineering
Kip Runyon	Environmental Lead	16 years, biology
Francis Walton	Threatened and Endangered Species	13 years, environmental compliance
Tim George	Air Quality	23 years, ecology
Kevin Slattery	HTRW	15 years, environmental science
Mark Smith	Historic and Cultural Resources	20 years, archaeology
Danny McClendon	Regulatory	27 years, regulatory compliance and biology
Keli Robertson	Legal Review	1 year USACE, 6 years private sector law

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DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI)

MOSENTHEIN/IVORY LANDING PHASE 4 REGULATING WORKS
MIDDLE MISSISSIPPI RIVER MILES 175-170
ST. CLAIR COUNTY, IL
ST. LOUIS CITY, MO

I. In accordance with the National Environmental Policy Act, I have reviewed and evaluated the documents concerning the Regulating Works, Mosenthein/Ivory Landing Phase 4 Construction Project, St. Clair County, Illinois and St. Louis City, Missouri. As part of this evaluation, I have considered:

a. Existing resources and the No Action Alternative.

b. Impacts to existing resources from the Proposed Action.

II. The possible consequences of these alternatives have been studied for physical, environmental, cultural, social and economic effects, and engineering feasibility. My evaluation of significant factors has contributed to my finding:

a. The project would address repetitive dredging in the project area. This would be accomplished by the construction of a rootless dike and placement of revetment.

b. Federally listed endangered and threatened species would not be adversely impacted.

c. No significant impacts are anticipated to natural resources, including fish and wildlife resources. The proposed project would have no effect upon significant historic properties or archaeological resources. There would be no appreciable degradation to the physical environment (e.g., stages, air quality, and water quality) due to the project.

d. The "no action" alternative was evaluated and determined to be unacceptable as repetitive dredging expenditures would continue.

III. Based on the evaluation and disclosure of impacts contained within the Environmental Assessment, I find no significant impacts to the human environment are likely to occur as a result of the proposed action. Therefore, an Environmental Impact Statement will not be prepared prior to proceeding with the proposed Regulating Works, Mosenthein/Ivory Landing Phase 4 Construction Project, St. Clair County, Illinois and St. Louis City, Missouri.

_____ _____

(Date) CHRISTOPHER G. HALL
COL, EN Commanding

DRAFT ENVIRONMENTAL ASSESSMENT

WITH

UNSIGNED FINDING OF NO SIGNIFICANT IMPACT

REGULATING WORKS PROJECT
MOSENTHEIN/IVORY LANDING PHASE 4
MIDDLE MISSISSIPPI RIVER MILES 175-170
ST. CLAIR COUNTY, IL
ST. LOUIS CITY, MO

OCTOBER 2013

APPENDICES

Appendix A. Summary of Research on the Effects of River Training Structures on Stages

With implementation of the Proposed Action, stages at average and high flows both in the vicinity of the project area and on the Middle Mississippi River are expected to be similar to current conditions. An abundance of research has been conducted analyzing the impacts of river training structures on water surfaces dating to the 1940s. This research has analyzed historic gage data, velocity data, and cross sectional data. Physical and numerical models have also been used to determine the effects of dikes on water surfaces. A summary of research on the topic is detailed below. Based on an analysis of this research by the Corps and other external reviewers, the District has concluded that river training structures do not affect water surface elevations at higher flows.

The first study specifically addressing the effect of river training structure construction on water surfaces was conducted during the extreme high water of June and July 1935 (Ressegieu 1952). This study was prompted by the differences in observed streamflow for equal stages following the transfer of streamgaging responsibility from the Corps to the United States Geological Survey (USGS) in March 1933. The study addressed the accuracy of the standard equipment and method of observation between the two agencies. Similar simultaneous streamflow studies were conducted between 1935 and 1948. In 1952, the results of all of the studies were analyzed and it was concluded that, on average, the discharges measured by the Corps generally exceeded those measured by the USGS by zero percent at mean stage to slightly more than ten percent at high stages. Another conclusion of Ressegieu (1952) was that "the reduction in floodway capacity was not an actual physical reduction but an apparent reduction caused by a discrepancy in the accuracy of measuring streamflow by older methods and equipment." The conclusions by Ressegieu (1952) were analyzed along with new information and confirmed by Watson et al. (2013a)

The topic of the effect of dikes on flood heights was revisited in the 1960's when it was determined through an analysis of changes in the stage/discharge relationship over time that "the contraction by permeable dikes has had a negligible effect on the increase in flood heights" (Monroe 1962). The change in stages for higher flows was attributed to the construction and raising of levees on the Middle Mississippi River.

Munger et al. (1976) studied the changes in hydraulics on the Mississippi River resulting from river confinement by levees and the construction of river training structures. As was the case in previous studies using gage data, the reliability of early discharge data collected by the Corps was brought into question. In a study of velocity, stage and discharge data, Munger et al. (1976) concluded that "generalizations about the effect of dikes on stage-discharge relations are not justified." When examining cross section shape and velocity distributions at the St. Louis gage it was observed that there had been no striking changes in cross-section shape or velocity distributions at the section between 1942 and 1973.

Dyhouse (1985, 1995) found through numerical and physical modelling that published discharges for historic floods, including 1844 and 1903, were greatly overestimated. Dyhouse concluded that the use of early discharge data collected by the Corps including historic peak flood discharges in conjunction with streamflow measurements by the USGS will result in incorrect conclusions.

To update ongoing evaluations of the physical effects of river training structures, the Corps initiated a new study on the possible effect of these structures on water surfaces. This series of

studies included an analysis of past research, an analysis of the available gage data on the MMR, an analysis of historic measurement technique and instrumentation and its effect on the rating curve, specific gage analysis, numerical and physical modelling. In addition to the research conducted by the Corps, the St. Louis District engaged with external technical experts in the fields of river data collection, river engineering, geomorphology hydraulics and statistics.

In a review of historic streamflow data collected prior to the USGS, Watson & Biedenharn (2010) determined that pre-USGS data should be omitted for the following reasons (1) It has been confirmed through simultaneous measurement comparisons that there is much uncertainty in the historic data due to differences in methodology and equipment (2) there is much uncertainty with respect to the location of the discharge range (3) there is insufficient measured data at the higher flow ranges to produce reliable specific gage records (4) the homogeneous data set containing all discharges collected by the USGS provides an adequate long-term, consistent record of the modern-day river system including periods of significant dike construction.

In their analysis, Watson & Biedenharn (2010) studied the specific gage records at the three rated gages on the MMR: St. Louis, Chester and Thebes. The analysis for Thebes was omitted in this paper due to the effect of backwater from the Ohio River. For each streamgage studied, the specific gage record was analyzed and compared with a record of river training structure construction for a reach extending 20 river miles downstream. All data used in their study was collected by the USGS and retrieved from their website.

Bankfull stage at the St. Louis gage is +15 feet Low Water Reference Plane (LWRP) with a corresponding discharge of approximately 500,000 cfs. Flows below 400,000 cfs are contained within the top bank and flows above 700,000 cfs are well above the top-bank elevation. The time period 1933-2009 was studied. The top elevation of training structures in this reach was between +15 and +18 feet LWRP and all structures are completely submerged at discharges exceeding 280,000 cfs. In their analysis, Watson and Biedenharn (2010) found a statistically significant slightly decreasing trend in streamflows below 200,000 cfs. In streamflows between 300,000 cfs 500,000 cfs a statistically significant horizontal trend in stages was observed. At 700,000 cfs there was a trend in stages that was not statistically significant. The slight upward trend in stages at 700,000 cfs had considerable variability in the data and was strongly influenced by the 1993 flood.

Bankfull stage at the Chester gage is +27 feet LWRP with a corresponding discharge of approximately 420,000 cfs. The time period 1942-2009 was studied. The top elevation of navigation structures in this reach was +17 to +19 feet LWRP and all structures are completely submerged at discharges exceeding 280,000 cfs. The only statistically significant trend found was a statistically significant slightly decreasing trend for streamflows below 100,000 cfs. There was no trend for 200,000 and 400,000 cfs. There was a slightly increasing trend at 300,000 cfs. For both overbank flows, 500,000 cfs and 700,000 cfs, there were slight increasing trends.

After a closer examination of the specific gage trends it was apparent that the long term trends for both St. Louis and Chester were not continuous and there was a shift in stages that occurred in the early 1970's. When the record was broken into pre- and post-1973 sections different trends were observed. Prior to 1973 at all gages studied, there were no increasing trends for any of the flows. Post-1973 there were no increasing stage trends for within-bank flows at any of the gages. A slightly increasing stage trend occurred for overbank flows of 500,000 cfs and 700,000

cfs at the Chester gage. A majority of the construction of river training structures on the Middle Mississippi was performed prior to 1973.

In conjunction with the specific gage record, Watson & Biedenharn (2010) and Watson et al. (2013) analyzed the record of training structure construction including an analysis of the top elevation of the structures. The typical top elevation of the structures was between 10-16 feet below the top bank. Since the top elevation is so far below top-bank elevations, the most dramatic impacts of the structures should be in the low to moderate stages below top bank where the specific gage analysis revealed decreasing or no trends.

Watson & Biedenharn (2010) concluded that, "based on the specific gage records, there has been no significant increase in stages for within-bank flows that can be attributable to river training structure construction. Any increase in overbank flood stages may be the result of levees, floodplain encroachments, and extreme hydrologic events; and cannot be attributed to river training structures based solely on specific gage records."

Huizinga (2009) conducted a specific gage analysis using the direct step method on only data collected by the USGS for the gages at St. Louis and Chester. Similar to Watson & Biedenharn (2010), an apparent decrease of stage with time for smaller, in bank discharges was observed at both the St. Louis and Chester gages. This decrease in stage was attributed to the construction of river training structures and/or a decrease in sediment load available for transport on the Mississippi River due to the construction of reservoirs on the main stem tributaries of the Mississippi River, particularly the Missouri River.

Huizinga (2009) found a slight increase in stage over time for higher flows at both St. Louis and Chester over the entire period of record. The transitional discharge was 400,000 cfs and 300,000 cfs for the St. Louis and Chester gages respectively. These discharges correspond to stages of +25 feet LWRP at St. Louis and +22 feet LWRP at Chester. At these stages the navigation structures are submerged by 7-10 feet. Huizinga (2009) attributed the slight increase in out of bank flows to the construction of levees and the disconnection of the river to the floodplains. Similar to Watson & Biedenharn (2010), Huizinga (2009) observed a shift occurring in the out of bank flows in the mid-1960s and attributed it to the completion of the Alton to Gale levee system which paralleled the entire Middle Mississippi River.

In an analysis of cross sectional data collected at the St. Louis and Chester gages it was found that although the shape of the cross section had changed, the cross sectional area for moderate (400,000 cfs) and high (600,000 cfs) flows remained relatively constant throughout the period of record. The construction of river training structures immediately upstream of the Chester gage provided a case study on the effect of the absence and construction of structures on the cross section over time. Prior to the construction of the structures, the channel thalweg repeatedly shifted between the left and right banks. Following the construction of the structures, the cross sections displayed much less variability. An overall stabilizing effect of the structures was seen on the cross section for discharges of 100,000 cfs and 400,000 cfs. The cross sectional area for the first and last measurements of the period of record remained similar despite the river training structure construction upstream for all discharges.

Huizinga (2009) conducted a study of all rating curves developed for St. Louis and Chester, including those developed prior to 1933 by the Corps. When comparing daily values from the

Corps from 1861-1927 to the original USGS rating in 1933 there appeared to be an abrupt change in the upper end of the ratings used before 1933. When these daily values developed by the Corps were "adjusted" to compensate for the overestimation of Corps discharge measurements detailed in the simultaneous discharge measurement studies between the Corps and USGS the adjusted daily discharge values plotted in line with the original USGS rating (A). This study is further evidence of the overestimation of early discharges.

The Iowa Institute of Hydraulic Research (IIHR) at the University of Iowa performed a series of hydrodynamic simulations of a recently constructed chevron field and dike extension using the United States Bureau of Reclamation Sedimentation and River Hydraulics Two-Dimensional (SRH-2D) modelling software (Pitrowski et al. 2012). Simulations studied the impact of the construction on water surfaces and the magnitude of natural variation on water surfaces. The results indicated that structures did not cause significant differences in reach-scale water surface elevations. The simulations also found that the differences in pre- and post- construction water surface elevations were less than the differences resulting from natural variability.

A physical sediment transport model at the University of Illinois, Urbana-Champaign was used to test the effect of submerged dikes and dike fields on water surfaces (Brauer 2013). The study tested flows and stages along a rating curve from ½ bankfull to a flow with a 0.5% annual chance exceedance. The study concluded that the magnitude of the effect of dikes on water surfaces was smaller than other variables that can influence the stage/discharge relationship and decreased with increasing flow/submergence. The study also found that there was no direct cumulative effect for up to four structures.

Other reach scale numerical and physical models studying the effect of river training structures on water surfaces include USACE (1996) which used a Hydrologic Engineering Center (HEC-2) model used to analyze pre- and post- construction water surface elevations for the Nebraska Point Dike field on the Lower Mississippi River. For each cross section analyzed, the dike field construction lowered water surface elevations and reduced overbank discharges for the 50%, 20%, and 10% annual chance exceedance events. Xia (2009) used an Adaptive Hydraulics Modeling (ADH) model to study the changes in water surface resulting from the construction of a dike field. In this fixed bed analysis, Xia found that changes in water surface elevation due to the dikes was greatest at average flows and decreased with increasing and decreasing river flow. Azinfar and Kells (2007) developed a multiple function model to predict the drag coefficient and backwater effect of a single spur dike in a fixed bed. This study concluded that increasing submergence levels resulted in a decreasing backwater effect.

In a moveable bed model study conducted to develop structural alternatives for a power plant on the Minnesota River, Parker et al. (1988) measured water surface changes from a baseline for a series of dikes and determined that construction of the structures had a negligible effect on flood stages compared to calibration values. Yossef (2005) used a 1:40 scale fixed bed physical model of the Dutch River Waal to study the morphodynamics of rivers with groynes including their effect on water surface. Yossef found that on the River Waal, the effect of groynes decreased with increasing submergence. It was also observed that the maximum possible water level reduction of the design flood (378,000 cfs) by lowering all of the groynes in the system was 0.06 meters.

There is research supporting the claims that dike construction has resulted in an increase in flood heights of up to 16 feet. The first study proposing this link was Stevens et al. (1975) who proposed that the combination of river training structures constricting the main channel and levees isolating the main channel from its floodplain resulted in increased stages for flood discharges. Through the use of historic streamgage data, Belt (1975) arrived at the same conclusion. The source data, methodology and analysis used by these studies were questioned by Stevens (1976), Dyhouse (1976) Strauser & Long (1976) and Westphal & Munger (1976).

By comparing the trends in stage and streamflow measurements for rivers with and without river training structures, Criss & Shock (2001) concluded that stages have increased over time on rivers due to the construction of river training structures.

Pinter et al. (2001) used specific gage analyses to study the changes in stage and discharge relationships on the Middle Mississippi River and concluded that the presence of river training structures has increased roughness and resulted in an increase in flood stages.

One limitation of specific gage analysis is that it can only be performed on gages with a discharge record. Jemberie et al. (2008) developed a refined specific gage approach to overcome this limitation by developing "synthetic discharges" at stage only gages. The synthetic discharges are created by interpolating discharge values at nearby gages to create a stage-discharge relationship at stage only gages. Jemberie et al. (2008) also formulated a continuous specific gage time series for large, rare discharges by using "enhanced interpolation." The results of the refined specific gage study were that stages that correspond to flood discharges increased substantially at all stations consistent with what was documented by Pinter (2001).

Remo & Pinter (2007) used a 1-D unsteady Hydrologic Engineering Center River Analysis System (HEC-RAS) model ("retro-model") to assess the magnitude and type of changes in flood stages associated with 20th century river engineering. The "retro-model" used historic hydrologic and geospatial pre-USGS data to establish baseline roughness conditions. The baseline was then compared to present day hydraulic conditions to determine the changes in roughness as a result of engineering modifications. The results from the "retro-model" showed an increase in flood stages similar to those observed by Pinter (2001) and Jemberie et al. (2008).

The increase in water surfaces found by Stevens et al. (1975), Belt (1975), Criss & Shock (2001), Pinter et al. (2001) and Jemberie et al. (2008) are all driven by the difference in measured discharges between the Corps and USGS. When the homogenous data set of only discharges collected by the USGS are used, the trends shown in the aforementioned studies is not seen. In Remo & Pinter (2007) the proposed link between river training structures and water surfaces is tied to an increase in channel roughness between the two time periods modeled. The increase in roughness found by Remo & Pinter (2007) was a consequence of using an inaccurate stage-discharge relationship (rating curve) developed using early Corps discharges and comparing it to a more accurate rating curve developed using USGS data.

As part of the updated analysis of the effect of river training structures on water surfaces, experts in river engineering and statistics from the Corps and other external experts including the USGS and academia studied all of the available research on the topic. There is an abundance of research conducted by the Corps and others spanning over 80 years on the topic. The conclusions of recent research proposing a link between river training structures and flood

heights relies on dubious assumptions, source data and methodology. The results of the analysis of existing research have lead to the conclusion that river training structures do not have an impact on water surfaces for higher flows.

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APPENDIX B

TIER II BIOLOGICAL ASSESSMENT:

REGULATING WORKS PROJECT
MOSENTHEIN/IVORY LANDING PHASE 4
MIDDLE MISSISSIPPI RIVER MILES 175-170
ST. CLAIR COUNTY, IL
ST. LOUIS CITY, MO

U.S. Army Corps of Engineers
Regional Planning and Environmental Division North (CEMVP-PD-C)
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October 2013

Introduction

The tier I of a two-tiered biological assessment for the Operation and Maintenance of the 9-Foot Navigation Channel on the Upper Mississippi River System was prepared by the U.S. Army Corps of Engineers in April 1999 (USACE 1999a). This tier II biological assessment discusses the site-specific impacts of a proposed regulating works project on federally listed species known to occur in the Mosenthein/Ivory Landing Phase 4 reach, River Miles (RMs) 175-170: pallid sturgeon, Indiana bat, interior least tern, decurrent false aster, gray bat, pink mucket mussel, sheepnose mussel and spectaclecase mussel. USACE has proposed placing over 11,500 feet of revetment on the left descending bank (LDB) between RMs 175 and 171, and constructing a rootless dike at RM 173.4(L).

Problem Description:

Navigation through the St. Louis Harbor (RMs 182 to 170) has been described as one of the most treacherous on the entire Mississippi River (USACE 2004). Seven bridges cross over the Mississippi River between RMs 184 and 168.0. The navigation spans of nearly all of the bridges do not match the alignment of the main channel. Modification of regulating works are needed in this area of the Middle Mississippi River (MMR) in order to safely and effectively operate and maintain the 9-Foot Navigation Channel on the Upper Mississippi River System. Between RMs 182.0 and 170.0, approximately 6 million cubic yards of dredge material were relocated during the period 2002 through 2012, and 3.2 million cubic yards from 2008 to 2012. This reach of the river includes a long narrow bend of the Mississippi River. Because of this, the channel thalweg meanders back and forth between the Missouri and Illinois banks creating many crossing and shoaling problems. The shoaling occurring at RM 173 has necessitated numerous dredge cuts and was investigated in the 2013 Carondolet Hydraulic Sediment Response (HSR) model study (USACE 2013).

St. Louis Harbor, which is the third largest inland port of the United States, handles more than 110 million tons of freight each year. In terms of the river, fleeting is defined as the storing and moving of barges. Fleeting areas are numerous within the reach due to the St. Louis Harbor's close location to the Illinois River, Missouri River, Kaskaskia River, and Interstates 70, 64, 55, and 44. Furthermore, Locks 27, which is just upstream of the St. Louis Harbor, is the most downstream lock on the system. Once below Locks 27, tows can be reconfigured from 15 barges (3 wide by 5 long) to larger barge configurations that are more efficient on the open river.

The project area is located in St. Clair County, Illinois and St. Louis City, Missouri. Plate 1 is an aerial map of the study reach with nomenclature. At the present time, the St. Louis Harbor has a total of 11 dikes and 12 bendway weirs. Also, the majority of the banklines in the reach are revetted. Plate 2 is an aerial photograph illustrating the dredging locations of the study reach.

Alternatives:

The U.S. Army Corps of Engineers St. Louis District recently conducted an HSR study of the flow and sediment transport regime of the Carondelet reach of the MMR between RMs 181.0 and 165.0 near Saint Louis, Missouri (USACE 2013). This study was funded by the Regulating Works Project and was conducted between October 2011 and March 2013 using a physical HSR model at the Applied River Engineering Center in St. Louis, Missouri. The objective of the model study was to produce a report that outlined the results of an analysis of various river engineering measures intended to reduce or eliminate the need for repetitive maintenance dredging within the Mosenthein/Ivory Landing Phase 4 reach. The Carondolet HSR model study also looked at the shoaling occurring at the RM 173 location, shown on Plate 3. In order to determine the best alternative, certain criteria, based on the study purpose and goals, were used to evaluate each alternative. The first and most important consideration was that the alternative had to reduce or eliminate the need for repetitive maintenance dredging within the Mosenthein/Ivory Landing Phase 4 reach. The second condition was that the alternative had to maintain the navigation channel requirements of at least 9-foot depth and 300-foot width. Third, the alternative should avoid and minimize impacts to fleeting areas within the reach. Finally, the alternative should avoid and minimize impacts to environmental areas, i.e., bathymetry that supports good aquatic habitat. There

were a number of alternatives that showed minimal improvements to the repetitive dredging locations while maintaining the navigation channel requirements, although most involved placing structures within existing fleeting locations.

A rootless dike at RM 173.4, elevation 389.5 feet (+15 feet Low Water Reference Plane (LWRP)), was included as Alternative 31 in the Carondolet investigation. Alternative 31, shown on Plate 4, was recommended as the most desirable alternative because of its observed ability in the model to reduce or eliminate the need for repetitive maintenance dredging within the Carondelet reach. In addition, this alternative maintained the navigation channel requirements of at least 9-foot depth and 300-foot width and the structure was not placed directly within an existing fleeting location. The dike was within the immediate vicinity of two existing fleeting locations, but the operator of the fleeting area stated that they were agreeable with the proposed alternative being placed between the two existing fleeting locations. Finally, the alternative did not impact the existing river bars near RM 174.0 or between RMs 171.0 and RM 168.5. These river bars provide aquatic and terrestrial habitat for many organisms. Overall, this alternative, as modeled, enhanced navigation by providing a channel that would not require repetitive maintenance dredging, which has financial impacts on the navigation industry. It also protects valuable environmental habitat (USACE 2004).

The proposed revetment between RMs 175 and 171 is designed to prevent the continued erosion and migration of the associated bankline in the project area. The left descending bank in the project area has eroded up to 140 feet in the past 20 years. Channel widening has reduced the river's energy and ability to transport sediment in the area, resulting in sediment deposition and repetitive dredging requirements in the navigation channel. The addition of revetment in the proposed locations would maintain current channel planform and prevent future channel widening.

Project construction locations are shown on Plates 5, 6 and 7.

Recommendations

The Mosenthein/Ivory Landing Phase 4 Project would involve the following actions in order to attain the desired conditions based on the Carondolet HSR model investigation:

- Place revetment along the LDB at RMs 173.5 to 175 and RMs 172 to 171 as indicated on Plates 6 and 7. No grading or tree removal will be required. The revetment will help reduce erosion along the river bank and reduce sediment load in the river.

- Construct a 500-foot rootless dike with a top elevation of 389.5 feet (+15 feet LWRP) at RM 173.4 (L). This will help to reduce the shoaling and the need for repeated dredge cuts at RM 173.

Conservation Measures

The following measures will be implemented at the time of construction.

1. Construction will be conducted from the river in order to avoid impacting the adjacent shoreline and riparian habitat.
2. The dike proposed at RM 173.4 (L) is rootless and will not be attached to the riverbank, which should allow for secondary channel development and less sediment downstream of the dike.

Biological Assessment:

According to the U.S. Fish and Wildlife Service Endangered Species Midwest Region website on 17 September 2013 (USFWS 2013), the following species may occur in the project area (St. Louis Co.

MO and St. Louis, MO and St. Clair Co., IL): pallid sturgeon, Indiana bat, interior least tern, decurrent false aster, gray bat, pink mucket, sheepnose mussel and spectaclecase mussel. Several species listed on the website including Illinois cave amphipod, Eastern prairie fringed orchid, scaleshell, snuffbox, Mead's milkweed and running buffalo clover are not likely to be found within the project area and are not addressed.

Pallid Sturgeon (Scaphirhynchus albus) – Federally Endangered It is the position of the U.S. Fish and Wildlife Service (2000) that over time, channel training structures have adversely affected pallid sturgeon by affecting the quality and quantity of habitats in the MMR to which the species is adapted (e.g., braided channels, irregular flow patterns, flood cycles, extensive microhabitat diversity, and turbid waters). According to the Service, this loss of habitat has reduced pallid sturgeon reproduction, growth, and survival by (1) decreasing the availability of spawning habitat; (2) reducing larval and juvenile pallid sturgeon rearing habitat; (3) reducing the availability of seasonal refugia; and (4) reducing the availability of foraging habitat (USFWS 2000). Additionally, some authors believe that loss of habitat contributes to the hybridization of pallid and shovelnose sturgeon (Carlson *et al*. 1985, Keenlyne *et al*. 1993, Campton *et al*. 1995, USFWS 2000) although a study by Hartfield and Kuhajda (Hartfield et al. 2009) disputes that conclusion. The Service also asserts that these habitat changes have also reduced the natural forage base of the pallid sturgeon, and is another likely contributing factor in its decline (Mayden and Kuhajda 1997, USFWS 2000). The Service states that channel training structures have also altered the natural hydrograph of the MMR by contributing to higher water surface elevations at lower discharges than in the past and to a downward trend in annual minimum stages (Simons *et al*. 1974, Wlosinski 1999, USFWS 2000). Thus, as a result, previously aquatic habitats are now dry at low discharges (Wlosinski 1999). According to the Service, this has potentially reduced the availability of pallid sturgeon spawning habitat through the loss of habitat complexity (USFWS 2000).

Dikes are prominent channel regulating features common in the main channel and they are used to concentrate flow in order to reduce the need for dredging. Dikes are usually constructed in groups called dike fields. These areas are depositional zones that often fill from the bank outward toward the channel. Notching dikes, lowering dike profiles, adding trails to dikes, or altering dike angles to the channel are some actions that can be used to increase habitat diversity through the creation of new scour holes, sandbars, and flow refugia. When dike alteration is done on the dike field level, or in association with new structure placements, new side channels, islands, and off-channel areas can be created (USFWS 2004a). This project involves revetment placement and rootless dike construction. Rootless dike construction should increase habitat diversity in the area by creating scour holes and a secondary channel. The dike's rock would provide suitable habitat for epilithic macroinvertebrates.

Dikes and dike fields within the MMR are currently utilized by pallid sturgeon, including the project study area between RMs 195.0-154.0 (Sheehan and Heidinger 2001). Most notably, pallids congregate in the vicinity of the Chain of Rocks, with numerous detections documented between RMs 190.4 and 188.0 (J. Killgore, pers. comm.). Deep scour holes that develop in association with dikes and chevron dikes provide seasonal refugia, particularly during winter. Pallid sturgeon also utilize the sand bar habitat that accretes between dikes and chevron dikes. Although their preference for this habitat is poorly understood, at a minimum it is believed these areas provide important foraging habitat (USFWS 2004a). Though outside the Mosenthein/Ivory Landing Phase 4 project area, the Carterville Fisheries Research Office, prior to 2005, collected juvenile sturgeon in high concentrations over the flooded sandbar on the western shore of Rockwood Island between RMs 102 and 101. Juvenile sturgeon were also collected from Liberty Chute below the rock closing structure at RM 101.1, and juvenile shovelnose were collected within Liberty Chute (Colby Wrasse, pers. comm.). Juvenile sturgeon were also collected over flooded portions of the Mile 100 Islands during the spring of 2005 (Teri Allen, pers. comm.). While the 2000 Biological Opinion Reasonable Prudent Alternatives (RPA) identified modification of channel training structures as a medium priority for pallid sturgeon, dike alterations are critical to improving habitat diversity in the MMR for a wide range of species (USFWS 2004a).

Preventing bankline erosion by revetment placement could have a minor negative impact on the fish community in the area. Bankline erosion frequently leads to woody debris inputs to the system. Woody debris is an important habitat component in the MMR, providing nutrient inputs, macroinvertebrate

colonization substrate, and habitat diversity for fish and wildlife. The proposed revetment is likely to reduce the amount of beneficial woody debris entering the system from the project area. However, woody debris would continue to enter the system during overbank flow events, and revetment would benefit fish and wildlife by providing rock substrate.

Construction activities may result in short-term adverse effects for pallid sturgeon. Activities that impact any existing deepwater habitat may result in displacement of pallid sturgeon. Disruption of existing sand bar habitat may impact foraging habitat. However, these adverse effects are expected to occur at a local, individual dike scale. By completing regulating works projects with incorporated modifications to increase habitat diversity at the scale of the dike field, long-term beneficial effects for pallid sturgeon should result. The creation of scour holes and secondary channel and associated shallow water habitat through dike construction is expected to create additional larval/juvenile rearing habitat and seasonal refugia, and improve forage food production (USFWS 2004a).

It is the position of the St. Louis District that short-term adverse impacts that may occur are limited, and the long-term impacts associated with reduced dredging and increased habitat diversity, which is expected as a consequence of river training structure modification, are predicted to be beneficial to pallid sturgeon. Dredging disturbs main channel habitat, killing the resident benthic macroinvertebrates and temporarily leveling the dune and swale bed forms.

Thus, dike construction which results in the creation of diverse aquatic habitats would be beneficial to fish in general, and "may affect but is not likely to adversely affect" the pallid sturgeon.

Indiana Bat (Myotis sodalis) – Federally Endangered The range of the Indiana bat includes much of the eastern half of the United States, including Missouri and Illinois. Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods, as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds in pastures. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to a single young in June or early July. A maternity colony may include from one to 100 individuals. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females.

Disturbance and vandalism, improper cave gates and structures, natural hazards such as flooding or freezing, microclimate changes, land use changes in maternity range, and chemical contamination are the leading causes of population decline in the Indiana bat (USFWS 2000, 2004a). To avoid impacting this species, tree clearing activities should not occur during the period of 1 April to 30 September.

Modification measures resulting in aquatic habitat improvement should contribute to the species' forage base. Dike construction and revetment placement is anticipated to be primarily performed by river-based equipment and has minimal potential to affect Indiana bats because forested habitats would not be affected by placement of revetment. Additionally, creation of a secondary channel and associated shallow water habitat is expected to provide bathymetric diversity necessary to provide habitat for a range of aquatic species and life stages. Thus, dike construction which creates diverse aquatic habitats "may affect but is not likely to adversely affect" the Indiana bat.

Gray Bat (Myotis grisescens) – Federally Endangered The gray bat (Myotis grisescens) is listed as endangered and occurs in several Illinois and Missouri counties where it inhabits caves both summer and winter. This species forages over rivers and reservoirs adjacent to forests. No caves or forested

areas would be impacted by the proposed action; therefore, this project will have “no effect” on the gray bat.

Interior Least Tern (Sterna antillarum) – Federally Endangered The least tern is a colonial, migratory waterbird, which resides and breeds along the Mississippi River during the spring and summer. Least terns arrive on the Mississippi River from late April to mid-May. Reproduction takes place from May through August, and the birds migrate to the wintering grounds in late August or early September (USACE 1999b). Sparsely vegetated portions of sandbars and islands are typical breeding, nesting, rearing, loafing, and roosting sites for least terns along the MMR. Nests are often at higher elevations and well removed from the water’s edge, a reflection of the fact that nesting starts when river stages are relatively high (USACE 1999b). In alluvial rivers, sandbars are dynamic channel bedforms. Individual sandbars typically wax and wane over time as fluvial processes adjust channel geometry to varying sediment load and discharge, the construction of river engineering works, and other influences. There is limited data on site fidelity for Mississippi River least terns. Given the highly dynamic bed and planform of the historic river, ability to return to previously used colony sites is not likely a critical life history requirement. The availability of sandbar habitat to least terns for breeding, nesting, and rearing of chicks from 15 May to 31 August is a key variable in the population ecology of this water bird. Only portions of sandbars that are not densely covered by woody vegetation and that are emergent during the 15 May to 31 August period are potentially available to least terns (USACE 1999b). A 1999 report (USACE 1999b) estimated that there were approximately 20,412 acres of non-vegetated sandbar habitat above the MMR LWRP. About 4,975 acres (111 ac/RM) were located between the Mouth of the Ohio and Thebes Gap (RM 0-45) and 15,437 acres (103 ac/RM) between Thebes Gap and the Mouth of the Missouri River (RM 45-195). Currently, reoccurring nesting is known at Marquette Island (RM 50.5), Bumgard Island (RM 30), and Brown’s Bar (RM 24.5-23.5) (USFWS 2004a). Some nesting attempts have also been made at Ellis Island (RM 202), however these are not considered to be reoccurring.

Least terns are almost exclusively piscivorous (Anderson 1983), preying on small fish, primarily minnows (Cyprinidae). Prey size appears to be a more important factor determining dietary composition than preference for a particular species or group of fishes (Moseley, 1976; Whitman, 1988, USACE 1999b). Fishing occurs close to the nesting colonies and may occur in both shallow and deep water, in main stem river habitats or backwater lakes or overflow areas. Radiotelemetry studies have shown that terns will travel up to 2.5 miles to fish (Sidle and Harrison, 1990, USACE 1999b). Along the Mississippi River, individuals are commonly observed hovering and diving for fish over current divergences (boils) in the main channel, in areas of turbulence and eddies along natural and revetted banks, and at “run outs” from floodplain lakes where forage fish may be concentrated (USACE 1999b).

Although south of the project area, the least tern population surveys between Cape Girardeau, MO and Baton Rouge, LA were contracted by the USACE Memphis District from 1985 to 2012. These casual observance surveys have revealed a five to six-fold increase in individuals along the Lower Mississippi River from the initial survey years. Numbers of nesting sites have generally more than doubled. Since 2003, the number of individual birds has remained above 8,000, with five of those years being over 10,000. In 2010, over 18,000 birds were counted (Jones 2011).

According to the Service (USFWS 2000), existing dikes have the ongoing effect of altering natural river habitat processes, thereby reducing the quality, quantity, and diversity of habitat in the MMR. The Service asserts that continued disruption of natural processes will affect least terns by (1) reducing the availability of bare sandbar nesting habitat; (2) reducing the availability of foraging habitat; and (3) reducing the abundance of forage food.

The rock dike substrate provides habitat for epilithic macroinvertebrates that are capable of colonizing in very high densities and providing an important food source for fish (USFWS 2000). The construction of the Dike at 173.4 (L) should reduce shoaling at RM 173, but will not affect the bar at RM 174. By completing regulating works projects at a local scale, long-term beneficial effects for least tern should accrue from the incorporation of structure modifications resulting in the creation of additional side channels and sandbars. Such activities may create additional nesting and rearing habitat and improve

forage food production. Placement of revetment along the riverbank at RM 175 – 173.5 and RM 172-171 would not impact any least tern nesting habitat, i.e., isolated sand bars.

Thus, dike construction, which results in the diversification of aquatic habitats, including formation of a secondary channel and shallow water habitat in this project area would be beneficial to the least tern, as well as fish in general (the species' forage base), and "may affect but is not likely to adversely affect" the Interior Least Tern.

Spectaclecase (Cumberlandia monodonta) – Federally Endangered This mussel is "known to occur in the Meramec River and may potentially occur in the Mississippi River north of Monroe County, Illinois" (USFWS undated). In an assessment of the status of population viability at known locations of occurrence across its range, USFWS (undated) considered all spectaclecase populations in the Mississippi River in Illinois and Missouri to be either extirpated or "non-viable or unknown." None were classified as having "some evidence of viability."

Habitat destruction and degradation are the chief causes of imperilment, including reservoir construction, channelization, chemical contamination, mining, and sedimentation. Habitats are found in medium to large rivers with low to high gradients, and include shoals and riffles with slow to swift currents over coarse sand and gravel. Substrates sometimes consist of mud, cobble, and boulders (USFWS 2011).

The spectaclecase is not known to exist in any nearby mussels beds. The proposed construction and alteration of the dikes as well as revetment placement "may affect, but is not likely to adversely affect" the spectaclecase mussel because evidence suggests that it is likely extirpated from the project area.

Sheepnose (Plethobasus cyphyus) – Federally Endangered Sheepnose mussel is listed as a federally endangered species and occurs in Missouri in the Mississippi, Meramec, Bourbeuse, and Osage Fork (Gasconade) Rivers. This species inhabits gravel and mixed sand and gravel habitats in medium to large rivers.

The sheepnose is thought to be extant in five Mississippi River pools (3, 5, 15, 20 and 22) in very low numbers. In the upper Mississippi River, the sheepnose is an example of a rare species becoming rarer. Despite the discovery of juvenile recruitment in Mississippi River Pool 7, the sheepnose population levels in the upper Mississippi River appear to be very small and of questionable long-term viability. The sheepnose and other mussel populations in the upper Mississippi River are seriously threatened by zebra mussels. Even if some level of sheepnose recruitment was documented, the status of this species in the Mississippi River is highly jeopardized, with imminent extirpation a distinct possibility (USFWS 2003). This project could potentially benefit this species by providing some of its necessary habitat features, i.e. shallow shoal habitats and flow refugia. The sheepnose is not known to occur in any nearby mussel beds. This project "may affect but is not likely to adversely affect" the sheepnose mussel.

Pink Mucket (Lampsilis abrupta) – Federally Endangered The pink mucket is a medium-sized (reaching up to approximately 100 mm in length) freshwater mussel with a smooth, yellow or yellowish green shell and faint green rays. The life span of the species exceeds 50 years. Like other freshwater mussels, the pink mucket feeds by filtering food particles from the water column. The specific food habits of the species are unknown, but other juvenile and adult freshwater mussels have been documented to feed on detritus, diatoms, phytoplankton, and zooplankton.

The pink mucket has undergone a substantial range reduction. It was historically distributed in 25 rivers and tributaries in the Ohio, Cumberland, Mississippi, and Tennessee River systems. The species is likely extirpated in Ohio, Pennsylvania, and Illinois (NatureServe 2003). Records from 1990 indicate that the species remained in only 16 rivers and tributaries at that time (NatureServe 2003).

The pink mucket typically inhabits medium to large rivers with strong currents; however, it has also been able to survive and reproduce in areas of impounded reaches with river/lake conditions, but not

in standing water (NatureServe 2003, USFWS 1985). Substrate preferences include sand, gravel, and pockets between rocky ledges in high velocity areas and mud and sand in slower moving waters. Individuals have been found at depths up to one meter in swiftly moving currents and in much deeper waters with slower currents (Gordon and Layzer 1989). No pink mucket population is known in the project area; therefore the project "may affect, but is unlikely to adversely affect" the pink mucket.

Decurrent False Aster (Boltonia decurrens) – Federally Threatened Decurrent false aster is a threatened floodplain species that is considered to potentially occur in St. Clair County, Illinois and St. Louis City, Missouri, bordering the Mississippi River. It is a perennial, early successional plant found on moist, sandy, floodplains and prairie wetlands along the Illinois River. It relies on periodic flooding to scour away other plants that compete for the same habitat (USFWS 2011). Without disturbance, other plant species can outcompete decurrent false aster and eliminate it in 3 to 5 years from any given area. Decline in this species is due to several factors including excessive silting of habitat due to topsoil run-off, conversion of natural habitat to agriculture, drainage/development of wetlands, altered flooding patterns, and herbicide use. No critical habitat rules have been published for the decurrent false aster.

Decurrent false aster is not known to occur within the project area. Most of the known populations of this species occur north of the project area below the confluence of the Illinois River. Due to the placement of revetment and the loss of potential suitable habitat in the area, the project "may affect, but is not likely to adversely affect" the decurrent false aster.

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Plate 1 – 2007 Aerial Photograph Mosenthein/Ivory Landing Reach

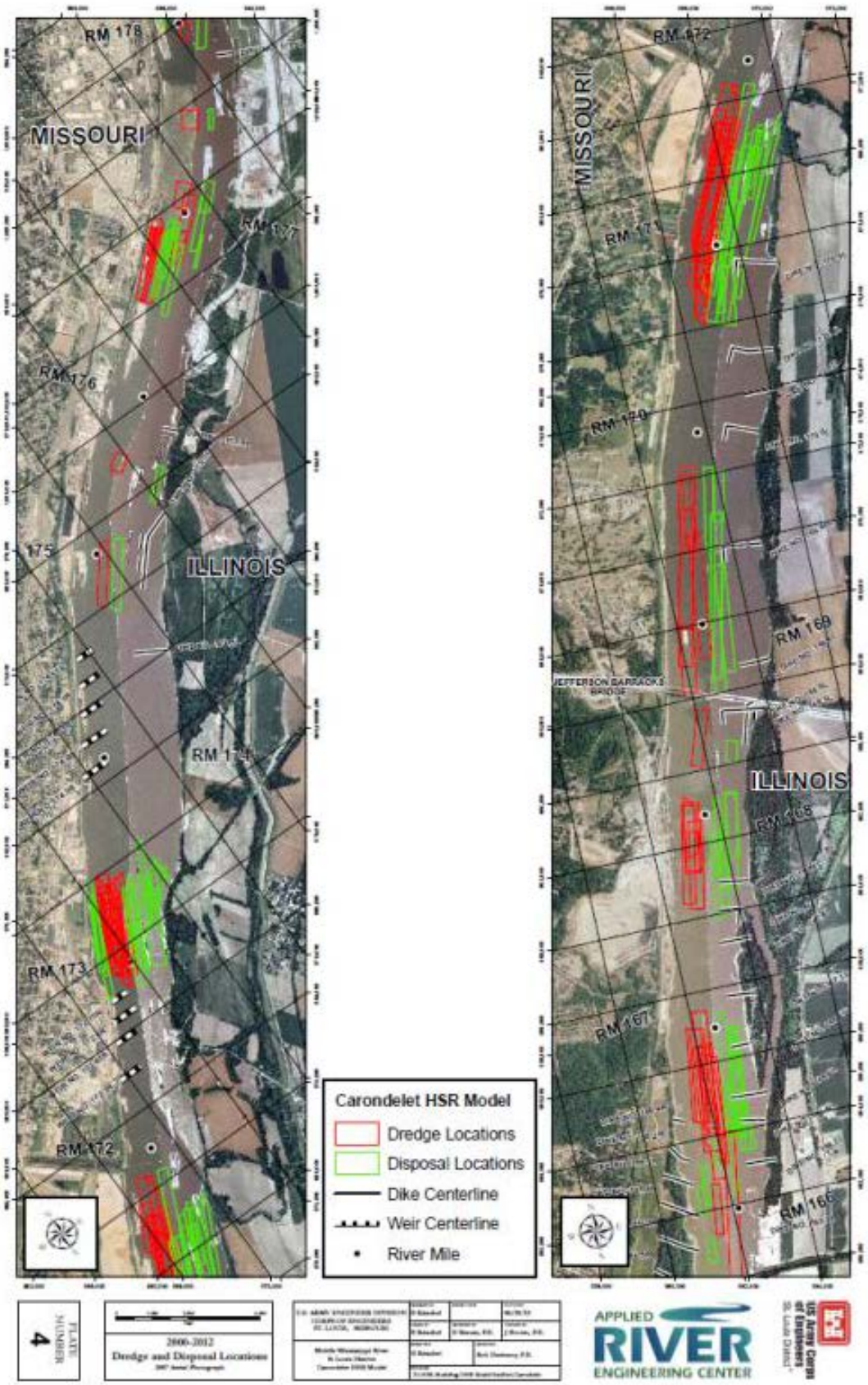

Plate 2 - Dredge and Disposal Locations

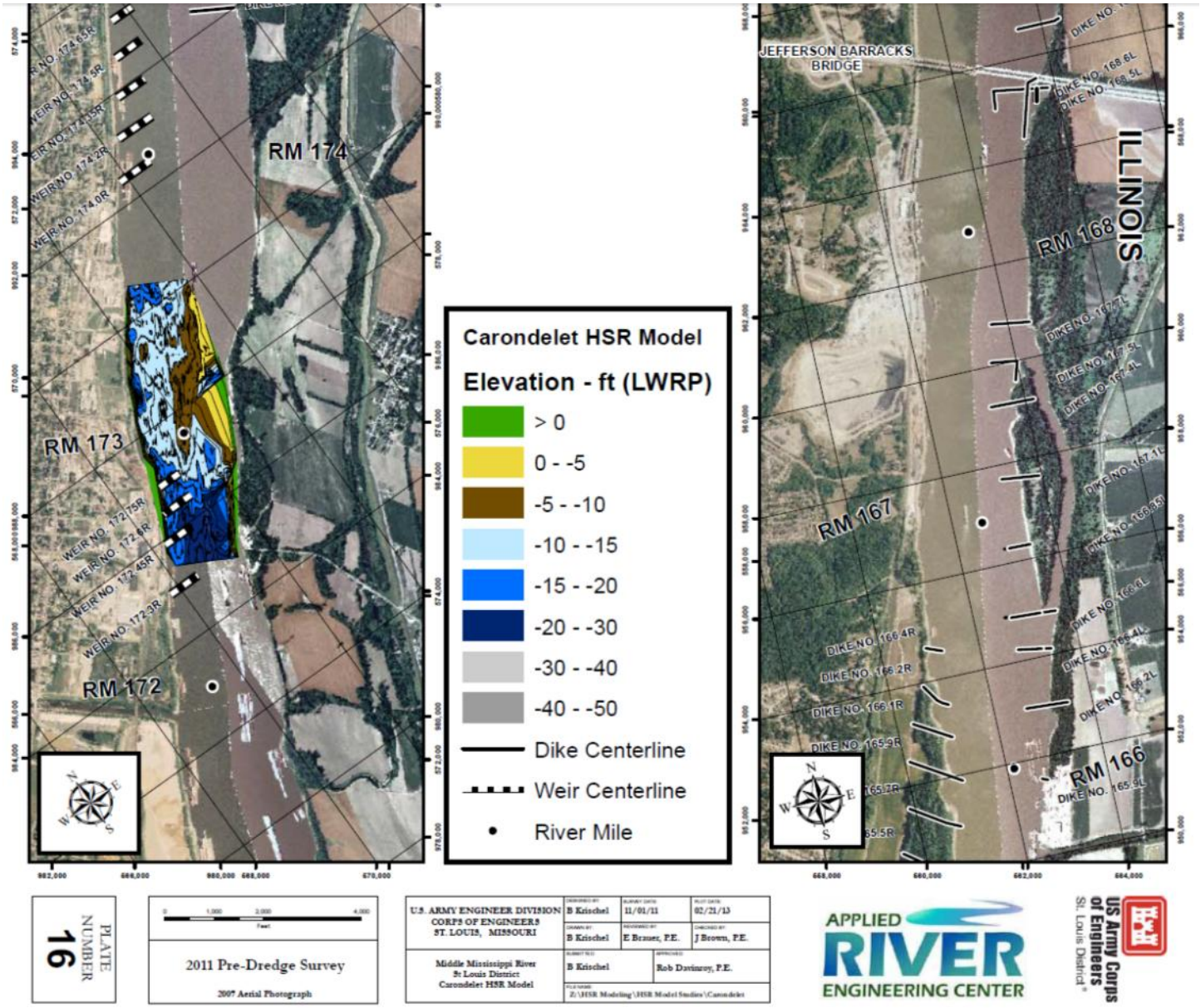

Plate 3 – Dredge Survey Showing Elevation and Shoaling at RM 173

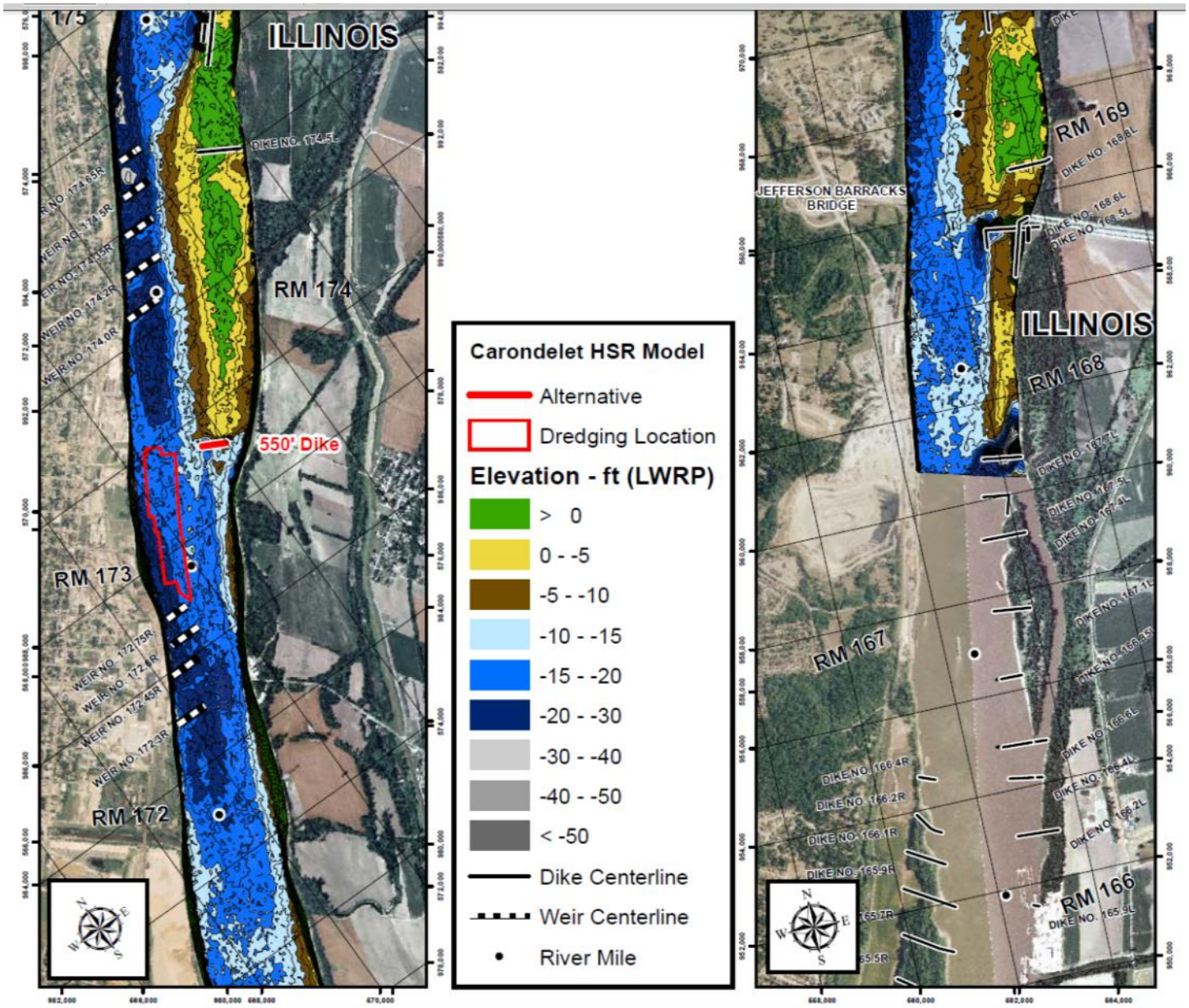

Plate 4 – Alternative 31

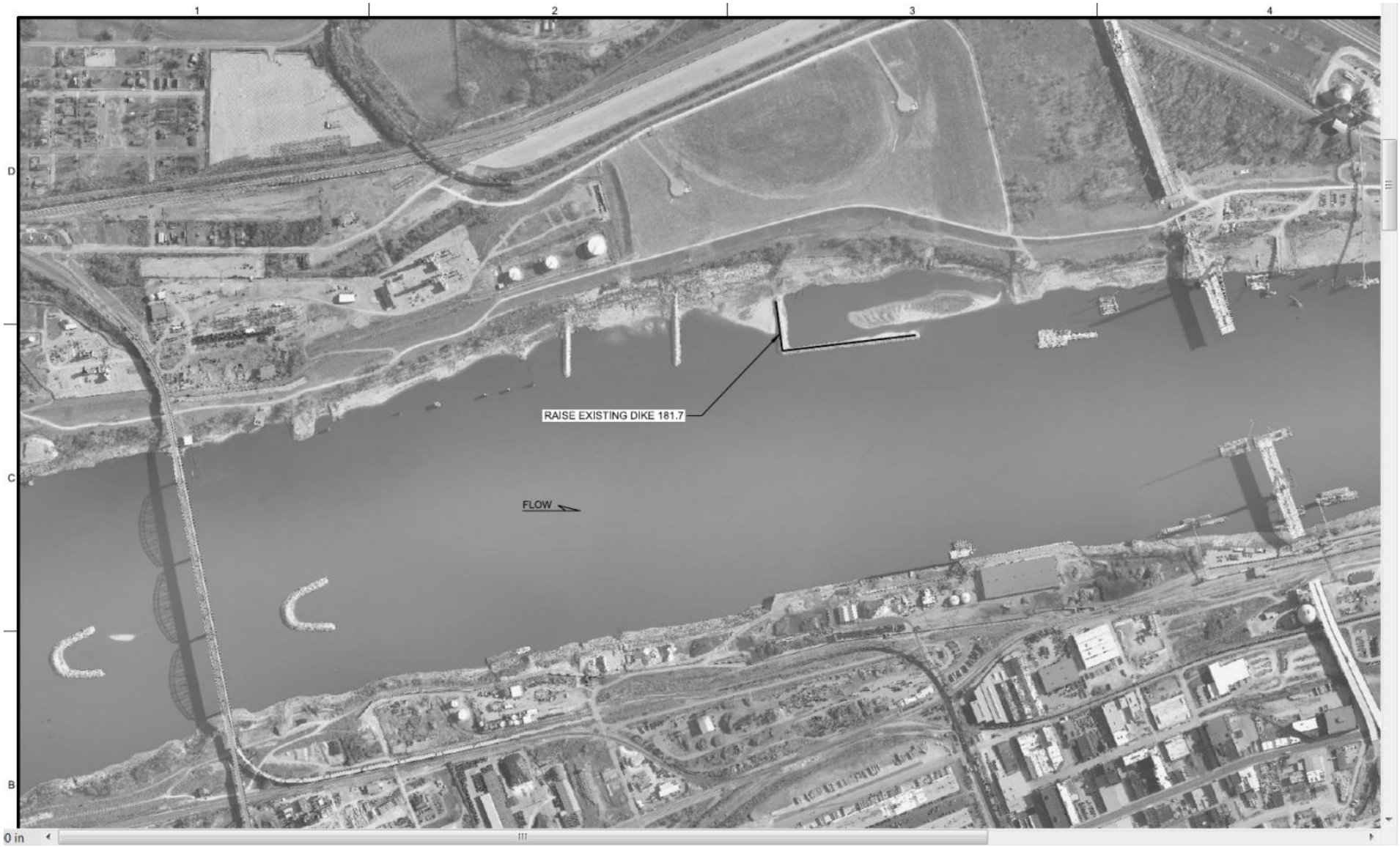

Plate 5 – Proposed Construction

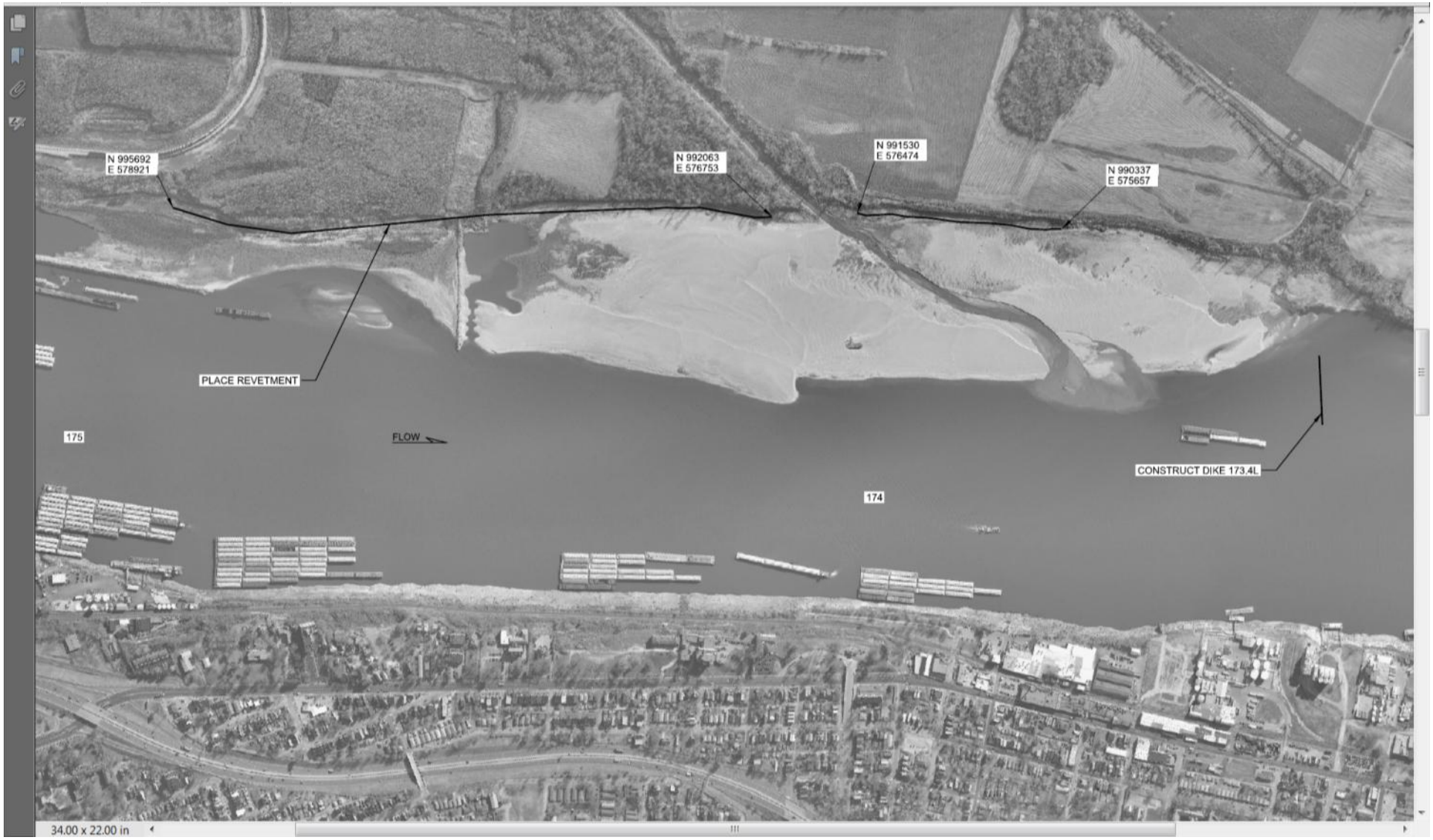

Plate 6 – Proposed Construction

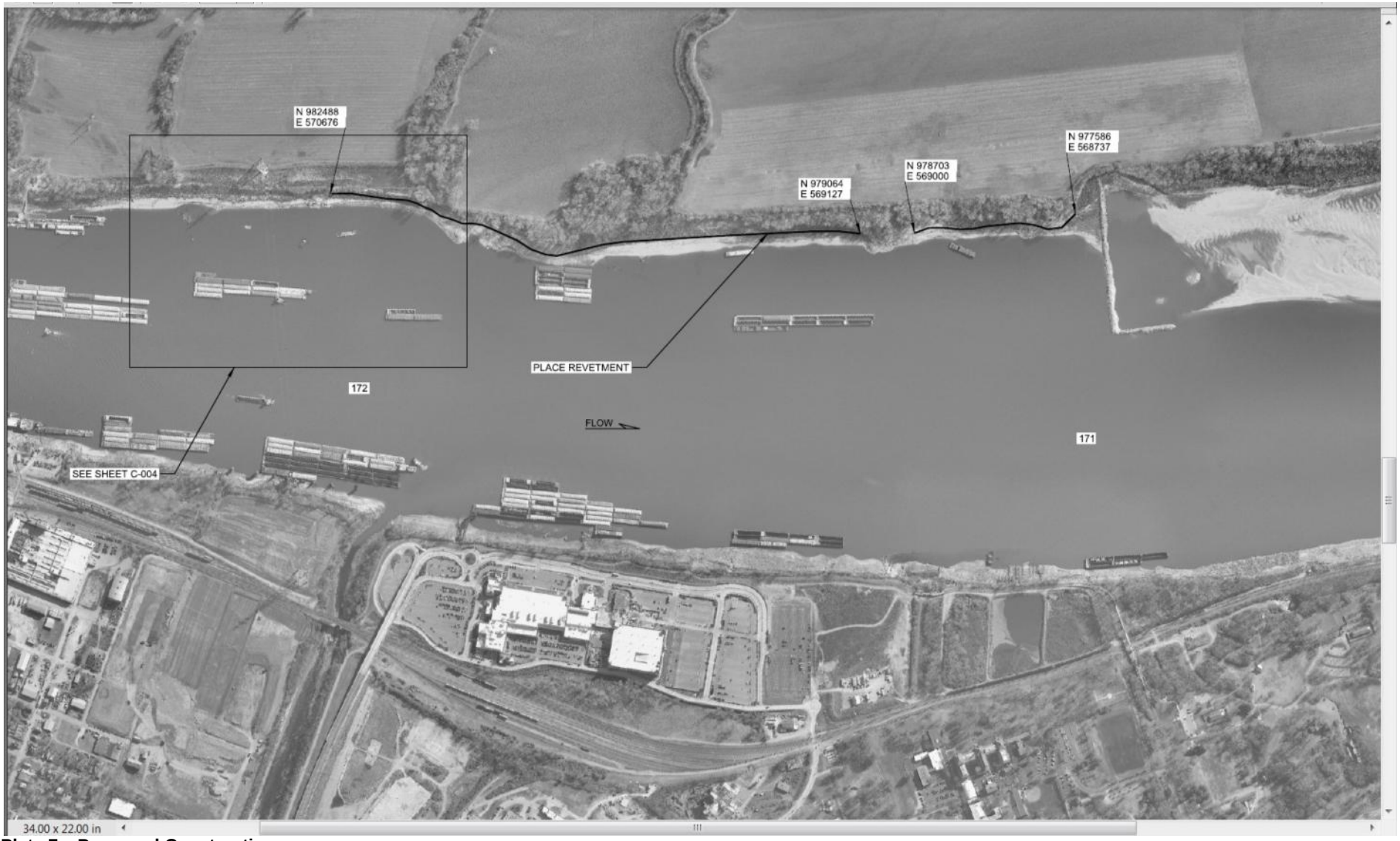

Plate 7 – Proposed Construction

Appendix C. Correspondence

Illinois Historic
Preservation Agency

FAX (217) 782-8161

1 Old State Capitol Plaza • Springfield, Illinois 62701-1512 • www.illinois-history.gov

Various Counties
East Carondelet to Brooklyn
New Construction of Revetments and Dike, Raise Existing Dike - Mosenthein-Ivory Landing Phase 4 River Training Structures
Between St. Louis Harbor River Miles 171 and 175, Existing Dike - 181.7L, Proposed Dike - 173.4L,
IHPA Log #011082013

September 4, 2013

Michael K. Trimble, Ph.D., Chief
Department of the Army
St. Louis District, Corps of Engineers
Curation and Archives Analysis Branch (EC-Z)
1222 Spruce St.
St. Louis, MO 63103-2833

Dear Chief Trimble:

We have reviewed the documentation submitted for the referenced project in accordance with 36 CFR Part 800.4. Based upon the information provided, no historic properties are affected. We, therefore, have no objection to the undertaking proceeding as planned.

Please retain this letter in your files as evidence of compliance with section 106 of the National Historic Preservation Act of 1966, as amended. This clearance remains in effect for two years from date of issuance. It does not pertain to any discovery during construction, nor is it a clearance for purposes of the Illinois Human Skeletal Remains Protection Act (20 ILCS 3440).

If you have any further questions, please contact me at 217/785-5027.

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

Illinois Historic
Preservation Agency

1 Old State Capitol Plaza, Springfield, IL 62701-1512

FAX 217/782-8161

www.illinoishistory.gov

Various County PLEASE REFER TO: IHPA LOG #011082013
East Carondelet to Brooklyn
Between St. Louis Harbor River Miles 171 and 175, Existing Dike - 181.7L, Proposed Dike - 173.4L
COESTL
New Construction of Revetments and Dike, Raise Existing Dike - Mosenthein-Ivory Landing Phase 4 River Training Structures

September 19, 2013

Michael K. Trimble, Ph.D., Chief
Department of the Army
St. Louis District, Corps of Engineers
Curation and Archives Analysis Branch (EC-Z)
1222 Spruce St.
St. Louis, MO 63103-2833

Dear Chief Trimble:

Acre(s): 13.7 Site(s): 0
Archaeological Contractor: COESTL/Smith

Thank you for submitting the results of the archaeological reconnaissance. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

Our staff has reviewed the archaeological Phase I reconnaissance report performed for the project referenced above. The Phase I survey and assessment of the archaeological resources appear to be adequate. Accordingly, we have determined, based upon this report, that no significant historic, architectural, and archaeological resources are located in the project area.

Please submit a copy of this letter with your application to the state or federal agency from which you obtain any permit, license, grant, or other assistance. Please retain this letter in your files as evidence of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. This clearance remains in effect for two years from date of issuance. It does not pertain to any discovery during construction, nor is it a clearance for purposes of the Illinois Human Skeletal Remains Protection Act (20 ILCS 3440).

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:

August 16, 2013

Engineering and Construction Division
Curation and Archives Analysis Branch

COPY

Ms. Glenna J. Wallace, Chief
Eastern Shawnee Tribe of Oklahoma
P.O. Box 350
Seneca, Missouri 64865

Dear Chief Wallace:

This letter addresses the construction of river training structures in four major areas of the middle Mississippi River. River training structures are used to help reduce sediment deposition in the navigation channel and to limit the need for dredging. The U.S. Army Corps of Engineers proposes adding, or modifying, twenty seven (27) training structures.

This project is located along the Mississippi River from St. Louis Harbor, located in St. Clair County, Illinois, south along the Mississippi River to the counties of Alexander located in Illinois, and Mississippi located in Missouri (see Figure 1). See Figures 2–7 for the location and structure types to be constructed on both the Illinois and Missouri sides of the Mississippi River. Federal monies have been received for the river training structures. The project areas are located on private land both in Missouri and Illinois. This federal action falls under Section 106 of the National Historic Preservation Act (NHPA), in conjunction with the National Environmental Policy Act (NEPA) and the Clean Water Act (CWA). This project is being implemented to improve navigation, reduce dredging in the channel, and enhance wildlife habitat along the river.

In 1866 the Federal Government allocated funding for a 4-foot navigation channel between Minneapolis and St. Louis. In 1878 this channel was deepened to a 4.5-foot channel, and in 1907 it was once again deepened to a 6-foot channel. This was achieved using a system of wing and closing dikes in conjunction with river dredging. On July 3, 1930, the Rivers and Harbors Act was amended, and the lock and dam system along the upper Mississippi River, from Minneapolis to St. Louis, was put in place. However, the middle and lower sections of the Mississippi River, below St. Louis, remains an open river navigation channel.

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Training structures will be incorporated into the pre-existing system of structures already located along the river. There are numerous types of river structures including dikes, revetments, and bendway weirs. Below is a description of the different types of training structures proposed for this project. See Table 1 for the proposed location and type of structure to be constructed.

- **Wing dikes** are the oldest form of river training structure. They are constructed from the bankline into the river generally at a perpendicular angle to the current (see Figure 2 for an example). They redirect the river's own energy to manage sediment distribution within the river channel. While the original dikes of the nineteenth century were largely pile structures, by the middle of the twentieth century many had been converted to stone-fill types.

- **L-dikes** are shaped like an L with the shorter arm extending to the bank and the longer arm parallel with the current (see Figure 2 for an example). They are used to restrict sediment-carrying bottom currents from moving into the area between a series of dikes.

- **Rootless dikes** are wing dikes that are not connected to the shore (see Figure 3 for an example). The gap between the structure and the bank promotes habitat diversity.

- **Diverter (or S-) dikes** are in-stream structures useful in creating secondary side channels as they capture water from the main channel and direct it toward areas of interest, while still providing enough roughness and constriction to maintain a navigable channel (see Figure 5 for an example). They cause minimal erosion along the bankline because eddies are formed at their downstream tip.

- **Chevrons** are blunt nosed arch-shaped structures constructed parallel to the river flow (see Figure 4 for an example). Like other dikes they utilize the energy of the river to redistribute water flow, but unlike traditional dikes that create a unidirectional deflection, they create a split flow. The riverside bank of the chevron directs flow to maintain the navigation channel while the other side directs flow toward the near bank region. These structures have been proven to be effective at promoting environmental diversity, including a low velocity habitat behind the chevron itself.

- **Revetments** are structures placed along the river bank to stabilize or protect the bank from erosion (see Figure 3 for an example). They are usually constructed out of stone, but a variety of other materials have been used including concrete-mat, willow mattresses, and gabions.

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- **Bendway weirs** are submerged rock structure that are positioned from the outside bankline of a river-bend and angled upstream toward the river flow (see Figure 7 for an example). These underwater structures extend directly into the navigation channel and shift the current away from the outside bankline. This controls channel scouring, and reduces riverbank erosion, resulting in a wider and safer navigation channel through the bend without the need for periodic dredging.

Impacts to potentially significant historic properties are not anticipated during this work. River training structures are constructed via barge, without recourse to land access; therefore, any impact is limited to submerged cultural resources. Primary among these are historic period shipwrecks. Given the continual river flow and associated sedimentary erosion, deposition, and reworking, it is highly unlikely that any more ephemeral cultural material remains on the river bed. USACE has conducted shipwreck surveys during times of historic low water levels and maintains a database of known shipwrecks for the middle Mississippi. All proposed locations for river training structures are compared to the database, as well as aerial imagery from low water years, to ensure historical shipwrecks are not adversely impacted.

River embankments can potentially have adverse affects on cultural resources. As with other training structures they are conducted via barge, without recourse to land access. The placement of the rock on the shoreline, however, has the potential to affect any resources on that shoreline. With all embankment features, historical research is conducted on the proposed location to determine if the area is on recently accreted land or cut-banks in an existing, older, landform. Recently accreted land is highly unlikely to contain deeply buried cultural resources. If appropriate, pedestrian and/or shovel test surveys will be conducted to investigate all proposed locations. Should an inadvertent discovery of human remains occur, then state law will be followed, and work will stop within the area of the discovery. Tribes will be notified, and any human remains will be treated with respect and dignity. The following Federally recognized tribes are being notified of this project.

Absentee-Shawnee Tribe of Oklahoma
Eastern Shawnee Tribe of Oklahoma
Shawnee Tribe
Cherokee Nation
United Keetoowah Band of Cherokee of Oklahoma
Delaware Nation, Oklahoma
Delaware Tribe of Indians, Oklahoma
Citizen Potawatomi Nation
Forest County Potawatomi Community
Match-e-be-nash-she-wish Band of Potawatomi of Michigan
Hannahville Indian Community
Nottawaseppi Band of Huron Potawatomi
Pokagon Band of Potawatomi
Prairie Band Potawatomi Nation
Ho-Chunk Nation of Wisconsin
Winnebago Tribe of Nebraska
Iowa Tribe of Kansas and Nebraska
Iowa Tribe of Oklahoma
Kickapoo Traditional Tribe of Texas

Kickapoo Tribe of Oklahoma
Kickapoo Tribe of Indians of Kansas
Sac & Fox Nation of Oklahoma
Sac & Fox Nation of Missouri in Kansas and Nebraska
Sac & Fox Tribe of the Mississippi in Iowa
Miami Tribe of Oklahoma
Osage Nation of Oklahoma
Peoria Tribe of Oklahoma
Quapaw Tribe of Indians, Oklahoma

The U.S. Army Corps of Engineers, St Louis District is requesting you review the maps and information about this project and notify our office if you have any concerns such as a traditional cultural properties or sacred sites that are located within or near the construction sites. Please notify our office no later than October 4, 2013, if you have any areas of concern. If you have any questions regarding this matter, please contact Ms. Roberta L. Hayworth, Native American Coordinator directly at (314) 331-8833, or by electronic mail at roberta.l.hayworth@usace.army.mil. Thank you in advance for your timely review of this request.

Sincerely,

Michael K. Trimble, Ph.D.
Chief, Curation and Archives
Analysis Branch

COPY

Enclosures

Copy Furnished:
Mr. Joseph Blanchard

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Major Reach	Localized Reach	Work	County	State
Mosethein-Ivory Landing Phase 4 (RM 195-154)	St Louis Harbor	Revetment RM 175-171	St. Clair	IL
		Raise Dike 181.7L	St. Clair	IL
		Dike 173.4L	St. Clair	IL
Eliza Point/Greenfield Bend Phase 3 (RM20-0)	Bird's Point (RM 4-0)	Rootless Dike 3.0L	Alexander	IL
		Weir 2.6R	Mississippi	MO
		Weir 2.5R	Mississippi	MO
		Weir 2.3R	Mississippi	MO
		Weir 2.2R	Mississippi	MO
Grand Tower Phase 5 (RM90-67)	Crawford Towhead (RM 75-71)	Chevron 73.6L	Union	MO
		Dike Extension 72.9L	Union	MO
		Chevron 72.5L	Union	MO
	Vancil Towhead (RM 70-66)	Weir 69.15R	Cape Girardeau	MO
		Weir 68.95R	Cape Girardeau	MO
		Weir 68.75R	Cape Girardeau	MO
		Diverter Dike 68.10L	Union	IL
		Diverter Dike 67.80L	Union	IL
		Diverter Dike 67.50L	Union	IL
		Repair Dike 67.80L	Union	IL
		Shorten Dike 67.30L	Union	IL
		Shorten Dike 67.10L	Union	IL
		600 feet Revetment	Union	IL
Dogtooth Bend Phase 5 (RM 40-20)	Bumgard (RM 33-27)	Weir 34.20L	Alexander	IL
		Weir 34.10L	Alexander	IL
		Weir 32.50L	Alexander	IL
		Weir 32.40L	Alexander	IL
		Weir 32.3L	Alexander	IL
		Weir 32.2L	Alexander	IL
		Shorten Dike 32.0L	Alexander	IL
		Extend Dike 31.8L	Alexander	IL
		Extend Dike 31.6L	Alexander	IL
		Dike 31.6R	Scott	MO
		Extend Dike 31.4L	Alexander	IL
		Extend Dike 31.2L	Alexander	IL
		Extend Dike 31.1L	Alexander	IL
		Weir 30.80R	Scott	MO
		Weir 30.70R	Scott	MO

Table 1

Proposed FY 2014 river training structure projects

Figure 1. Location of proposed work.

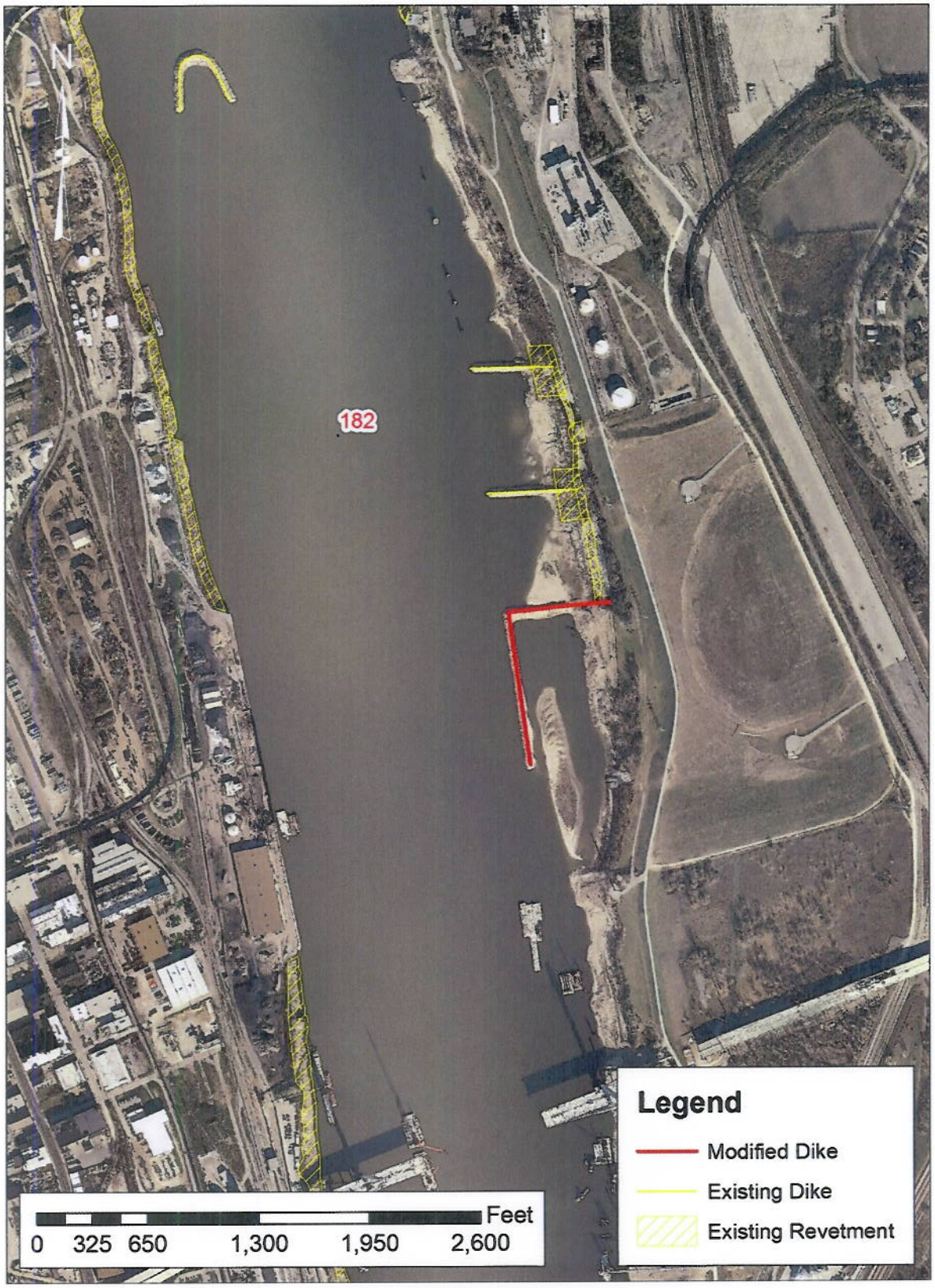

Figure 2. Location of Dike 181.7L in St. Louis Harbor.

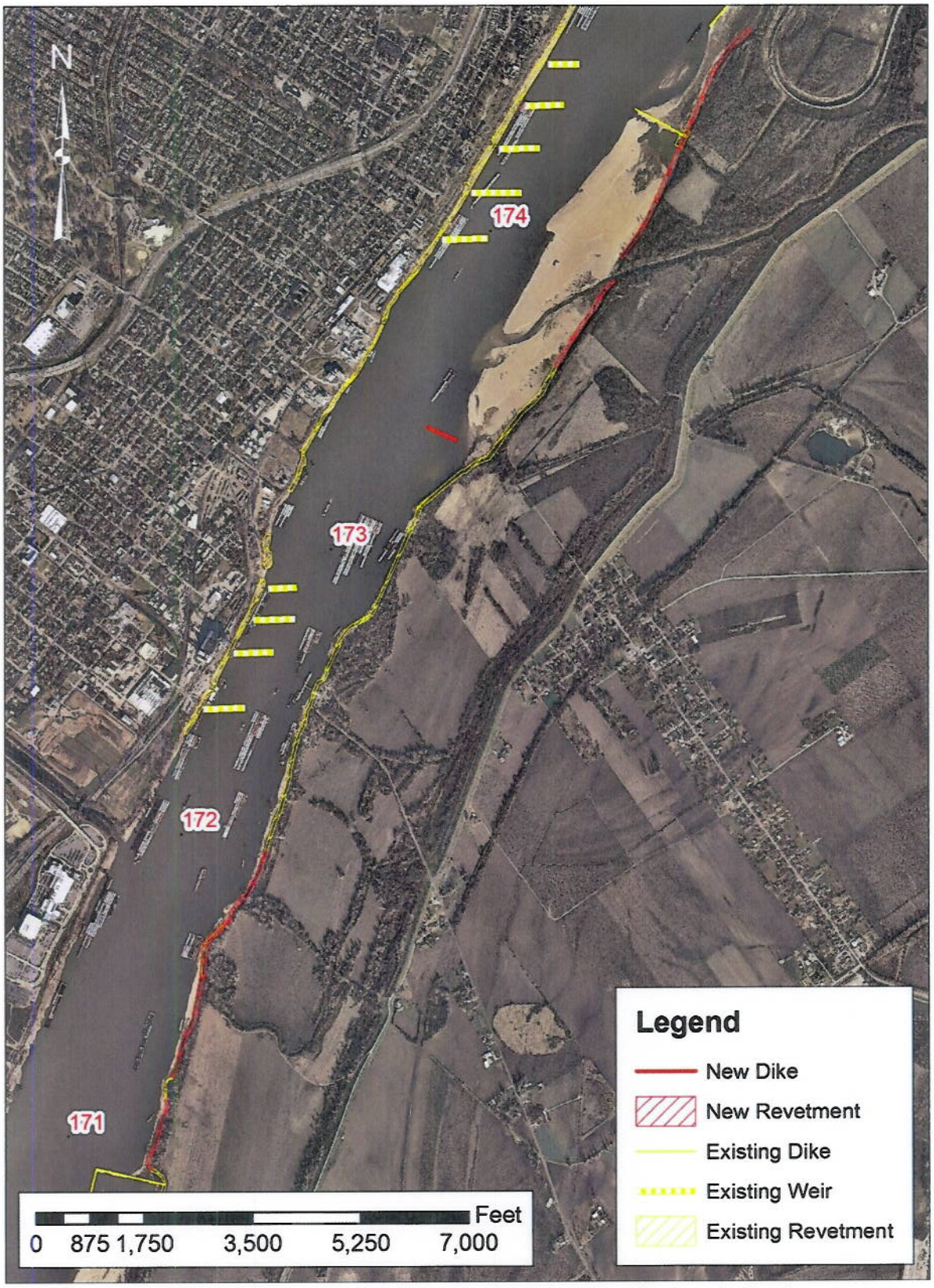

Figure 3. Location of proposed work in St. Louis harbor.

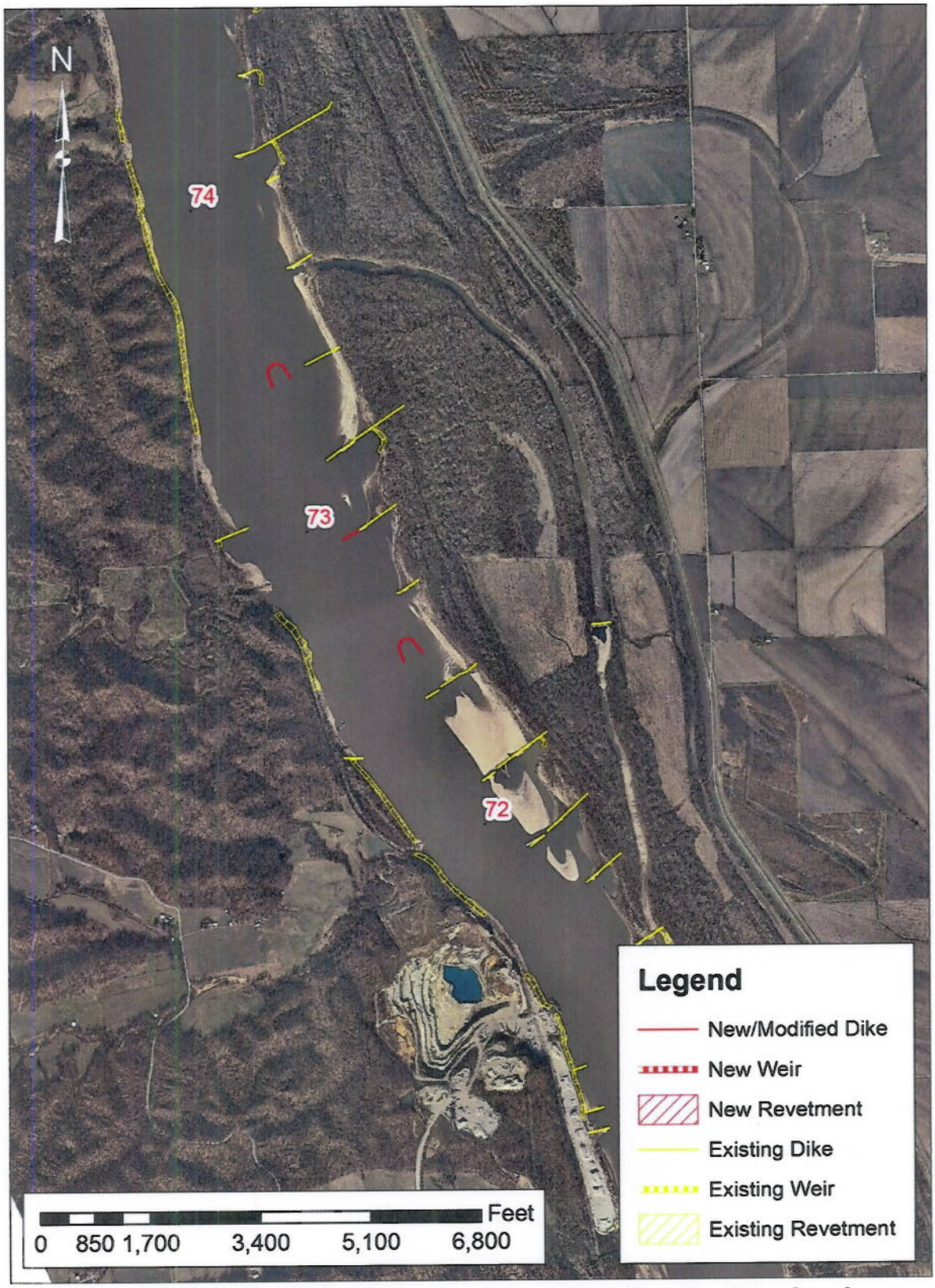

Figure 4. Location of proposed work at Crawford Towhead.

Figure 5. Location of proposed work at Vancil Towhead.

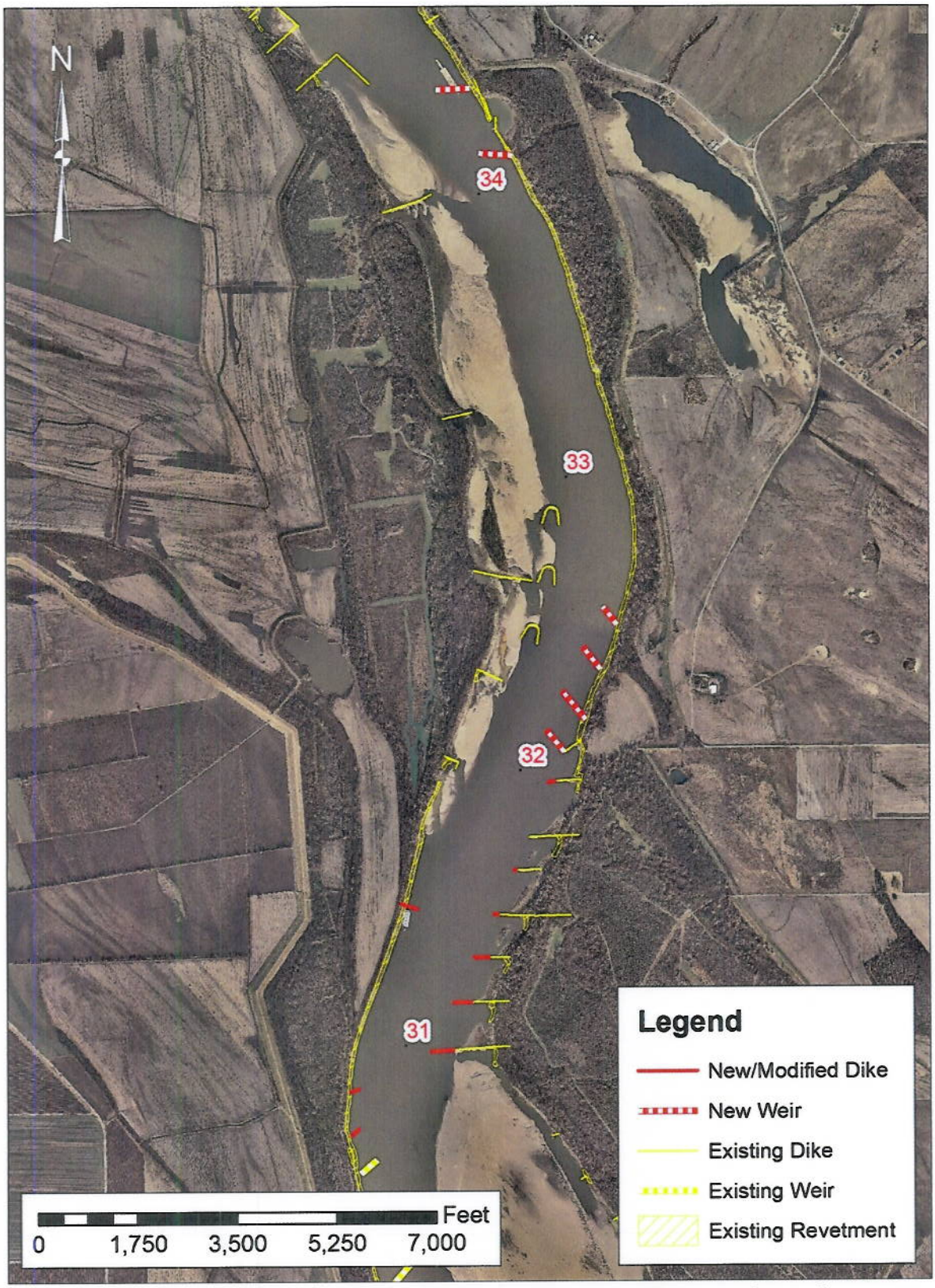

Figure 6. Location of proposed work at Bumgard reach.

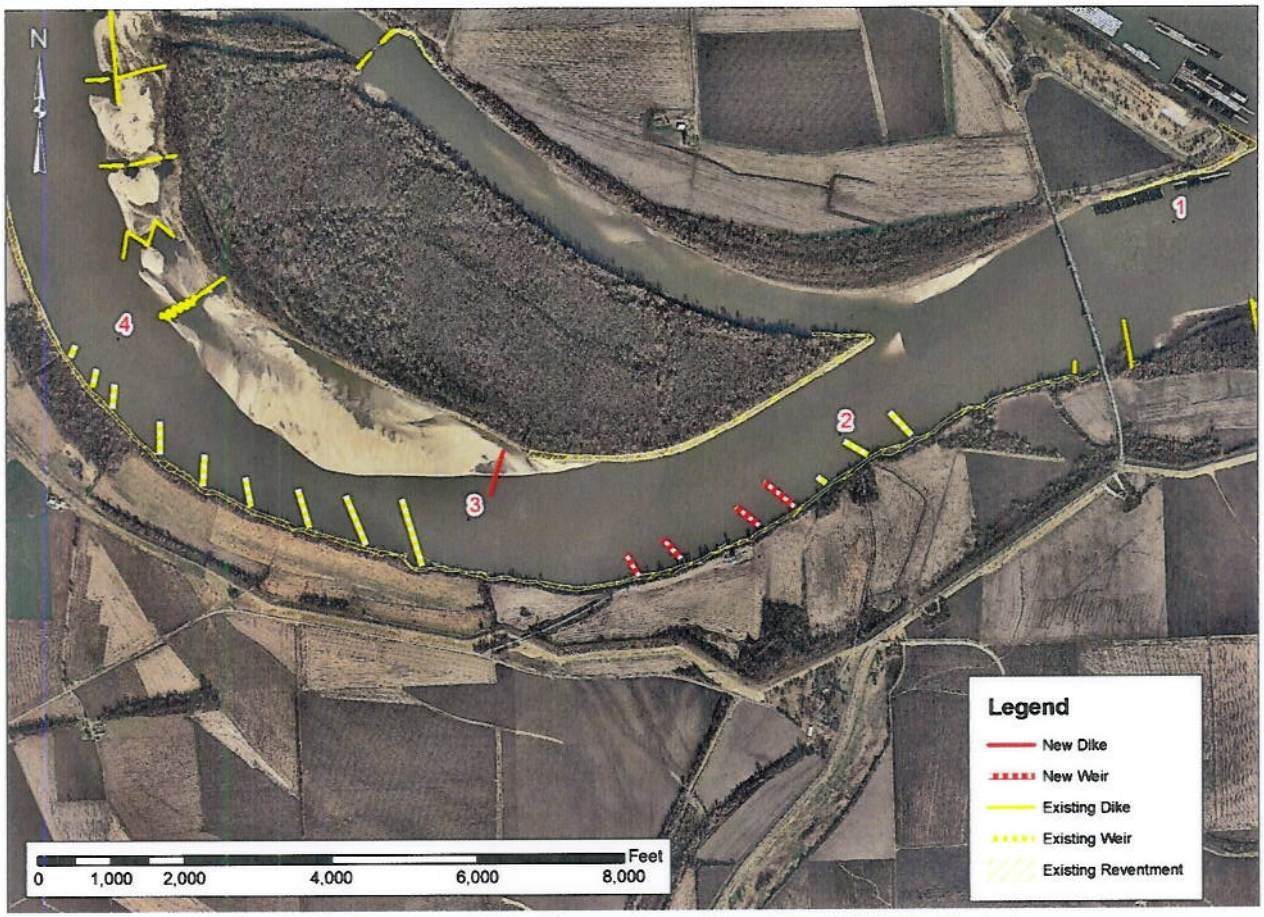

Figure 7. Location of proposed work at Birds Point.

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REGULATING WORKS PROJECT
MOSENTHEIN/IVORY LANDING PHASE 4
MIDDLE MISSISSIPPI RIVER MILES 175-170
ST. CLAIR COUNTY, IL
ST. LOUIS CITY, MO

OCTOBER 2013

APPENDIX D
CLEAN WATER ACT
SECTION 404(b)(1) Evaluation

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APPENDIX D
CLEAN WATER ACT
SECTION 404(b)(1) Evaluation

1. PROJECT DESCRIPTION

A. Location. The Mosenthrin/Ivory Landing Phase 4 Regulating Works Project is located in the Middle Mississippi River (MMR) between river miles (RM) 182 and 170 in St. Louis City, Missouri and St. Clair County, Illinois. The MMR is defined as that portion of the Mississippi River that lies between the confluences of the Ohio and Missouri rivers.

B. General Description. The Corps of Engineers St. Louis District is proposing to construct the Mosenthein/Ivory Landing Phase 4 Project as part of its Regulating Works Project. The Regulating Works Project utilizes bank stabilization and sediment management to maintain bank stability and ensure adequate navigation depth and width. Bank stabilization is achieved by revetments, while sediment management is achieved by river training structures, i.e. dikes. The Mosenthein/Ivory Landing Phase 4 Project is designed to address repetitive maintenance dredging conditions in the project area. The project involves construction of rootless dike 173.4 (L), and placement of bankline revetment at four locations on the left descending bank from river mile 175 to 171.

C. Authority and Purpose. The Middle Mississippi River Regulating Works Project is specifically and currently authorized pursuant to Rivers and Harbors Acts beginning in 1881. These authorize USACE to provide a 9-foot-deep by minimum of 300-foot-wide navigation channel at low river levels corresponding to 40,000 cubic feet per second discharge.

The purpose of this project is to reduce the need for repetitive channel maintenance dredging in the project area, thereby providing a sustainable, safe and dependable navigation channel.

D. General Description of the Fill Material.
Fill material would include quarry run limestone consisting of graded “A” stone. Size requirements for graded “A” stone are shown below. Stone (260,000 tons) required for construction would be obtained from commercial stone quarries in the vicinity of the project area capable of producing stone which meets USACE specifications.

GRADED “A” STONE	
Stone Weight (LBS)	Cumulative % Finer by Weight
5000	100
2500	70-100
500	40-65
100	20-45
5	0-15
1	0-5

E. Description of the Proposed Placement Site.
The proposed project would consist of the following:

Construction of rootless dike at river mile 173.4 (L)

- 550 feet long
- Top elevation of 389 feet (+15 feet LWRP)

Placement of revetment on the bankline at 4 locations from river mile 175 to 171

- Approximately 11,500 linear feet
- Top elevation of approximately 404 feet (+30 feet LWRP) or existing high bank elevation, whichever is lower

F. Description of the Placement Method.
Placement of material would be accomplished by trackhoe or dragline crane. Stone would be transported to placement sites by barges. All construction would be accomplished from the river and all work would be performed below ordinary high water. No grading of banks for revetment placement will be performed.

2. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

I. **Elevation and Slope.** There would be an immediate change in substrate elevation and slope over the areal extent of the placement location of rootless dike 173.4 (L). The rootless dike would consist of a rock mound of uniform shape, 550 feet long, placed approximately 450 feet off the existing bankline and extending toward the navigation channel. The top elevation of the rootless dike would be 389 feet. Side slopes would be approximately 1 vertical on 1.5 horizontal. After placement, sediment patterns in the immediate vicinity of the structure would change with scour occurring off both ends of the dike. Areas immediately downstream of the dike would experience some areas of accretion and some areas of scour.

There would be an immediate change in elevation over the areal extent of the revetment placement locations. Elevation change associated with revetment placement will be 30 inches minimum. In areas with steep, caving banks, elevation changes will be greater as enough revetment will be placed to bring the slope to 1 vertical on 1.5 horizontal. After placement, sedimentation patterns in the immediate vicinity of the revetment will change as bankline erosion is prevented.

II. **Sediment Type.** The project site is located entirely within the existing channel of the Middle Mississippi River. The Middle Mississippi River channel is comprised mainly of sands with some gravels, silts, and clays. The stone used for construction would be Graded “A” limestone.

III. **Fill Material Movement.** No bank grading or excavation would be required for placement of stone. Draglines and/or trackhoes would pull rock from floating barges and place the material into the river and on the banks. Fill materials would

be subject to periodic high flows which may cause some potential movement and dislodging of stone. This may result in the need for minor repairs; however, no major failures are likely to occur.

IV. **Physical Effects on Benthos.** Material placement should not significantly affect benthic organisms. Shifting sediments at structure placement sites likely harbor oligochaetes, chironomids, caddisflies, turbellaria, and other macroinvertebrates. High densities of hydropsychid caddisflies and other macroinvertebrates would be expected to colonize the large limestone rocks after construction. Fish would temporarily avoid the area during construction. Greater utilization of the project location by fish is expected after construction due to the expected increase in densities of macroinvertebrates.

V. **Actions Taken to Minimize Impacts.** Best Management Practices for construction would be enforced.

B. Water Circulation, Fluctuation, and Salinity Determinations

I. **Water.** Some sediments (mostly sands) would be disturbed when the rock used for construction is deposited onto the riverbed. This increased sediment load would be local and minor compared to the natural sediment load of the river, especially during high river stages.

II. **Current Patterns and Circulation.** The rootless dike 173.4 (L) would create split flow conditions at river stages below the top structure elevation of 389 feet. The rootless dike would increase channel depth in the thalweg and along the adjacent bankline. Revetment is not expected to appreciably change current and circulation patterns.

III. **Normal Water Level Fluctuations.** The structures would have no discernible effects on normal water level fluctuations or overall river stages.

IV. **Actions Taken to Minimize Impacts.** Best Management Practices for construction would be enforced.

C. Suspended Particulate/Turbidity Determinations

I. **Expected Changes in Suspended Particles and Turbidity Levels in Vicinity of Placement Site.** Increases in suspended particulates and turbidity due to construction activities are expected to be greatest within the immediate vicinity of the rock structures. The increased sediment load would be local and minor compared to the natural sediment load of the river. This would cease soon after construction completion. Revetment is designed to prevent bankline erosion, thereby reducing suspended particulate and turbidity levels in the immediate vicinity in the future.

II. **Effects on Chemical and Physical Properties of the Water Column**

a. Light Penetration. There would be a temporary reduction in light penetration until sediments suspended as part of project construction activities settled out of the water column. There would be a minor increase in light penetration in the immediate vicinity of revetment locations in the future due to reduced bankline erosion.
b. Dissolved Oxygen. No adverse effects expected.
c. Toxic Metals and Organics. No adverse effects expected.
d. Aesthetics. Aesthetics of work sites are likely to be adversely affected during construction, but are expected to return to normal after construction.

III. **Effects on Biota.** The project would likely result in some short-term displacement of biota in the immediate vicinity of construction activities due to temporary decreases in water quality and disturbance by construction equipment.

IV. **Actions Taken to Minimize Impacts.** Impacts are anticipated to be minimized by the use of clean, physically stable, and chemically non-contaminating limestone rock for project construction.

D. Contaminant Determinations. It is not anticipated that any contaminants would be introduced or translocated as a result of project activities.

E. Aquatic Ecosystem and Organism Determinations

I. **Effects on Plankton.** The project could have a temporary, minor effect on plankton communities in the immediate vicinity of the project area. This would cease after construction completion.

II. **Effects on Benthos. S**ediments at structure placement sites likely harbor oligochaetes, chironomids, caddisflies, turbellaria, and other macroinvertebrates. Construction activities would eliminate some of these organisms. High densities of hydropsychid caddisflies and other macroinvertebrates would be expected to colonize the large limestone rocks after construction. Fish would be expected to temporarily avoid the area during construction. Greater utilization of the project location by fish is expected after construction due to the expected increase in densities of macroinvertebrates. Fish habitat is expected to improve at the dike placement site due to improved flow, bathymetry, and prey resource conditions. A minor decrease in woody debris inputs into the system is anticipated due to decreased bankline erosion associated with revetment sites. Decreased woody debris would have a minor negative impact on fish and macroinvertebrate communities that utilize this resource for foraging and refuge.

III. **Effects on Nekton.** Nekton would be temporarily displaced during construction activities, but would return shortly after project completion. Greater utilization of the project area by fish may occur after construction due to the expected increase in densities of macroinvertebrates and areas of improved flow and bathymetry.

Decreased woody debris inputs due to decreased bankline erosion would have a minor negative impact on fish and macroinvertebrate communities that utilize this resource for foraging and refuge.

IV. **Effects on Aquatic Food Web.** Temporary reductions in macroinvertebrate and fish communities during construction in the relatively small project area should not significantly impact the aquatic food web in the Middle Mississippi River. Improvements in lower trophic levels (macroinvertebrates) subsequent to project completion should benefit the aquatic food web. Minor negative impacts on fish and macroinvertebrate communities due to reduced woody debris should not significantly impact the aquatic food web.

V. **Effects on Special Aquatic Sites.** There are no special aquatic sites within the project area.

VI. **Threatened and Endangered Species.** Presence of, or use by, endangered and threatened species is discussed in the Environmental Assessment and Biological Assessment. No significant adverse impacts to threatened and endangered species are expected to result from this project.

VII. **Other Wildlife.** The project would likely result in some very localized, short-term displacement of wildlife in the immediate vicinity of construction activities. Displacement would end immediately after construction completion.

VIII. **Actions Taken to Minimize Impacts.** Best Management Practices for construction would be enforced.

F. Proposed Placement Site Determinations

I. **Mixing Zone Determinations.** The fill material is inert and would not mix with the water. The lack of fine particulate typically contained in rock fill and main channel sediments indicates negligible chemical or turbidity effects resulting from the proposed action.

II. **Determination of Compliance with Applicable Water Quality Standards.** Section 401 water quality certifications would be obtained from the states of Illinois and Missouri. All other permits necessary for the completion of the project would be obtained prior to project implementation.

III. **Potential Effects on Human Use Characteristics.** The proposed project would have no adverse impact on municipal or private water supplies; water-related recreation; aesthetics; or parks, national and historic monuments, national seashores, wilderness areas, research sites or similar preserves. During construction the area would not be available for recreational and commercial fishing.

G. Determinations of Cumulative Effects on the Aquatic Ecosystem. Dikes and revetment have been used extensively throughout the Lower, Middle, and Upper Mississippi River System to provide a safe and dependable navigation channel. Due to concerns from natural resource agency partners about the potential cumulative impacts of river training structures, and other actions within the watershed, on the aquatic ecosystem, the St. Louis District has been utilizing innovative river training structures such as offset dikes to increase habitat diversity in the Middle Mississippi River while still maintaining the navigation channel. The District conducts extensive coordination with resource agency and navigation industry partners to ensure that implementation of each project is accomplished effectively from an ecological and navigation viewpoint. Although minor short-term construction-related impacts to local fish and wildlife populations are likely to occur, no significant cumulative impacts on the aquatic ecosystem are identified for the Mosenthein/Ivory Landing Phase 4 Project.

H. Determinations of Secondary Effects on the Aquatic Ecosystem. No adverse secondary effects would be expected to result from the proposed action.

3. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON PLACEMENT

A. No significant adaptations of the 404(b)(1) guidelines were made relative to this evaluation.

B. Alternatives that were considered for the proposed action included:

1. No Action Alternative - The No Action Alternative consists of not constructing any new structures in the project area but continuing to maintain the existing river training structures. Dredging would continue as needed to address the shoaling issues in the project area.
2. Proposed Action - The Proposed Action consists of construction of a rootless dike at RM 173.4 (L) and placement of revetment at four locations from RM 175 (L) to 171 (L).

C. Certification under Section 401 of the Clean Water Act would be obtained from the Missouri Department of Natural Resources and the Illinois Environmental Protection Agency prior to project implementation.

D. The proposed fill activity is in compliance with Applicable Toxic Effluent Standards of Prohibition under Section 307 of the Clean Water Act.

E. No significant impact to threatened or endangered species is anticipated from this project. Prior to construction, full compliance with the Endangered Species Act would be documented.

F. No municipal or private water supplies would be affected by the proposed action, and no degradation of waters of the United States is anticipated.

G. The project is situated along an inland freshwater river system. No marine sanctuaries are involved or would be affected by the proposed action.

H. The materials used for construction would be chemically and physically stable and non-contaminating.

I. The proposed construction activity would not have a significant adverse effect on human health and welfare, recreation and commercial fisheries, plankton, fish, shellfish, wildlife, or special aquatic sites. No significant adverse effects on life stages of aquatic life and other wildlife dependent on aquatic ecosystems are expected to result. The proposed construction activity would have no significant adverse effects on aquatic ecosystem diversity, productivity, and stability. No significant adverse effects on recreational, aesthetic, and economic values would occur.

J. No other practical alternatives have been identified. The proposed action is in compliance with Section 404(b)(1) of the Clean water Act, as amended. The proposed action would not significantly impact water quality and would improve the integrity of an authorized navigation system.

_____ _____

(Date) CHRISTOPHER G. HALL
COL, EN Commanding

Appendix E. Distribution List

The following individuals and organizations received a hard copy mailing of the Public Notice:

Governor Jay Nixon
P.O. Box 720
Jefferson City, MO 65102

The Osage Nation
Assistant Chief Scott Bighorse
627 Grandview
P.O. Box 779
Pawhuska, Ok 74056

Anne Haaker
IL State Historic Preservation Office
Springfield, IL 62701

Russell Bradley
Kickapoo Tribe in Kansas
Chairman
1107 Goldfinch Road
Horton, KS 66439

MDNR Division of State Parks
Planning and Development
PO Box 176
Jefferson City, MO 65102

Yvonne Homeyer
Webster Groves Nature Society
1508 Oriole Lane
St. Louis, MO 63144

Honorable Blaine Luetkemeyer
1118 Longworth HOB
Washington, DC 20515

Senator Gary Forby
903 West Washington, Suite 5
Benton, IL 62812

Honorable Claire McCaskill
5850 A Delmar Blvd
St. Louis, MO 63112

Advisory Council on Historic
Preservation
1100 Pennsylvania Avenue NW, Suite
803
Old Post Office Building
Washington, DC 20004

Kelly Isherwood
5072 Oak Tree Lane
House Springs, MO 63051

Pat Malone
IDNR Natural Resource Review
1 Natural Resource Way
Springfield, IL 62702

Raymond Hopkins
RIAC/ARTCO
P.O. Box 2889
St. Louis, MO 63111

Mike Larson
MDNR
Land Reclamation Program
Jefferson City, MO 65102

Honorable Lacy Clay
6830 Gravois
St. Louis, MO 63116

Honorable Ann Wagner
301 Sovereign Court, Suite 201
Ballwin, MO 63011

Honorable John M. Shimkus
15 Professional Park Drive
Maryville, IL 62062

Representative Ed Schieffer
Missouri House of Representatives
201 West Capitol Avenue
Jefferson City, MO 65101-6806

US Coast Guard Marine Safety Office
Commanding Officer
225 Tully Street
Paducah, KY 42003

Rose M. Schulte
2842 Chadwick Dr.
St. Louis, MO 63121

Honorable Roy Blunt
United States Senator
2502 Tanner Drive – Suite 208
Cape Girardeau, MO 63703

Leon Campbell, Chairman
Iowa Tribe of Kansas and Nebraska
3345B Thrasher Road
White Cloud, Kansas 66094

Jack Norman
906 N. Metter Avenue
Columbia, IL 62236

Donald Rea
City of St. Louis
Water Division
10450 Riverview Drive
St. Louis, MO 63137

Nick Nichols
City of St. Louis Port Authority
1520 Market Street
St. Louis, MO 63103

Timothy V. Johnson, M.C.
IL15
202 N. Prospect Rd., Suite 203
Bloomington, IL 61704

Nellie Keo
Kickapoo Tribe in Kansas
Land/NAGPRA Office
1107 Goldfinch Road
Horton, KS 66439

Hoppies Marine
P.O. Box 44
Kimmwick, MO 63053

Environmental Coordinator
Planning and Compliance Office
Natural Park Service, Midwest Region
601 Riverfront Drive
Omaha, NE 68102-4226

Joseph Standing Bear Schranz
Midwest Soaring
5158 S. Mobile Avenue
Chicago, IL 60638

Great Rivers Environ. Law Center
705 Olive Street, Ste. 614
St. Louis, MO 63101

Mike Diedrichsen
IDNR Natural Resource Review
1 Natural Resource Way
Springfield, IL 62702

Representative Daniel Beiser
528 Henry Street
Alton, IL 62002-2611

Senator John Jones
2929 Broadway
Suite 5
Mt. Vernon, IL 62864

Dave Schulenburg
US EPA
Wetland and Watersheds Section
WW16J
77 W. Jackson Boulevard
Chicago, IL 60604-3590

Senator Larry Bomke
307 Capitol Building
Springfield, IL 62706

Honorable Aaron Schock
235 S. Sixth Street
Springfield, IL 62701

Honorable Sam Graves
906 Broadway
P.O. Box 364
Hannibal, MO 63401

Southern Illinois Sand Company
P.O. Box 262
Chester, IL 62233

David Jones
Environmental Director
Nottawaseppi Huron Band of
Potawatomi
2221 1-1/2 Mike Road
Fulton, MI 49052

Governor Pat Quinn
Office of the Governor
207 State House
Springfield, IL 62706

Honorable William Enyart
23 Public Square
Belleville, IL 62220

Honorable Richard Durbin
525 South 8th Street
Springfield, IL 62703-1601

Senator Mark Kirk
Springfield Senate Office
607 East Adams, Suite 1520
Springfield, IL 62701

Honorable Rodney Davis
2004 Fox Drive
Champaign, IL 61820

Russell Cissell
1075 LeSieur
Portage des Sioux, MO 63373

Patrick J. Lamping
Executive Director
The Jefferson County Port Authority
PO Box 603
Hillsboro, MO 63050

Fay Houghton
Land Management Director
Winnebago Tribe of Nebraska
P.O. Box 687
Winnebago, NE 68071

Mr. Ed Schieffer
183 Thornhill Cemetery Road
Troy, MO 63379

Senator Dale Righter
88 Broadway Avenue, Suite 1
Mattoon, IL 61938-4597

Senator James Clayborne Jr.
Kenneth Hall State Office Building
#10 Collinsville Avenue
East St. Louis, IL 62201

Honorable Jason Smith
2502 Tanner Drive, Suite 205
Cape Girardeau, MO 63703

The following individuals and organizations received e-mail notification of the Public Notice:

Adams, R.
Adrian, D.
Amato, Joel
Andria, Kathy
Atwood, Butch
Bacon, T.
Barnes, Robert
Bax, Stacia
Beardslee, Tom
Bellville, Colette
Bensman, Jim
Boaz, Tracy
Boehm, Gerry
Brandom, Ellen
Brescia, Chris
Brown, Danny
Brown, Doyle
Buan, Steve
Buffalo, Jonathan
Burlingame, Chuck
Byer, J. R.
Caito, J.
Campbell-Allison, Jennifer
Carney, Doug
Clements, Mark
Coder, Justin S.
Crowley, Steve
Cruse, Lester
Darst, E. B.
Deel, Judith
Dewey, Dave
Dock Hardware and Marine Fabrication
Dodd, Harold
Dorothy, Olivia
Dougherty, Mark
Duncan, Cecil
Ebey, Mike
Elmestad, Gary
Enos, Tim
Erickson, Tom
Fabrizio, Christi
Favilla, Christy
Foster, Bill
Goldstein, Jeff

Genz, Greg
Glenn, S.
Goode, Peter
Goodwin, Bill
Greer, Courtney
Gross, Andrea
Hammond, Cheryl
Hanke Terminals
Hanneman, M.
Hansen, Rick
Hansens Harbor
Harding, Scott
Held, Eric
Henleben, Ed
Herschler, Mike
Herzog, Dave
Hilburn, Craig
Hogan-Smith, Shelly
Howard, Chuck
Hubertz, Elizabeth
Hughes, Shannon
Hunter, Andrea
Hussell, B.
Illinois Corn Growers Association
Illinois Department of Natural Resources
Illinois Environmental Protection Agency
Jamison, Larry
Johnson, Erick
Johnson, Frank
Johnson, Tom
Knowles, Kim
Knuth, Dave
Lauer, Steve
Leary, Alan
Leipus, Ed
Leiser, Ken
Lensing, Brian
Lipeles, Maxie
Louis Marine
Mangan, Matthew
Mannion, Clare
Mauer, Paul
Melgin, Wendy
Miller, Kenneth
Miller, Melissa
Missouri Corn Growers Association

Missouri Department of Conservation
Missouri Department of Natural Resources
Muench, Lynn
Muir, T.
Nelson, Lee
Nelson, Rick
Novak, Ron
O'Carroll, J.
Overbey, Dan
Paurus, Tim
Pehler, Kent
Phillip, C.
Pivor, Jeremy
Pondrom, Gary
Popplewell, Mickey
Porter, Jason
Red, Chief John
Reichert, Joe
Reitz, Paul
Reuters Chicago
Rickert, Ron
Roark, Bev
Rodenberg, V.
Rowe, Kelly
Samet, Melissa
Sauer, Randy
Schieffer, Ed
Shepard, Larry
Shoulberg, J.
Slay, Glen
Smith, David
Southeast Missouri Regional Port Authority
Southern Illinois Transfer
Spath, Robert
Stahlman, Bill
Staten, Shane
Sternburg, Janet
Stevens, Mark
Stout, Robert
Streight, Tom
Teah, Philip
Todd, Brian
Tow Inc.
Tyson, J.
Urban, David
U.S. Coast Guard Marine Safety Office

U.S. Environmental Protection Agency Region 7
Weber, Angie
Welge, Owen
Werner, Paul
Wilmsmeyer, Dennis
York Bridge Co.
Zupan, T.